



# AGRORES

IV International Symposium  
and  
XX Scientific-Professional Conference  
of Agronomists of Republic of Srpska



# BOOK OF ABSTRACTS



Bijeljina, March 2 - 6, 2015  
Republic of Srpska, Bosnia nad Herzegovina



# **BOOK OF ABSTRACTS**



**AGRORES**

2015

IV INTERNATIONAL SYMPOSIUM  
AND  
XX SCIENTIFIC-PROFESSIONAL  
CONFERENCE OF AGRONOMISTS  
OF REPUBLIC OF SRPSKA

March 2<sup>nd</sup> – 6<sup>th</sup>, 2015  
Bijeljina, Bosnia and Herzegovina

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March 2<sup>nd</sup> – 6<sup>th</sup>, 2015





# IMPRESSUM

## ORGANIZERS

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Faculty of Agriculture, University of Banjaluka  
*in cooperation with*  
Biotechnical faculty, University of Ljubljana

## SUPPORTED BY

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Ministry of Science and Technology of Republic of Srpska

Ministry of Agriculture, Forestry and Water Management of  
Republic of Srpska

City of Bijeljina

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**AGRORES** 2015



# ***SYMPOSIUM PROGRAMME***

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## **SYMPOSIUM PROGRAMME** PROGRAM RADA

**Monday, March 02, 2015.**  
**Ponedjeljak, 02.03.2015.**

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10:00 - 13:30 **Registration / Registracija učesnika**

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13:30 - 14:00 **Welcome Coctail / Koktel dobrodošlice**

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14:00 - 14:45 **Symposium Opening and Welcome / Otvaranje skupa i pozdravni govori**

**Moskva Hall / Sala Moskva**

Working Committee / Radno predsjedništvo:

Nikola Mičić, Emil Erjavec, Mladen Todorović

Welcome speech of organisers / Uvodno obraćanje organizatora:

Prof. Nikola Mičić, dean, University of Banjaluka, Faculty of Agriculture

prof. dr Nikola Mičić, dekan Poljoprivrednog fakulteta Univerziteta u Banjaluci

Prof. Emil Erjavec, vicedean, University of Ljubljana, Biotechnical faculty

prof. dr Emil Erjavec, prodekan Biotehničkog fakulteta Univerziteta u Ljubljani

Welcome speech of mayor, City of Bijeljina / Uvodno obraćanje gradonačelnika grada Bijeljina

Miće Mičić

Welcome speech of Minister of Science and Technology, Government of Republic of Srpska / Uvodno obraćanje ministra nauke i tehnologije u Vladi Republike Srpske

Prof. Jasmin Komić / prof. dr Jasmin Komić

Welcome speech of Minister of Agriculture, Forestry and Water Management, Government of Republic of Srpska / Uvodno obraćanje ministra poljoprivrede, šumarstva i vodoprivrede u Vladi Republike Srpske

Prof. Stevo Mirjanić / prof. dr Stevo Mirjanić

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14:45 - 15:00 **Press Conference / Konferencija za štampu**

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|               |   |
|---------------|---|
| 15:00 - 17:00 | <b>Plenary Session / Plenarna izlaganja</b><br><b>Moskva Hall / Sala Moskva</b><br>Working Committee / Radno predsjedništvo:<br>Gordana Đurić, William H. Meyers, Miljan Cvetković  |
| 15:00 - 15:30 | Mladen Todorović, CIHEAM – Mediterranean Agronomic Institute of Bari, Italy<br><i>Application of new technologies for eco-efficient water and land management</i><br><i>Primjena novih tehnologija za ekološki efikasnije upravljanje vodom i zemljištem</i>  |
| 15:30 - 16:00 | Nikola Mičić, Faculty of Agriculture, University of Banjaluka, BiH<br><i>Reproductive biology as an open question of agricultural plant production intensivity</i><br><i>Reproduktivna biologija kao otvoreno pitanje intenzivnosti gajenja poljoprivrednih biljaka</i>   |
| 16:00 - 16:30 | Emil Erjavec, Biotechnical Faculty, University of Ljubljana, Slovenia<br><i>Western Balkan agriculture and European Union: Challenges and possible rational concept of adjustments and reforms</i><br><i>Poljoprivreda Zapadnog Balkana i Evropska unija: izazovi i mogući racionalni koncept prilagođavanja</i>  |
| 16:30 - 17:00 | Slavča Hristov, Faculty of Agriculture, University of Belgrade, Serbia<br><i>The basic principles of dairy cattle welfare plan creation and implementation</i><br><i>Osnovni principi kreiranja i implementacije plana dobrobiti mliječnih goveda</i>   |
| 17:00 - 17:30 | <b>Discussion on Plenary Session / Diskusija po plenarnim izlaganjima</b>   |
| 17:30 - 19:30 | <b>Round Table / Okrugli sto</b><br><b>St. Petersburg Hall / Sala St. Petersburg</b><br><i>"Agricultural policy and work of Think tank as a tool for improvement of public policy"</i> organized by ACED (Agency for Cooperation, Education and Development)<br><i>"Poljoprivredne politike i rad Think Tank-a kao sredstva za unapređenje javnih politika"</i><br>u organizaciji Agencije za saradnju, edukaciju i razvoj (ACED)<br>Introductory speakers / Uvodničari: Emil Erjavec, Željko Vaško<br>Moderators / Moderatori: Miodrag Matavulj, Olja Radlović |
| 19:00 - 21:00 | <b>Dinner / Večera</b>  |

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**Tuesday, March 03, 2015.**  
**Utorak, 03.03.2015.**

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|               |   |
|---------------|---|
| 08:30 - 09:00 | <b>Registration / Registracija učesnika</b> |
|---------------|---|

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**Section: Plant Sciences****Sekcija: Biljne nauke**

Moskva Hall / Sala Moskva

Working Committee / Radno predsjedništvo:

Desimir Knežević, Novo Pržulj, Danijela Kondić

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09:00 - 09:30 **Introductory Lecture / Uvodno predavanje**  
AGRICULTURAL DEVELOPMENT IN CHINA: EXPERIENCES  
IN FRUIT CROPS ADVISORY SERVICE  
K. Hrotkó

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09:30 - 11:50 **Subsection: Crop Science**  
**Podsekcija: Ratarstvo**  
**Oral Presentations / Usmene prezentacije**

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09:30 - 09:50 MODERN BREEDING OF CEREAL PLANTS FOR FOOD SECURITY  
D. Knežević, D. Kondić, A. Yu. Dragović, S. Srdić, N. Mičić

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09:50 - 10:00 INFLUENCE OF YEAST S  
TRAIN ON STANUSINA CHEMICAL COMPOSITION AND  
SENSORIAL ANALYSIS  
D. Nedelkovski, K. Beleski, A. Serafimoska, K. Boskov, G. Milanov, M.  
Taseska Gjorgijevski, B. Korunoska

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10:00 - 10:10 THE DYNAMICS OF DRY MATTER ACCUMULATION IN  
ABOVEGROUND VEGETATIVE PART OF THE PLANT AND EAR OF  
CORN (*Zea mays* L.)  
DINAMIKA AKUMULACIJE SUVE MATERIJE U NADZEMNOM  
VEGETATIVNOM DIJELU BILJKE I KLIPU KUKURUZA (*Zea mays*  
L.)  
D. Kondić, D. Knežević, S. Marinković, S. Kantar

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10:10 - 10:20 GENETIC SIMILARITY OF MAIZE INBRED LINES BASED ON RAPD  
MARKERS  
GENETIČKA SLIČNOST INBRED LINIJA KUKURUZA NA OSNOVU  
RAPD MARKERA  
S. Mladenović Drinić, D. Kovačević, A. Nikolić, M. Filipović, Z. Čamdžija

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10:20 - 10:30 IMPACT OF DIFFERENT NUTRIENT SUPPLY ON THE WEED  
FLORA IN MAIZE CULTIVATION  
É. Lehoczky, M. Kamuti, N. Mazsu, P. Csathó

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10:30 - 10:40 EFFECT OF CROP ROTATION ON MAIZE PRODUCTIVE  
CHARACTERISTICS  
I. Spasojević, M. Simić, D. Kovačević, Ž. Dolijanović, V. Dragičević, M.  
Brankov

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|               |  |
|---------------|--|
| 10:40 - 10:50 | THE EFFECT OF NITROGEN FERTILIZATION ON DRY MATTER YIELD OF ALFALFA AND LEGUME-GRASS MIXTURES<br>UTICAJ ĐUBRENJA AZOTOM NA PRINOS JEŽEVICE U MONOKULTURI I U SMEŠI SA LUCERKOM I LIVADSKIM VIJUKOM<br>A. Simić, Z. Tomić, Z. Bijelić, S. Vučković, V. Mandić, D. Ružić Muslić                  |
| 10:50 - 11:00 | WEED VEGETATION OF CORN IN THE REGION OF SEMBERIJA<br>KOROVSKA VEGETACIJA KUKURUZA NA PODRUČJU SEMBERIJE<br>R. Stepić, M. Dugonjić, V. Milošević, N. Stošić, Ljiljana Tanasić  |
| 11:00 - 11:10 | BIOMASS YIELD AND QUALITY PARAMETERS OF SELECTED RYEGRASS ( <i>Lolium perenne</i> L.) POPULATIONS<br>PRINOS BIOMASE I PARAMETRI KVALITETA SUVE MATERIJE ODABRANIH POPULACIJA ENGLESKOG LJULJA ( <i>Lolium perenne</i> L.)<br>Ž. Lakić, V. Svetko   |
| 11:10 - 11:20 | THE INFLUENCE OF THE STRUCTURE OF TRANSPORT TRAIN AND THE DISTANCE OF THE PLOT ON THE TRANSPORT EFFICIENCY<br>UTICAJ STRUKTURE TRANSPORTNOG VOZA I UDALJENOSTI PARCELE NA EFIKASNOST TRANSPORTA<br>B. Railić, Z. Maličević, D. D. Mitrović, Lj. Drinić   |
| 11:20 - 11:30 | CONTRIBUTION OF STORED PREANTHESIS ASSIMILATE TO GRAIN YIELD IN SPRING BARLEY<br>ZNAČAJ REZERVNIH ORGANSKIH MATERIJA ZA PRINOS ZRNA JAROG JEČMA<br>N. Pržulj, V. Momčilović, M. Miroslavljević, V. Radić   |
| 11:30 - 12:00 | <b>Coffee break / Kafe pauza</b>   |
| 12:00 - 13:30 | <b>Subsection: Plant Protection</b><br><b>Podsekcija: Zaštita bilja</b><br><b>Oral presentations / Usmene prezentacije</b><br>Working Committee / Radno predsjedništvo:<br>Snježana Hrnčić, Duška Delić, Danijela Pavlović   |
| 12:00 - 12:20 | PHYTOPLASMA DISEASES OF POME FRUITS IN NURSERIES OF REPUBLIC OF SRPSKA<br>D. Delić, M. Radulović, B. Lolić, G. Đurić   |
| 12:20 - 12:30 | COMPARATIVE REVIEW OF HARMFUL ORGANISMS IN THE UNIVERSITY PARKS IN BANJA LUKA AND PODGORICA<br>UPOREDNI PREGLED ŠTETNIH ORGANIZAMA U UNIVERZITETSKIM PARKOVIMA BANJALUKE I PODGORICE<br>S. Hrnčić, G. Đurić, B. Lolić, S. Radonjić, T. Perović, D. Delić, B. Nježić, S. Bodružić, J. Davidović |

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|---------------|---|
| 12:30 - 12:40 | MASS OCCURRENCE OF POWDERY MILDEW ON PLANE TREES IN MONTENEGRO IN 2014<br>MASOVNA POJAVA PEPELNICE NA PLATANIMA U CRNOJ GORI TOKOM 2014. GODINE<br>J. Latinović, N. Latinović   |
| 12:40 - 12:50 | TOSPOVIRUSES CURRENT STATUS IN BOSNIA AND HERZEGOVINA AND POSSIBLE MANAGEMENT<br>D. Delić, B. Lolić, A. Kohnić, V. Todorović  |
| 12:50 - 13:00 | MEDITERRANEAN CARNATION TORTRIX MOTH <i>Cacoecimorpha pronubana</i> Hübner ( <i>Lepidoptera: Tortricidae</i> ) IN NURSERIES IN MONTENEGRO<br>S. Radonjić, S. Hrnčić   |
| 13:00 - 13:10 | THE PRESENCE OF <i>Phytophthora rubi</i> IN RASPBERRY PRODUCTION<br>PRISUSTVO <i>Phytophthora rubi</i> U PROIZVODNJI MALINE<br>B. Lolić, D. Delić   |
| 13:10 - 13:20 | VIPS – AN OPEN SOURCE TECHNOLOGY PLATFORM FOR PROGNOSIS AND DECISION SUPPORT AND ITS IMPLEMENTATION IN BOSNIA AND HERZEGOVINA<br>T-E. Skog, M. Cucak, B. Nordskog, H. Eikemo, H. Hole, A. F. Schjøll, J. Netland, N. Trandem, T. Rafoss, R. Meadow                              |
| 13:20 - 13:30 | EFFECTIVENESS OF SOME FUNGICIDES FOR CONTROL OF <i>Botrytis squamosa</i><br>M. Koščica, J. Hrustić, M. Mihajlović, V. Trkulja, V. Todorović, B. Tanović   |
| 13:30 – 13:40 | DETECTION OF VIRUSES PRESENCE IN FRUIT COLLECTION IN GENE BANK IN REPUBLIC OF SRPSKA<br>VIRUSNI STATUS PRINOVA U KOLEKCIJI VOĆAKA U BANCI GENA REPUBLIKE SRPSKE<br>Đurić G., Lolić B., Kajkut Zeljković M., Delić D., Koprivica M., Radulović M., Nikolić P., Mičić N., Erić Ž. |
| 13:30 - 15:00 | <b>Lunch / Ručak</b>  |
| 15:00 - 16:00 | <b>Subsection: Vegetable Growing</b><br><b>Podsekcija: Povrtarstvo</b><br><b>Oral presentations / Usmene prezentacije</b><br>Working Committee / Radno predsjedništvo:<br>Đorđe Moravčević, Mirjana Vasić, Vida Todorović   |
| 15:00 - 15:20 | HEAVY METALS AND HEALTH SAFETY OF VEGETABLES<br>I. Maksimović, M. Putnik Delić, Ž. Ilin, B. Adamović, M. Miroslavljević, D. Lazić, R. Kastori   |

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|               |   |
|---------------|---|
| 15:20 - 15:30 | INFLUENCE OF GRAFTING AND SUBSTRATE SALINITY ON MORPHOLOGICAL CHARACTERISTICS OF TOMATO<br>UTICAJ KALEMLJENJA I ZASLANJENOSTI SUPSTRATA NA MORFOLOŠKE OSOBINE PARADAJZA<br>V. Todorović, I. Koleška, R. Oljača, B. Bosančić, S. Srdić   |
| 15:30 - 15:40 | CORRELATION OF MORPHOLOGICAL, PRODUCTIVE AND CHEMICAL CHARACTERISTICS OF LOCAL POPULATIONS OF SPRING GARLIC<br>KORELATIVNI ODNOSI MORFOLOŠKIH, PROIZVODNIH I HEMIJSKIH OSOBINA DOMAĆIH POPULACIJA BELOG LUKA PROLETNJAKA<br>Đ. Moravčević, J. Gvozdanović Varga, A. Stojanović, D. Danojević, D. Beatović                                   |
| 15:40 - 15:50 | BEAN IN ORGANIC AND CONVENTIONAL FARMING<br>PASULJ U SISTEMIMA ORGANSKE I KONVENCIONALNE POLJOPRIVREDE<br>M. Vasić, S. Šeremešić, G. Dozet, J. Marinković, S. Đurić, G. Cvijanović, V. Ugrenović, M. Manojlović   |
| 15:50 - 16:00 | UTICAJ PRIMJENE RAZLIČITIH BILJNIH HORMONA NA PARAMETRE RAZVOJA PRESADNICA PAPRIKE ( <i>Capsicum annum</i> L. cv. 'Sivrija')<br>INFLUENCE OF DIFFERENT PLANT HORMONES APPLICATION ON PARAMETERS OF PEPPERS SEEDLINGS ( <i>Capsicum annum</i> L. cv. 'Sivrija')<br>S. Murtić, H. Čivić, A. Ahmić, L. Karić, E. Omanović Mikličanin, D. Gadžo |
| 16:15 - 16:45 | <b>Poster Presentations: Plant Sciences</b><br><b>Poster prezentacije: Biljne nauke</b><br>Moskva Hall / Sala Moskva  |

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**Subsection: Crop Science**  
**Podsekcija: Ratarstvo**

- 
1. EFFECT OF THE FOLIAR APPLICATION OF BORON, PHOSPHORUS AND POTASSIUM ON THE GRAIN YIELD OF FORAGE PEAS ON ACID SOIL  
UTICAJ FOLIJARNE PRIMENE BORA, FOSFORA I KALIJUMA NA PRINOS ZRNA STOČNOG GRAŠKA NA KISELOM ZEMLJIŠTU  
D. Tomić, N. Bokan, V. Stevović, D. Đurović, M. Madić
  2. QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF CLOVER-GRASS MIXTURES IN HIGHLAND AREA  
B. Đurić, M. Drinić, A. Kralj, Đ. Gatarić, V. Radić
  3. THE RESPONSE OF MAIZE LINES TO HERBICIDES AND FOLIAR FERTILIZER  
M. Brankov, M. Simić, S. Vrbničanin, V. Dragičević, I. Spasojević
-



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4. ANALYSIS OF SEEDS QUALITY OF DIFFERENT VARIETIES OF WHEAT  
ANALIZA KVALITETA SEMENA RAZLIČITIH SORATA PŠENICE  
J. Knežević, D. Knežević, M. Aksić, D. Beković, D. Đokić, J. Stojadinović
- 
5. YIELD OF WINTER BARLEY DEPENDING ON FERTILIZING SISTEM OF ACID SOILS  
M. Biberdžić, S. Barać, B. Knežević, S. Stojković, D. Beković
- 
6. GRAIN YIELD OF WINTER WHEAT IN DIFFERENT CROPPING SYSTEMS  
Ž. Dolijanović, D. Kovačević, S. Oljača, Z. Jovović, I. Jug
- 
7. ANALYSIS OF TRIALS WITH SOYBEAN IN EXTREME WEATHER CONDITIONS IN 2013 AND 2014  
ANALIZA OGLEDA NA SOJI U EKSTREMNIM VREMENSKIM USLOVIMA U 2013 I 2014. GODINI  
M. Nožinić, N. Pržulj, V. Đorđević, Ž. Lakić, Š. Suljkanovic, D. Spremo
- 
8. YIELD COMPONENTS AND PROTEIN CONTENT IN TWO SPELT WHEAT CULTIVARS (*Triticum spelta* L.)  
KOMPONENTE PRINOSA I SADRŽAJ PROTEINA KOD DVE SORTE PŠENICE KRUPNIK (*Triticum spelta* L.)  
S. Janković, J. Ikanović, Ž. Dolijanović, S. Rakić, D. Mandić, Lj. Živanović
- 
9. THE EFFECT OF SOWING DATE, SEEDING RATES AND NITROGEN RATES ON PRODUCTION AND TECHNOLOGICAL CHARACTERISTICS OF CULTIVARS OF SPRING OATS "SANA"  
UTICAJ ROKA SJETVE, SJETVENE NORME I KOLIČINE AZOTA NA PROIZVODNE I TEHNOLOŠKE OSOBINE SORTE PROLJETNE ZOBI „SANA“  
D. Mandić, G. Đurašinović, R. Dimitrić, I. Mihić
- 

**Subsection: Plant Protection**  
**Podsekcija: Zaštita bilja**

- 
1. DISTRIBUTION OF *PLUM POX VIRUS* IN COMMERCIAL NURSERIES IN REPUBLIC OF SRPSKA  
D. Delić, B. Lolić, M. Radulović, G. Đurić
- 
2. BEETLE FAUNA (*Coleoptera*) IN HONEY BEE HIVES WITH SPECIAL REFERENCE TO SMALL HIVE BEETLE *Aethina tumida* Murray IN SERBIA  
A. Zatezalo, S. Rasic, M. Mladenovic
- 
3. BARK BEETLES ON SPURCE TREES IN PARK COMPLEX OF PROTECTED AREA „UNIVERSITY CITY“ BANJA LUKA  
POTKORNJACI NA SMRČAMA U PARKOVSKOM KOMPLEKSU ZAŠTIĆENOG PODRUČJA „UNIVERZITETSKI GRAD“ BANJA LUKA  
S. Bodružić, S. Hrnčić, G. Đurić, M. Tabaković Tošić, M. Ševarika
- 
4. THE WESTERN CORN ROOTWORM *Diabrotica virgifera virgifera* LeConte (*Coleoptera: Chrysomelidae*) - CURRENT STATUS IN MONTENEGRO  
S. Hrnčić, S. Radonjić
- 
5. DISTRIBUTION OF THE NORTHERN ROOT-KNOT NEMATODE *Meloidogyne hapla* IN REPUBLIC OF SRPSKA  
P. Nikolić, M. Bjelobrč, B. Nježić
-



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6. RESULTS OF HERBICIDE EFFICIENCY IN SOYA CROP OF COOPERATIVE PROGRAM DANUBE – SOYA  
REZULTATI ISPITIVANJA EFIKASNOSTI HERBICIDA U USJEVU SOJE KOOPERATIVNOG PROGRAMA DUNAV- SOJA  
V. Trkulja, M. Nožinić, G. Babić, B. Ćurković, J. Stojčić, D. Spremo
- 

**Subsection: Vegetable Growing**  
**Podsekcija: Povrtarstvo**

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1. CROP COEFFICIENT OF MELON GROWN UNDER MULCH AND NON MULCH CONDITIONS IN POLICORO (SOUTHERN ITALY)  
N. Ćereković, M. Todorović, R.L. Snyder, S. Srdic, F. Boari, B. Pace, V. Cantore
- 
2. ANTIMICROBIAL, ANTIOXIDANT ACTIVITIES AND PHYTOCHEMICAL SCREENING OF THE VEGETABLE EXTRACTS  
J. Mladenović, R. Pavlović, J. Zdravković, M. Đurić
- 
3. CHANGES IN ACTIVITIES AND ISOENZYME PROFILE OF SUPEROXIDE DISMUTASE IN THE CELLS OF ROOT AND LEAVES OF BEANS (*Phaseolus vulgaris*) UNDER THE INFLUENCE OF HIGH CONCENTRATIONS OF Cu AND Zn  
PROMJENE U AKTIVNOSTI I IZOENZIMSKOM PROFILU SUPEROKSID DISMUTAZA U ĆELIJAMA KORIJENA I LISTA PASULJA (*Phaseolus vulgaris*)  
POD UTICAJEM POVIŠENIH KONCENTRACIJA Cu I Zn  
D. Hasanagic, T. Veselić, M. Boroja, B. Kukavica
- 

**Subsection: Fruit Growing**  
**Podsekcija: Voćarstvo**

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1. EFFECT OF POLLENISER ON INITIAL AND FINAL FRUIT SET OF APPLE CULTIVARS  
UTICAJ OPRAŠIVAČA NA INICIJALNO I FINALNO ZAMETANJE PLODOVA SORTI JABUKE  
M. Lukić, S. Marić, N. Milošević
- 
2. DISTRIBUTION OF LENTICELS ON THE FRUIT OF OLD APPLE CULTIVARS  
ZASTUPLJENOST LENTICELA NA PLODU STARIH SORTI JABUKE  
I. Kecman, G. Đurić, B. Pašalić, N. Mičić
- 
3. MORPHOLOGICAL AND ANATOMICAL CHARACTERISTICS OF APPLE ROOTSTOCK SHOOTS  
S. Stojnić, G. Đurić, M. Cvetković, N. Mičić
- 
4. INFLUENCE OF TRAINING SYSTEM ON YIELD AND FRUIT QUALITY OF APPLE CV. 'BRAEBURN'  
T. Arsov, M. Kiprijanovski, V. Gjamovski
- 
5. TEMPERATURE AND ITS INFLUENCE ON FERTILITY IN SOME CULTIVARS OF APPLES  
TEMPERATURA VAZDUHA I NJEN UTICAJ NA RODNOST KOD NEKIH SORTI JABUKE  
M. Kulina, M. Radović
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6. CHANGE SKIN COLOR OF PEAR (*Pyrus communis L.*) DURING STORAGE  
PROMJENA BOJE POKOŽICE PLODA KRUSKE (*Pyrus communis L.*) TOKOM  
SKLADIŠTENJA  
S. Stanivuković, D. Civčić, G. Đurić, B. Pašalić, B. Bosančić
- 
7. PHENOLOGICAL PROPERTIES OF CORNELIAN CHERRY (*Cornus mas L.*)  
VARIETIES AND SELECTIONS UNDER THE CONDITIONS OF GORNJE  
POLIMLJE REGION  
FENOLOŠKE OSOBINE SORTI I SELEKCIJA DRIJENA (*Cornus mas L.*) U  
USLOVIMA GORNJEG POLIMLJA  
V. Jaćimović, Đ. Božović
- 
8. TECHNOLOGICAL VALUE OF DIFFERENT VARIETIES OF CHERRY FOR  
COMPOTE PRODUCTION  
TEHNOLOŠKA VRIJEDNOST RAZLIČITIH SORTI TREŠNJE ZA PRERADU U  
KOMPOT  
N. Zavišić, Ž. Rosić
- 

**Subsection: Viticulture**  
**Podsekcija: Vinogradarstvo**

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1. STATE OF AND CONDITIONS FOR VITICULTURE DEVELOPMENT IN BOSNIA  
AND HERZEGOVINA  
T. Banjanin, S. Berjan, V. Milic, H. El Bilali
- 
2. FERTILITY CHARACTERISTICS OF NEWLY INTRODUCED INTERSPECIES  
GRAPEVINE VARIETIES IN KOZARA VINEYARDS REGION  
KARAKTERISTIKE RODNOSTI NOVO INTRODUKOVANIH INTERSPECIES  
SORTI VINOVE LOZE U USLOVIMA KOZARAČKOG VINOGORJA  
D. Mijatović, T. Jovanović Cvetković, B. Prpić, A. Slavnić
- 

**Section: Sustainable Management of Natural Resources**  
**Sekcija: Održivo upravljanje prirodnim resursima**  
**Oral Presentations / Usmene prezentacije**

St. Peterburg Hall / Sala St. Peterburg  
Working Committee / Radno predsjedništvo:  
Hamid Čustović, Mladen Todorović, Sretenka Srdić

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- 09:00 - 09:30 **Introductory Lecture/ Uvodno predavanje**  
SUSTAINABLE MANAGEMENT OF LAND AS A NATURAL  
RESOURCE IN BOSNIA AND HERZEGOVINA  
ODRŽIVO UPRAVLJANJE ZEMLJIŠTEM KAO PRIRODNIM  
RESURDOM U BOSNI I HERCEGOVINI  
Čustović H., Kovačević Z., Ljuša M.
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- 09:30 - 10:40 **Oral Presentations / Usmene prezentacije**
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| 09:30 - 09:40  | CLIMATIC IMPACTS ON THE PERFORMANCE OF SOME FIELD CROP SPECIES IN HUNGARY<br>Jolánkai M., Tarnawa A., Kis J., Horváth C., Pósa B., Kassai K.  |
| 09:40 - 09:50  | IMPACT OF DRINA AND SAVA RIVERS FLOODING ON POLLUTION OF AGRICULTURAL LAND WITH HEAVY METALS AND ORGANIC POLLUTANTS<br>UTICAJ PLAVLJENJA SAVE I DRINE NA ZAGAĐENJE POLJOPRIVREDNOG ZEMLJIŠTA TEŠKIM METALIMA I ORGANSKIM ZAGAĐIVAČIMA<br>Predić T., Nikić-Nauth P., Cvijanović T., Docić Kojadinović T., Radanović B., Jokić D. |
| 09:50 - 10:00  | COMPARATIVE INVESTIGATION OF BULGARIAN SPECIES FROM GENUS MENTHA, GROWN IN EX SITU AND IN VITRO CONDITIONS"<br>Uzundzhaliyeva K., Ruseva R.   |
| 10:00 - 10:10  | WATER AND SEDIMENT QUALITY MONITORING OF SMALLER WATER COURSES IN VOJVODINA – CASE STUDY OF TATARNICA MONITORING KVALITETA VODE I SEDIMENTA MANJIH VODOTOKA U VOJVODINI - PRIMER VODOTOKA TATARNICA<br>Savić R., Josimov Dunderški J., Belić A., Ondrašek G., Letić Lj., Nikolić V.   |
| 10:10 - 10:20  | AWARENESS OF THE POPULATION IN BITOLA, R. MACEDONIA WITH THE ARTIFICIAL SWEETENER ASPARTAME<br>Gacovski Ž., Čilev G., Petrovska B. Gacovska M., Hristovska T.   |
| 10:20 - 10:30  | STUDY OF THE PRESENCE OF INVASIVE WEED SPECIES IN THE RUDERAL AREA OF PANČEVAČKI RIT (BELGRADE)<br>Anđelković A., Pavlović D., Marisavljević D.   |
| <hr/> <b>13:30 - 15:00 Lunch / Ručak</b> <hr/>   |   |
| <hr/> <b>16:00 - 16:45 Poster Presentations: Sustainable Management of Natural Resources</b><br><b>Poster prezentacije: Održivo upravljanje prirodnim resursima</b><br>Moskva Hall / Sala Moskva <hr/> |   |
| 1.   | THE CONTENT OF HEAVY METALS IN THE SOILS IN THE NORTHEASTERN AREA OF BOSANSKA KRAJINA<br>SADRŽAJ TEŠKIH METALA U ZEMLJIŠTIMA SJEVEROISTOČNOG DIJELA BOSANSKE KRAJINE<br>Mihajlović D., Antić Mladenović S., Radanović D., Bojanić V., Srdić S.  |

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2. IN VITRO CONSERVATION OF POTATO (*Solanum tuberosum*) ACCESSIONS IN THE GENE BANK OF REPUBLIC OF SRPSKA  
IN VITRO KONZERVACIJA PRINOVA KROMPIRA (*Solanum tuberosum*) U BANCI GENA REPUBLIKE SRPSKE  
Kajkut Zeljković M., Đurić G., Kondić D.

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  3. UTILIZATION OF PLANT GENETIC RESOURCES IN PEANUT BREEDING PROGRAM OF BULGARIA  
Stamatov S., Velcheva N., Deshev M.

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  4. IMPACT OF WEATHER ON CORN FIELD IN SEMBERIJA IN THE YEARS 2007, 2010, 2012 AND 2014  
UTICAJ EKTREMNIH VREMENSKIH PRILIKA NA KUKURUZ NA PODRUČJU SEMBERIJE ZA 2007, 2010, 2012. I 2014. GODINU  
Supić D., Đorđević M., Čizmić I.

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  5. POSSIBILITIES FOR SUSTAINABLE USE OF POTATO GENETIC RESOURCES IN MONTENEGRO  
MOGUĆNOSTI ODRŽIVOG KORIŠĆENJA GENETIČKIH RESURSA KROMPIRA U CRNOJ GORI  
Jovović Z., Dolijanović Ž., Mitrović D., Poštić D., Šilj M.

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  6. EFFECT OF FERTILIZATION REGIMES ON WINTER WHEAT YIELDS AND SOIL FERTILITY  
Jelić M., Milivojević J., Djekić V., Paunović A., Madić M., Dugalić G., Biberdžić M.

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  7. DETERMINING THE PRESENCE AND REPRESENTATION OF WILD FRUIT TREES IN THE STARCEVICA FOREST PARK  
UTVRĐIVANJE PRISUSTVA I ZASTUPLJENOSTI SAMONIKLIH VRSTA VOĆAKA U PARK ŠUMI STARČEVICA  
Antić M., Đurić Đ., Šumatić N., Travar J.

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  8. SOIL FERTILITY OF FAMILY COMMERCIAL FARMS IN THE REPUBLIC OF SRPSKA  
PLODNOST ZEMLJIŠT PORODIČNIH KOMERCIJALNIH GAZDINSTAVA U REPUBLICI SRPSKOJ  
Predić T., Radanović B., Nikić-Nauth P., Cvijanović T., Docić-Kojadinović T., Jokić D.

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  9. DEVELOPMENT OF LAND CAPABILITY CLASSIFICATION SYSTEMS IN REPUBLIC OF SRPSKA HARMONISED WITH THE APPROACH IN OTHER COUNTRIES AND THE EU  
IZRADA METODA BONITIRANJA ZEMLJIŠTA U REPUBLICI SRPSKOJ USKLAĐENIH SA DRUGIM ZEMLJAMA I EU  
Garača D., Marković M.

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  10. THE EFFECTS OF THE CONDUCTED LAND CONSOLIDATION PROCESS IN THE BASIC CADSTRE UNIT VELIKO SREDIŠTE  
Benka P., Grabić J., Bezdán A., Zarić D., Zemunac R.
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16:45 - 17:15 **Discussion on Oral and Poster Presentations:  
Plant Sciences and Sustainable Management of Natural Resources**  
**Diskusija po usmenim i poster prezentacijama sekcija:  
Biljne nauke i Održivo upravljanje prirodnim resursima**  
Moderators of Plant Sciences Section / Moderatori sekcije Biljne nauke: Desimir Knežević; Miljan Cvetković; Mirjana Vasić; Nada Parađiković; Duška Delić; Milenko Blesić;  
Moderator of Sustainable Management of Natural Resources Section / Moderator sekcije Prirodni resursi: Sretenka Srdić

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17:15 - 17:30 **Coffee Break / Kafe pauza**

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17:30 - 19:00 **Round Table / Okrugli sto**  
St. Peterburg Hall / Sala St. Peterburg  
*"Seed and Plant Nursery Production in BiH – Status, Perspectives and Challenges"*  
*"Sjemenska i rasadnička proizvodnja u BiH - stanje, perspektive i izazovi"*  
Moderator / Moderator: prof. dr Gordana Đurić,  
Introductory Lecturers / Uvodničari:  
Novo Pržulj, Danijela Kondić: *"The List of Varieties and Varietal Policy"* / *"Sortna politika i sortne liste"*  
Jelena Davidović, Tatjana Jovanović Cvetković: *"Analysis of Bosnia and Herzegovina Legislative"* / *"Pregled legislative u BiH"*

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19:00 - 20:15 **Dinner / Večera**

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20:30 **Theater Performance / Pozorišna predstava**  
*"My Best Friend's Wife"*, comedy by Branislav Nušić / "Žena mog najboljeg druga", komedija Branislava Nušića  
Teatar Ubuntu

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**Wednesday, March 04, 2015.**  
**Srijeda, 04.03.2015.**

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08:30 - 09:00 **Registration / Registracija učesnika**

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**Section: Plant Sciences**  
**Sekcija: Biljne nauke**  
Moskva Hall / Sala Moskva

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09:00 - 11:20 **Subsection: Fruit Growing**  
**Podsekcija: Voćarstvo**  
**Oral Presentations / Usmene prezentacije**  
Working Committee / Radno predsjedništvo:  
Tomo Milošević, Viktor Gjamovski, Miljan Cvetković

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| 09:00 - 09:20 | PERSIAN WALNUT ( <i>Juglans regia</i> L.) BREEDING AT NARIC FRUITCULTURE RESEARCH INSTITUTE<br>G. Bujdosó, F. Izsépi, K. Szügyi - Bartha, P. Szentiványi  |
| 09:20 - 09:30 | META-ANALYSIS AND THE COMBINED ANALYSIS OF VARIANCE OF THE STUDIES WITH BIOSTIMULATOR TREATMENT IN APPLE<br>B. Bosančić, M. Pecina, N. Mičić  |
| 09:30 - 09:40 | DISTRIBUTION OF SOME MICRO AND MACRO ELEMENTS IN LEAF AND FRUITS AT APPLE CV. "GRANNY SMITH" GRAFTED ON NINE DIFFERENT ROOTSTOCKS<br>V. Gjamovski, M. Kiprijanovski, K. Baceva, T. Arsov, T. Stafilov   |
| 09:40 - 09:50 | THE IMPACT OF NON-STANDARD FERTILIZERS ON YIELD, POMOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF APPLES<br>H. Waisi, B. Nikolić, V. Jovanović, S. Đurović, Z. Milićević  |
| 09:50 - 10:00 | MICROSPOROGENESIS OF SWEET CHESTNUT ( <i>Castanea sativa</i> Mill.) IN POTKOZARJE REGION<br>MIKROSPOROGENEZA PITOMOG KESTENA ( <i>Castanea sativa</i> Mill.) U REGIJI POTKOZARJA<br>N. Mičić, M. Čopić, G. Đurić, M. Cvetković                            |
| 10:00 - 10:10 | PHENOLOGICAL AND POMOLOGICAL PROPERTIES OF OLD APPLE VARIETIES IN NORTH MONTENEGRO<br>FENOLOŠKE I POMOLOŠKE OSOBINE STARIH SORTI JABUKE U SJEVERNOJ CRNOJ GORI<br>Đ. Božović, V. Jaćimović, B. Lazović, M. Adakalić                                       |
| 10:10 - 10:20 | PRODUCTIVE TRAITS OF SOME GERMAN PLUM VARIETIES IN THE FIRST YEARS AFTER PLANTING<br>N. Milošević, I. Glišić, M. Lukić, M. Đorđević   |
| 10:20 - 10:30 | THE INFLUENCE OF ROOTSTOCK ON VIGOUR, YIELD AND CHARACTERISTICS OF FRUIT OF PLUM CULTIVARS<br>UTICAJ PODLOGE NA BUJNOST, RODNOST I OSOBINE PLODA SORTI ŠLJIVE<br>R. Ilić, I. Glišić, T. Milošević, G. Paunović, I. Glišić, M. Mitrović                    |
| 10:30 - 10:40 | VEGETATIVE GROWTH, PRODUCTIVITY AND FRUIT QUALITY OF APRICOTS AS AFFECTED BY ROOTSTOCK OR INTER-STEM VEGETATIVNI RAST, PRODUKTIVNOST I KVALITET PLODA KAJSIJE U ZAVISNOSTI OD PODLOGE ILI MEĐUPODLOGE<br>T. Milošević, N. Milošević, I. Glišić, R. Ilić   |
| 10:40 - 10:50 | STATE OF NURSERY PRODUCTION IN THE REPUBLIC OF SRPSKA AND OVERVIEW OF LEGISLATION IN THIS DOMAIN<br>STANJE RASADNIČKE PROIZVODNJE U REPUBLICI SRPSKOJ I PREGLED LEGISLATIVE U TOJ OBLASTI<br>J. Davidović, G. Đurić, S. Zeljković, T. Jovanović Cvetković |

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| 10:50 - 11:00 | FORECASTING MODEL APPLICATION IN RISK ASSESSMENT OF SECONDARY APPLE SCAB ( <i>Venturia inaequalis</i> ) INFECTIONS ON APPLE FRUITS IN 2014. IN THE REGION OF POTKOZARJE<br>PRIMJENA PROGNOZNOG MODELA U ANALIZI RIZIKA OD SEKUNDARNIH INFEKCIJA ČAĐAVOM KRASTAVOŠĆU ( <i>Venturia inaequalis</i> ) NA PLODOVIMA JABUKE U 2014. NA PODRUČJU POTKOZARJA<br>M. Jokić |
| 11:00 - 11:10 | POPULATION CHARACTERISTICS OF WALNUT IN THE BANJA LUKA REGION<br>KARAKTERISTIKE POPULACIJE ORAHA NA PODRUČJU BANJALUČKE REGIJE<br>Lj. Radoš, D. Novaković   |
| 11:10 - 11:20 | VEGETATIVE POTENTIAL OF WALNUT CULTIVARS GRAFTED ON DIFFERENT ROOTSTOCKS<br>M. Velickovic, C. Oparnica, D. Radivojevic  |
| 11:20 - 11:40 | <b>Coffee break / Kafe pauza</b>  |
| 11:40 - 12:50 | <b>Subsection: Viticulture</b><br><b>Podsekcija: Vinogradarstvo</b><br><b>Oral Presentations / Usmene prezentacije</b><br>Working Committee / Radno predsjedništvo:<br>Dragutin Mijatović, Klime Beleski, Tatjana Jovanović Cvetković, Dragan Nikolić   |
| 11:40 - 12:00 | CHROMATIC CHARACTERISTICS OF WINES OF DIFFERENT AGES<br>HROMATSKE KARAKTERISTIKE VINA RAZLIČITE STAROSTI<br>M. Blesić, S. Hodžić, N. Spaho, M. Smajić Murtić  |
| 12:00 - 12:10 | DECREASING OF THE CONTENT OF HEAVY METALS IN WHITE WINE CHARDONNAY BY USING DIFFERENT TREATMENTS<br>A. Serafimovska, M. Taseska Gjorgijevski, D. Nedelkovski, G. Milanov, B. Korunoska  |
| 12:10 - 12:20 | ESTIMATION OF THE STATE THE RED/OX-SYSTEM OF THE TYPES OF GRAPES, INTRODUCED IN BELARUS', WHICH REFLECTS STRESS-RESISTANCE TO THE UNFAVORABLE FACTORS OF THE MEDIUM<br>T.G. Yanchevskaya, E.N. Oleshuk, A.N. Grits, O.V. Lemeza, N. Marković, Z. Pržić  |
| 12:20 - 12:30 | EVALUATION OF PROMISING GRAPEVINE GENOTYPES OBTAINED FROM SEYVE VILLARD<br>D. Nikolić, Z. Ranković Vasić, Z. Pržić  |



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| 12:30 - 12:40 | TESTING THE BIOLOGICAL EFFICACY OF THE PRODUCT ORVEGO IN CONTROL OF GRAPEVINE DOWNY MILDEW ( <i>Plasmopara viticola</i> ) IN MONTENEGRO<br>ISPITIVANJE BIOLOŠKE EFIKASNOSTI PREPARATA ORVEGO U SUZBIJANJU PLAMENJAČE VINOVE LOZE ( <i>Plasmopara viticola</i> ) U CRNOJ GORI<br>D. Pavlović, J. Latinović, B. Kandić, N. Latinović |
| 12:40 - 12:50 | EXAMINATION THE CELL DIVISIONS AND DETERMINATION OF IRREGULARITIES IN THE FERTILIZATION IN SOME GRAPEVINE VARIETIES CULTIVATED IN R. MACEDONIA<br>B. Korunoska, D. Nedelkovski, A. Sarafimovska  |
| 13:00 - 15:00 | <b>Lunch / Ručak</b>   |
| 15:00 - 15:40 | <b>Subsection: Ornamental Plants and Landscape Design</b><br><b>Podsekcija: Ukrasne biljke i hortikulturno uređenje prostora</b><br><b>Oral Presentations / Usmene prezentacije</b><br>Working Committee / Radno predsjedništvo:<br>Nada Parađiković, Ljiljana Došenović, Svjetlana Zeljković                                      |
| 15:00 - 15:20 | THE STUDY OF INCIDENCE AND THE VARIATION OF BEARBERRY FOR SOME MORPHOLOGICAL INDICATOR OF BEARBERRY POPULATIONS ( <i>Arctostaphylosuva-ursi</i> L. Spreng) IN DIBRA DISTRICT<br>Z. Gjoni, N. Bardhi, F. Kashta   |
| 15:20 - 15:30 | EFFECTS OF DIFFERENT GROWTH STIMULATORS ON DEVELOPMENT PARAMETERS OF MARIGOLD ( <i>Tagetes patula</i> L.)<br>UTICAJ RAZLIČITIH STIMULATORA NA PARAMETRE RAZVOJA KADIFICE ( <i>Tagetes patula</i> L.)<br>S. Murtić, H. Čivić, I. Koleška, M. Vehabović, J. Avdić, Z. Ašimović   |
| 15:30 - 15:40 | USE OF ALTERNATIVE SUBSTRATES IN THE CULTIVATION OF SEEDLINGS GERANIUMS ( <i>Pelargonium zonale</i> L.)<br>PRIMJENA ALTERNATIVNIH SUPSTRATA U UZGOJU RASADA MUŠKATLE ( <i>Pelargonium zonale</i> L.)<br>U. Šušak, N. Parađiković, S. Zeljković, M. Tkalec, M. Savić  |
| 15:40 - 15:55 | <b>Project Presentation / Prezentacija projekta</b><br>Danube soya / Dunav Soja  |
|               | <b>Section: Agricultural Economics and Rural Development</b><br><b>Sekcija: Agrarna ekonomija i ruralni razvoj</b><br>St. Peterburg Hall / Sala St. Peterburg  |

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| 09:00 - 09:30 | <b>Introductory Lecture / Uvodno predavanje</b><br>VEGETABLES PRODUCTION TENDENCIES IN THE EU COUNTRIES<br>TENDENCIJE POVRTARSKÉ PROIZVODNJE U ZEMLJAMA EVROPSKE UNIJE<br>Novković N., Mutavdžić B., Lazić D.   |
| 09:30 - 11:20 | <b>Oral Presentations 1 / Usmene prezentacije 1</b><br>Working Committee / Radno predsjedništvo:<br>Nebojša Novković, Gordana Rokvić, Ljiljana Drinić   |
| 09:30 - 09:40 | MAKING SENSE OF COMMODITY MARKETS FAPRI-MU OUTLOOK AND POLICY IMPLICATIONS<br>Meyers W. H., Schoeder K. G.  |
| 09:40 - 09:50 | PROBABILITY OF BANKRUPTCY OF COMPANIES IN AGRICULTURAL – FOOD SECTOR IN SERBIA<br>Tica N., Zekić V., Milić D.   |
| 09:50 - 10:00 | STATUS OF RURAL WOMEN IN REPUBLIC OF SRPSKA POLOŽAJ ŽENA NA SELU U REPUBLICI SRPSKOJ<br>Rokvić G., Drinić Lj., Brković D.   |
| 10:00 - 10:10 | THE METHODOLOGY OF ASSESSMENT OF LOCAL RURAL LABOR MARKETS<br>Noskova O.  |
| 10:10 - 10:20 | THE RECENT LEGISLATURE IN THE REPUBLIC OF SERBIA IN AREA OF INCENTIVES AND FINANCING OF AGRICULTURE AND RURAL DEVELOPMENT<br>NAJNOVIJA ZAKONSKA REGULATIVA U REPUBLICI SRBIJI U OBLASTI PODSTICAJA I FINANSIRANJA POLJOPRIVREDE I RURALNOG RAZVOJA<br>Vasiljević Z., Zakić V., Kovačević V. |
| 10:20 - 10:30 | THE COMPETITIVENESS OF AGROINDUSTRY SECTOR OF THE REPUBLIC OF SRPSKA IN INTERNATIONAL TRADE<br>KONKURENTNOST AGROINDUSTRIJSKOG SEKTORA REPUBLIKE SRPSKE U MEĐUNARODNOJ RAZMJENI<br>Mrdalj V.  |
| 10:30 - 10:40 | DYNAMICS AND STABILITY OF SOYBEAN PRICES IN SERBIA<br>DINAMIKA I STABILNOST CENA SOJE U REPUBLICI SRBIJI<br>Bošnjak D., Rodić V., Karapandžin J.  |
| 10:40 - 10:50 | ECONOMIC JUSTIFICATION FOR USE OF MULCH IN WINTER PRODUCTION OF LETTUCE<br>EKONOMSKA OPRAVDANOST UPOTREBE MALČA U ZIMSKOJ PROIZVODNJI SALATE<br>Govedarica Lučić A., Perković G., Kurtović O., Tanović N., Rahimić A., Mašić J.   |
| 10:50 - 11:00 | GLOBAL TRENDS OF FOOD PRODUCTION<br>Knežević D., Radosavac A., Mićanović D., Zečević V.   |

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| 11:00 - 11:10 | RURAL DEVELOPMENT OF THE REPUBLIC OF SRPSKA UNTIL 2015 AND DIRECTIONS FOR FUTURE DEVELOPMENT<br>RURALNI RAZVOJ REPUBLIKE SRPSKE DO 2015. GODINE I PRAVCI BUDUĆEG RAZVOJA<br>Mirjanić S., Rokvić G., Brković D.  |
| 11:10 - 11:20 | BEHAVIOR AND ATTITUDES OF FISH CONSUMERS<br>PONAŠANJE I STAVOVI POTROŠAČA RIBE<br>Ostojić A., Vaško Ž., Savić N.  |
| 11:20 - 11:40 | <b>Coffee break / Kafe pauza</b>  |
| 11:40 - 12:20 | <b>Oral Presentations 2 / Usmene prezentacije 2</b><br>Working Committee / Radno predsjedništvo:<br>Željko Vaško, Vesna Rodić, Vesna Mrdalj   |
| 11:40 - 11:50 | VALUE CHAIN OF DAIRY SECTOR IN BOSNIA AND HERZEGOVINA AT YEAR 2013<br>LANAC VRIJEDNOSTI SEKTORA MLJEKARSTVA U BOSNI I HERCEGOVINI 2013. GODINE<br>Glavić M., Zenunović A., Budiša A.  |
| 11:50 - 12:00 | TRENDS IN PRODUCTION AND CONSUMPTION OF POULTRY MEAT IN THE WORLD AND BOSNIA AND HERZEGOVINA<br>TRENDOVI U PROIZVODNJI I POTROŠNJI MESA PERADI U SVIJETU I BOSNI I HERCEGOVINI<br>Salihbašić E., Vaško Ž., Bašić M., Ahmetović M.   |
| 12:00 - 12:10 | COMPARISON OF STRUCTURE OF BUDGETARY SUPPORT TO AGRICULTURAL PRODUCERS (PSEB) AT THE LEVEL OF THE REPUBLIC OF SRPSKA AND EUROPEAN UNION<br>KOMPARACIJA STRUKTURA BUDŽETSKE PODRŠKE POLJOPRIVREDNIM PROIZVOĐAČIMA (PSEb) NA NIVOU REPUBLIKE SRPSKE I EVROPSKE UNIJE<br>Mrdalj V. |
| 12:10 - 12:20 | MARKETING CHANNELS OF FRESH STRAWBERRIES – A CASE STUDY OF PRODUCERS FROM OBREZ, VARVARIN MUNICIPALITY, REPUBLIC OF SERBIA<br>MARKETINŠKI KANALI SVEŽIH JAGODA – PRIMER PROIZVOĐAČA IZ OBREŽA, OPŠTINA VARVARIN, REPUBLIKA SRBIJA<br>Zarić V., Čabrić S., Rajković B.           |
| 13:00 - 15:00 | <b>Lunch / Ručak</b>  |
| 16:00 - 16:30 | <b>Poster Presentations: Agricultural Economics and Rural Development</b>   |

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**Poster prezentacije: Agrarna ekonomija i ruralni razvoj**

Moskva Hall / Sala Moskva

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1. THE INCLUSION OF AGRO-INDUSTRY SECTOR OF THE REPUBLIC OF SRPSKA IN INTERNATIONAL INTEGRATION  
UKLJUČIVANJE AGROINDUSTRIJSKOG SEKTORA REPUBLIKE SRPSKE U MEĐUNARODNE INTEGRACIJE  
Mrdalj V.

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  2. CORPORATE GOVERNANCE AND THE PERFORMANCE OF BEVERAGE INDUSTRY IN MONTENEGRO  
Jovanović M., Despotović A., Joksimović M.

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  3. DEGREE OF CADASTER UP TO DATE AND ITS INFLUENCE ON THE AGRAR ECONOMY AND RURAL DEVELOPMENT OF THE RIBNIK MUNICIPALITY  
STEPEN AŽURNOSTI KATASTRA NEPOKRETNOSTI I NJEGOV UTICAJ NA AGRARNU EKONOMIJU I RURALNI RAZVOJ OPŠTINE RIBNIK  
Valan D., Macanović D.

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  4. ANALYSIS OF AGGREGATE BUDGETARY SUPPORT TO AGRICULTURE ( PSEB) IN THE REPUBLIC OF SRPSKA  
ANALIZA AGREGATNE BUDŽETSKE PODRŠKE POLJOPRIVREDNIM PROIZVOĐAČIMA ( PSEB) U REPUBLICI SRPSKOJ  
Mrdalj V.

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  5. FINANCIAL POSITION ANALYSIS OF AGRICULTURAL ENTERPRISES IN REPUBLIC OF SRPSKA  
FINANSIJSKA ANALIZA POLOŽAJA PREDUZEĆA IZ POLJOPRIVREDNOG SEKTORA REPUBLIKE SRPSKE  
Stojanović T., Stojanović S.

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  6. FOOD SELF-SUFFICIENCY OF THE REPUBLIC OF SRPSKA  
PREHRAMBENA SAMODOVOLJNOST REPUBLIKE SRPSKE  
Vaško Ž., Ostojić A., Šegrt L.

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  7. CLUSTERS AS A FACTOR OF SERBIAN ENCLAVES SUBSISTENCE IN KOSOVO  
KLASTERI KAO FAKTOR OPSTANKA SRPSKIH ENKLAVA NA KOSOVU  
Maksimović G., Milošević B., Milenković M., Đorđević Lj.

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  8. IMPORTANCE OF FAMILY FARMS FOR DEVELOPMENT OF LOCAL COMMUNITIES IN THE NORTHERN AND MOUNTAINOUS AREAS OF MONTENEGRO  
Despotović A., Jovanović M., Joksimović M.

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  9. LIFE CYCLE OF COMPANIES - CASE STUDY "Slavnić LLC"  
Janjetović M., Drinić Lj.

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  10. MARKET ANALYSIS OF MEDICINAL AND AROMATIC PLANTS IN SERBIA  
ANALIZA TRŽIŠTA LEKOVITOG I AROMATIČNOG BILJA U SRBIJI  
Turudija Živanović S., Živanović T.

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  11. PROJECT FINANCING IN AGRICULTURE  
PROJEKTO FINANSIRANJE U POLJOPRIVREDI  
Jovičić Ž., Jovičić J.
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**Section: Animal Sciences****Sekcija: Animalne nauke**

Small Hall / Mala Sala

Working Committee / Radno predsjedništvo:

Lidija Perić, Branislav Stanković, Dragutin Matarugić

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- 09:00 - 09:30 **Introductory Lecture / Uvodno predavanje**  
PROBLEMS IN THE IMPLEMENTATION OF LAYING HEN WELFARE REGULATION IN SERBIA  
PROBLEMI U PRIMENI REGULATIVE ZA OBEZBEĐENJE DOBROBITI NOSILJA U SRBIJI  
Rodić V., Perić L., Pavlovski Z.
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- 09:30 - 11:10 **Oral Presentations / Usmene prezentacije**
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- 09:30 – 09:40 SUSTAINIBILITY AND EFFICIENCY OF DAIRY FARMS  
BIOSECURITY PLANS  
Stanković B., Hristov S., Zlatanović Z., Bojkovski J., Maksimović N.
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- 09:40 - 09:50 THE HEALTH STATUS OF BREEDING BOARS FOR NATURAL AND ARTIFICIAL INSEMINATION, REGULATORY COMPLIANCE IN SERBIA: ARE WE CLOSER OR FURTHER AWAY EUROPEAN UNION?  
Urosević M. I., Nešić V., Smola J., Vanickova A., Rozkot M., Milovanović A., Filipović N.
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- 09:50 - 10:00 THE EGGS QUALITY FROM ORGANIC AND CONVENTIONAL PRODUCTION  
KVALITET JAJA IZ ORGANSKE I KONVENCIONALNE PROIZVODNJE  
Đukić Stojčić M., Perić L., Bjedov S., Milošević N.
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- 10:00 - 10:10 ANALYSIS PRODUCTION RESULTS CHICKEN OF MEET TYPE HYBRIDS  
ANALIZA PROIZVODNIH REZULTATA PILIĆA TEŠKIH LINIJSKIH HIBRIDA  
Bjedov S., L. Perić, Đukić Stojčić M., Milošević N.
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- 10:10 - 10:20 GENETIC RESOURCES OF INDIGENOUS BREEDS OF DOMESTIC ANIMALS IN THE REPUBLIC OF SRPSKA – FROM CONSERVATION TO SUSTAINABLE USE  
GENETIČKI RESURSI AUTOHTONIH RASA DOMAĆIH ŽIVOTINJA U REPUBLICI SRPSKOJ – OD OČUVANJA DO ODRŽIVE UPOTREBE  
Sjениčić J., Jotanović S., Matarugić D., Savić Đ., Radošević D., Vekić M., Đurić G.
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| 10:20 - 10:30 | SPEED OF FOOD CONSUMPTION OF SUMMER BEES IN ORDER TO GREATER PRODUCTIVITY OF BEE COLONIES<br>BRZINA KONZUMIRANJA HRANE KOD LJETNIH PČELA U CILJU VEĆE PRODUKTIVNOSTI PČELINJIH DRUŠTAVA<br>Mirjanić G.   |
| 10:30 - 10:40 | INSULIN RESISTANCE IN COWS AFFECTED WITH FATTY LIVER<br>INSULINSKA REZISTENCIJA KOD KRAVA OBOLELIH OD MASNE JETRE<br>Sladojević Ž., Prodanović R., Vujanac I., Ignjatović M., Stevanović Dorđević S., Celeska I., Kirovski D.  |
| 10:40 - 10:50 | SIGNIFICANCE OF CORTISOL DETECTION IN MILK OF DAIRY COWS WITH DIFFERENT MILK YIELD<br>ZNAČAJ ODREĐIVANJA KONCENTRACIJE KORTIZOLA U MLEKU KRAVA SA RAZLIČITOM PROIZVODNOM MLEKA<br>Kirovski D., Nedić S., Nedić D., Đurić M., Jovanović Lj., Ignjatović M., Vranješ-Đurić S.                    |
| 10:50 - 11:00 | ESTIMATION A GLUCOSE UTILIZATION BY PERIPHERAL TISSUE ON THE BASIS BLOOD CHANGES OF GLUCOSE, INSULIN AND INORGANIC PHOSPHORUS IN HEALTHY AND KETOTIC COWS DURING AN INTRAVENOUS GLUCOSE TOLERANCE TEST<br>Đoković R., Cincović M., Kurčubić V., Ilić Z., Petrović M., Lalović M.               |
| 11:00 - 11:10 | NUTRITION VALUE OF IMPORTED FEEDSTUFFS WHO USED IN ANIMAL NUTRITION IN R. MACEDONIA<br>HRANIDBENA VREDNOST STOCNIH HRANIVA OD UVOZA KOJE SE KORISTE U ISHRANI ŽIVOTINJA U R. MAKEDONIJI<br>Cilev G., Gacovski Ž., Petrovska B., Pacinovski N.  |
| 11:20 - 11:40 | <b>Coffee Break / Kafe pauza</b>   |
| 13:00 - 15:00 | <b>Lunch / Ručak</b>   |
| 16:00 - 16:45 | <b>Poster Presentations: Animal Sciences</b><br><b>Poster prezentacije: Animalne nauke</b><br>Moskva Hall / Sala Moskva  |
| 1.            | CHEESE YIELD AND CHEESE ABATEMENT<br>RANDMAN I KALO SIRA<br>Budimir D., Stipić Bagarić M.  |
| 2.            | HYGIENIC SCORE OF THE PRODUCTION PROCESS ON THE FARM AND ITS RELATIONSHIP WITH THE PARAMETERS OF QUALITY OF RAW MILK<br>HIGIJENSKI SKOR PROIZVODNOG PROCESA NA FARMI I NJEGOV ODNOS SA PARAMETRIMA HIGIJENSKE ISPRAVNOSTI SIROVOG MLIJEKA<br>Spahić Bajrić A., Pračić, N., Savić, Đ., Jahić S. |

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3. ANALYSIS OF THE VIEWS OF CITIZENS IN RELATION TO ANIMAL POISONING  
Petrovska B., Petrovska N., Gacovski Ž., Cilev G., Zdraveski I.
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4. HYGIENIC SCORE OF THE PRODUCTION PROCESS ON THE FARM AND ITS RELATIONSHIP WITH THE CHEMICAL COMPOSITION OF RAW MILK  
HIGIJENSKI SKOR PROIZVODNOG PROCESA NA FARMI I NJEGOV ODNOS SA HEMIJSKIM SASTAVOM SIROVOG MLIJEKA  
Pračić N., Savić Đ., Jahić S.
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5. POSSIBILITY OF ASSESMENT OF THE TOTAL LENGTH OF WILD BOAR (*Sus scrofa* L.) TUSKS BASED ON THE VISIBLE PART OF THE TUSKS  
MOGUĆNOST PROCENE UKUPNE DUŽINE SEKAČA I BRUSAČA DIVLJEG VEPIRA (*Sus scrofa* L.) NA OSNOVU VIDLJIVOG DELA  
Urošević B. M., Urošević M. M., Matarugić D., Drobnjak D. Fury M.
- 
6. EFFECT OF AIR TEMPERATURE AND RELATIVE HUMIDITY ON MORTALITY OF RABBITS  
UTICAJ TEMPERATURE I RELATIVNE VLAŽNOSTI VAZDUHA NA MORTALITET KUNIČA  
Urošević M. M., Drobnjak D., Matarugić D., Urošević M. B., Stojić P.
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7. HEAD LENGTH AND PELVIS LENGTH RATIO IN RELATION TO THE HEIGHT AT WITHERS IN DONKEY FEMALE  
ODNOS DUŽINE GLAVE I DUŽINE KARLICE U ZAVISNOSTI OD VISINE GREBENA KOD ŽENKI MAGARCA  
Urošević M. M., Nemeček M., Drobnjak D. Urošević B. M., Matarugić D., Stojić P.
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8. OBJECTS OF CLASSIC FISH FARM AND BREEDING SYSTEMS OF SALMONIDS  
OBJEKTI KLASIČNIH RIBOGOJILIŠTA I SISTEMI GAJENJA SALMONIDNIH VRSTA RIBA  
Mikavica D., Savić N.
- 
9. IMPACT OF PESTICIDES ON HEALTH AND BEHAVIOR OF BEES (Fam. *Apidae*)  
UTICAJ PESTICIDA NA ZDRAVLJE I PONAŠANJE PČELA (Fam. *Apidae*)  
Bekić B., Mladenović M., Mačukanović Jocić M.
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10. THE QUALITY OF QUEEN BEES OBTAINED THROUGH TRANSPLANTING OF LARVAE, WITH JENTER'S APPARATUS AND MILLER'S METHOD  
KVALITET MATICA DOBIJENIH PRESADIVANJEM LARVI, JENTEROVIM APARATOM I MILEROVOM METODOM  
Milosavljević S., Mladenović M., Stošović A.
- 
11. CORRELATION OF BROOD AREA AND PRESENCE OF VARROA IN THREE LINES OF BEES IN TOPLICA REGION  
KORELACIJA POVRŠINE LEGLA I PRISUTNOSTI VAROE TRI LINIJE PČELA U TOPLIČKOM OKRUGU  
Mladenović M., Milosavljević S., Stošović A.
- 
12. EFFECT OF TEMPERATURE AND LENGTH OF STORAGE ON SOME EGG QUALITY PARAMETERS  
UTICAJ TEMPERATURE I DUŽINE SKLADIŠTENJA NA POKAZATELJE KVALITETA KONZUMNIH JAJA  
Vekić M., Jotanović S., Borojević D., Savić Đ.
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13. EFFECT OF ORGANIC PRODUCTION ON CHEMICAL COMPOSITION OF EGGS  
EFEKAT ORGANSKE PROIZVODNJE NA HEMIJSKI SASTAV JAJA  
Perić L., Đukić Stojčić M., Milošević N., Bjedov S.
- 
14. EFFECT OF AGE OF LIGHT LINE HYBRIDS HENS HENS ON EGG QUALITY TRAITS  
UTICAJ STAROSTI NOSILJA LAKOG LINIJSKOG HIBRIDA KOKOŠI NA OSOBINE KVALITETA JAJA  
Pandurević T., Mitrović S., Đekić V., Ristanović B.
- 
15. IMPORTANCE OF SMALL GRAIN SILAGE IN DAIRY CATTLE NUTRITION  
ZNAČAJ SILAŽE STRNIH ŽITA U ISHRANI GOVEDA  
Radivojević M., Stojić P., Miletić A., Urošević M., Drobnjak D.
- 
16. CEREAL PROTEINS IN FISH NUTRITION  
Marković G., Madić M., Đurović D., Pantović J.
- 
17. EFFECTS QUANTITY OF MEALS AND FREQUENCY OF FEEDING ON COMPENSATORY GROWTH RAINBOW TROUT (*Oncorhynchus mykiss* WAL.) FRY  
EFEKTI KOLIČINE OBROKA I FREKVENCIJE ISHRANE NA KOMPENZACIJSKI RAST MLAĐI DUŽIČASTE PASTRMKE (*Oncorhynchus mykiss* WAL.)  
Đogatović V., Marić A., Savić N.
- 
18. THE HEALTH STATUS OF BULLS IN ARTIFICIAL INSEMINATION CENTRES: HARMONIZATION OF LEGISLATION IN SERBIA WITH THE EUROPEAN UNION  
Urošević M. I., Nešić V., Smola J., Vanickova A., Rozkot M., Milovanović A., Filipović N.
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16:45 - 17:15 **Discussion on Oral and Poster Presentations: Agricultural economics and Rural Development, Animal Sciences**  
**Diskusija po usmenim i poster prezentacijama: Agrarna ekonomija i ruralni razvoj, Animalne nauke**  
Moderator of Agricultural economics and Rural Development Section / Moderator sekcije Agrarna ekonomija i ruralni razvoj: Željko Vaško  
Moderator of Animal Sciences Section / Moderator sekcije Animalne nauke: Mirjana Đukić Stojčić

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17:15 - 17:30 **Coffee Break / Kafe pauza**

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17:30 - 19:00 **Assembly of the Chamber of Agricultural Engineers of Republic of Srpska**  
**Skupština Komore inženjera poljoprivrede Republike Srpske**  
St. Peterburg Hall / Sala St. Peterburg

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20:00 **Gala Dinner / Svečana večera**

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Thursday, March 05, 2015.  
Četvrtak, 05.03.2015.

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**XX Scientific-Professional Conference of Agronomists of Republic of Srpska**  
**XX Naučno-stručno savjetovanje agronoma Republike Srpske**

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| 09:30 - 11:00 | <b>Section: Plant Production</b><br><b>Sekcija: Biljna proizvodnja</b><br>Moskva Hall / Sala Moskva<br>Moderator: Radmila Nešković  |
| 09:30 - 09:45 | <i>"The Newest Achievements in Fruit Growing in Region" / "Najnovija dostignuća u voćarskoj proizvodnji u regionu"</i><br>Dalibor Panić, Nikola Mičić, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet<br>Phytosanitary Aspects in Plant Production / Fitosanitarni aspekti u biljnoj proizvodnji: |
| 09:45 - 10:00 | <i>"The List of Varieties and Varietal Policy" / "Sortna lista i sortna politika"</i><br>Danijela Kondić, Svjetlana Zeljković, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet   |
| 10:00 - 10:15 | <i>"Official Control in Production of Seed and Planting Material" / "Kontrola proizvodnje sjemena i sadnog materijala"</i><br>Jelena Davidović, Tatjana Jovanović Cvetković, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet   |
| 10:15 - 10:30 | <i>"The Conditions for the Export of Potatoes" / "Uslovi za izvoz krompira"</i><br>Branimir Nježić, Mile Dardić, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet   |
| 10:30 - 10:45 | <i>"Quarantine Viruses, Viroids and Phytoplasmas" / "Karantinski virusi, viroidi i fitoplazme"</i><br>Duška Delić, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet   |
| 10:45 - 11:00 | <i>"IPM Directive – Sustainable Use of Pesticides" / "IPM direktiva – Održiva upotreba pesticida"</i><br>Siniša Mitrić, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet  |
| 11:00 - 11:15 | <i>"Regulation of Soil Water Balance in Agricultural Land after the Flood" / "Regulisanje vodno-vazdušnog režima poljoprivrednog zemljišta nakon poplava"</i><br>Mihajlo Marković, Sretenka Srdić, University of Banjaluka, Faculty of Agriculture / Univerzitet u Banjaluci, Poljoprivredni fakultet   |

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| 09:00 - 10:00 | <b>Section: Animal Production</b><br><b>Sekcija Animalna proizvodnja</b><br>St. Peterburg Hall / Sala St. Peterburg<br>Moderator: Zoran Maletić  |
| 09:00 - 09:30 | <i>"Dressage of Honey Bees to Achieve Higher Yields in Agriculture" /<br/>"Dresurom medonosne pčele do viših prinosa u poljoprivredi"</i><br>Goran Mirjanić, University of Banjaluka, Faculty of Agriculture /<br>Univerzitet u Banjaluci, Poljoprivredni fakultet |
| 09:30 - 10:00 | <i>"Oestrus Diagnosis in Cows" / "Dijagnostika estrusa u krava"</i><br>Dragutin Matarugić, University of Banjaluka, Faculty of Agriculture /<br>Univerzitet u Banjaluci, Poljoprivredni fakultet   |
| 11:15 - 11:30 | <b>Coffee Break / Kafe pauza</b>   |
| 11:30 - 12:15 | <b>Oral Presentations for Sponsors / Usmene prezentacije za<br/>sponzore</b><br>Moskva Hall / Sala Moskva<br>BASF<br>Syngenta<br>Agromarket  |
| 12:15 - 13:00 | <b>Demonstration of Mistblowers Calibration / Demostracija<br/>kalibriranja orošivača</b><br>Zoran Maličević, University of Banjaluka, Faculty of Agriculture /<br>Univerzitet u Banjaluci, Poljoprivredni fakultet  |
| 13:00 - 14:00 | <b>Lunch / Ručak</b>   |
| 14:00 - 18:00 | <b>Professional Excursion / Stručna ekskurzija</b><br>Cherry Orchard, Čađavica / Trešnjik, Čađavica<br>Meat Industry "ZP Komerc", Vršani / Mesna industrija "ZP komerc",<br>Vršani   |
| 18:00 - 19:00 | <b>Visit to St. Petka Monastery with Guidance / Posjeta Manastiru<br/>Svete Petke sa vodičem</b>   |
|               | <b>Friday, March 06, 2015.</b><br><b>Petak, 06.03.2015.</b>  |
| 09:00 - 12:00 | <b>Departure of Participants / Odjavljivanje učesnika</b>  |

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# *PLENARY SESSION*



## APPLICATION OF NEW TECHNOLOGIES FOR ECO-EFFICIENT WATER AND LAND MANAGEMENT

Mladen Todorović

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In the recent years, new automatized decision support systems (DSS) for water and land management have been receiving growing attention. This is due to i) the consolidation of scientific achievements in the field of crop water requirements, soil water balance modelling and irrigation scheduling, ii) the maturity of technological innovations in the field of data acquisition, transmission and management, and iii) the widespread use of web and app tools for real-time data control and elaboration. The systems combine agronomic, engineering, environmental and economic aspects of water management, and promote the eco-efficiency with the aim to increase the economic benefits while reducing the input of resources. This work focusses on the description of functional characteristics of the Hydro-Tech DSS, recently developed and implemented for irrigation management in Southern Italy. The system works at both farm and irrigation district scale and uses the advanced technological solutions for the continuous sensor-based monitoring of the soil-plant-atmosphere continuum and the remote control of irrigation supply networks. Hydro-Tech is based on the standard FAO-56 approach for the estimation of reference evapotranspiration using the Penman-Monteith equation and determination of crop water requirements and irrigation inputs under different water management strategies. The system has a modular and flexible structure which permits the creation of the user specific scenarios based on the real on-farm conditions and constraints. Hence, Hydro-Tech allows the estimation of reference and crop evapotranspiration under limited data availability and employs the latest scientific achievements to recover the missing data and to develop the crop coefficient curves according to the specific crop variety, biometric and phenological characteristics. The crop development is modelled by means of both calendar-day and heat-unit concepts. The real-time soil water balance is based on a simply cascading approach, runs on a daily basis and includes the high-resolution weather forecasting data which permits the pro-active irrigation management considering 3 to 7 forthcoming days. A dynamic multi-crop/farm optimizer supports the user-defined setting of constraints and irrigation priorities at the farm scale by taking into account the water availability at its quality, the soil water moisture level and eventual crop water stress, and the economic parameters including the cost of applied management practices and expected market price. Hydro-Tech provides standard interfaces connecting the on-field devices with the client software application through a Data Cloud Network which permits wireless, via new generation of smart devices (tablets, smartphones), and continuous monitoring of the on-field conditions and the remote control and management of irrigation. Several examples of application are briefly described.

Key words: soil water balance model, irrigation management, water supply optimization, decision support system, resources use efficiency, remote data monitoring and control.

## REPRODUCTIVE BIOLOGY AS AN OPEN QUESTION OF AGRICULTURAL PLANT PRODUCTION INTENSIVITY

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Genetic potential of cultivated agricultural plant species and varieties is greater than today's average yields that are being realised in given production conditions. Today, main agrotechnical and pomotechnical principles of agricultural plant cultivation are brought to high intensity and sustainability levels. However, after 22 world congresses on plant fertilization, it was understood that only open questions from reproductive biology stand in the way of greater realization of cultivated plants' genetic potential (processes starting from the initiation of generative apex differentiation in creation of fruiting potential, to fruit forming and their maintenance at the realization level for given agricultural production). So, even though the science has completely realized processes of plant fertilization, that can be interpreted on molecular level, and even though the science has interpreted interaction effects between genotype and agrotechnical measures in given soil and climate conditions, it was irrefutably determined that in intensive and highly intensive production systems over 40% of potential yield is being lost due to inadequate planning and approach to solving questions in reproductive biology domain and in given production conditions. Understanding that over 40% of potential yield in intensive and highly intensive productions is being lost due to unsolved questions from reproductive biology, and that these losses cannot be substituted by any agro-economic or organisational-political approach to increasing plant production intensity [A. Bloom et al.: "Development of agricultural production depends on new technologies that are based on knowledge, both in developed and in developing countries".]<sup>1</sup>, resulted in formation of international Society of plant reproductive biologists in 1995, and organisation of the first international conference on these issues in 2008, and then in 2010 the I Global Congress on Plant Reproductive Biology (India). The II Global Congress was held in 2012 in Hungary, and the III Global Congress was held in December of 2014 (India). Through these activities complex of open and multidisciplinary questions, that are covered by scientific domain of plant reproductive biology, have been defined and are being considered, in order to increase control in realisation of genetic potential of cultivated plants. Actuality of these questions is additionally highlighted by open questions of climate changes, and for intensive plant production in certain regions the key question of sustainability will be the influence of climate changes on dormancy of cultivated winter cultures and perennial plants. Coping with open questions of dormancy and reproductive biology of cultivated winter plants and perennials is impending, and if solving of these questions is neglected or is observed only as agro-economic question of agricultural production, sustainability of these production lines will be endangered. This paper exhibits globally opened questions of reproductive plant biology, and also displays results of research, conducted by Institute of Horticulture of the Faculty of Agriculture and Genetic Resources

Institute, of the University of Banja Luka, on initiation of generative buds differentiation as main process in creation of fruiting potential, and its role in constituting male and female gametophyte in its realisation. Also, research and development of methods for determination of plants' transition from physiological dormancy into ecological resting period, as fundamental question of biological control of sustainability of fruiting potential for winter and perennial cultivated plants, is part of these Institutes' research, which, through project activities, is supported by the Ministry of Science and Technology of the Republic of Srpska.

<sup>1</sup>*Blum, A., Röling, N. & Engel, P.G.H. (1990): Effective management of Agricultural Knowledge Systems (AKS): an analytical approach. Quarterly Journal of International Agriculture, 29(1): 27-37.*

## REPRODUKTIVNA BIOLOGIJA KAO OTVORENO PITANJE INTENZIVNOSTI GAJENJA POLJOPRIVREDNIH BILJAKA

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Genetski potencijal gajenih vrsta i sorti poljoprivrednih biljaka daleko je veći od onoga što se danas realizuje kao prosečni prinosi u datim proizvodnim uslovima. Osnovni agrotehnički i pomotehnički principi gajenja poljoprivrednih biljaka, danas, dovedeni su na nivo visoke intenzivnosti i održivosti. Međutim, posle 22 svetska kongresa o oplodnji biljaka, nepobitno se došlo do spoznaje da na putu veće realizacije genetskog potencijala gajenih biljaka stoje isključivo otvorena pitanja iz reproduktivne biologije (proces od inicijacije generativne diferencijacije apeksa u stvaranju rodnog potencijala do zametanja plodova i njihove održivosti na nivou realizacije date poljoprivredne proizvodnje). Dakle, iako je nauka u potpunosti spoznala procese oplodnje biljaka i može da ih tumači na molekularnom nivou, iako je nauka protumačila interakcijske efekte genotipa i agrotehničkih mera u datim pedo-klimatskim uslovima, nepobitno je utvrđeno da se u intenzivnim i visokointenzivnim sistemima gajenja gubi preko 40 % potencijalnih prinosa kao posledica neadekvatnog projektovanja i pristupa u rešavanju pitanja iz domena reproduktivne biologije prema datim proizvodnim uslovima. Spoznaja da se preko 40 % potencijalnih prinosa gubi zbog nerešenih pitanja iz reproduktivne biologije, i to u intenzivnim i visokointenzivnim proizvodnjama, te da se ovi gubici ne mogu nadomestiti bilo kakvim agro-ekonomskim ili organizaciono-političkim pri-stupima intenziviranja biljne proizvodnje [A. Blum i sar.: "Razvoj poljoprivredne proizvodnje zavisi od novih tehnologija zasnovanih na znanju, kako u razvijenim zemljama, tako i u zemljama u razvoju".]<sup>1</sup>, dovela je do osnivanja međunarodnog društva za reproduktivnu biologiju 1995. godine, (1995. godine, osnovano je međunarodno društvo za reproduktivnu biologiju biljaka,) koje je 2008. godine organizovalo prvu međunarodnu konferenciju o ovim pitanjima, a zatim 2010. godine i I globalni kongres reproduktivne biologije biljaka (Indija). II globalni kogres održan je 2012. godine u Mađarskoj, a III globalni kongres održan je u decembru 2014. godine (Indija). Kroz ove aktivnosti definisan je i razmatra se kompleks otvorenih i multidisciplinarnih pitanja koje obuhvata naučna oblast reproduktivne biologije biljaka, kako bi se povećala kontrola u realizaciji genetskog potencijala gajenih biljaka. Aktualnost ovih pitanja dodatno je istaknuta otvorenim pitanjima klimatskih promena, a za intenzivnu biljnu proizvodnju u pojedinim regijama ključno pitanje održivosti biće uticaj klimatskih promena na dormantnost gajenih ozimih kultura i višegodišnjih biljaka. Suočavanje sa otvorenim pitanjima dormantnosti i reproduktivne biologije, gajenih ozimih kultura i višegodišnjih biljaka, tek predstoji, i ukoliko se rešavanje ovih pitanja bude zanemarivalo ili se bude posmatralo isključivo kao agro-ekonomsko pitanje poljoprivredne proizvodnje, održivost ovih linija proizvodnje biće dovedena u pitanje. U ovom radu izložena su globalno otvorena pitanja reproduktivne biologije biljaka, kao i prikaz rezultata istraživanja Instituta za hortikulturu Poljoprivrednog fakulteta i Instituta za genetičke

resurse, Univerziteta u Banjaluci, na inicijaciji diferencijacije generativnih pupoljaka kao osnovnog procesa u stvaranju rodnog potencijala, i ulozi konstitucije muškog i ženskog gametofita u njegovoj realizaciji. Takođe, istraživanje i razvoj metoda za determinaciju prelaska biljaka iz fiziološke dormantnosti u ekološko mirovanje, kao fundamentalno pitanje biološke kontrole održivosti rodnog potencijala ozimih i višegodišnjih gajenih biljaka, deo je istraživanja ovih instituta, koje, kroz projektne aktivnosti podržava Ministarstvo nauke i tehnologije Republike Srpske.

<sup>1</sup>A. Blum, N. Roling i P. Engel (1993): "Efikasno upravljanje sistemima znanja u poljoprivredi." *Quarterly Journal of International Agriculture, Vol.29, No.1*

## WESTERN BALKAN AGRICULTURE AND EUROPEAN UNION: CHALLENGES AND POSSIBLE RATIONAL CONCEPT OF ADJUSTMENTS AND REFORMS

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The paper provides a brief overview of the situation and trends in agriculture and agricultural policy in Southeastern European (SEE) countries. It attempts to describe the gaps that define the development and integration process of agriculture in the SEE countries and to develop some conceptual and paradigmatic recommendations of agricultural policy in the region with some notes on situation in Republika Srpska and Bosnia and Herzegovina. The economic and geographical features in SEEs are very diverse. Natural production potential for agriculture is relatively poorly used in the SEE countries. The available data reveals a persistently large proportion of uncultivated arable land as well as unused or poorly used permanent grassland, especially low-productivity pastures. The average farm size is comparable only to very smallest in the EU. Compared to the EU, the crop output prices are somewhat more competitive, while the prices of livestock products are typically higher than in most EU Member States. With the exception of Serbia, all SEEs are net importers of agro-food products. Agricultural policy implemented in SEEs is not aligned with the actual policy in the EU in any aspect. On the other hand, the relative level of budgetary support as well as its composition is quite comparable to that recorded in some new Member States in the period before accession to the EU (1999). In the composition of total budgetary funds for agriculture in most SEEs direct producer support has the highest share (40-90 percent). The dominant form of direct support in most SEEs is commodity-linked payments per area or per animal. Direct support is also implemented in the form of price supplements (dominant in Bosnia and Herzegovina) and variable input subsidies. In SEEs, the level of budgetary funds for rural development support is generally low. From this analysis stems the fact that the agricultural sector and rural areas of the SEE have considerable development needs. A clear road map for the implementation of agricultural policy reforms, incorporating the expected EU integration process, identifying the steps for a systematic implementation of strategies is a precondition for the efficient adjustment of agriculture.

Key words: South Eastern Europe, EU integration, agricultural policy

## THE BASIC PRINCIPLES OF DAIRY CATTLE WELFARE PLAN CREATION AND IMPLEMENTATION

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In this review paper basic principle of dairy cattle welfare plan creation and implementation were given. The plan includes goals wanted to be achieved related to specificities of dairy farm technology, selection of measures and procedures that have to be included, order and manner of measures and procedures description, as well as plan implementation. Efficiency and further sustainability of dairy cattle welfare plan implementation could be measured through differences between cattle welfare level before and after plan application established by questionnaire about welfare indicators, such us 1. planning, organization and implementation of dairy cattle welfare standards, 2. competence of employees in relation to dairy cattle welfare, 3. stockman attitude towards the animals behavioral needs, 4. monitoring and inspection of cattle and equipment, 5. handling of cattle, 6. feeding and watering of cattle, 7. accommodation, microclimate, and sanitary conditions in the stable, 8. hygiene and body care of animals, 9. reproduction, and productivity, 10. behavior and health status of dairy cattle. The owners of the farm should develop, define and write the plan attached to the health and welfare of dairy cattle in cooperation with the veterinarian and the other professionals, when necessary, experts and technical persons who are engaged in providing advice on production technology - especially engineers of animal husbandry. This plan also should include the use of appropriate equipment in dairy cattle farm. At least once a year, it is necessary to reconsider the plan and supplemented by new practical experience and current scientific knowledge.

Key words: welfare, plan, creation, implementation, dairy farms

CHARACTERISTICS, ANALYSES AND EXPERINCES OF  
RENEWED (BOLOGNA) STUDY PROGRAMS AT  
THE BIOTECHNICAL FACULTY,  
UNIVERSITY OF LJUBLJANA

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After seven years of implementation of renewed study programs at Biotechnical Faculty a first institutional evaluation was conducted in order to achieve re-accreditation of all programs. It revealed some expected positive as well as some problematic results. Paper presents analyses of nine basic study programs emphasizing advantages and disadvantages of so called Bologna reform. Various specifics of reformed programs on all three levels are presented with different problems accompanying each level of studies. Critical overview also reflects on some wider problems in terms of program structures, contact hours, teachers' tasks, students' responsibilities, funding system, registration procedure, organization of lectures and exercises and connected schedule problems. Many problems on detailed operational level can be solved rather fast and are not so problematic but the question of wider system reforms remains opened. Particularly to the point when difficult financial situation will demand institutional reorganization not just correction of program curriculums. At the end some of unused advantages of reformed study programs are discussed that can serve as reference for other schools in their accreditation process.





# ***ORAL PRESENTATION***

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*Section 1. Plant Sciences*

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## AGRICULTURAL DEVELOPMENT IN CHINA: EXPERIENCES IN FRUIT CROPS ADVISORY SERVICE

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Measured on a purchasing power parity basis, China is the second-largest economy in the world, although in per capita terms the country is still lower middle-income. Population is 1.4 billion, 20% of the global, while only 7% of the world's cultivated land is located in the country, which may cause tensions in improving food supply. From the area around 15% is arable land, 39% of that is irrigated. China today is the leading producer in the world of grain, cotton, tobacco, meat, eggs, fish and vegetables. 35% of the labor force is occupied in agriculture, which produces 12% of the GDP. The domestic consume is the main engine of production. The different climatic regions produce many vegetable varieties. Besides the own consumption farmers grow vegetables for sale to meet the demand of urban consumers. Temperate, subtropical, and tropical fruits are cultivated in China. Output of fruit industry rapidly expanded over the last decades. Reforms in the early 1980-es encouraged farmers to plant orchards. The per capita fruit supply today nears to the level of USA. The agricultural reform program by the end of 80-es had achieved remarkable results in food supply and had created a new climate of dynamism and opportunities. Agricultural production was also stimulated by free farmers' markets in urban areas, as well as in the countryside, and by allowing to operate on a profit-making basis. The appointed "High-Tech Agricultural Zone" in cooperation with Agricultural and Forestry University in Shaanxi province resulted successful development in various fields. Cooperation with the "OVOP" movement originated from Japan helps the specialized villages to put their products onto market. The role of free markets for farm produce was further expanded and, with increased marketing possibilities and rising productivity, farm incomes rose rapidly. The profit oriented farms in provinces of North-China in the 80-es, 90-es planted huge apple orchards; their production caused disturbances in the world's apple concentrate market during the last decade. Today the high profitability of sweet cherry attracts farmers to planting cherries. The world's largest cherry nurseries in Shaanxi province produce 2-2 million cherry trees yearly to meet the requirements of farmers.





*Subsection: Crop Science*



## MODERN BREEDING OF CEREAL PLANTS FOR FOOD SECURITY

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The permanent task of plant breeding is improvement of grain yield, bread making quality, nutritional quality, resistance to pests and diseases and adaptability to different stress of environmental condition. For achievement of this and new requirements of producers and consumers is necessary utilise genetic diversity by improving selection criteria including the use of marker assisted selection and developed agronomic strategies to nutrient concentrations in grain of wheat in frame of conventional breeding strategies. A better understanding of the genetic basis for breeding wheat cultivars with enhanced quality traits is required. For achievement of success in plant breeding could be develop climate-crop model, model of prediction capabilities and limitation of trait values. Combining conventional breeding with marker assisted selection (MAS) and genetic engineering strategies will be contribute to develop new cultivar adaptive to dry land, wet land, saline soil, drought as well as other limiting factor of high yield and quality. For example of possible direction of breeding in this study will presented wheat, barley specises. In a lot of plant species, the period of development from vegetative to reproductive phase is critical for adaptation to their climatic environment. Plant adaptation to environmental condition is under control genes for flowering. Breeding of plant need directed to satisfy requirements of farmers, food processing industry, consumers in agreement to legislation. The necessary is to create cultivars with reduced requirement of nutrient, high content and composition of protein which associated to immune system. Also, enhancing photosynthetic activity is the most important for surviving productivity under drought stress.

Key words: Breeding, plant, gene, environment, food.

## THE DYNAMICS OF DRY MATTER ACCUMULATION IN ABOVEGROUND VEGETATIVE PART OF THE PLANT AND EAR OF CORN (*Zea mays* L.)

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The survey was conducted in order to determine the trend of dry matter accumulation of corn aboveground vegetative part in function of yield potential realization. The experiment was conducted during the growing season of 2013 in agroecological conditions of Banja Luka. In the experiment were used four maize genotypes: NS 4023, ZP 560, ZP 434 and domestic genotype Bjelčić. In the production of maize was applied standard agrotechnique. Dry matter of corn aboveground vegetative part and ear was followed by analysis of five plants per genotype every seven days. Trendlines daily changes in the accumulation of dry matter of corn aboveground vegetative part and ear was performed by approximating the software data obtained after drying the plant samples at 105 °C to constant weight. Trend analysis of dry matter accumulation showed the following general trends: dry matter accumulation in corn aboveground vegetative part showed a strong trend growth from germination until the moment when start the accumulation of dry matter in the ear. Trend start of accumulation of dry matter in the ear of the examined maize genotypes was observed when the dry matter accumulation in aboveground vegetative part of the plant exceeded an average of 100 g/plant, and that is observed between 77 and 83 days after plant emergence. The lowest dry matter accumulation in corn aboveground vegetative part had a domestic genotype Bjelčić, where the accumulation of dry matter slightly exceeding 100 g/plant, and the highest was detected in genotype ZP 560, where the accumulation of dry matter averaged over 145 g/plant. As a general tendency we can conclude genotypic specificity, i.e. genotypic predisposition to high yields based on the fast and high dry matter accumulation in aboveground plant vegetative part until the moment of the appearance of noticeable growth trend of dry matter in the ear. Maize agrotechnique in the observed conditions must be directed at achieving maximum biomass of aboveground vegetative plant part in the first 70 days after plant emergence, when creating a biological basis for the development of the ear, because all physiological functions of aboveground plant vegetative part then be redirected towards growth and development of the ear.

Keywords: genotypic specificity of dry matter accumulation, genotypic agrotechnique

## DINAMIKA AKUMULACIJE SUVE MATERIJE U NADZEMNOM VEGETATIVNOM DIJELU BILJKE I KLIPU KUKURUZA (*Zea mays* L.)

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Istraživanje je sprovedeno u cilju determinacije trenda akumulacije suve materije nadzemnog vegetativnog dijela biljke u funkciji realizacije rodnog potencijala kukuruza. Eksperiment je izvršen tokom vegetacionog perioda 2013. godine u agroekološkim uslovima Banje Luke. U radu su korišćena četiri genotipa kukuruza: NS 4023, ZP 560, ZP 434 i domaći genotip Bjelčić. U proizvodnji kukuruza je primjenjena standardna agrotehnika. Suva materija nadzemnog vegetativnog dijela biljke i klipa kukuruza praćena je analizom 5 biljaka po genotipu svakih sedam dana. Linije trenda dnevnih promjena u akumulaciji suve materije nadzemnog vegetativnog dijela biljke i klipa kukuruza izvršena je softverskom aproksimacijom podataka dobijenih nakon sušenja uzoraka na 105 °C do konstantne mase. Analiza trenda akumulacije suve materije pokazala je sljedeće opšte tendencije: akumulacija suve materije u nadzemnom vegetativnom dijelu biljke pokazala je izražen trend rasta od nicanja do momenta kada se može konstatovati početak akumulacije suve materije u klipu. Početak trenda akumulacije suve materije u klipu ispitivanih genotipova kukuruza uočen je kada je akumulacija suve materije u nadzemnom vegetativnom dijelu biljke prešla prosjek od 100 g/biljci, a što je konstatovano između 77 i 83 dnana nakon nicanja. Najmanju akumulaciju suve materije u nadzemnom vegetativnom dijelu biljke imao je domaći genotip Bjelčić, gdje akumulacija suve materije neznatno prelazi 100 g/biljci, a najveća je konstatovana kod genotipa ZP 560, gdje je akumulacija suve materije u prosjeku bila iznad 145 g/biljci. Kao opšta tendencija može se konstatovati i genotipska specifičnost, odnosno, da se genotipska predispozicija za visoke prinose bazira na brznoj i visokoj akumulaciji suve materije u nadzemnom vegetativnom dijelu biljke do momenta pojave uočljivog trenda rasta suve materije u klipu. Dakle, agrotehnika kukuruza u posmatranim uslovima mora biti usmjerena na dostizanje maksimuma biomase nadzemnog vegetativnog dijela biljke u prvih 70 dana od nicanja, kada se stvara biološka osnova za razvoj klipa, jer će sve fiziološke funkcije nadzemnog vegetativnog dijela biljke nakon toga biti preusmjerene prema rastu i razvoju klipa.

Ključne riječi: genotipske specifičnosti akumulacije suve materije, genotipska agrotehnika.

## GENETIC SIMILARITY OF MAIZE INBRED LINES BASED ON RAPD MARKERS

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Genetic characterization of 29 inbred lines has been done by ten RAPD primers. Genetic similarity between inbred lines is calculated according Jaccard's coefficients by NTSYS program. Matrixes of genetic similarities have served for cluster and PCA analysis. A total of 79 alleles of which 56 are polymorphic are detected. Number of alleles was from 4 (OPB-08) to 12 (GEN- 1-70-5) . Genetic similarity was in range from 0.492 to 0.941. The smallest genetic similarity coefficient was detected between inbred lines L10 and L15, and the highest between inbred lines L7 and L8. The average genetic similarity was 0.61. Inbred lines are grouped into two clusters, except line L17 which are allocated in relation to all other genotypes. Smaller cluster consist of four inbred lines, and second one includes two subclusters. Within the smaller cluster two of the four lines have different origin in relation to majority of inbred lines, and thus the between them and other lines there is a higher level of genetic diversity, which may be an explanation for their separate clustering.

Key words: maize, RAPD markers, genetic similarity

## GENETIČKA SLIČNOST INBRED LINIJA KUKURUZA NA OSNOVU RAPD MARKERA

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Primenom deset RAPD markera urađena je genetička karakterizacija 29 inbred linija kukuruza. Genetičke sličnosti izračunate su primenom Jaccard-ovog koeficijenta pomoću NTSYS programa. Matrice genetičkih sličnosti poslužile su za klaster i PCA analizu. Detektovano je ukupno 79 traka od kojih je 56 bilo polimorfno. Broj alela se kretao od 4 (OPB-08) do 12 (GEN- 1-70-5). Genetička sličnost kretala se u opsegu od 0.492 do 0.941. Najmanja genetička sličnost detektovana je između linija L10 i L15, a najveća između linija L7 i L8. Prosečna genetička sličnost iznosila je 0.61. Ispitivane linije su se grupisale u dva velika klastera, izuzev linije L17 koja se izdvojila u odnosu na sve ostale genotipove. Manji klaster obuhvata četiri inbred linije, dok se drugi klaster sastoji od dva manja subklastera. U okviru manjeg klastera dve od četiri linije imaju različito poreklo u odnosu na većinu ispitivanog materijala, a samim tim između njih i ostalih linija postoji veći stepen genetičke različitosti, što može biti objašnjenje za njihovo odvojeno grupisanje.

Ključne reči: kukuruz, RAPD markeri, genetska sličnost

## IMPACT OF DIFFERENT NUTRIENT SUPPLY ON THE WEED FLORA IN MAIZE CULTIVATION

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The investigations of weed flora on cultivated areas have high importance in terms of sustainable agriculture. Our examination to study the effect of different nutrient levels on weed flora composition was investigated in a long-term fertilization experiment, set up in 2003 in Nagyhörcsök, Hungary. The pilot area has loamy chernozem soil with lime deposits (FAO Calcic Phaeozem). The cultivated crop was maize (*Zea mays* L.), the examinations were implemented in early growth stage. The studied treatments were as follows: control (no fertilization) and NPK (150 kg·ha<sup>-1</sup> N, 100 kg·ha<sup>-1</sup> P<sub>2</sub>O<sub>5</sub>, 100 kg·ha<sup>-1</sup> K<sub>2</sub>O). On each plots two 4 m<sup>2</sup> areas were kept herbicide free. Collecting and counting of weeds was carried out on these weedy plots. The base of the evaluation was the presence, density, frequency and dominance index of weed species. According to the results, the order of dominance and the density of weed species were mathematically proved different in connection with the nutrient supply. Regarding the order of dominance, *Ambrosia artemisiifolia* L. was on the first place in the control and *Chenopodium album* L. in the plots with good nutrient supply (NPK).

Keywords: density, dominance, maize, nutrient supply, weeds

## EFFECT OF CROP ROTATION ON MAIZE PRODUCTIVE CHARACTERISTICS

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Crop rotation has many advantages in comparison with maize monoculture. Different previous crop with different application of cropping practices and chemical compounds can on the other way influence on conditions in soil. Wheat is one of the best possible previous crops for maize. From that reason is very important which crop we growing before maize. The aim of this experiment was to investigate effect of two different crop sequences on height, leaf area index and maize grain yield. The experiment was set up on experimental field of Maize Research Institute Zemun Polje in 2009. We compared two type of three crop rotation: wheat-soybean-maize (W-S-M) and soybean-wheat-maize (S-W-M) rotation. ZP 677 (older hybrid) and ZP 606 (new hybrid) sown as sub-treatment, because we tested influence crop rotation on different hybrids. We measured leaf area and height after period of pollination and grain yield in full maturity of maize. In this paper we show results from the first year (2009) and after first rotation of maize, soybean and wheat (2012). After first rotation (2012), in hybrid ZP 606, higher LAI (leaf area index), height and grain yield were in soybean-wheat-maize rotation ( $3.90 \text{ m}^2/\text{m}^2$ , 197.5 cm,  $6970 \text{ kg ha}^{-1}$ ) in comparison with wheat-soybean-maize rotation ( $2.98 \text{ m}^2/\text{m}^2$ , 175.8 cm,  $5880 \text{ kg ha}^{-1}$ ). In hybrid ZP 677, wheat-soybean-maize rotation had higher maize yield only for  $410 \text{ kg ha}^{-1}$ . But higher value of LAI and height achieved in soybean-wheat-maize rotation ( $3.51 \text{ m}^2/\text{m}^2$  and 201.9 cm in S-W-M;  $2.36 \text{ m}^2/\text{m}^2$  and 180.3 cm in W-S-M). Based on results, wheat is much better previous crop for maize in comparison with soybean and role of crop sequence is very important for achieving higher productive characteristics of maize regardless on choice of maize hybrid.

Key words: crop rotation, maize, wheat, soybean, yield.

## THE EFFECT OF NITROGEN FERTILIZATION ON DRY MATTER YIELD OF ALFALFA AND LEGUME-GRASS MIXTURES

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Nitrogen fertilization is one of the most important agro-technical measures used to increase the yield of forage crops. Alfalfa as nitrogen fixator has the ability to independently provide nitrogen from the atmosphere and partially provide it to plants that are grown in mixture with it. Adding of nitrogen to grasses in the mixture through fertilization is thus compensated for through nitrogen fixation. When more grasses are sowed in mixture with alfalfa, their competitive ability dictates the amount of nitrogen utilized. Cocksfoot is grass species known for its very high competitive ability and the successful growing in the mixture with alfalfa. The study was performed on the experimental field of the Institute for Animal Husbandry in Zemun, Serbia and it included the pure cocksfoot crop, dual mixture of alfalfa and cocksfoot (50% : 50%) and the triple mixture of cocksfoot with alfalfa and meadow fescue in different proportions (25% : 50% : 25% and 50% : 25% : 25%). Nitrogen fertilizer was applied in the spring in the following rates: 0, 50 and 100 kg N ha<sup>-1</sup>. The aim of the research was to determine the influence of nitrogen fertilization on yield of cocksfoot in monoculture and in mixtures, and whether the cultivation of cocksfoot mixed with alfalfa and meadow fescue compensated for certain levels of fertilization of monoculture. Increasing quantity of nitrogen fertilizer has decreased the percentage of alfalfa in the mixture by about 30%. Cocksfoot in the mixture achieved higher yields than pure crop. A mixture of cocksfoot and alfalfa in the first harvest, in the treatment without fertilization, showed significantly higher dry matter yield of 14.3 t compared to the pure crop in the same fertilization treatment of 11.8 t.

Key words: alfalfa, cocksfoot, meadow fescue, mixture, nitrogen

## UTICAJ ĐUBRENJA AZOTOM NA PRINOS JEŽEVICE U MONOKULTURI I U SMEŠI SA LUCERKOM I LIVADSKIM VIJUKOM

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Đubrenje azotom je jedna od najvažnijih agrotehničkih mera koja se koristi radi povećanja prinosa krmnih biljaka. Lucerka kao azotofiksator ima sposobnost da samostalno obezbedi azot iz atmosfere, ali time i da delimično obezbedi biljke koje se gaje zajedno u smeši sa njom. Dodavanje azota travama u smeši putem đubrenja je time kompenzovano azotofiksacijom. Pri setvi više trava u smeši sa lucerkom, njihova konkurentna sposobnost diktira i količinu usvojenog azota. Ježevica je travna vrsta poznata po veoma velikoj konkurentskoj sposobnosti i uspešnom gajenju u smeši sa lucerkom. Ispitivanje izvedeno na oglednom polju Instituta za stočarstvo u Zemunu, Srbija je obuhvatilo pored čistog useva ježevice, dvojnju smešu ježevice i lucerke (50% : 50%) i trojne smeše ježevice sa lucerkom i livadskim vijukom u različitom odnosu (25% : 50% : 25% i 50% : 25% : 25%). Azotno đubrivo se primenjivalo u proleće sa količinama od 0, 50 i 100 kg N ha<sup>-1</sup>. Cilj istraživanja je bio utvrđivanje uticaja azotnog đubriva na prinos ježevice u monokulturi i u smešama, te da li gajenje ježevice u smeši sa lucerkom i livadskim vijukom kompenzovalo određene nivoe đubrenja monokulture. Rastuće norme azotnog đubriva su smanjile udeo lucerke u smeši za oko 30%. Ježevica je u smeši ostvarila veći prinos nego u čistom usevu. Smeša ježevice i lucerke u prvom otkosu, u tretmanu bez đubrenja, imala je značajno veći prinos suve mase od 14,3 t u odnosu na čist usev u istom tretmanu đubrenja od 11,8 t.

Ključne reči: azot, ježevica, livadski vijuk, lucerka, smeša

WEED VEGETATION OF CORN IN  
THE REGION OF SEMBERIJAR. Stepić<sup>1</sup>, M. Dugonjić<sup>2\*</sup>, Vera Milošević<sup>3</sup>, N. Stošić<sup>4</sup>, Ljiljana Tanasić<sup>5</sup>

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The region of Semberija is situated in the northeast part of the Republic of Srpska and Bosnia and Herzegovina. It is bordered upon the River of Sava in the north, the River of Drina in the east, and the slopes of the Mountain of Majevica in the southwest and west. The total area of Semberija is 734 km<sup>2</sup>, arable land covers 53.926 ha and wheat is represented on approx. 80%. Phytocoenological examinations of row crops in the region of Semberija were done during 2014 on 21 locations ( Glavičice, Obrež, Janja 1, Janja 2, Glogovac, Patkovača, Amajlije, Popovi, Dvorovi, Mađaši, Balatun, Brodac, Batković, Velika Obarska, Donje Crniljevo, Gornje Crniljevo, Donji Dragaljevac, Ljeljenča, Hase, Suho Polje and Modran ).The subject of this examination is weed vegetation, life forms, flora elements, agroecological indexes as well as syntaxonomic belonging. The aim of this paper is to help solving the problem of weed suppression in row crops in the region of Semberija. Phytocoenological examinations were done by the method of Swiss-French Braun-Blanquet school (1964 ). Life forms were determined according to Raunkier, added by Ujvaros ( 1957 ). Flora elements were given according to Gajić ( 1980 ). Ecological indexes were given according to Landolt ( 1977 ). Syntaxonomic position of weed vegetation was determined according to Kojić ( 1998 ). From the syntaxonomic point of view, plant association was registered on the examined locations: Class *Stellarietae mediae* Tx., Lohm.et Prsg. 1950. Order *Chenopodietalia Albi* Tx., Lohm.et.Prsg.1950. Alliances *Polygono-Chenopodion* Koch, 1926 *mm Sissingh*, 1946 *Ass. Panico-Ambrosietum artemisifoliae* ( Vera Milošević, 2008 ). On the examined locations, in the region of Semberija, 74 weed types were noticed. Terophytes are registered with 67,57%, geophytes with 21,62%. The large presence of floral elements widely disseminated ( 78,56% ) were noticed as well as about 9,72% of weed plants from Mediterranean region. On the examined regions, weed association *Panico-Ambrosietum artemisifiliae* was noticed, having 74 weed species, terophite character, with the highest percent of late spring weeds ( 64 % ) making their suppression rather difficult. That is, the appearance of late spring weeds is noticed after stopping herbicide effects, used in pre emergence usage. Because of that, it is necessary to use herbicides after growing both weeds and corn ( post emergence ) usage. Agroecological indexes present the real condition of habitats in the region of Semberija, being confirmed by agrochemical analyses of soil from all the habitats.

Keywords: weeds, association, corn, Semberija

## KOROVSKA VEGETACIJA KUKURUZA NA PODRUČJU SEMBERIJE

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Područje Semberije se nalazi u severoistočnom delu Republike Srpske i Bosne i Hercegovine. Na severu graniči se rekom Savom, sa istoka rekom Drinom, a jugozapadno i zapadno su obronci planine Majevice. Ukupna površina Semberije je 734 km<sup>2</sup>, obradivih površina je 53.926 ha, od čega su žita zastupljena na oko 80%. Fitocenološka istraživanja okopavina na području Semberije su obavljena tokom 2014. godine na 21 lokalitetu (Glavičice, Obrež, Janja 1, Janja 2, Glogovac, Patkovača, Amajlije, Popovi, Dvorovi, Međaši, Balatun, Brodac, Batković, Velika Obarska, Donje Crnaljevo, Gornje Crnaljevo, Donji Dragaljevac, Ljeljenča, Hase, Suho Polje i Modran). Predmet istraživanja u ovom radu je korovska vegetacija, životni oblici, florni elemenati, agroekološki indeksi kao i sintaksonomska pripadnost. Cilj ovog rada je da pomogne rešavanju problema suzbijanja korova u okopavinama na području Semberije. Fitocenološka istraživanja su obavljena metodom švajcarsko-francuske škole Braun-Blanquet (1964). Životni oblici su određeni prema Raunkier-u, koji je dopunio Ujvaros-i (1957). Florni elementi su dati prema Gajiću (1980). Ekološki indeksi dati su prema Landolt-u (1977). Sintaksonomski položaj korovske vegetacije određen je prema Kojiću (1998). U sintaksonomskom pogledu, na ispitivanim lokalitetima konstatovana je biljna zajednica: Klasa *Stellarietae mediae* Tx., Lohm.et. Prsg.1950. Red *Chenopodietalia Albi* Tx., Lohm.et. Prsg.1950. Sveze *Polygono-Chenopodion* Koch, 1926 mm Sissingh. 1946. Ass. *Panico-Ambrosietum artemisifoliae* (Vera Milošević, 2008). Na ispitivanim lokalitetima, na području Semberije konstatovano je 74 korovske vrste. Terofite su zastupljene sa 67,57%, a geofite sa 21,62%. Uočeno je veliko prisustvo flornih elemenata široko rasprostranjenih (78,56%) i oko 9,72% korovskih biljaka mediteranskog područja. Na ispitivanim lokalitetima konstatovana je korovska zajednica *Panico-Ambrosietum artemisifoliae*, koja ima 74 korovske vrste, terofitskog karaktera, sa najvećim procentom poznoprolećnih korova (64%) što znatno otežava njihovo suzbijanje. Naime pojava poznoprolećnih korova se javlja nakon prestanka delovanja herbicida koji se primenjuju u pre emergence primeni. Zato je neophodna primena herbicida posle nicanja i korova i kukuruza (post emergence) primena. Agroekološki indeksi odražavaju stvarno stanje staništa na području Semberije, što su potvrdile i agrohemijske analize zemljišta sa svih staništa.

Ključne reči: korovi, asocijacija, kukuruz, Semberija.

## BIOMASS YIELD AND QUALITY PARAMETERS OF SELECTED RYEGRASS (*Lolium perenne* L.) POPULATIONS

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Yield and quality parameters were assessed on genetically divergent ryegrass populations in a three year field-experiment. Ryegrass populations were obtained from expedition collections of indigenous ryegrass (*Lolium perenne*) species from the area of Bosnia and Herzegovina (Republic of Sprska). Following seed multiplication, seven ryegrass populations were selected in 2006 for further evaluation. Selected ryegrass populations were the following: Banja Luka, Kosjerovo, Laminci, Kobatovci, Kobas, Delibašino selo and Sarajevo. The experimental design followed was random in a continuous three-year experiment. Parameters of yield and quality were assessed during harvest: a) yield of fresh and dry biomass, b) content of protein and c) cellulose content. Based on the three-year study of green biomass and dry mass yield, by the yield height and stability, the population of Banja Luka stands out (29.1 t ha<sup>-1</sup> green biomass and 6.52 t ha<sup>-1</sup> dry mass). In the first harvest of dry mass a highest raw proteins content (141.3 g kg<sup>-1</sup> SM) and the lowest content of raw cellulose (230.0 g kg<sup>-1</sup> SM) had the population Delibašino selo. The average raw proteins content in the second harvest was highest at the populations Delibašino selo, and the third at a population Sarajevo. The highest average raw proteins yield measured during these tests was achieved at a population Sarajevo. Based on the results of this research ryegrass populations can be distinguished and included in the programme of development of new ryegrass cultivars for different purposes and ways of utilization.

Key words: harvest, biomass, protein content, cellulose content.

PRINOS BIOMASE I PARAMETRI KVALITETA  
SUVE MATERIJE ODABRANIH POPULACIJA  
ENGLESKOG LJULJA (*Lolium perenne* L.)

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Ispitivanja komponenti prinosa genetički divergentnih populacija engleskog ljulja obavljena su na oglednom polju i u laboratorijama Poljoprivrednog instituta Republike Srpske u Banja Luci, tokom 2006., 2007. i 2008. godine. Korišćeni materijali su potomstva autohtonih populacija engleskog ljulja, koje su sakupljene na širem području Republike Srpske, odnosno Bosne i Hercegovine. Nakon multiplikacije sjemena odabranih populacija, 2006. godine zasnovan je mikroogled, a za ova istraživanja korišćeno je 7 populacija engleskog ljulja. Tokom trogodišnjih istraživanja analizirana su slijedeća svojstva: a) prinos zelene biomase i suve materije; b) hemijski sastav suve materije u prvom otkosu; c) sadržaj sirovih proteina i celuloze u drugom i trećem otkosu; d) prinos sirovih proteina. Na osnovu trogodišnjih ispitivanja prinosa zelene biomase i suve materije, po visini i stabilnosti prinosa, ističe se populacije Banja Luka (29,1 t ha<sup>-1</sup> zelene biomase i 6,52 t ha<sup>-1</sup> suve mase). U prvom otkosu suve materije najviši prosječan sadržaj sirovih proteina (141,3 g kg<sup>-1</sup> SM) i najniži sadržaj sirove celuloze (230,0 g kg<sup>-1</sup> SM) imala je populacija Delibašino selo. Prosječan sadržaj sirovih proteina u drugom otkosu bio je najviši kod populacija Delibašino selo, a u trećem kod populacije Sarajevo. Najviši prosječan prinos sirovih proteina tokom ovih ispitivanja ostvaren je sa populaciom Sarajevo. Rezultata ovih istraživanja omogućiće izdvajanje pojedinih populacija engleskog ljulja, koje će se uključiti u progama stvaranja novih sorti engleskog ljulja za različita namjene i načine iskorišćavanja.

Ključne riječi: otkos, biomasa, sirovi proteini, sirova celuloza.

## THE INFLUENCE OF THE STRUCTURE OF TRANSPORT TRAIN AND THE DISTANCE OF THE PLOT ON THE TRANSPORT EFFICIENCY

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Process of the transport as activity in the agricultural production is essential and it is her constant companion. As such has a significant impact on the cost of agriculture products. The largest volume of agricultural production, and also of the transport, is carried out in plant production. He includes the entire transport of agricultural products, raw materials and other goods from the place of production to the place of storage or processing continuation and vice versa. Big time share of transport in plant production in relation to the total volume of mechanized works ranges from 35% to 50% and has a significant impact on overall costs. Therefore, determining of the optimal transport organization and formation of a transport train can greatly contribute to improve the economy. This essay presents the research of three types of transport train during corn combining with a distance of 1, 10 and 15 km, and on the basis of the obtained data determined the most efficient transport train. The aim of this research is analysis of the impact of the transport train structure and the distance of the plot on the efficiency of transport with characteristics and specifics of agricultural transport, as well as influencing factors on transport such as: the structure of the transport train, road network, transport distance, volume and capacity of transport vehicle, the speed of movement, time of loading and unloading. During the research, three transport trains A, B and C at a distance of 1, 10 and 15 km was found that: A transport vehicle at a distance of 1 km has transported 150,30 t at an average speed of 11.20 km/h, transport vehicle B has transported 104,50 t at an average speed of 7.41 km/h and transport vehicle C has transported 103,60 t at an average speed of 14.69 km/h. At a distance of 10 km transport vehicle A has transported 27.60 t at an average speed of 12.78 km/h, transport vehicle B has transported 72,50 t at an average speed of 10.75 km/h and transport vehicle C has transported 187,50 t at an average speed of 23.25 km/h. At a distance of 15 km transport vehicle A has transported 19.40 t at an average speed of 17.00 km/h, transport vehicle B has transported 56,70 t at an average speed of 15.00 km/h and a transport vehicle C has transported 143,30 t at an average speed of 30.50 km/h.

Key words: transport train, efficiency, transport, grain corn

## UTICAJ STRUKTURE TRANSPORTNOG VOZA I UDALJENOSTI PARCELE NA EFIKASNOST TRANSPORTA

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Transportni proces u poljoprivrednoj proizvodnji kao aktivnost je neophodan i stalni je njen pratilac. Kao takav znatno utiče na cijenu koštanja poljoprivrednih proizvoda. Najveći obim poljoprivredne proizvodnje, pa time i transporta, ostvaruje se u biljnoj proizvodnji. On obuhvata cjelokupan prevoz poljoprivrednih proizvoda, repromaterijala i drugih tereta od mjesta proizvodnje do mjesta skladištenja ili nastavka prerade i obrnuto. Veliko vremensko učešće transporta u biljnoj proizvodnji, u odnosu na ukupni obim mehanizovanih radova, kreće se od 35 % do 50 % i ima znatan uticaj na ukupne troškove. Prema tome, utvrđivanje optimalne organizacije transporta i formiranje transportnog voza može u velikoj mjeri da doprinese poboljšanju ekonomičnosti. U radu je dato istraživanje tri tipa transportnog voza pri kombajniranju kukuruza sa udaljenosti 1, 10 i 15 km. Na osnovu dobijenih podataka utvrđen je najefikasniji transportni voz. Cilj ovog izraživanja je analiza uticaja strukture transportnog voza i udaljenosti parcele na efikasnost transporta sa karakteristikama i specifičnostima poljoprivrednog transporta, kao i uticajnim faktorima na transport kao što su: struktura transportnog voza, putna mreža, transportna rastojanja, zapremine i nosivosti transportnih sredstava, brzine kretanja, vremena utovara i istovara. Prilikom istraživanja tri transportna voza A, B i C na udaljenosti 1, 10 i 15 km utvrđeno je da: transportno sredstvo A na udaljenosti 1 km prevezlo je 150,30 t prosječnom brzinom 11,20 km/h, transportno sredstvo B prevezlo je 104,50 t prosječnom brzinom 7,41 km/h i transportno sredstvo C prevezlo je 103,60 t prosječnom brzinom 14,69 km/h. Na udaljenosti 10 km transportno sredstvo A prevezlo je 27,60 t prosječnom brzinom 12,78 km/h, transportno sredstvo B prevezlo je 72,50 t prosječnom brzinom 10,75 km/h i transportno sredstvo C prevezlo je 187,50 t prosječnom brzinom 23,25 km/h. Na udaljenosti 15 km transportno sredstvo A prevezlo je 19,40 t prosječnom brzinom 17,00 km/h, transportno sredstvo B prevezlo je 56,70 t prosječnom brzinom 15,00 km/h i transportno sredstvo C prevezlo je 143,30 t prosječnom brzinom 30,50 km/h.

Ključne riječi: transportni voz, efikasnost, transport, zrno kukuruza

## CONTRIBUTION OF STORED PREANTHESIS ASSIMILATE TO GRAIN YIELD IN SPRING BARLEY

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Growing kernel of barley (*Hordeum vulgare* L.) can be supplied with carbohydrate and nitrogen (N) from current assimilation or from translocation of pre-anthesis accumulated reserves, which are stored in the vegetative plant parts. This study was conducted to assess the contribution of pre-anthesis accumulated dry matter (DM) and N to grain yield and N content in spring barley. Eight spring barley cultivars were grown on a non-calcareous chernozem soil in three growing seasons (1995-1997) at Novi Sad (45°20' N, 15°51' E, 86 m asl) at two N levels—low and high N level. Pre-anthesis DM contributed to total DM at anthesis 44, 33, and 31% in 1995, 1996, and 1997, respectively. DM translocation occurred only in favorable growing conditions. The cultivars did not differ in vegetative DM at anthesis and maturity and yield. N accumulated at pre-anthesis represented 92, 68, and 51% at the low N level and 138, 76, and 54% of total N at maturity at the high N level in 1995, 1996, and 1997, respectively. Depending on the year and N level, translocated N across cultivars represented 34-71% of grain N. Nitrogen losses occurred when anthesis N exceeded 150 kg ha<sup>-1</sup>. Selection of genotypes with a higher ability of pre-anthesis reserve utilization or genotypes with efficient post-anthesis DM and N accumulation may be two possible solutions in spring barley breeding for semiarid growing conditions.

**Key words:** accumulation, dry matter, nitrogen, spring barley (*Hordeum vulgare* ssp. *distichum* L.), translocation

## ZNAČAJ REZERVNIH ORGANSKIH MATERIJA ZA PRINOS ZRNA JAROG JEČMA

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Ugljeni hidrati i azot neophodni za rast zrna ječma (*Hordeum vulgare* L.) mogu voditi porijeklo iz tekuće fotosinteze ili od translociranih, prije cvjetanja akumuliranih rezervnih materija u vegetativnim dijelovima biljke. U radu je prikazan doprinos do cvjetanja akumulirane rezervne organske materije i azota prinosu zrna i sadržaju azota u zrnu kod jarog ječma. Osam sorti jarog dvoredog ječma porijeklom iz semiaridnih područja (Pek i Jelen-Srbija, Skuner i Kantala-Australija) i umjereno humidnih područja (KM.184 i Orbit – Češka, Triumf i Gimpel-Njemačka) testirano je u Novom Sadu tokom tri godine (1995-1997) pri gajenju na dva nivoa azota. Akumulirana suva materija do cvjetanja predstavljala je manje od 50% ukupne suve materije u zrenju u 1995, 1996 i 1997 godini. Translokacija suve materije akumulirane do cvjetanja u zrno bila je samo u povoljnim ekološkim uslovima proizvodnje. Ispitivane sorte nisu se razlikovale u količini akumulirane suve materije u cvjetanju, zrenju i prinosu zrna. Od ukupnog azota utvrđenog u zrenju akumulirano je do cvjetanja 92% kod niskog i 138% kod visokog nivoa N u 1995, 68% kod niskog i 75% kod visokog nivoa N u 1996. godini i 51% kod niskog i 54% kod visokog nivoa N u 1997. godini. Zavisno od godine i nivoa azota, translocirani N predstavljao je 34-17% N utvrđenog u zrnu kod žetve. Gubitak azota iz biljke utvrđen je u uslovima kada je ukupni N u nadzemnom dijelu useva iznosio 150kg ha<sup>-1</sup>. Selekcija genotipova veće sposobnosti iskorišćavanja do cvjetanja akumulirane suve materije i N ili genotipova sa efikasnijom akumulacijom suve materije i N tokom nalivanja zrna predstavlja dva načina oplemenjivanja jarog ječma za semiaridne uslove proizvodnje. Gajenje ovakvih genotipova dovelo bi do smanjenja upotrebe azota u proizvodnji, očuvanja ekologije i proizvodnje zdravstveno bezbjedne hrane.

Ključne riječi: ječam (*Hordeum vulgare* L.) organska materija, akumulacija, translokacija





*Subsection: Plant Protection*



## PHYTOPLASMA DISEASES OF POME FRUITS IN NURSERIES OF REPUBLIC OF SRPSKA

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The most common phytoplasmas in pome fruits are "*Candidatus* Phytoplasma mali" (causal agent of apple proliferation, AP) and "*Candidatus* Phytoplasma pyri" (causal agent of pear decline, PD). They are phylogenetically related and belong to the 'Apple proliferation' phytoplasma group, subgroups 16SrX-A and 16SrX-C. These phytoplasmas are transmitted in the persistent circulative mode by psyllid species and through movement of infected plant propagation material. In Bosnia and Herzegovina presence of "*Ca.*Phytoplasma mali" and "*Ca.*Phytoplasma pyri" are reported on pome fruits, as well as some of their putative psyllid vectors (*Cacopsylla pyri* (L.), caring PD and *C. picta* (Foerster) and *C. melanoneura* (Forster) caring AP. The main objective of "Plant protection program" in 2013 and 2014 was to test apple and pear cultivars of mother plants in commercial nurseries for the presence of "*Ca.*Phytoplasma mali" and "*Ca.*Phytoplasma pyri". Inspection samples were taken from Republic of Srpska nurseries: Gradiška, Banjaluka, Doboj, Derventa, Šamac and Bijeljina. From July to middle of September, 67 samples (24 apples and 43 pears) were delivered for the laboratory testing. Total nucleic acid extraction was done from the leaf midrib and root phloem scraping following DNeasy Plant MiniKit (Qiagen) protocol with slight modification. For detection and identification of the phytoplasma nested PCR was employed. Nested-PCR was done with phytoplasma universal primer pair P1/P7 in direct PCR and with pair of 16SrX phytoplasma ribosomal group specific primers f01/r01 in nestedPCR. In addition, 12 positive f01/r01PCR products were send for sequencing. Restriction fragment length polymorphisms (RFLP) was used for the characterization of all identified phytoplasmas with *Bsa*I and *Ssp* I restriction enzymes. PCR/RFLP analyses showed that "*Ca.* Phytoplasma pyri" was identified in 12 pear samples and "*Ca.*Phytoplasma mali" in 6 apple samples. BLAST analyses showed that obtained sequences are 97-99% identical with sequences from Slovenia, Germany and Italy. All infected apple and pear mother plants should be eradicated (Law: Sl. Glasnik Republike Srpske number 75 from 26.08.2014.).

Key words: pear, apple, PCR, RFLP, BLAST.

## COMPARATIVE REVIEW OF HARMFUL ORGANISMS IN THE UNIVERSITY PARKS IN BANJA LUKA AND PODGORICA

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Urban green structures, parks and alleys, has a important influence on the quality of humans life and is one of the key factors of humans functioning in towns. Numerous abiotic and biotic factors have negative impact on urban green structures that affects the physiological condition and aesthetic value of each species. Within university parks in Banja Luka and Podgorica there significant variety of trees and shrub species. Park in Banja Luka is several decades old and contains more than 100 species. Park in Podgorica was established 8 years ago and there are about 60 species. Considering that the presence of harmful organisms can lead to a complete decay of trees, the aim of this study was to determine differences in the presence of harmful organisms in these two cities, and influence of climatic factors on the occurrence of harmful organisms. During 2014, two visual inspections (June and September) of plants in both parks, during the growing season, has been made. During the examination, samples with symptoms in order to determine pests and pathogens in the laboratory were taken. In the Banja Luka University park, the presence of harmful organisms was established in more species then in the park in Podgorica. 13 species grows in both parks, and the presence of harmful organisms on five species has been detected. *Platanus x acerifolia* (Aiton) Willd. revealed the presence of *Corythucha ciliata* Say., *Phyllonorycter platani* Staudinger and *Erysiphe platani*; on *Aesculus hippocastanum* L., *Cameraria ohridella* Deschka & Dimic and *Guignardia aesculi*; on *Catalpa bignonioides* Walt. leaf spot (*Cercospora* sp., *Phyllosticta* sp.) and powdery mildew (*Microsphaera alni*, *Phyllactinia corylea*); *Acer negundo* L. *Microsphaera alni*; at *Tilia cordata* Miller. Aphididae and *Eriophyes* sp. It can be conducted that the climatic factors in Banja Luka has better conditions for harmful organisms development than the climatic factors in Podgorica.

Key words: parks, presence, harmful organisms, urban green structures

## UPOREDNI PREGLED ŠTETNIH ORGANIZAMA U UNIVERZITETSKIM PARKOVIMA BANJALUKE I PODGORICE

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Urbano zelenilo, posebno parkovi i drvoređi, ima nezamjenjivu vrijednost za kvalitet života ljudi i jedan je od ključnih faktora funkcionisanja čovjeka u gradu. Na urbano zelenilo negativan uticaj ima niz štetnih abiotičkih i biotičkih faktora, koji utiču na fiziološko slabljenje stabala i narušavaju estetsku vrijednost svake vrste. U okviru univerzitetskog kompleksa u Banjaluci i Podgorici formirani su parkovi sa više različitih drvenastih i žbunastih vrsta. Park u Banjaluci je starosti više desetina godina i u njemu se nalazi više od 100 vrsta, a u Podgorici park je formiran prije 8 godina i u njemu raste oko 60 vrsta. S obzirom da prisustvo štetnih organizama može dovesti do slabljenja i potpunog propadanja stabala, cilj rada je bio da se utvrdi da li i u kojoj mjeri postoje razlike u prisustvu štetnih organizama u ova dva grada, odnosno da li klimatski faktori mogu uticati na pojavu štetnih organizama. U toku 2014. godine dva puta u toku vegetacije (juni i septembar) urađeni su vizuelni pregledi biljaka u oba parka. Prilikom pregleda uzimani su uzorci sa štetočinama i simptomima oboljenja u cilju determinacije štetočina i uzročnika oboljenja u laboratoriji. U parku u Banjaluci je utvrđeno prisustvo štetnih organizama na više vrsta u odnosu na park u Podgorici. U oba parka raste 13 istih vrsta, a na pet je utvrđeno prisustvo istih štetnih organizama. Na *Platanus x acerifolia* (Aiton) Willd. utvrđeno je prisustvo: *Corythucha ciliata* Say., *Phyllonorycter platani* Staudinger i *Erysiphe platani*; na *Aesculus hippocastanum* L.: *Cameraria ohridella* Deschka & Dimic i *Guignardia aesculi*; na *Catalpa bignonioides* Walt.: pjegavost (*Cercospora* sp., *Phyllosticta* sp.) i pepelnica (*Microsphaera alni*, *Phyllactinia corylea*); na *Acer negundo* L.: *Microsphaera alni*; na *Tilia cordata* Miller. Aphididae i *Eriophyes* sp. S obzirom da je u parku u Banjaluci utvrđeno prisustvo štetnih organizama na više vrsta u odnosu na park u Podgorici može se zaključiti da su klimatski uslovi u Banjaluci povoljniji za razviće štetnih organizama u odnosu na klimatske uslove u Podgorci.

Ključne riječi: parkovi, pojava, štetni organizmi, urbano zelenilo

## MASS OCCURRENCE OF POWDERY MILDEW ON PLANE TREES IN MONTENEGRO IN 2014

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Plane trees (*Platanus* spp.) represent an important ornamental plant of urban greenery in central and southern parts Montenegro. They are usually located along sidewalks, in parks or alleys. In the second half of the summer 2014 symptoms were observed on leaves as grayish white powdery zones. Symptoms were especially visible on younger leaves, which were during their development totally covered by ashy coating. Those leaves became deformed because of leaflets twisting that reduced assimilation surface. Based on symptoms and microscopic analysis it was confirmed that the disease is powdery mildew on plane trees. Microscopic examination of grayish white powdery spots on diseased leaves revealed epiphytic, branched, colorless, septate mycelium. Conidiophores were single, unbranched, bearing conidia of ellipsoidal or barrel shaped, hyaline, unicellular, individual or in short chains. Measure of a hundred of conidia established that their size were  $24,5-39,2 \times 14,7 - 19,6 \mu\text{m}$ . Anamorph characteristics indicate that the fungus is *Erysiphe platani* (Howe) Braun & Takamatsu, 2000b. On infected leaves no teleomorphic phase of the fungus was found. In Montenegro powdery mildew on plane trees was recorded in 1989 by Mijušković on the Montenegrin coast while, to our knowledge, this is the first recorded outbreak in Podgorica, which indicates the parasite's spreading. Considering the disease intensity and the spread of the parasite, further studies related to plane tree powdery mildew in Montenegro are required, especially research on epidemiological aspects of the disease, the fungus persistence in environmental conditions and possible presence of its teleomorphic phase.

Key words: powdery mildew, *Erysiphe platani*, plane trees, Montenegro

## MASOVNA POJAVA PEPELNICE NA PLATANIMA U CRNOJ GORI TOKOM 2014. GODINE

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Platani (*Platanus* sp.) predstavljaju važnu ukrasnu biljku urbanog zelenila centralnog i južnog dijela Crne Gore. Nalaze se obično duž šetališta, u parkovima ili u drvodredima pored ulica. U drugoj polovini ljeta 2014. godine na listovima su uočeni simptomi u vidu sivobjeličastih praškastih zona. Posebno su bili izraženi na mlađem lišću, koje je tokom svog razvoja bilo u potpunosti zahvaćeno pepeljastom prevlakom. Takvo lišće je, zbog savijanja liske, postajalo deformisano, sa smanjenom asimilacionom površinom. Na osnovu simptoma i mikroskopskih analiza utvrđeno je da se radi o pepelnici platana. Mikroskopskim pregledom sivobjelih praškastih gomilica na listovima uočena je epifitna, razgranata, bezbojna, septirana micelija. Konidiofore su pojedinačne, nerazgranate, daju konidije elipsoidnog ili buretastog oblika, hijaline i jednoćelijske, pojedinačne ili u kraćim lancima. Mjerenjem 100 konidija ustanovljeno je da se njihova veličina kretala u vrijednostima  $24,5-39,2 \times 14,7 - 19,6 \mu\text{m}$ . Karakteristike anamorfa upućuju da se radi o vrsti *Erysiphe platani* (Howe) Braun & Takamatsu, 2000. Na zaraženim listovima nije utvrđeno prisustvo teleomorfog stadijuma gljive. Pojava pepelnice na platanima zabilježena je u Crnoj Gori na primorju još 1989. godine od strane Mijuškovića, a prema našim saznanjima, ovo je prva pojava oboljenja u Podgorici, što ukazuje na širenje parazita. Imajući u vidu intenzitet napada i širenje parazita, potrebna su dalja istraživanja vezana za pepelnicu platana u Crnoj Gori, prvenstveno sa epidemiološkog stanovišta, eventualne pojave teleomorfog stadijuma i načina održavanja gljive.

Ključne riječi: pepelnica, *Erysiphe platani*, platani, Crna Gora

## TOSPOVIRUSES CURRENT STATUS IN BOSNIA AND HERZEGOVINA AND POSSIBLE MANAGEMENT

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The Tospoviruses are group of plant pathogenic viruses, members of family *Bunyaviridae*. The group is composed of quarantine and economically important plant viruses such as *Tomato spotted wilt virus* (TSWV), *Impatiens necrotic spot virus* (INSV) and *Iris yellow spot virus* (IYSV). So far, in Bosnia and Herzegovina (B&H) the presence of TSWV was reported on gloxinia (*Sinningia speciosa* Baill), ISWV on begonia (*Begonia x tuberhybrida*) and IYSV on onion (*Allium cepa* L.). TSWV is quarantine and one of the most important viruses infecting pepper and tomato, while IYSV is emerging pathogen on onions. TSWV and IYSV are thrips-transmitted viruses and their presence and distribution on vegetable crops in B&H is not examined sufficiently. Therefore, the main aim of the study was to check presence and distribution of the viruses on tomato (*Solanum lycopersicum* L.), pepper (*Capsicum annuum* L.), onion (*Allium cepa* L.) and garlic (*Allium sativum* L.) samples from several locations in Semberija and Herzegovina regions. In period from 2011 to 2013 samples were collected from tomato, pepper, onion and garlic production sites and nurseries for the laboratory analyses. Tomato and pepper leaf samples were used for DAS ELISA test using commercial antiserum to TSWV (Bioreba, Switzerland) and onion and garlic leaves for DAS ELISA with commercial antiserum to IYSV (DSMZ, Germany). The serological analyses confirmed TSWV in pepper samples from Semberija and IYSV in garlic sample from Herzegovina. The main control measures against the virus diseases considering improvement of cultural controls. The main aspect is pointed to the control of thrips vectors using different physical barriers, biological and chemical control measures. However to assume appropriate control measures, laboratory plant testing for the virus presence is suggested.

Key words: TSWV, IYSV, Semberija, Herzegovina, DAS ELISA

MEDITERRANEAN CARNATION TORTRIX MOTH  
*Cacoecimorpha pronubana* Hübner (Lepidoptera: Tortricidae)  
IN NURSERIES IN MONTENEGRO

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Mediterranean carnation tortrix moth *Cacoecimorpha pronubana* Hübner is an A2 quarantine pest for EPPO recommended for regulation (European Council Directive 74/647/EEC). It is a highly polyphagous. Larvae attacks plants in 138 genera including many ornamental, fruit and vegetable crops. The major host is carnation (*Dianthus caryophyllus* L.). *C. pronubana* originates in the Mediterranean where is widespread, but also occurs in some northern European countries. The larvae feed on leaves and petals, binding them with silken webbing. They can also bore flower buds and damage the skin of fruits. Presence of *C. pronubana* was sporadically found in Montenegro in the open, in period 2007-2009 at the seacoast on laurel (*Laurus nobilis* L.), and in the area of Podgorica on laurel, *Lantana* sp. and *Lonicera* sp. From 2011 to 2013 the pest was monitored using pheromone traps Csalomon® (RAG). Traps were set up in second half of April in four localities along the seacoast (Ulcinj, Bar, Radanovići, Đenovići) and in one locality in Podgorica and checked in intervals from 15 to 25 days until mid November. On the seacoast traps were placed in four nurseries with ornamental plants and in two mixed nurseries, both with ornamental and fruit plants, and in mixed nursery in Podgorica. In one nursery with ornamental plants in Bar and one mixed in Đenovići traps were placed in the open, while in other localities in greenhouses. During period of monitoring visual inspection of nursery plants were also done. Our results showed presence of *C. pronubana* in all inspected localities. Depending on locality and year first adults were captured from end of April to mid June. During June adults were found in all localities and captures were until end of October to the first half of November. Visual inspection showed presence of symptoms of attack on carnation, laurel and lemon.

Key words: *Cacoecimorpha pronubana*, nurseries, monitoring, symptoms

## THE PRESENCE OF *PHYTOPHTHORA RUBI* IN RASPBERRY PRODUCTION

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During 2014 in the laboratories of the Institute of Horticulture, Faculty of Agriculture, University of Banja Luka as part of regular annual health inspections of nursery production has been analyzed the presence of *Phytophthora rubi* from the raspberry nursery and motherplant production. The analysis is done with 3 raspberry samples, of which one was a sample from the motherstock. Also, it is analyzed 3 inspector raspberry samples from motherplant production. During regular services carried out in the laboratories of the Institute, analyzed 5 samples of commercial production of raspberries and 2 samples of blackberries. DNA extraction was done from raspberry and blackberry root, which were amplified by the nested PCR and then visualized on a 1% agarose gel. The presence of *Phytophthora rubi* was confirmed in one sample from the motherplant of raspberry and in three samples from the commercial raspberries production. The presence of *Phytophthora rubi* has not been confirmed in blackberries samples.

Key words: raspberry, *Phytophthora rubi*, nested PCR.

PRISUSTVO *PHYTOPHTHORA RUBI* U  
PROIZVODNJI MALINE

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Tokom 2014. godine u laboratorijama Instituta za hortikulturu na Poljoprivrednom fakultetu Univerziteta u Banjaluci u okviru redovne godišnje kontrole zdravstvene ispravnosti rasadničke proizvodnje izvršena je analiza uzoraka iz matičnjaka i rasadnika maline na prisustvo *Phytophthora rubi*. Tom prilikom je urađena analiza 3 uzorka maline, od čega je jedan uzorak bio iz matičnjaka. Takođe su analizirana 3 inspektorska uzorka iz matičnog zasada maline. Tokom redovnih usluga koje se provode u laboratorijama Instituta, analizirano je 5 uzoraka maline iz komercijalne proizvodnje, kao i 2 uzorka kupine. Ekstrakcija DNK je vršena iz uzoraka korjena maline i kupine, koji su umnoženi metodom nested PCR, a zatim vizualizirani na 1% agaroznom gelu. Prisustvo *Phytophthora rubi* je potvrđeno u jednom uzorku iz matičnog zasada maline i u 3 uzorka iz komercijalne proizvodnje maline. Prisustvo *Phytophthora rubi* nije potvrđeno u uzorcima kupine.

Ključne riječi: malina, *Phytophthora rubi*, nested PCR.

## VIPS – AN OPEN SOURCE TECHNOLOGY PLATFORM FOR PROGNOSIS AND DECISION SUPPORT AND ITS IMPLEMENTATION IN BOSNIA AND HERZEGOVINA

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The rapid worldwide adaptation of mobile telecom technology creates new opportunities for information flow and interactive forecasting of pests and diseases. VIPS is a technology platform developed for international collaboration on prognosis and decision support, where results from forecasting models can be easily distributed to users anywhere. The model output views are flexible and simple to incorporate in existing web sites or distribute on smart phones and tablets. Worldwide cooperation on development, implementation, testing and validation of forecasting models is made easy in VIPS. The source code for the platform is released under an Open Source License, guaranteeing partners that their efforts will be mutually shared and beneficial. The VIPS system is based on 14 years of experience with a web based forecasting and information service for integrated management of pests and diseases in cereals, vegetables, and fruit crops in Norway. The system allows for local adaptations, including language, incorporation of models and other services. VIPS was tested in Sweden and Bosnia and Herzegovina in 2014. In 2015, testing will continue in apple orchards and vineyards in Bosnia and Herzegovina, while the system will be put into production for several disease models in Sweden and Norway. As part of a project financed by the Norwegian ministry of Foreign affairs with focus on ICT development as a tool for improving IPM in Bosnia and Herzegovina. The system will include forecasting models relevant for diseases and pests in apple orchards (*Venturia inaequalis*, *Cydia pomonella*) and vineyards (*Plasmopara viticola* and *Lobesia botrana*). Seven weather stations have been installed in the fruit growing region of Tuzla, and one in the research vineyard of the University of Mostar during year 2014. Two stations were added, one in the Potkozarje fruit region and in vineyards in Popovo polje in the beginning of season 2015. Models that are used are a combination of commercial models, ones developed within VIPS and software offered from producers of meteorological stations. Combining data from these stations with weather forecasts from the free Norwegian weather forecasting service YR, the models will be tested and validated in these regions. Insect traps with automated image capture have been developed within the project, and will be tested in Norway and Bosnia and Herzegovina and compared with commercially available traps. An important overall goal is to provide a flexible and sustainable tool for further improvement of IPM in Bosnia and Herzegovina.

Keywords: VIPS, decision support systems, *Venturia inaequalis*, *Cydia pomonella*, *Plasmopara viticola*, *Lobesia botrana*

## EFFECTIVENESS OF SOME FUNGICIDES FOR CONTROL OF *BOTRYTIS SQUAMOSA*

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Botrytis leaf blight, caused by *Botrytis squamosa*, is one of the most important diseases of onion (*Allium cepa*). The disease is widespread in the UK but it has restricted distributions in France, China and Canada. The fungus is also present in commercial onion fields in Florida and Texas (USA) and in Republika Srpska (BiH). Although sanitation practice that reduce primary inoculum could significantly decrease infection pressure, control of the disease relies mainly on fungicide applications at regular basis. During 2007 and 2009 growing season, field experiments were conducted in a commercial onion crop to evaluate effectiveness of some fungicides for control of *Botrytis squamosa*. In addition, sensitivity of *B. squamosa* isolates to fungicides with different modes of action was studied under laboratory conditions. Field trials were designed as randomized blocks with four replicates per treatment. In the first trial, fungicides including: fenhexamid, cyprodinil, boscalid+pyraclostrobine, cyprodinil+fludioxonil, chlorothalonil and captan were applied four times – from five-leaf stage until bulbs reached 50% of their final size (BBCH 15-45) in 7-day intervals. All the products were applied at the same time and at producers' recommended rates. Untreated plots were used as a control. The effect of the tested products was assessed 14 days after the last fungicide treatment, according to the intensity of leaf infection. In order to determine optimal fungicide application schedule for cost-effective onion protection, nine different spraying programs were evaluated using chlorothalonil as a model fungicide. The programs differ in the timing of the first treatment, in the duration of the period between two treatments, as well as in the total number of treatments. Maximum eight and minimum three treatments were applied, while the control plots were receive no applications. The assessment was performed the same way as in the previous trial. *In vitro* sensitivity of *B. squamosa* was determined based on fungicide concentration that inhibited mycelial growth by 50% (EC-50) values which was determined in radial growth experiments using 4-day old mycelium of *B. squamosa* grown on PDA medium. Under field conditions, the highest efficacy of *B. squamosa* control was achieved by chlorothalonil (35.2%) and by the combination pyraclostrobin + boscalid (33.9%). The lowest efficacy was recorded for cyprodinil (5.4%). In the second trial, the most effective was the spraying program that consisted of five treatments in 7-day intervals, starting from eight-leaf stage of onion. In the *in vitro* experiments, the highest toxicity was recorded for fenhexamid (EC-50 = 0.043-0.095 mg/l) and boscalid (EC-50 = 0.088-1.98 mg/l), while chlorothalonil and captan were less toxic with EC-50 values 0.34-3.13 mg/l and 1.98-4.30 mg/l, respectively.

Key words: onion, Botrytis leaf blight, fungicides, efficacy, sensitivity

## DETECTION OF VIRUSES PRESENCE IN FRUIT COLLECTION IN GENE BANK IN REPUBLIC OF SRPSKA

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Detection of viruses presence were tested by DAS-ELISA on 227 accessions of pome and stone fruit trees originated from the fruit collection of the Gene Bank of the Republic of Srpska at the site of the Institute of Genetic Resources, University of Banja Luka. The pome fruit trees were analyzed on presence of the following viruses: Apple Chlorotic Leaf Spot Virus (ACLSV), Apple Stem Grooving Virus (ASGV), Apple Stem Pitting Virus (ASPV) and Apple Mosaic Virus (ApMV). The stone fruits were analyzed on presence of Plum Pox Virus (PPV), Prune Dwarf Virus (PDV) and Prunus Necrotic Ring Spot Virus (PNRSV). All samples were tested serologically by DAS-ELISA method with commercial antisera according to recommended protocol (Bioreba, Switzerland). A total of 207 acquisitions of apples and pears were analyzed, of which 24 samples were positive on ACLSV presence, 12 samples were positive on ASGV presence, and 9 samples were positive on ASPV presence. One sample was suspected on ApMV presence. Of the total 19 analyzed acquisitions of stone fruit trees, 6 samples were positive on PPV presence and 5 samples were positive on PDV presence. The presence of PNRSV was not confirmed from the analyzed acquisitions of stone fruit trees.

Key words: pome fruit viruses, stone fruit viruses, DAS-ELISA

## VIRUSNI STATUS PRINOVA U KOLEKCIJI VOĆAKA U BANCI GENA REPUBLIKE SRPSKE

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Provjera virusnog statusa izvršena je na 227 prinova jabučastih i koštičavih voćaka iz kolekcije u Banci gena Republike Srpske na lokaciji Instituta za genetičke resurse Univerziteta u Banjaluci primjenom DAS-ELISA testa. Na jabučastim voćkama je urađena analiza na prisustvo sljedećih virusa: virus hlortične lisne pjegavosti (*Apple Chlorotic Leaf Spot Virus*, ACLSV), virus brazdavosti stabla jabuke (*Apple Stem Grooving Virus*, ASGV), virus jamičavosti stabla jabuke (*Apple Stem Pitting Virus*, ASPV) i virus mozaika jabuke (*Apple Mosaic Virus*, ApMV). Na koštičavim voćkama je urađena analiza prisustva virusa šarke šljive (*Plum Pox Virus*, PPV), virusa kržljivosti šljive (*Prune Dwarf Virus*, PDV) i virusa nekrotične prstenaste pjegavosti (*Prunus Necrotic Ring Spot Virus*, PNRSV). Svi uzorci su serološki testirani DAS-ELISA metodom sa komercijalnim antiserumima po preporučenim protokolima (Bioreba, Switzerland). Analizirano je 207 prinova jabuke i kruške, od čega je 24 uzoraka pozitivno na prisustvo ACLSV, 12 uzoraka pozitivno na prisustvo ASGV, a 9 uzoraka pozitivno na prisustvo ASPV. Jedan uzorak je bio sumnjiv na prisustvo ApMV. Od ukupno analiziranih 19 prinova koštičavih voćaka, 6 uzoraka je pozitivno na prisustvo PPV, a 5 uzoraka je pozitivno na prisustvo PDV. Prisustvo PNRSV nije potvrđeno kod analiziranih prinova koštičavih voćaka.

Ključne riječi: virusi jabučastih voćaka, virusi koštičavih voćaka, DAS-ELISA





*Subsection: Vegetable Growing*



## HEAVY METALS AND HEALTH SAFETY OF VEGETABLES

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Vegetables are very important source of vitamins, minerals, proteins, carbohydrates and trace elements in human nutrition. Therefore, the chemical composition of vegetables is very important from the standpoint of food quality and safety. Heavy metals are one of many pollutants that can be found on the surface and in tissues of fresh vegetables. Some of them, like Fe, Zn and Cu, are essential for living organisms, while the other, like Pb and Cd, are adverse. Although in the majority of agricultural soils levels of heavy metals are not so high as to cause acute toxicity, elevated concentrations of heavy metals in various kinds of food can significantly affect human health. In particular, metals that get into the human body by food ingestion, as Cd and Pb, can severely jeopardize health. High concentrations of these metals in food are associated with the development of many diseases, in particular of cardiovascular, kidney, nerve and bone tissues, cancer and mutagenesis. Vegetable species can sometimes accumulate significant amounts of heavy metals without displaying visible symptoms of damage on plants themselves. Therefore, there is concern of consumers about the quality of food, especially vegetables and fruits that are consumed daily, with regard to concentration of toxic heavy metals. It is of crucial importance to regularly analyze concentration of those metals in vegetables to ensure that it does not exceed the limits allowed by regulations and to take care in agronomic practice to prevent entry of undesirable elements into the food chain. This is especially important because Pb and Cd are among the most widespread heavy metals of high toxicity. Concentrations of heavy metals, recorded during three years period, in various kinds of vegetables (broccoli, cabbage, carrots, cauliflower, celery, cucumber, eggplant, garlic, leek, lettuce, melon, onion, paprika, parsley, parsnip, potatoes, red beet, radish, squash, tomato, watermelon) will be discussed.

Key words: Lead, cadmium, vegetables

## INFLUENCE OF GRAFTING AND SUBSTRATE SALINITY ON MORPHOLOGICAL CHARACTERISTICS OF TOMATO

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Intensive production of tomato in greenhouses is subjected to frequent irrigations on a daily basis and abundant nutrition through fertigation that could build up soil salinity. The effects of soil salinity is manifested on the plants as symptoms of physiological stress due to a reduction of water absorption. In this experiment were tested four levels of substrate salinity (0.68 dS/m; 0.92 dS/m; 3 dS/m and 9 dS/m), on three different tomato hybrids (Bella, Buran and Berberana) both, grafted and nongrafted seedlings repetitions. All hybrids showed a tendency to decrease the measured morphological traits (plant height, leaf number, leaf number to blossom and the stem thickness) with an increase of the soil salinity. Substrate salinity up to 0.92 dS/m did not show a greater negative impact on the studied traits of hybrids. On the other hand, salinity over 3 dS/m had a major negative impact on the vigor traits of tomato hybrids. In all tested hybrids, grafted plants showed significantly better results for plant height, number of leaves and number of leaves to blossom. Higher level of substrate salinity showed no significant effect on the stem thickness with all repetitions. This experiment has shown that grafted plants of studied tomato hybrids were more vigorous and more resistant to water stress caused by increased salinity of the substrate regarding nongrafted plants. According to that, grafting measures could be recommended as a way of fighting physiological stress induced with high level of soil salinity.

Key words: tomato, grafting, salinity, morphology

## UTICAJ KALEMLJENJA I ZASLANJENOSTI SUPSTRATA NA MORFOLOŠKE OSOBINE PARADAJZA

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Intenzivni sistem proizvodnje paradajza u zaštićenom prostoru uz svakodnevno navodnjavanje i obilnu ishranu dovodi do zaslanjivanja zemljišta, pri čemu se problemi na biljkama manifestuju kao simptomi fiziološke suše jer je onemogućeno usvajanje vode. Istraživanja su rađena u supstratu sa četiri nivoa zaslanjenosti (0,68 dS/m; 0,92 dS/m; 3 dS/m i 9 dS/m), na tri različita hibrida paradajza (*bella*, *buran* i *berberana*) u varijantama kalemljenog i nekalemljenog rasada. Svi hibridi su pokazali tendenciju opadanja mjerenih morfoloških osobina (visina biljke, broj listova, broj listova do prve cvasti i debljina stabla) sa porastom saliniteta supstrata. Salinitet do nivoa od 0,92 dS/m nije pokazao veći negativan uticaj na ispitivane osobine hibrida. S druge strane, salinitet preko 3 dS/m je imao veliki negativan uticaj na ispitivane osobine bujnosti hibrida paradajza. Kod svih ispitivanih hibrida kalemljene biljke su imale bolje rezultate za visinu biljke, broj listova i broj listova do cvasti. Viši nivo zaslanjenosti supstrata nije pokazao značajan uticaj na debljinu stabla kod svih ispitivanih varijanti. Naša istraživanja su pokazala da su kalemljene biljke ispitivanih hibrida paradajza bujnije i otpornije na stres izazvan povećanim salinitetom supstrata od nekalemljenih biljaka, pa se kalemljeni rasad može preporučiti kao jedan od načina borbe u smanjenju fiziološke suše na zaslanjenim zemljištima.

Ključne riječi: Paradajz, kalemljenje, zaslanjenost, morfologija

## CORRELATION OF MORPHOLOGICAL, PRODUCTIVE AND CHEMICAL CHARACTERISTICS OF LOCAL POPULATIONS OF SPRING GARLIC

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Twenty populations of spring garlic were examined. Most of the production of this garlic in Serbia is based on them. They were examined in Zminjak, which is located in the central Mačva (Serbia). The method of field experiments was used. The research lasted for three years (2007-2009). The natural conditions (climate and soil) were favourable for growing garlic. During the year of 2008, there were the best conditions for garlic. Between the studied parameters (morphological, productive and chemical characteristics) were determined specific correlations. They are detected in the morphological and production characteristics, and the chemistry just for dry matter content. The largest number of correlative relationship expressed by the plant height, leaf area, weight of bulbs and yield. Characteristics that had a small number of correlative connection are: length of pseudostem, number of leaves and number of cloves. Dry matter content was correlated only with the diameter and weight of bulb and yield.

Key words: garlic, populations, characteristics, correlations

## KORELATIVNI ODNOSI MORFOLOŠKIH, PROIZVODNIH I HEMIJSKIH OSOBINA DOMAĆIH POPULACIJA BELOG LUKA PROLETNJAKA

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Ispitano je 20 domaćih populacija belog luka proletnjaka. Na njima se zasniva najveći deo proizvodnje ovog luka u Srbiji. One su ispitane u mestu Zminjak, koje je locirano u centralnoj Mačvi (Srbija). Korišćen je metod poljskih oglada. Ispitivanja su trajala tri godine (2007-2009). Prirodni uslovi (klima i zemljište) bili su povoljni za uspevanje luka. Najbolje uslove luku pružila je 2008. godina. Ispitivane su morfološke, proizvodne i hemijske osobine belog luka. Između ispitivanih parametara utvrđene su određene korelativne veze. One su konstatovane kod morfoloških i proizvodnih osobina, a kod hemijskih samo za sadržaj suve materije. Najveći broj korelativnih veza ispoljila je visina biljke, površina lista, masa lukovice i prinos. Osobine koje su imale mali broj korelativnih veza bile su: dužina lažnog stabla, broj listova i broj čenova. Sadržaj suve materije bio je u korelaciji samo sa prečnikom i masom lukovice, te prinosom.

Ključne reči: beli luk, populacije, osobine, korelacija

## BEAN IN ORGANIC AND CONVENTIONAL FARMING

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Bean takes a significant place in agricultural production as a profitable crop and a good preceding crop. Being a short season legume and possible second crop or intercrop, it is especially usable in intensive agricultural systems under irrigation, but also in sustainable ecological agricultural systems. Trials were set up in 2014. on several sites in Vojvodina, Serbia on several soil types in organic and conventional farming. The aim was to test certain features of bean growing and assess microbiological activity and nutrient content in soil. Number of plants in harvest and yields of different treatments within the trial were recorded. Bean plants were morphologically analysed at the stage of physiological maturity. Use of various symbiotic and free-living microorganisms is gaining importance in bean growing. Various microorganisms (e.g. *Rhizobium leguminosarum* bv. *phaseoli*, *Trichoderma atroviride*) and their different applications (seed or soil treatment) were analysed. These preparations affected yields and soil fertility, which is especially important in organic farming. From the viewpoint of rational soil use, economic and environmental efficiency of the production, bean cultivar specificity towards quantity of necessary nutrient (N) to form yield was analysed. Bean cultivars that make better use of the nutrients can be recommended for growing in production systems where fertilization is limited. It is well known that intercropping maize and bean affects the productivity of both species. Different intercropping systems were tested: row cropping in alternating strips and mixed cropping with adjusted plant stand and distribution. Two trials were set up – in organic and conventional farming systems. Intercropping bean with maize affected bean yields, plant weight and height, but did not affect 1000 grain weight. This intercropping also affected better crop stand in bean.

Key words: Dray bean, variety, growing, intrcropping, organic and conventional farming

## PASULJ U SISTEMIMA ORGANSKE I KONVENCIONALNE POLJOPRIVREDE

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Pasulj zauzima značajno mesto u poljoprivrednoj proizvodnji kao ekonomski isplativa biljna vrsta i dobar predusev. Posebno je pogodan, kao leguminoza kratke vegetacije, sa mogućnošću uzgoja kao drugi usev ili međusev, u sistemima intenzivne poljoprivrede sa obaveznim navodnjavanjem, ali i u sistemima održive, ekološke poljoprivrede. Tokom 2014. godine postavljeni su ogledi na više lokaliteta u Vojvodini sa ciljem ispitivanja reakcije pasulja na različite uslove proizvodnje. Ogledi su postavljeni na više tipova zemljišta u sistemima organske i konvencionalne poljoprivrede. Analiziran je broj biljaka u žetvi kao i prinos i morfološke osobine biljaka u fiziološkoj zrelosti. Merena je mikrobiološka aktivnost i sadržaj hraniva u zemljištu u više momenata tokom vegetacije. Korišćenje različitih simbiotskih i asimbiotskih mikroorganizama sve je značajnije u proizvodnji pasulja. Sem različitih mikroorganizama (*Rhizobium leguminosarum* bv. *phaseoli*, *Trichoderma atroviride* i druge) ispitani su i različiti načini primene preparata (seed or soil treatment). Primena ovih preparata imala je efekat na prinos i plodnost zemljišta, što je posebno značajno u organskoj proizvodnji. Sa gledišta racionalnog korišćenja zemljišta, ekonomske i ekološke efikasnosti proizvodnje, ispitana je sortna specifičnost pasulja u odnosu na zahteve prema azotu za formiranje potrebnog prinosa. Sorte koje bolje ekonomišu hranivima mogu se preporučiti za proizvodnju u sistemima proizvodnje u kojima je ograničena mogućnost dodavanja đubriva. Poznato je da efekat združivanja kukuruza i pasulja utiče na produktivnost obe biljne vrste. Ispitani su načini združivanja: setvom u neizmenične trake ili usejavanjem pasulja u kukuruz sa prilagođenim sklopom i rasporedom biljaka. Postavljena su dva ogleda, u organskom i konvencionalnom sistemu proizvodnje. Gajenje pasulja u združenoj setvi sa kukuruzom je uticalo na visinu prinosa, masu biljaka i visinu biljaka pasulja, ali nije uticalo na masu 1000 zrna. Združivanje kukuruza i pasulja je takođe uticalo na ostvarivanje boljeg sklopa kod pasulja.

Ključne reči: Pasulj, uzgoj, sorte, združeni usev, organska, konvencionalna

INFLUENCE OF DIFFERENT PLANT HORMONES APPLICATION  
ON PARAMETERS OF PEPPERS SEEDLINGS  
(*Capsicum annuum* L. cv. 'Sivrija')

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The aim of this study was to investigate the influence of different concentrations of synthetic plant hormones on production parameters of peppers seedlings (*Capsicum annuum* L. cv. 'Sivrija'). Plant hormones used in this experiment were indole-acetic acid (IAA), indole-butyl acid (IBA) and benzyl adenine (BA), each of it was applied to five different concentrations: 100, 300, 500, 1000 and 3000 mg l<sup>-1</sup>. In this study were analyzed pappers seedlings growing parameters: the mass of fresh root, root hair number per unit area of the root, leaf area, and the content of photosynthetic pigments in leaves. The highest impact on increment of pappers seedlings growing parameters was obtained using hormones IAA and IBA at concentrations of 100 and 300 mg l<sup>-1</sup>, which is recommended for use in growing of peppers seedlings (*Capsicum annuum* L. cv. 'Sivrija'). In repetitions where the hormone IAA, IBA and BA were used at concentrations of 500 or more mg l<sup>-1</sup> young peppers seedlings were unable to continue their life cycle, and it came to their wilting. This could be explained by the fact that too high concentration of the hormone could have herbicidal effect on the plant, particularly in the early stages of plant development.

Key words: auxin, cytokinin, root, leaf

## UTICAJ PRIMJENE RAZLIČITIH BILJNIH HORMONA NA PARAMETRE RAZVOJA PRESADNICA PAPRIKE (*Capsicum annuum* L. cv. 'Sivrija')

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Cilj ovog istraživanja je bio ispitati uticaj primjene različitih koncentracija sintetski proizvedenih biljnih hormona na parametre razvoja presadnica paprike (*Capsicum annuum* L. cv. 'Sivrija'). Biljni hormoni korišteni u ovom ogledu bili su indol-sirćetna kiselina (IAA), indol-butilna kiselina (IBA) i benzil adenin (BA), a svaki od njih primijenjen je u pet različitih koncentracija: 100, 300, 500, 1000 i 3000 mg l<sup>-1</sup>. Od parametra razvoja presadnica paprike u ovom istraživanju ispitivani su: masa svježe tvari korijena, broj korijenovih dlačica po jedinici površine korijena, površina listova, te sadržaj fotosintetskih pigmenata u listovima. Najveći uticaj na povećanje ispitivanih parametara razvoja presadnica paprike je iskazala primjena hormona IAA i IBA u koncentracijama 100 i 300 mg l<sup>-1</sup>, te se iste preporučuju za primjenu kod uzgoja presadnica paprike (*Capsicum annuum* L. cv. 'Sivrija'). U varijantama gdje su hormoni IAA, IBA i BA primijenjeni u koncentracijama od 500 i više mg l<sup>-1</sup> mlade presadnice paprike nisu uspjele nastaviti svoj životni ciklus, te je došlo do njihovog venuća, što se može objasniti činjenicom da previsoka koncentracija hormona može iskazati i herbicidni učinak na biljku, posebno u ranim stadijima razvoja biljke.

Ključne riječi: auksin, citokinin, korijen, list





*Subsection: Fruit Growing*



## PERSIAN WALNUT (*Juglans regia* L.) BREEDING AT NARIC FRUITCULTURE RESEARCH INSTITUTE

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Importance of Persian walnut (*Juglans regia* L.) increased a lot in Hungary during the last 10 to 15 years. Today, there are more than 5 000 ha commercial Persian walnut orchard surface in the country, based on the estimation this commercial orchard surface is increasing in the near future. The Hungarian growers prefer the Hungarian bred cultivars; 'Milotai 10' is the most grown cultivar (its growing ratio is 50%), followed by 'Alsószentiványi 117', which growing ratio is 40%. Other Hungarian bred walnut cultivars, which are on the National Cultivar List, don't play an important role in the Hungarian production. Our aim is to evaluate previously twice selected Persian walnut hybrid population to select new genotypes for candidate. The trial was planted by Prof. Péter Szentiványi at the Research Station of Érd of National Agricultural Research and Innovation Centre Fruitculture Research Institute in 1997. This hybrid population was selected twice previously. At present there are 100 genotypes derived from different crossing combinations. Progenies of 'Milotai 10' x 'Pedro', 'Pedro' x 'Alsószentiványi 117', 'Alsószentiványi 117 x Pedro' combinations were examined in the study between 2012-2014. The following phenological characteristics were checked in the hybrid population: leafing out time, blooming characteristics, ripening time as well as fruit characteristics such as fruit diameter, weight of dried fruit, kernel weight, kernel ratio, fruit volume, cracking ratio. Unfortunately, it was not possible to harvest any fruits in 2013 because of autoregulation of Persian walnut. Based on our examination there are two genotypes in our population, which have good characteristics, therefore those genotypes are suitable for state approval process. The first genotype is from 'Pedro x Alsószentiványi 117' crossing (its tree number is *V/2/28-30*), the second one is from 'Milotai 10' x 'Pedro' crossing (its tree number is *V/3/30-31*). The Research Institute has other research programs related to Persian walnut because there are some challenges in different branches of walnut industry. Prof. Szentiványi has created the walnut propagation in the nursery. The Persian walnut has a special nursery technology because it takes two leaves to produce non-feathered grafted trees in the nursery. The Persian walnut needs a special orchard system because of its large tree size. In the commercial orchards the growers use double tree number to reach big yield as early as possible. This fruit species has special diseases and pests, which can attack green parts of the tree during the vegetation season. Walnut growing needs special machines to spray the bearing tree and to harvest the fruits. Walnut growing doesn't finish with harvest because it needs to make post-harvest technology, otherwise, it is not possible to save the good fruit quality and to store them for long time. The intensive growing is a successful story in the pome and stone fruit production, but there are just some results in the field of shell fruit species therefore a walnut hedge trail was started in spring of 2000. The grafted trees are on 75% less surface compared to extensive commercial orchard surface, therefore it is a challenge to evaluate their yield and fruit quality.

Keywords: Persian walnut, breeding, hybrid population, growing technology

## META-ANALYSIS AND THE COMBINED ANALYSIS OF VARIANCE OF THE STUDIES WITH BIOSTIMULATOR TREATMENT IN APPLE

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Meta-analysis is novel statistical tool in agricultural sciences intended for summarizing treatment effects and the conclusions in scientific studies. Its application in agricultural sciences in general and especially in horticulture has been limited so far. This paper aims i) to introduce meta-analysis model; ii) to compare the results with traditionally and widely recognized analysis of variance; and iii) to discuss the application of those two models in five studies in apple. Data from five studies of Golden delicious apple cultivar treated with Sigma biostimulator were generated for yield. Dataset included normally distributed both treatment and control (non-treated) cases, with equal number of plots and trees in the plots, in order to match requirements for both combined analysis of variance and meta-analysis. Results and Five studies were analyzed using first the method of analysis of variance and provided full modeling with results. It was found that out of five studies three resulted with statistically significant treatment effect and two without. Combined analysis of variance of the studies set up as blocks was provided by highly significant result ( $F=9.22$ ,  $p=0.002$ ), in favor of biostimulator treated plants in comparison to the control plants. Meta-analysis of the same studies proved to provide similar results as by combined analysis of variance, but with much less requirements for the data, i.e. only metadata were used. In addition, straightforward meta-analysis provided average effect size with its confidence intervals and thus enabled easy comparison with individual studies. This research has demonstrated through practical example that meta-analysis yields results directly comparable to the combined analysis of variance. Moreover, meta-analysis requires only metadata and therefore it represents a good method of selection of the reliable decision making on the available research regarding the statistical significance of the effect and, more practical, treatment effect size in situations where several studies are compared on the basis of similar treatment. This is of particular importance for treatments providing ambiguous results through different studies, which is often the case in agricultural research.

Key words: meta-analysis, anova, horticulture, fruit science, treatment effect

**DISTRIBUTION OF SOME MICRO AND MACRO ELEMENTS  
IN LEAFS AND FRUITS AT  
APPLE CV. "GRANNY SMITH" GRAFTED ON  
NINE DIFFERENT ROOTSTOCKS**

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The influence on nine different dwarf apple rootstocks (M.9 T 984, M.9 T 337, Jork 9, Mark 9, Budagowski 9, M.9 EMLA, Pajam 1, Pajam 2, Supporter 4) on the distribution of some micro and macro elements in leafs and fruits were evaluated on "Granny Smith" apple variety. The experimental orchard was established in 2004, with planting distance 3.5 m x 1.5 m. the study has been performed during three consecutive years (2008-2010). The results showed that the influence of the evaluated rootstocks on distribution micro and macro elements was insignificant. But, behind insignificancy, the results showed different behavior in distribution of phosphorus, potassium, calcium, magnesium, boron, zinc, copper and aluminum. Namely, trees grafted on rootstock Mark 9 have higher concentration of the previously mentioned elements. Although the concentration of most of the analyzed elements was higher in 2008, the significant difference between years were not registered. Generally it can be concluded that more vigorous rootstocks (Suporter 4, Pajam 2 and EMLA 9) have higher concentration of N, P and K in the leaves. The correlation between the concentrations of micro and macro elements in soil leafs and apple fruits were also analyzed. The obtained results showed that Mg, B, Zn, Cu, Al and Fe in leafs, negatively relate with the Ca concentration in the fruits. In contrary, N, P and K concentrations, positively relate with the Ca concentration, which is very important for the firmness of the fruits.

Keywords: apple, dwarf rootstock, nutrition's, leaves, fruits, firmness

## THE IMPACT OF NON-STANDARD FERTILIZERS ON YIELD, POMOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF APPLES

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One way of fast and effective impact on yield, pomological and biochemical properties of apple fruits is foliar fertilization. Thus, the fruit efficiently recharge poorly mobile secondary and micronutrients, and so the plant protects against environmental stress in sensitive developmental stages. The last hypothesis we checked during the second part of the growing seasons of 2014, which were characteristic of abundant precipitation during the first part of the season. The experiment was set in 19th May 2014., in the 18 years old apple (*Malus domestica* L.; cv. „Idared“) orchard by a block system (10-12 trees per treatment), at a density of 1300 trees per ha. Treatments (19<sup>th</sup> May and 3<sup>rd</sup> Jun of 2014) per blocks were: control, “Eco-Fus” (45 ml; based on algae extract), “Vegard” (48 ml), “Calbit-C” (20 ml), “Zircon” (2,4 ml), “Cropmax” (40 ml), (all based on plant extracts), “Chitosan” (8 ml; based on shellfish extract), all dissolved in 8 l of water. The samples for biochemical analysis (determination the pH value and coefficient of refraction of the fruit extracts) were taken on 19th May, 3rd June, 2nd July, and on 9th September, when estimated yield. The yield was estimated by counting fruits on the tree in each block-treatment, followed by sampling a large number of fruits (20 and over), measuring their weight and multiplication, in order to estimate the yield per tree and per ha. All of the tested fertilizers in the given conditions are significantly higher estimated yield than in the control plants. Estimated yield of treated plants increased from +28.93% (“Calbit-C” fertilizer) to +253.26% (“Chitosan” fertilizer) per tree, ie. from +26.52% (“Calbit-C” fertilizer) to +253.27% (“Chitosan” fertilizer) per hectare, all relative to control. The average fruit weight was not significantly varied between treatments (200-230 g), but the number of fruits per tree is very influenced by the type of fertilizer, particularly in the case of “Chitosan” fertilizer. It should be noted that the type of fertilizer affects the coefficient of refraction of the fruit extracts, particularly in the case of “Eco-Fus” fertilizer.

Key words: apple; non-standard fertilizers; yield; yield components

## MICROSPOROGENESIS OF SWEET CHESTNUT (*Castanea sativa* Mill.) IN POTKOZARJE REGION

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The sweet chestnut (*Castanea sativa* Mill.) is a monoecious woody species, whose vulnerability in nature is caused by the spread of pathogens *Endothia parasitica* and due the specificity of the reproductive organs which are dependent on genotypic characteristics and teratological changes in the embryonic development of male reproductive organs. Chestnut has a different representation of male and female flowers on the inflorescence axis, and the morphology of the male flowers of the chestnut has been determined and the four different types of flower. The aim of this paper is to study the process of microsporogenesis and pollen up to release from the anther in 22 genotypes of sweet chestnuts in a wider area of Potkozarje. Previous research of male flowers among sweet chestnut population in the Potkozarje region shows that present sweet chestnuts genotypes have male catkins with exclusively longistamine flowers type. The regularity of the microsporogenesis process at longistamine type of sweet chestnut male flowers is an open question with the aim of selection of genotypes with high production of fertile pollen, as the basis for selection and breeding program of sweet chestnut. Sampling of staminate catkins was done in 2010 and 2011. Chestnut inflorescences from the middle part of the crown were sampled immediately before pollination. The staminate catkins were fixed by Navashin procedure. Cyto-histological analysis of sweet chestnut male gametophyte was performed by the analysis of permanent histological preparations. At the observed cytogenetic and embryological levels genotypic specificities that differentiate the observed genotypes were not detected. In all 22 genotypes of sweet chestnut processes of destruction and degradation of pollen grains were not observed. This leads to the conclusion that in all genotypes the process of male gametophyte organogenesis is regular with a large production of normal pollen grains, which means that all 22 genotypes can be used in selection program as a pollen donor.

Key words: male flowers, pollen, longistaminae.

## MIKROSPOROGENEZA PITOMOG KESTENA (*Castanea sativa* Mill.) U REGIJI POTKOZARJA

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Pitomi kesten (*Castanea sativa* Mill.) je jednodomna drvenasta vrsta, čija ugroženost u prirodi je uzrokovana širenjem patogena *Endothia parasitica*, ali i specifičnošću reproduktivnih organa, odnosno genotipskim specifičnostima i teratološkim promjenama u embriogenezi muških reproduktivnih organa. Pitomi kesten ima različito zastupljene muške i ženske cvasti na osovini cvasti, a morfologija muških cvetova kestena determinisana je i sa četiri različita tipa cveta. Predmet ovog istraživanja je proučavanje procesa mikrosporogeneze i razvoja polena do oslobađanja iz antera kod 22 genotipa pitomog kestena na širem području Potkozarja. Prethodna istraživanja strukture muških cvasti u populaciji kestena u regionu Potkozarja pokazuju da prisutni genotopovi kestena imaju muške cvasti isključivo sa cvetovima tipa longistamine. Naime, otvoreno je pitanje regularnosti ovog procesa kod longistamine tipa muških cvetova kestena sa ciljem izdvajanja genotipova visoke produkcije fertilnog polena, kao osnove za program selekcije i oplemenjivanja kestena. Uzorkovanje cvasti vršeno je tokom 2010. i 2011. godine. Osovine cvasti iz srednjeg dela krošnje uzorkovane su neposredno pred polinaciju. Pojedinačne cvasti sa sredine osovine cvasti su fiksirane po Navašinu. Cito-histološka analiza muškog gametofita analiziranih genotipova pitomog kestena izvršena je analizom trajnih histoloških preparata. Na citogenetičkom i embriološkom nivou posmatranja nisu konstatovane genotipske specifičnosti koje diferenciraju posmatrane genotipove kestena. Kod svih 22 genotipa pitomog kestena nisu uočeni procesi destrukcije i propadanja polenovih zrna. Ovo upućuje na zaključak da je kod svih ispitivanih genotipova proces organogeneze muškog gametofita regularan sa velikom produkcijom normalnih polenovih zrna, što znači da se svih 22 genotipa mogu koristiti u selekciji kao donatori polena.

Ključne reči: muški cvetovi, polen, longistamine.

## PHENOLOGICAL AND POMOLOGICAL PROPERTIES OF OLD APPLE VARIETIES IN NORTH MONTENEGRO

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Very favorable natural conditions and long tradition apple growing caused that the apple is the first fruit species in North Montenegro. In the assortment, there is still a significant role of the old varieties. These varieties are grown for a long period and adapted during the time to our climatic conditions and they have great economic importance. The aim of this paper is to study the phenological and pomological properties of old apple varieties in the area of most interest referrals for further cultivation on a large scale. The research on old apple varieties was conducted *in situ* in the period 2008-2009. The trees are grown in free shape without application of agrotechnical measures. During the trial the standard methods for characterization were used. During the work has been used internationally descriptor for apple. The fruits of pomological characterization were sampled during their full maturity. Soluble solids content was determined using a refractometer. The earliest ripening (the mid of August) was performed on *petrovaca*, and the latest (the beginning of November) on *zuvaca* varieties. The fruit weight varied from 37,5 of *petrovaca* to 187 g of *busuta*. Poor coloured varieties dominate. The smallest content of soluble solids was in *trpezljika* and *zuvaca* 8,90%. The fruit varieties *Busuta* and *pazarka* with a significant amount of soluble solids, 15.2 or 14.7%, can be good raw material for industrial processing.

Key words: apple, old variety, North Montenegro

## FENOLOŠKE I POMOLOŠKE OSOBINE STARIH SORTI JABUKE U SJEVERNOJ CRNOJ GORI

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Povoljni prirodni uslovi i duga tradicija gajenja su usloveli da je jabuka vodeća voćna vrsta na području sjevera Crne Gore. U sortimentu, još uvijek, značajnu ulogu imaju stare sorte. Ove sorte su se tokom dugog vremenskog perioda prilagodile postojećim agroekološkim uslovima i imaju veliki privredni značaj. Cilj ovog rada je da se proučavanjem fenoloških i pomoloških osobina starih sorti jabuke na ovom području najinteresantnije preporuča za dalje gajenje u većem obimu. U periodu 2008-2009. godine izvršeno je proučavanje 14 starih sorti jabuke u sjevernoj Crnoj Gori u „in situ“ uslovima. Stabla ispitivanih sorti se gaje u slobodnom porastu, uglavnom bez ikakvih agrotehnikih mjera. U toku rada korišćen je internacionalni dekriptor za jabuku. Plodovi za pomološku karakterizaciju uzorkovani su u periodu njihove pune zrelosti. Sadržaj rastvorljivih suvih materija utvrđen je refraktometrijskom metodom. Najranije zrenje (početak avgusta) je utvrđeno kod sorte *petrovača*, a najkasnije (početak novembra) kod sorte *zukvača*. Masa ploda je varirala u intervalu od 37,5 g *petrovača* do 187 g *busuta*. Dominiraju slabo obojene sorte. Najmanju količinu rastvorljive suve materije u plodu imale su sorte *trpezljika* i *zukvača* 8,90 %. Plodovi sorti *busuta* i *pazarka* sa značajnom količinom rastvorljive suve materije, 15,2 odnosno 14,7 %, mogu biti dobre sirovine za industrijsku preradu.

Ključne riječi: jabuka, stare sorte, sjeverna Crna Gora

## PRODUCTIVE TRAITS OF SOME GERMAN PLUM VARIETIES IN THE FIRST YEARS AFTER PLANTING

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This study was carried out to determine the productive traits of five plum varieties derived from former German breeding program in Geisenheim in the first years after planting in the western Serbian conditions. The varieties 'Top', 'Top 2000', 'Topfive', 'Topking' and 'Topstar plus' were used and grafted on Myrobalan seedlings rootstocks. The orchard was established in April 2011 at planting distance  $5 \times 3$  m at locality 'Ljubic' near Čačak, Western Serbia. The trial was conducted during 2013 and 2014 years. The following determinations were assessed: trunk cross sectional area, yield per tree and unit area, yield efficiency, fruit and stone mass, fruit linear dimensions (height, weight and thickness) and flesh ratio. Phenological properties were also evaluated. 'Topfive' and 'Topstar plus' ripened in the mid-August, 'Top' and 'Top 2000' in the mid-September, while 'Topking' ripened in the third decade of September. 'Topstar plus' had the most vigor tree, the highest fruit and stone mass and fruit linear dimensions. 'Top 2000' had the smallest values of these traits, but had the highest yield per tree and unit area and yield efficiency. This variety also had the lowest tree vigor. The highest flesh ratio was found in 'Top' and the smallest in 'Topfive'. 'Topking' and 'Topstar plus' showed the best productive traits, but all varieties requires further evaluation in the period of full productivity.

Keywords: plum varieties, fruit mass, productivity, yield efficiency

## THE INFLUENCE OF ROOTSTOCK ON VIGOUR, YIELD AND CHARACTERISTICS OF FRUIT OF PLUM CULTIVARS

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This study presents results on the influence of rootstock on vigour, yield and characteristics of fruit of plum cultivars. The research was conducted from year 2012 to year 2014, respectively from growing season 3 to growing season 5. Cultivars that have been researched are Čačanska leptotica and Čačanska najbolja, grafted on Pixy, St. Julien A, Fereley and Myrobalan seedlings (*Prunus cerasifera*, Ehrh.) rootstocks. Spacing is  $4 \times 1.80$  m, which corresponds to the density of planting  $1,380$  trees  $\text{ha}^{-1}$ . The results showed that the cultivars grafted on Pixy rootstock were vigourless ( $16.76 \pm 1.01$   $\text{cm}^2$  in Čačanska leptotica or  $23.49 \pm 0.56$   $\text{cm}^2$  in Čačanska najbolja at the end of the growing season 5). The greatest vigour of cultivars were on Myrobalan seedling rootstock ( $34.31 \pm 0.72$   $\text{cm}^2$  in Čačanska leptotica, respectively  $47.66 \pm 1.54$   $\text{cm}^2$  in Čačanska najbolja at the end of the growing season 5). The first significant yield was made in third year after planting and ranged from  $1.01 \pm 0.37$   $\text{t ha}^{-1}$  in Čačanska najbolja grafted on Myrobalan seedling rootstock to  $5.03 \pm 0.40$   $\text{t ha}^{-1}$  in Čačanska leptotica on the Fereley rootstock. Cumulatively, to the end of the fifth growing season the largest yield is achieved when grafted on Myrobalan seedling rootstock, in both cultivars ( $25.05 \pm 1.63$   $\text{t ha}^{-1}$  in Čačanska leptotica or  $32.92 \pm 2.75$   $\text{t ha}^{-1}$  in Čačanska najbolja). The value of yield efficiency varied from  $0.03$   $\text{kg cm}^{-2}$  (Čačanska najbolja grafted on Myrobalan seedling rootstock in the third year after planting) to  $0.49$   $\text{kg cm}^{-2}$  (Čačanska najbolja grafted on Pixy rootstock in the fourth year after planting). Fruit weight and soluble solids content in the fruit varied depending on the cultivar, the rootstock and the year of research.

Key words: plum, rootstock, vigour, yield.

UTICAJ PODLOGE NA BUJNOST, RODNOST I OSOBINE PLODA  
SORTI ŠLJIVE

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U radu su prikazani rezultati uticaja podloge na bujnost, rodnost i osobine ploda sorti šljive. Ispitivanja su vršena u periodu od 2012. do 2014. godine, odnosno od 3. do 5. vegetacije. Sorte na kojima su vršena istraživanja su Čačanska leptotica i Čačanska najbolja, kalemljene na podlogama Pixy, St. Julien A, Fereley i sejanac džanarike (*Prunus cerasifera*, Ehrh.). Razmak sadnje je  $4 \times 1,80$  m što odgovara gustini sadnje od  $1.380$  stabala  $\text{ha}^{-1}$ . Rezultati su pokazali da je najmanja bujnost tokom svih godina istraživanja utvrđena kada su sorte kalemljene na podlozi Pixy ( $16,76 \pm 1,01$   $\text{cm}^2$  kod Čačanske leptotice, odnosno  $23,49 \pm 0,56$   $\text{cm}^2$  kod Čačanske najbolje na kraju 5. vegetacije). Najveća bujnost je ostvarena na podlozi sejanac džanarike ( $34,31 \pm 0,72$   $\text{cm}^2$  kod Čačanske leptotice, odnosno  $47,66 \pm 1,54$   $\text{cm}^2$  kod Čačanske najbolje na kraju 5. vegetacije). Prvi značajniji prinos je ostvaren u 3. godini po sadnji i kretao se od  $1,01 \pm 0,37$   $\text{t ha}^{-1}$  kod Čačanske najbolje kalemljene na džanarici do  $5,03 \pm 0,40$   $\text{t ha}^{-1}$  kod Čačanske leptotice na podlozi Fereley. Kumulativno, najveći prinos do kraja 5. vegetacije kod obe sorte je dobijen kada su kalemljene na podlozi sejanac džanarike ( $25,05 \pm 1,63$   $\text{t ha}^{-1}$  -kod Čačanske leptotice, odnosno  $32,92 \pm 2,75$   $\text{t ha}^{-1}$  -kod Čačanske najbolje). Vrednost koeficijenta rodnosti se kretala od  $0,03$   $\text{kg cm}^{-2}$  (Čačanska najbolja kalemljena na podlozi sejanac džanarike u 3. godini po sadnji) do  $0,49$   $\text{kg cm}^{-2}$  (Čačanska najbolja kalemljena na podlozi Pixy u 4. godini po sadnji). Vrednosti mase ploda, kao i sadržaja rastvorljive suve materije u plodu su varirale u zavisnosti od sorte, podloge i godine istraživanja.

Ključne reči: šljiva, podloga, bujnost, prinos.

## VEGETATIVE GROWTH, PRODUCTIVITY AND FRUIT QUALITY OF APRICOTS AS AFFECTED BY ROOTSTOCK OR INTER-STEM

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During 2008 to 2013, we investigated behavior of five apricot cultivars ('Aleksandar', 'Biljana', 'Vera', 'Roxana' and 'Harcot') grafted across Blackthorn inter-stem on Myrobalan stock and on Myrobalan rootstock through vegetative growth, tree mortality, productivity and external fruit quality in conditions of Cacak region. Results showed that both source of variability (rootstock or inter-stem and cultivar) induced significant changes of properties evaluated. Mrobalan provoked vegetative growth, yield per tree, cumulative yield and fruit weight, whereas Blackthorn induced higher tree mortality, yield efficiency and yield per unit area. 'Biljana' cultivar exhibited the highest tree vigour on both Myrobalan rootstock and Blackthorn inter-stem, whereas the highest yield per tree had 'Vera' on inter-stem and 'Biljana' on Myrobalan. Statistically similar and the highest stone weight and flesh rate had 'Vera' and 'Harcot' on both inter-stem and Myrobalan rootstock, respectively. The highest percent of dead trees had 'Biljana', and the lowest 'Roxana'.

Key words: Apricot, tree mortality, Myrobalan, Blackthorn, yield and fruit quality

## VEGETATIVNI RAST, PRODUKTIVNOST I KVALITET PLODA KAJSIJE U ZAVISNOSTI OD PODLOGE ILI MEĐUPODLOGE

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U periodu od 2008 do 2013. godine, ispitivali smo ponašanje pet sorti kajsije ('Aleksandar', 'Biljana', 'Vera', 'Roksana', 'Harkot') kalemljenih preko crnog trna kao posrednika na džanariku i direktno na džanariku kroz vegetativni rast, sušenje stabala, rodnost i spoljašnji kvalitet ploda u ekološkim uslovima Čačka. Rezultati su pokazali da su oba izvora varijabiliteta (podloga, tj. interpodloga i sorta) uslovia značajne promene ispitivanih osobina. Džanarika je pospešila vegetativni rast, prinos po stablu, kumulativni prinos i masu ploda, dok je crni trn uticao na povećanje broja osušenih stabala, koeficijent rodnosti i prinos po jedinici površine. Sorta 'Biljana' je ispoljila najveću bujnost kalemljena direktno na džanarici i preko posrednika, dok su najveći prinos po stablu imale sorte 'Vera' na posredniku i 'Biljana' na džanarici. Statistički sličnu i najveću masu ploda imale su 'Roksana' i 'Harkot', a najveću masu koštice i randman mezokarpa imali su 'Vera' i 'Harkot', kako na džanarici tako i na posredniku. Najveći procenat uginulih stabala je imala 'Biljana', a najmanji 'Roksana'.

Ključne reči: Kajsija, uginuće stabala, džanarika, crni trn, prinos i kvalitet ploda

## STATE OF NURSERY PRODUCTION IN THE REPUBLIC OF SRPSKA AND OVERVIEW OF LEGISLATION IN THIS DOMAIN

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Production of healthy and quality planting material is basis for successful, up-to-date nursery production, but also satisfactory results in fruit and grape cultivation greatly depend on quality and health status of plant material. Currently there are 37 registered planting material producers in the Republic of Srpska, of which 26 were active in 2013, and produced 2.299.493 fruit, vine and ornamental plants. From 137.130 mother plants registered in 2013, 5.050.290 scions, 2.023.273 rootstocks and 686,3 kg of seed for production of generative rootstocks were produced. Nursery production is regulated by the Law on planting material and the Law on plant protection in the Republic of Srpska, as well as by associated subordinate regulations. Analysis of plant regulation frame in the Republic of Srpska and BiH showed inconsistencies in laws that are laid by responsible institutions of the entities and common BiH institutions, which caused unfair competition between planting material producers in common BiH market. In addition, the introduction of mandatory certification was not accompanied by support to development of adequate professional and scientific infrastructure, which causes decreased profitability of nursery production, because certified seeds, scions and rootstocks are mostly being imported from neighbouring countries and the European Union, and domestically produced planting material mostly comes under standard planting material category. Analysis of data on import of plants and plant reproductive material was not possible, because they are being monitored only for BiH market as a whole. However, survey that was conducted among fruit and grape producers in western Republic of Srpska, showed that many of them import planting material from neighbouring countries. In conclusion, it is essential to perform more extensive evaluation of legislation concerning nursery production in order to create harmonized domestic legal frame, besides harmonization with EU legislation, that will enable successful, profitable and sustainable nursery production.

Key words: planting material, production, certification, evaluation of legislation.

## STANJE RASADNIČKE PROIZVODNJE U REPUBLICI SRPSKOJ I PREGLED LEGISLATIVE U TOJ OBLASTI

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Proizvodnja zdravog i kvalitetnog sadnog materijala predstavlja osnovu uspješne, savremene rasadničke proizvodnje, a zadovoljavajući rezultati u gajenju voćaka i vinove loze u velikoj mjeri zavise od kvaliteta i zdravstvene ispravnosti sadnog materijala. U Republici Srpskoj je trenutno registrovano 37 proizvođača sadnog materijala, od kojih se njih 26 aktivno bavilo rasadničkom proizvodnjom u 2013. godini i proizvelo 2 299 493 komada sadnica voćaka, vinove loze i ukrasnog bilja. Od ukupno registrovanih 137 130 matičnih satabala u 2013. godini je proizvedeno 5 050 290 komada plemki (okaca), 2 023 273 komada podloga i 686,3 kg sjemena za proizvodnju generativnih podloga. Oblast rasadničke proizvodnje je regulisana Zakonom o sadnom materijalu i Zakonom o zaštiti bilja u Republici Srpskoj, kao i pratećim podzakonskim aktima. Analiza okvira za rasadničku proizvodnju u Republici Srpskoj i BiH je pokazala neusklađenost zakonske regulative koju su donijele nadležne institucije entiteta i zajedničke institucije BiH, što je dovelo do pojave nelojalne konkurencije između proizvođača sadnog materijala na zajedničkom tržištu BiH, pri čemu uvođenje obavezne sertifikacije nije pratila podrška razvoju adekvatne stručne i naučne infrastrukture, što dodatno utiče na smanjenu rentabilnost rasadničke proizvodnje, jer se sertifikovano sjeme, plemke i podloge najvećim dijelom uvoze iz zemalja u okruženju i Evropske Unije, a domaći proizvedeni sadni materijal najvećim dijelom spada u kategoriju standardnog sadnog materijala. Analizu podataka o uvozu sadnica i reproduktionog sadnog materijala nije bilo moguće izvršiti, jer se oni prate zbirno za teritoriju cijele BiH. Međutim, anketa koja je sprovedena među proizvođačima voća i grožđa na području zapadne Republike Srpske je pokazala da veliki broj voćara i vinogradara uvozi sadni materijal iz zemalja u okruženju. Neophodno je izvršiti opsežniju evaluaciju propisa u oblasti rasadničke proizvodnje, kako bi se, pored usklađivanja sa regulativom Evropske Unije, stvorio unutrašnji harmonizovani okvir koji će omogućiti uspješnu, rentabilnu i održivu rasadničku proizvodnju.

Ključne riječi: sadni materijal, proizvodnja, sertifikacija, evaluacija propisa.

FORECASTING MODEL APPLICATION IN  
RISK ASSESSMENT OF SECONDARY APPLE SCAB (*Venturia  
inaequalis*) INFECTIONS ON APPLE FRUITS IN 2014. IN THE  
REGION OF POTKOZARJE

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Problem of secondary infections of apple scab represent latent risk in storage chambers. Risk comes from often practice that infected fruits are directed to storage, with no visible disease symptoms. Although such a fruits are harvested as healthy ones, during storage comes to pathogen incubation and development of characteristic disease symptoms, manifested through few or numerous dark spots on apple fruits. Susceptible varieties are: Golden Delicious, Gala, Granny Smith and Pink Lady, but also another varieties that comes from orchards with high presence of primary infections are considered. Plots with 3-5% infested shoots in the end of June are considered as risky ones. For analysis of secondary infections on apple fruits it is used model originally developed by Schwabe (1985). For purpose of risk assesment in season 2014. data from automatic weather station iMetos (Turjak, Gradiska) is used. Two critical moments are detected when favorable conditions for infection development occurred (07.08. and 05.09.2014.). In both cases, big amount of precipitation is registered, with potential to completely wash-off eventual fungicide deposit (>40 mm), making fruit unprotected from pathogen infestation. In orchards where presence of primary infections is detected during the end of June, active protection is necessary to be provided until harvest. Fruits harvested from risky plots should not be stored for more than 3 months, but directed to market in shorter time. Main limitations of the model are related to inconsistent data regarded to conidia viability under intermittent wet periods. Model application may significantly contribute to plant protection, harvest, storage and market strategy assessment.

Key words: *Venturia inaequalis*, forecasting model, risk, secondary infections, apple.

PRIMJENA PROGNOZNOG MODELA U ANALIZI RIZIKA OD  
SEKUNDARNIH INFEKCIJA ČAĐAVOM KRASTAVOŠĆU  
(*Venturia inaequalis*) NA PLODOVIMA JABUKE U 2014. NA  
PODRUČJU POTKOZARJA

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Problem sekundarnih infekcija čađavom krastavošću predstavlja latentnu opasnost u skladištima voća. Rizik potiče otuda što se često skladište inficirani plodovi na kojima nije došlo do pojave prvih simptoma bolesti. Iako ubrani kao naizled zdravi, tokom čuvanja dolazi do inkubacije patogena i pojave simptoma, koji se manifestuju u vidu većeg ili manjeg broja tamnih mrlja na plodovima. U osvjetljive sorte spadaju Zlatni Delišeš, Gala, Greni Smit i Pink Lejdi ali i ostale sorte koje potiču iz zasada sa visokim prisustvom primarnih zaraza. U rizične zasade spadaju oni u kojima ce krajem juna utvrdi 3-5% zaraženih mladara. Za analizu sekundarnih infekcija na plodovima jabuke korišten je model Schwabe-a (1985). Za procjenu rizika u sezoni 2014. korišteni su podaci sa automatske meteorološke satnice iMeros (Turjak, Gradiška). Detektovana su najmanje dva rizična momenta u kojima su ostvareni uslovi za nastanak sekundarnih infekcija na plodovima (07.08. i 05.09.2014.). Navedena dva perioda odlikuju se velikom količinom padavina koje su mogle da izvrše spiranje depozita fungicida (>40 mm), čineći plodove nezaštićenim od infekcije patogenom. U zasadima u kojima je krajem juna utvrđeno prisustvo primarnih infekcija iznad navedenog praga, zaštita se vodi aktivno do berbe. Plodove ubrane iz rizičnih parcela ne bi trebalo čuvati duže od 3 mjeseca, već ih ranije uputiti na tržište. Osnovna ograničenja modela odnose se na neusaglašenost mišljenja koja se odnose na vitalnost konidija u uslovima isprekidanog vlaženja lista. Primjena modela može značajno da doprinese planiranju strategije zaštite, berbe, skladištenja i prodaje plodova jabuke.

Ključne riječi: *Venturia inaequalis*, prognozni model, rizik, sekundarne infekcije, jabuka.

## POPULATION CHARACTERISTICS OF WALNUT IN THE BANJA LUKA REGION

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Walnut is the kind of fruit that can be reproduced and spread in three ways: 1. by spontaneous seed dispersal, 2. by planting of seedlings from the nursery and 3. by planting of grafted well-known walnut varieties. In our growing conditions all three of these ways of walnut spreading are present. The most common, and worst one is the method of spontaneous sowing of nuts seed of unknown origin that is done with the help of animals, a very rare of man. The resulting seedlings, as a rule, remain permanently in a place where they originated or they might be accidentally destroyed during the processing of land, and very rarely transplanted. Since that the largest number of productive walnut trees in our growing conditions is originating from seedlings from seeds spontaneously dispersed, we can talk about the population of different walnut genotypes that represent a significant walnut genofond and are subject to these investigations. These populations are interesting from the point of production of fruit and wood, and are particularly important from the point of separation of trees with the positive characteristics of the fruit in order to introduce them in the process of registration of new genotypes and dissemination of such cultivars in the wider area. In the wider area of Banja Luka (municipality Doboj, Samac and Laktasi), based on visual observations, we identified 20 trees of spontaneous walnut seedlings for the following studies: flowering time, ripening time, fruit weight, core weight, core randman, fruit hardness. The data were systematized and compared with the results obtained from the variety Sheinovo in the year of research. Of the total number of tested genotypes as promising are selected: type 2, type 3, type 13 and typ19.

Keywords: walnut, genotype, seedling, production tree

## KARAKTERISTIKE POPULACIJE ORAHA NA PODRUČJU BANJALUČKE REGIJE

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Orah je voćna vrsta koja se razmnožava i širi na tri načina i to: 1. Spontanom raznošenjem sjemena, 2. sadnjom sjemenjaka iz rasadnika i sadnjom kalemljenog oraha poznatih sorti. U našim uslovima gajenja su prisutna sva tri navedena načina širenja oraha. Najčešći, i najlošiji, način je spontana sjetva sjemena oraha nepoznatog porijekla koja se obavlja uz pomoć životinja, a vrlo rijetko čovjeka. Tako dobijeni sjemenjaci, u pravilu, ostaju trajno na mjestu gdje su i ponikli ili se slučajno unište prilikom obrade zemljišta, a vrlo rijetko se presađuje. S obzirom da najveći broj proizvodnih stabala oraha, u našim uslovima gajenja vodi porijeklo od sijanaca spontano raznesenog sjemena možemo govoriti o populaciji različitih genotipova orha koji predstavljaju značajan genofond oraha i predmet su ovih istraživanja. Ovakve populacije su interesantne sa stanovišta proizvodnje plodova i drveta, a posebno su značajne sa stanovišta izdvajanja stabala sa pozitivnim karakteristikama ploda u cilju uvođenja istih u postupak registracije novih genotipova i širenja kao priznatih sorti na širem području. Na širem području Banjaluke (opštine Derventa, Prnjavor i Laktaši) na osnovu vizuelnih opažanja, izdvojeno je 20 stabala spontanih sijanaca oraha na kojima su vršena slijedeća proučavanja: Vrijeme cvjetanja, vrijeme dozrijevanja, masa ploda, masa jezgre, randman jezgre, tvrdoća ploda. Dobijeni podaci su sistematizovani i upoređeni sa rezultatima koji su dobijeni od sorte Šeinovo u godini istraživanja. Od ukupnog broja ispitivanih genotipova kao perspektivne izdvojili smo: Tip 2, tip 3, tip 13 i tip 19.

Ključne riječi: orah, genotip, sijanac, proizvodno stablo

## VEGETATIVE POTENTIAL OF WALNUT CULTIVARS GRAFTED ON DIFFERENT ROOTSTOCKS

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Walnut is the most important representative of the nuts fruit trees. The walnut fruit has a high nutritional value, and the wood is used in carpentry and military industry. The paper presents the effect of two rootstocks: *Juglans regia* and *Juglans nigra*, chosen from selected trees. On the above rootstocks following varieties were grafted: Sheynovo, Champion, G-139, Rasna and Fernet. Height of seedlings, seedling thickness above and below the connecting place and the percentage of succesfulnes of grafting was evaluated. Based on two years of testing of above parameters, it was found that the seedlings on both rootstocks are high quality with well-developed root and aboveground part. On the rootstock *Juglans regia* was found slightly higher percentage of calloused grafts. The highest percentage was found in variety Sheynovo on both rootstocks, unlike variety Fernet in which is found the lowest percentage of good callused grafts. Diameter of plants above and below the connecting places was higher on the rootstock *Juglans regia* compared to *Juglans nigra*. Varieties Sheynovo and Champion had significantly higher diameter compared to other varieties. Also, the hights and quality of seedlings of these varieties was better than the other tested varieties. The results can be directly applied in agricultural practice for high-quality selection of the appropriate varieties and rootstocks for specific agro-climatic conditions.

## VEGETATIVNI POTENCIJAL SORTI ORAHA KALEMLJENIH NA RAZLIČITIM GENERATIVNIM PODLOGAMA

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Orah je najvažniji predstavnik u grupi jezgrastih voćaka. Plod oraha poseduje visoku nutritivnu vrednost, a drvo se koristi u stolarskoj i vojnoj industriji. U radu su prikazani rezultati uticaja dve podloge: *Juglans regia* i *Juglans nigra* odabrane sa selekcionisanih stabala. Na navedene podloge kalemljene su sledeće sorte: Šejново, Šampion, G-139, Rasma i Fernet. Ispitivana je visina sadnica, debljina sadnica ispod i iznad spojnog mesta i procenat prijema sadnica. Na osnovu dvogodišnjih ispitivanja navedenih parametara konstatovano je da su dobijene sadnice na obe podloge visokog kvaliteta sa dobro razvijenim korenim i nadzemnim delom. Na podlozi *Juglans regia* utvrđen je nešto veći procenat kalusiranih kalemova. Najveći procenat je utvrđen kod sorte Šejново na obe podloge, za razliku od sorte Fernet kod koje je utvrđen najmanji procenat dobro kalusiranih kalemova. Prečnik sadnica iznad i ispod spojnog mesta bio je veći na podlozi *Juglans regia* u odnosu na podlogu *Juglans nigra*. Sorte Šejново i Šampion imale su značajno veći prečnik u odnosu na ostale sorte. Takođe, visina i kvalitet sadnica ovih sorata je bio bolji od ostalih ispitivanih sorti. Dobijeni rezultati mogu se direktno aplicirati u proizvodnu praksu u cilju kvalitetnog izbora odgovarajuće sorte i podloge za konkretne agroklimatske uslove.

Ključne riječi: *Juglans regia*, *Juglans nigra*, generativne podloge, sorta





*Subsection: Viticulture*



## CHROMATIC CHARACTERISTICS OF WINES OF DIFFERENT AGES

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Beside other changes, wine ageing causes changes in wine colour characteristics. Practical problems related to collection of series of same trade mark wines of successively different ages do not allow more detailed researches of nature and regularity of wine colour changes with their ageing. Thus, objective of this research was to find possible changes of classical (colour intensity, hue) and CIELAB parameters of wine colour with ageing of 3 red and 2 white regional wines with their ageing. Each of the wines was originating from three successive vintages. Analyses were done according to OIV (Organisation Internationale de la Vigne et du Vin) methods (OIV-MA-AS2-07B – colour intensity and hue; OIV-MA-AS2-11 – CIELAB chromatic characteristics) on Shimadzu UV-1700 spectrophotometer (2, 5, and 10 mm optical path). CIELAB parameters were calculated by MSCV<sup>®</sup> software. Values of classical parameters of red wine colour (colour intensity, hue) were in the expected latitudes, with expected trends of changes with ageing of wines. A decline in value of the h\* CIELAB parameter was observed with all analyzed wines. With exception of one red wine, the values of a\*, b\*, L\*, and C\* CIELAB parameters were not changed regularly with wines' ageing. Among others, such results leave space for reasonable assumption that the composition of the varieties of grapes for the production of the analyzed regional wines of the same trademarks varies considerably from year to year. With slight differences from wine to wine, colour of the ageing red wines could be described as nuances of moderately strong red – light yellow, and the colour of white wines as nuances of light yellow – light green.

Key words: wine, wine ageing, chromatic characteristics, CIELAB

## HROMATSKE KARAKTERISTIKE VINA RAZLIČITE STAROSTI

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Sazrijevanjem i starenjem vina, pored ostalog, mijenjaju se i karaktersitike njihove obojenosti. Praktični problemi prikupljanja serija vina sukcesivno različite starosti ne dozvoljavaju obimnija istraživanja prirode i zakonomjernosti promjena obojenosti vina sa starenjem. Cilj istraživanja bio je utvrđivanje promjena klasičnih (intenzitet i nijansa boje) i CIELAB pokazatelja obojenosti tri crvena i dva bijela regionalna vina, pri čemu je svako od vina proizvedeno od grožđa iz tri uzastopne godine berbe. Istraživanja su vršena spektrofotometrijskim mjerenjima primjenom OIV (Organisation Internationale de la Vigne et du Vin) metoda analize boje vina (OIV-MA-AS2-07B – intenzitet i nijansa boje; OIV-MA-AS2-11 – CIELAB hromatske karakteristike vina). Mjerenja su vršena na spektrofotometru Shimadzu UV-1700 (optički put 2, 5 i 10 mm), a CIELAB pokazatelji su izračunati primjenom MSCV<sup>®</sup> softvera. Klasični pokazatelji obojenosti crvenih vina (intenzitet i nijansa boje) bili su u očekivanim rasponima, a njihove vrijednosti su se sa starenjem vina kretale u očekivanim pravcima. Kod svih vina je kostatovan pad vrijednosti  $h^*$  CIELAB pokazatelja starenjem vina. Sa izuzetkom jednog crvenog vina,  $a^*$ ,  $b^*$ ,  $L^*$  i  $C^*$  CIELAB pokazatelji nisu imali zakonomjerne promjene sa starenjem vina, što, pored ostalog, ostavlja mjesta opravdanoj pretpostavci da sortni sastav grožđa za proizvodnju analiziranih regionalnih vina iste trgovinske marke znatno varira iz godine u godinu. Sa blagim promjenama tokom starenja boju analiziranih crvenih vina u osnovi je činio nijansni prelaz umjereno jaka crvena – slaba žuta, a boju bijelih vina slaba žuta – slaba zelena.

Ključne riječi: vino, starenje vina, hromatske karakteristike, CIELAB

## DECREASING OF THE CONTENT OF HEAVY METALS IN WHITE WINE CHARDONNAY BY USING DIFFERENT TREATMENTS

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A research was made on the content of heavy metals (As, Cd, Cu, Fe, Ni, Pb and Zn) in wine made from Chardonnay grape variety, grown in Skopje vineyards. The aim of our analysis was to determine which treatments that have been used decrease the content of the heavy metals in wine and what is the influence of those treatments on the quality (chemical composition, sensor evaluation) of the wine. Clarification with skimmed milk, clarification with tannin and gelatin, blue clarification, centrifugation and filtration were the treatments applied to the wine. The analysis of the heavy metals was made with a Varian atomic absorption spectrometer, model Spectra AA 880 with a deuterium corrector. The instrument was equipped with supplies for a flame technique, with graphite oven GTA 100 and an autosampler. The greatest effect on decreasing of the content of the heavy metals was determined at the blue clarification of the wine which is due to adding 0.5% solution of  $K_4[Fe(CN)_6]$ , which shows that the content of heavy metals is significantly lower compared to the control sample.

Key words: Chardonnay, wine, heavy metals, blue clarification, sensor evaluation.

## ESTIMATION OF THE STATE THE RED/OX-SYSTEM OF THE TYPES OF GRAPES, INTRODUCED IN BELARUS', WHICH REFLECTS STRESS-RESISTANCE TO THE UNFAVORABLE FACTORS OF THE MEDIUM

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It is considered that the oxidizing stress is caused not so much by production active forms of oxygen (AFO), as by disturbance of the balance between their generation and removal. The latter is achieved by a system of the antioxidant protection, which includes the numerous antioxidants. Most frequently the antioxidants subdivide into the high-molecular (superoxidedismutase-SOD, catalase, peroxidase and others) and the low-molecular (ascorbic acid, glutathione, carotenoids, phenol connections and others), that interact with AFO and those “neutralizing” their action. Under the conditions of oxidizing stress antioxidant ferments play the key role in the protection of metabolism from damage; however, they can be inactivated rapidly as a result change in intracellular Red/Ox- status. The laws governing the change in the level of the accumulation of products POL and activities of the isoenzymes of peroxidase and SOD in the different types of grapes, which experience the state of the abiotic stress of different origin (cold and thermal stress, a deficiency in the moisture, illumination, the disturbance of the level of mineral nourishment) in the represented work are established. The specificity in the realization of the adaptive potential of the plants of the different types of grapes under the conditions of Belarus is revealed. The greatest plasticity and high adaptability appeared the types of the North American selection of *Marquette* and *Frontenac*, which reacted to the stress factors of water deficiency, reduced temperatures and insufficient illumination by a substantial increase in the activity of peroxidase and SOD. In the types of the European selection - *Bianka*, *Krasen*, *Platovskiy* is noted the less expressed capability for stress - adaptation - it is not revealed the essential dynamics of the growth of the activity of the ferments of Red/Ox system during the making more active of the accumulation of products POL. The obtained results and the developed the test on the activity of the Red/Ox-system of leaves of grapes during the adaptation make it possible to make a preliminary forecast of the expediency of the introduction of the chosen types into the northern regions of the cultivation of grapes.

Key words: RED/OX-system, grapes, stress resistance

## EVALUATION OF PROMISING GRAPEVINE GENOTYPES OBTAINED FROM SEYVE VILLARD 12375

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In grapevine breeding programs at the Faculty of Agriculture, University of Belgrade, one of the most used methods is the interspecies hybridization. Collection of obtained plants is rich in a number of genotypes in terms of yield, grape quality and resistance to diseases and pests. As a starting material for the hybridization and selection of resistant forms Seyve Villard 12375 is used among others. From crossing combination Muscat Hamburg x Seyve Villard 12375 three promising genotypes (9846, 9896 and 9973) were selected, intended for table consumption, and the crossing combination Seyve Villard 12375 x Godominka two genotypes (18374 and 18385) intended for the production of white wines. The characterization of these genotypes was made compared to the standard cultivar (Muscat Hamburg and Godominka) based on morphological characteristics (young shoot, mature leaf and bunch), and the evaluation on the basis of ripening time, yield and quality of grapes. The morphological properties of genotypes from both crossing combinations showed the similarities and differences in relation to the both standard cultivars. Bunch weight for all three genotypes for table consumption was higher than the standard cultivar Muscat Hamburg (266 g). A significant deviation was obtained in genotype 9896 (304 g). Bunch weight in both genotypes of white wine was higher than the standard cultivar Godominka (157 g). Very significant deviation obtained in genotype 18374 (235 g). Ripening time of genotypes for table consumption was at the level of standard or later period. In the second crossing combination one genotype had an earlier and other later ripening time compared to the standard. The genotypes of both crossing combinations were satisfactory yield of grapes. Also, all genotypes had harmonious relationship of sugar and acids in the must. Genotype 9896 was significantly different in content of sugar (20.4%), and genotype 9846 with regard to the content of total acids in must (8.1 g/l) in relation to the standard cultivar Muscat Hamburg (18.6%; 6.7 g/l). Susceptibility to disease in the genotypes for table consumption and genotypes of white wine was significantly smaller than standard cultivars. All investigated genotypes have been reported to the Commission for the recognition of new grapevine cultivars in Serbia.

Key words: grapevine, genotype, evaluation, morphological characteristics, quality

TESTING THE BIOLOGICAL EFFICACY OF  
THE PRODUCT ORVEGO IN CONTROL OF  
GRAPEVINE DOWNY MILDEW (*Plasmopara viticola*)  
IN MONTENEGRO

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Grapevine downy mildew, a disease caused by the phytopathogenic fungus *Plasmopara viticola*, occurs in Montenegro every year and can cause significant yield reduction. During 2013 and 2014, downy mildew reduced yields up to 100% in some vineyards. Therefore, the control of the disease is necessary measure in the technology of grapevine protection. The introduction of new products with new active substances in technology of grapevine protection from downy mildew is of great importance in the creation of antiresistance strategy. Besides, check of products used for many years in Montenegro aims to determine whether the resistance appeared, which could affect to the unreliability of the measures applied to protect vines from the disease. In 2014, at the Experimental field of Biotechnical Faculty in Podgorica the trial has been set up to test the biological efficacy of the fungicide Orvego (ametoktradin + dimetomorf), since it has not been applied in Montenegro before. Orvego was applied in two doses of 0.8 l/ha and 1.0 l/ha. Fungicide Profiler (fosetyl - aluminium + fluopicolide) was used at a dose of 3 kg/ha as a standard. The experiment was set up according to EPPO standards. Treatment was performed by motorized sprayer at water consumption of 228 to 475 liters of water per hectare depending on the phenological growth stage of grapevine. In the period from the stage when inflorescences are clearly visible until the stage when majority of berries are touching (from 24 April to 30 June) seven treatments were done. During the period from the beginning of vegetation until the stage when berries are developing color, rainfall distribution and temperatures were favorable for the development of grapevine downy mildew. Assessment of efficacy (according to EPPO standards) of the applied products was carried out on 26 May (before blossoming - BBCH 60) and on 13 June (pea-sized berries, grapes hanged - BBCH 75) on the leaves and on 16 July (berries developing color BBCH 83) on leaves and bunches of grapes. During all three assessments on all checked leaves and in assessment of bunches in control, the presence of symptoms of grapevine downy mildew was recorded, while the leaves and bunches of grapes that have been treated with fungicides showed no symptoms. The efficacy of applied fungicides was 100%. The intensity of infection on the leaves in control, depending on the time of assessment, ranged between 3.6% and 81.6%, while the intensity of infection in bunches during the assessment was 99.8%.

Key words: downy mildew, grapevine, Orvego, efficacy

## ISPITIVANJE BIOLOŠKE EFIKASNOSTI PREPARATA ORVEGO U SUZBIJANJU PLAMENJAČE VINOVE LOZE (*Plasmopara viticola*) U CRNOJ GORI

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Plamenjača vinove loze, oboljenje koje prouzrokuje fitopatogena gljiva *Plasmopara viticola*, javlja se u Crnoj Gori svake godine i može izazvati značajno smanjenje prinosa. Tokom 2013. i 2014. godine plamenjača je u pojedinim vinogradima redukovala prinos i do 100%. Zbog toga je suzbijanje prouzrokovala ove bolesti neophodna mjera u tehnologiji zaštite vinove loze. Uvođenje novih preparata sa novim aktivnim materijama u tehnologiju zaštite vinove loze od plamenjače ima veliki značaj u kreiranju antirezistentne strategije. Takođe, i provjera preparata koji se već duži niz godina koriste u Crnoj Gori ima za cilj da utvrdi da li je došlo do pojave rezistentnosti, koja može uticati na nepouzdanost primijenjenih mjera zaštite vinove loze od bolesti. Tokom 2014. godine na Oglednom imanju Biotehničkog fakulteta u Podgorici postavljen je ogled u cilju ispitivanja biološke efikasnosti fungicida Orvego (ametoktradin + dimetomorf), obzirom da se ovaj fungicid do sada nije primjenjivao u Crnoj Gori. Orvego je primijenjen u dvije doze 0,8 l/ha i 1,0 l/ha. Kao standard korišćen je fungicid Profiler (fosetil - aluminijum + fluopikolid) u dozi od 3kg/ha. Ogled je postavljen prema EPPO standardima. Tretiranje je izvedeno motornom leđnom prskalicom uz utrošak vode od 228 do 475 litara vode po hektaru u zavisnosti od fenofaze razvoja vinove loze. U periodu od zametanja cvasti do zatvaranja grozda (od 24. aprila do 30. juna) obavljeno je sedam tretiranja. Tokom perioda od kretanja vegetacije pa do šarka, raspored padavina i temperature bili su povoljni za razvoj plamenjače vinove loze. Ocjena efikasnosti (prema EPPO standardima) primijenjenih preparata obavljena je 26. maja (pred cvjetanje - BBCH 60) i 13. juna (bobice veličine zrna graška, grozdovi obješeni - BBCH 75) na listovima i 16. jula (šarak bobica BBCH 83) na listovima i grozdovima. Tokom sve tri ocjene na svim pregledanim listovima i ocjeni na grozdovima u kontroli, ustanovljeno je prisustvo simptoma plamenjače vinove loze, dok na listovima i grozdovima koji su tretirani fungicidima nije bilo ni jednog simptoma. Efikasnost primijenjenih fungicida iznosila je 100%. Intenzitet zaraze na listovima u kontroli, u zavisnosti od vremena ocjene, kretao se između 3,6 % i 81,6%, dok je intenzitet zaraze na grozdovima prilikom ocjene iznosio 99,8%.

Ključne riječi: plamenjača, vinova loza, Orvego, efikasnost

EXAMINATION THE CELL DIVISIONS AND DETERMINATION  
OF IRREGULARITIES IN  
THE FERTILIZATION IN SOME GRAPEVINE VARIETIES  
CULTIVATED IN R. MACEDONIA

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This paper covers examinations of some cytogenetic characteristics in several varieties of grapevine that are often represented in the assortment of different vineyards in R. Macedonia. Followed a few phenophases in vegetation period of grapevine which are important for the conduct of cellular divisions. But, most attention is given to an examination of cellular processes before the formation of flowers to determine the gender divisions (meiosis) and some somatic divisions (mitosis). Precisely, cell divisions are observed in order to discover some irregularities in the formation of subdivision spindle, the differentiation and the number of chromosomes and so on. The material is taken in formation phase of blossoms (before forming of gender cells) and the full bloom stage (pollen bags and pestle). For analysis of the material used are cytological techniques Thio and Levan (fixation, staining, maceration). While looking under microscope is determined the percentage of irregular divisions of the total number of cell divisions and determined the number of chromosomes in the nucleus. The results show that the tested varieties, the majority has correct divisions and a constant number of chromosomes. In some varieties (eg. Drenok) were observed anomalies in meiosis which creates defects in pollen grains and they influence in the further fertilization. These examinations of cell divisions are important because it determines the anomalies that occur in the fertilization and their direct impact on fertility, the number and quality of the grains in the cluster, the cluster quality etc.). All this has an impact on the quality of the yield varieties of grapevine. Tests were performed in several varieties grapevine which are most represented in the vineyard plantings in R. Macedonia (Vranac, Smederevka, Moldova, Red Drenok, Ribier, Palieri, Victoria etc.). The research has taken into account only the impact of inherited characteristics of the variety. All are grown in standard ampelotechnical measures. In the future, established irregularities can be corrected by appropriate breeding methods. Determining the problems in the genetic potential for heterogeneity and fertility, would resolve many problems in terms of getting the quality and stable yields of grapes in examined varieties.

Keywords: cell divisions, chromosomes, anomalies, grapevine, fertilization

## INFLUENCE OF YEAST STRAIN ON STANUSINA CHEMICAL COMPOSITION AND SENSORIAL ANALYSIS

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Every wine has its unique signature, it is defined by its chemical composition. There are numerous factors in the wine making process that influence the chemical composition of the wine. The more diversity there is in the chemical components in the wine, the more complex the wine will be. Numerous publications suggest that different yeast strains produce different chemical compounds, or same compounds but in different quantity, which gives the wine its uniqueness. In this study we used three different commercial yeast strains (Enoferm BDX, Lalvin 71B and Lalvin ICV D254 all produced by Lallemand) in order to determine what influence they will have on the phenolic content and sensorial analysis of the wine from the autochthon grape vine variety Stanusina. We analyzed the content of total phenols according to Folin ciocalteu assay, total flavan 3ols were measured with 4-(Dimethylamino) cinnamaldehyde reagent and total flavonoids with aluminum chloride colorimetric assay. The sensory evaluation of wine was conducted using the Davis 20-point scale system. The wine fermented with Lalvin 71B wine yeast had highest evaluation score of 18,5 points. The results obtained from this study show that the use of selected wine yeast strains improves the wine quality, contribute to more complex, more colored wines with higher extract and higher alcohol level. This wines are more harmonious and with nicer sensorial sensation.

Keywords: Stanusina, phenols, autochthon, yeast strain





*Subsection: Ornamental Plants and Landscape*

*Design*



THE STUDY OF INCIDENCE AND THE VARIATION OF  
BEARBERRY FOR SOME MORPHOLOGICAL INDICATOR OF  
BEARBERRY POPULATIONS (*Arctostaphylosuva-ursi* L.  
Spreng) IN DIBRA DISTRICT

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In this paper are been presented the results of a study of bearberry (*Arctostaphylosuva-ursi* (L) spreng) in the district of Dibra. Bearberry is known as a medicinal plant used as a diuretic, urinary disinfectant and as an astringent. Its antibacterial effect is due to the content of arbutine. Also, this plant is been successful in prostatic hypertrophy and urinary retention. Of interest is the study of this species in the massive of Korabi mountain-Dibra, where there are good conditions for the spread of this species. In this way, the study is focused on two aspects: First, in terms of the spread of this species in the massive of Korabi mountain. Secondly, to study the bearberry variation for some key morphological indicators of the population presented in this area. The study reveals that this species in this area is spread in a massive of 200 hectares. Based on the soil features, such as height above sea level, exposition, etc., we have divided it into seven massive holding their local denomination (As regards the variation of morphological indicators, it is resulted that in these populations is present a variation for all indicators of the plant, but in particular for the length of the internodes, the number of leaves on branch, the grain size and the weight of leaves / plant. Specifically, the internodes length ranges from 0.53 cm to 1.05 cm; the branch length varies from 10.59 cm to 4.14 cm; the number of branches/ plant varies from 8.3 to 20; the number of leaves/ branch varies from 17.2 to 20.1, etc.

Key words: Bear berry, branch, variation morphological, arbutine, population, internodes.

## EFFECTS OF DIFFERENT GROWTH STIMULATORS ON DEVELOPMENT PARAMETERS OF MARIGOLD (*Tagetes patula* L.)

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Marigolds (*Tagetes patula* L.) are hardy annuals, and because for their decorative qualities, occupies an increasing share of the production line of flower producers in Bosnia and Herzegovina. The growing demand for marigold seedlings imposes the need to intensify their production and improving their quality, and one of the way to do that is application of different growth stimulators. The aim of this study was to examine the impact of growth stimulators Bio-Algae S-92, SLAVOL and Ergonfilla on marigolds (*Tagetes patula* L.) growth parameters. The following parameters were examined: the content of pigment in leaves and leaf area and diameter of the inflorescence and the number of flower heads per plant. The results showed that none of the applied growth stimulators demonstrated a statistically significant effect on increasing aesthetic quality of the important parameters of flowers: inflorescence diameter and the number of flower heads per plant. It can be concluded that marigolds are not demanding plants, because there are able to bloom without growth stimulants application. The most important thing is to have soil which satisfies physical and chemical characteristics for successful growth and development of marigold.

Key words: growth stimulators, substrate, flower, pigment

## UTICAJ RAZLIČITIH STIMULATORA NA PARAMETRE RAZVOJA KADIFICE (*Tagetes patula* L.)

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Kadifica (*Tagetes patula* L.) se ubraja u grupu jednogodišnjih cvjetnih kultura, a zbog svojih dekorativnih osobina posljednjih godina zauzima sve veći udio u proizvodnom asortimanu proizvođača cvijeća u Bosni i Hercegovini. Sve veća potražnja za rasadom kadifice nameće potrebu intenziviranja njene proizvodnje i podizanje njene kvalitete, a jedan od načina kojim se to pokušava postići je primjena različitih stimulatora rasta. Cilj ovog rada je bio ispitati uticaj stimulatora rasta Bio-algeena S-92, Slavola i Ergonfilla na parametre rasta i razvoja kadifice (*Tagetes patula* L.). Od parametara rasta i razvoja kadifice u ovom istraživanju ispitivani su: sadržaj pigmenta u listovima i površina listova, te prečnik cvati i broj cvatnih glavica po biljci. Rezultati istraživanja su pokazali da ni jedan od primijenjenih stimulatora rasta nije iskazao statistički značajan uticaj na povećanje estetski važnih parametara kvaliteta cvijeća: prečnika cvati i broja cvatnih glavica na biljci iz čega se može zaključiti da kadifica nije zahtjevna kultura za uzgoj jer je u stanju uspješno razviti svoje cvjetove čak i ako joj se u toku uzgoja ne dodaju stimulatori rasta. Preduslov za ostvarenje navedenog je da supstrat u kojem se kadifice uzgajaju svojim fizičkim i hemijskim karakteristikama zadovoljava sve kriterije potrebne biljkama za njihov uspješan rast i razvoj.

Ključne riječi: stimulatori rasta, supstrat, cvijet, pigmenti

## USE OF ALTERNATIVE SUBSTRATES IN THE CULTIVATION OF SEEDLINGS GERANIUMS (*Pelargonium zonale* L.)

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The use of alternative substrates in a container production of horticultural plants in developed countries, is becoming increasingly popular. The reason is the high cost of commercial substrates and their availability on the market. When selecting an alternative substrate, care should be taken that it has all the features necessary for the smooth growth and development of plants. The aim of this study was to demonstrate the positive characteristics of poultry manure in the production of geraniums (*Pelargonium zonale* L.). Plants were divided into two groups with 30 plants in each of them. The first group was transplanted to a commercial substrate TS3 and served as control. The second group was transplanted to a mix of commercial substrate and chicken manure and was a treatment. Plants grown on a substrate containing chicken manure (1: 3) showed better results in terms of morphological characteristics (plant height, number of leaves, number of buds, number of flowering branches, number of flowers), because the average values of all examined parameters were significantly higher compared to the average value of the control plants. The average fresh and dry weight of roots and shoot parts are also in favor of the chicken manure. From the results it can be concluded that application of chicken manure as an alternative substrate in the production of geraniums (*Pelargonium zonale* L.) is reasonable.

Key words: alternative substrate, chicken manure, geranium

## PRIMJENA ALTERNATIVNIH SUPSTRATA U UZGOJU RASADA MUŠKATLE (*Pelargonium zonale* L.)

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Korištenje alternativnih supstrata u kontejnerskoj proizvodnji hortikulturnih biljaka, u razvijenim zemljama, postaje sve popularnije. Razlog tome su visoka cijena koštanja komercijalnih supstrata kao i njihova dostupnost na tržištu. Prilikom izbora alternativnog supstrata, treba voditi računa da ima sve karakteristike neophodne za nesmetan rast i razvoj biljaka. Cilj ovog rada je bio da se pokažu pozitivne osobine pilećeg stajnjaka u proizvodnji stojeće pelargonije - muškatle (*Pelargonium zonale* L.). Biljke su bile podijeljene u dvije grupe sa po 30 biljaka u svakoj od njih. Prva grupa je presađena na komercijalni supstrat TS3 i služila je kao kontrola. Druga grupa je presađena na mješavinu komercijalnog supstrata i pilećeg stajnjaka i predstavljala je tretman. Biljke uzgajane na supstratu koji je sadržao pileći stajnjak (u razmjeri 1:3), pokazale su bolje rezultate u pogledu morfoloških karakteristika (visina biljaka, broj listova, broj pupoljaka, broj cvjetnih grana, broj cvjetova), jer su prosječne vrijednosti svih ispitivanih parametara bile statistički značajno veće u odnosu na prosječne vrijednosti kontrolnih biljaka. Prosječna svježa i suva masa korijena i nadzemnog dijela su takođe išle u korist pilećeg stajnjaka. Iz dobijenih rezultata može se zaključiti da je opravdana primjena pilećeg stajnjaka, kao alternativnog supstrata u proizvodnji rasada stojeće pelargonije – muškatle (*Pelargonium zonale* L.).

Ključne riječi: alternativni supstrat, pileći stajnjak, pelargonija





*Section 2. Sustainable Management of Natural Resources*

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## SUSTAINABLE MANAGEMENT OF LAND AS A NATURAL RESOURCE IN BOSNIA AND HERZEGOVINA

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Agricultural land in Bosnia and Herzegovina (BiH), according to statistical data (2012) covers approximately 2,158,271.4 ha of which arable land accounts for about 1,570,090.4 ha. The total area of agricultural land in the entity of Federation of BiH (FBiH) amounts to 1,145,560.0 ha, and in Republika Srpska (RS) 981,452.4 ha. In the Brcko District of BiH, the total area of agricultural land amounts to 31.259 ha. The share of arable land and gardens per capita in RS is 0.44 ha, and in FBiH only 0.17 ha. The country with the smallest amount of arable land per capita is Japan with 0.03, then come China with 0.8, the Netherlands with 0.06, Bulgaria with 0.45, France 0.33, Brazil 0.36, USA 0.75, and Australia with 2.80 ha. Deforestation, ploughing of meadows and pastures, drainage of wetlands increase the area of arable land around the world. The problem is partially mitigated by converting the land into fertile and arable areas, but at the expense of environmental balance. In the period from 1992 to 2002 the world arable land area increased by 28.5 million hectares. On the other hand, population in Asia, Africa and Latin America is constantly growing, thus reducing the arable land per capita from 0.28 ha in 1992 to 0.25 ha in 2002. This means that the world population growth is more dynamic compared to the expansion of arable land, thus the problem of rational use of land has been constantly intensified. In BiH, due to the movement of population to cities for economic reasons but also as a result of war activities, the urban settlements and industrial zones and infrastructural networks have expanded. According to Corine data, in the period 2000-2006, 6.327 ha of agricultural land have been used for these purposes. On the one hand, the process of abandonment of rural areas leads to a succession of invasive crops on arable areas, and on the other hand urbanization leads to permanent loss of fertile agricultural land. Both these processes are very intense in BiH and very adverse in terms of preserving agricultural land as a natural unrenewable or conditionally renewable resource for future generations. This has resulted in a constant reduction of agricultural, especially arable land per capita. Management of land in BiH, as an important natural resource and factor of development in terms of its capacities and functions in ecosystem, has been underestimated. Particularly noteworthy is the problem related to extensive use, extremely small size of the private farms in terms of commodity production, large number of small land parcels, inadequate fertilization system and different types of intense land degradation are the subject of this paper.

Key words: land, soil functions, land degradation, sustainable management

## ODRŽIVO UPRAVLJANJE ZEMLJIŠTEM KAO PRIRODNIM RESURSAM U BOSNI I HERCEGOVINI

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Površina poljoprivrednog zemljišta prema statističkim podacima (2012) u Bosni i Hercegovini (BiH) iznosi oko 2.158.271 ha od čega na obradive površine otpada oko 1.570.090 ha. Ukupna površina poljoprivrednog zemljišta u entitetu Federacija BiH (FBiH) iznosi 1.145.560 ha, a u Republici Srpskoj (RS) 981.452 ha. U Brčko Distriktu BiH, ukupna površina poljoprivrednog zemljišta iznosi 31.259 ha. Udio površina oranica i bašta po stanovniku u RS iznosi 0,44 ha, a u FBiH iznosi svega 0,17 ha. U svijetu najmanje obradivog zemljišta po stanovniku ima Japan 0,03, zatim Kina 0,08, Holandija 0,06, Bugarska raspolaže sa 0,45, Francuska 0,33, Brazil 0,36, SAD 0,75, a Australija sa 2,80 ha. Krčenjem šuma, preoravanjem livada i pašnjaka, isušivanjem močvara u svijetu se povećavaju obradive površine. Pretvaranjem u plodno i obradivo zemljište ovaj problem se djelimično ublažava, ali se pogoršava ekološka ravnoteža. Obradive površine su se u svijetu povećale za 28,5 mil. ha u periodu od 1992. do 2002. godine. Međutim, u Aziji, Africi i Latinskoj Americi broj stanovništva stalno raste, te se i obradive površine per capita smanjuju sa 0,28 ha 1992. na 0,25 ha 2002. godine. To znači da je u svijetu priraštaj stanovništva dinamičniji od proširenja obradivih površina, čime se problem racionalnog korištenja zemljišta stalno zaoštrava. U BiH premještanjem stanovništva u gradove zbog ekonomskih razloga, ali i kao posljedica ratnih događanja došlo je do širenja urbanih naselja, industrijskih zona i infrastrukturne mreže. Prema podacima Corine za ove namjene, u periodu 2000-2006. godina, utrošeno je 6.327 ha poljoprivrednog zemljišta. S jedne strane, proces napuštanja ruralnog prostora dovodi do sukcesije invazivnih kultura na obradivim površinama, a na drugoj strani urbanizacijom dolazi do trajnih gubitaka plodnog poljoprivrednog zemljišta. Oba procesa su veoma izražena u BiH i nepovoljna sa stanovišta očuvanja poljoprivrednog zemljišta kao prirodnog neobnovljivog ili uslovno obnovljivog resursa za buduće generacije. Upravljanje zemljištem u BiH, kao važnim prirodnim resursom i faktorom razvoja sa stanovišta njegovog potencijala i funkcija u ekosistemu, je podcijenjeno. Posebno se ističe problem ekstenzivnog načina korištenja, izrazito mala veličina posjeda privatnih gazdinstava (farmi) sa stanovišta robne proizvodnje, veliki broj malih parcela, neadekvatan sistem gnojidbe, te izraženi različiti vidovi degradacije zemljišta su predmet ovog rada.

Ključne riječi: zemljište, funkcije zemljišta, degradacija zemljišta, održivo upravljanje

## CLIMATIC IMPACTS ON THE PERFORMANCE OF SOME FIELD CROP SPECIES IN HUNGARY

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Climatic impacts determine the success of field crop production. Aridity, water scarcity and drought are physiological water stresses influencing plant growth and development. An assessment study has been done at the Szent István University, Gödöllő to evaluate and identify the main factors of aridity. Six field crop species (Sugar beet *Beta vulgaris*, winter barley *Hordeum vulgare*, winter wheat *Triticum aestivum*, maize *Zea mays*, potato *Solanum tuberosum*, and alfalfa *Medicago sativa*) were involved in the study. 50 years' data of twelve meteorological stations (Békéscsaba, Budapest, Debrecen, Miskolc, Mosonmagyaróvár, Nagykanizsa, Nyíregyháza, Pécs, Siófok, Szeged, Szolnok, Szombathely) representing all regions of Hungary were used as a basis of evaluation. PAI indices of each station were processed with vulnerability indices of the field crops studied. The results obtained suggest, that susceptibility of cereals proved to be the lowest, however maize and potato were highly affected by aridity x vulnerability interactions. The strongest climatic influence could be detected in the case of alfalfa and sugar beet.

Key words: aridity, water scarcity, drought, field crops

## IMPACT OF DRINA AND SAVA RIVERS FLOODING ON POLLUTION OF AGRICULTURAL LAND WITH HEAVY METALS AND ORGANIC POLLUTANTS

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Rivers Drina and Sava flooded 17980 ha of land in Bijeljina municipality during May 2014 (Drina 9709 ha, Sava 9235 ha). The duration of the Drina River flood wave was from 1 to 8 days, and the Sava 7 to 27 days. Maximum height of water was: Drina 1 m; Sava 4 m. Sampling of sediment and soil was performed according to a network of points ETRS89 references European Network 500x500 m. The average samples were taken from the homogeneous parts of the plots, from the surface of a circle 30 m in diameter. There were taken 53 samples - 15 sediment samples (only if it was thicker than 1 cm) and 38 soil samples (topsoil). In the samples was analyzed the total content of heavy metals: Pb, Cd, Cr, Ni, Zn, Cu (aqua regia, AAS) and organic pollutants PCBs and TPHs (gas chromatography). All samples of sediment were alkaline reactions and 89% of soil samples were neutral, slightly alkaline and alkaline reaction. In the analyzed samples were found increased content of Ni, Cu and Zn. The increased nickel content was detected in all samples of sediment (Drina: 87 to 136 mgNi/kg; Sava: 102 to 219 mgNi/kg) and it is higher than in the soil samples (Drina 81 to 100 mgNi/kg; Sava 58 to 149 mgNi/kg). In the flooded area of the Sava, in soil samples that are closer to the riverbed (within 2,5 km) were detected the contents of Ni from 110 to 149 mgNi/kg which this soil classify as contaminated soil with Ni according to the classification of Dutch Soil Remediation Circular, 2009. According this classification in the flooded area of the Drina are not detected soils contaminated with Ni. In 43% of sediment samples from the area of Drina river was detected increased content of Zn (146 to 164 mgZn/kg) and in 57% samples increased content of Cu (38 to 48 mgCu/kg) while in the sediment samples of the Sava river detected only increased content of Cu in 78% of samples. However, the content of Zn and Cu in the soil samples were within the expected concentrations. The research results indicate that flooding in May 2014 did not cause contamination of arable topsoil but contributed that the overall content of the investigated heavy metals in topsoil are slightly increased. Due to the large amounts of water and the duration of its stagnation, a danger exists for contamination of groundwater.

Key words: flooding, soil, pollution, heavy metals, PCBs, TPHs

## UTICAJ PLOVLJENJA DRINE I SAVE NA ZAGAĐENJE POLJOPRIVREDNOG ZEMLJIŠTA TEŠKIM METALIMA I ORGANSKIM ZAGAĐIVAČIMA

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Rijeke Drina i Sava su na području opštine Bijeljina u majskim polavama 2014. god. plavile 17980 ha zemljišta (Drina 9709 ha; Sava 9235 ha). Trajanje plavnog vala Drine od 1 do 8 dana, a Save 7 do 27 dana. Maksimalna visina vode: Drina 1 m; Sava 4 m. Uzimanje uzoraka nanosa i zemljišta vršeno je po mreži tačaka ETRS89 reference European Network 500 m x 500 m. Prosječni uzorci su uzeti sa homogenih dijelova parcele, sa površine kruga prečnika 30 m. Uzeta su 53 uzorka - 15 uzoraka nanosa (samo ako je bio deblji od 1 cm) i 38 uzorka zemljišta (oranični sloj). Analiziran je ukupni sadržaj teških metala Pb, Cd, Cr, Ni, Zn, Cu (carska vodica, AAS) i organskih zagađivača: PCB i TPH (gasna hromatografija). Svi uzorci nanosa su alkalne reakcije, a 89% uzoraka zemljišta je neutralne, slabo alkalne i alkalne reakcije. U analiziranim uzorcima su utvrđene povišene koncentracije Ni, Cu i Zn. Povišen sadržaj nikla utvrđen je u svim uzorcima nanosa (Drina: 87 do 136 mgNi/kg; Sava: 102 do 219 mgNi/kg) i veći je nego u oraničnom sloju zemljišta (Drina 81 do 100 mgNi/kg; Sava 58 do 149 mgNi/kg). U plavnom području Save, u uzorcima zemljišta koji se nalaze bliže koritu rijeke (do 2,5 km) utvrđene su koncentracije Ni od 110 do 149 mgNi/kg što ova zemljišta svrstava u zemljišta kontaminirana Ni prema klasifikaciji *Dutch Soil Remediation Circular 2009*. U plavnom području Drine nisu utvrđena zemljišta koja se po ovoj klasifikaciji svrstavaju u zemljišta kontaminirana Ni. U 43% uzoraka nanosa Drine utvrđen je povećan sadržaj Zn (146 do 164 mgZn/kg) a u 57% povećan sadržaj Cu (38 do 48 mgCu/kg) dok je u nanosu Save utvrđen samo povećana sadržaj Cu (78% uzoraka). Međutim, sadržaj Zn i Cu u oraničnom sloju svih uzoraka zemljišta je bio u očekivanim koncentracijama. Rezultati analiza ukazuje da poplave u maju 2014. godine nisu uzrokovale kontaminaciju oraničnog sloja zemljišta ali su doprinijele da se ukupni sadržaj ispitivanih teških metala u oraničnom sloju zemljišta neznatno poveća. Zbog velike količine vode i trajanja njene stagnacije, opasnost postoji za kontaminaciju podzemnih voda.

Ključne riječi: plavljenje, zemljište, zagađenje, teški metali, PCB, TPH

## COMPARATIVE INVESTIGATION OF BULGARIAN SPECIES FROM GENUS MENTHA, GROWN IN IN FIELD AND IN VITRO CONDITIONS

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The genus *Mentha* belongs to the botanical family *Lamiaceae*. In Bulgaria are spread 6 varieties and numerous natural hybrids. The species from the genus *Mentha* are been well known since ancient days as oil and honey bearing plants. That is why it is considered that most of the known nowadays species are very old. In the Institute of Plant Genetic Resources – Sadovo are maintained *in field* two *Mentha* varieties. – *M. arvensis* L and *M. spicata* L. Besides the *in field* conservation of the species, *in vitro* techniques are a reliable means of reproduction and long-term storage. After introduction of the raw cuttings from plant species in culture *in vitro*, the process of micropropagation is accomplished by single bud microcuttings in nutrient medium fitted with growth regulators, enabling the development of single-rooted stems with options of repeatedly subcultivating. Along with that the possibility for long term *in vitro* propagation by reduction of the composition of the nutrient medium was tested, where the period for conservation of the cultivated explants reaches 8 months. The aim of the current study is to make comparative investigation of *M. arvensis* L and *M. spicata* L. maintained *in field* and *in vitro* conditions.

Key words: genus *Mentha*, *M. arvensis* L., *M. spicata* L., *in field* conservation, *in vitro* conservation, *Lamiaceae*.

WATER AND SEDIMENT QUALITY MONITORING  
OF SMALLER WATER COURSES IN  
VOJVODINA – CASE STUDY OF TATARNICA

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Water quality conditions of the Tatarnica *canalized watercourse* are considered in this paper. Tatarnica is the main canal of one of the drainage systems, which is situated about twenty kilometers to the west of Novi Sad (Vojvodina, Serbia). The quality of water and sediments in this canal is important because its water is used for irrigation of vegetable crops on the surrounding arable lands. In addition, its confluence into the Danube is near Begečka jama, which is a nature park with special ecological value. Based on the monthly water sampling and the analysis of relevant quality indicators during the research period, from year 2006 to 2012, the results of seven-year-long water and sediments quality monitoring are presented. According to the most relevant water quality parameters, water has a good ecological potential in most samples. However, occasional occurrence of inadequate water quality was noted, usually due to organic pollution, manifested as increased values of Biological Oxygen Demand - BOD<sub>5</sub> (~60% samples) and decreased concentration of dissolved oxygen - O<sub>2</sub> (~35% samples). Sediment properties, according to all analyzed parameters, are generally within limits which do not have negative influences on the canal environment and its surroundings.

Key words: ecological potential, quality indicators, water pollution, canal, drainage,

## MONITORING KVALITETA VODE I SEDIMENTA MANJIH VODOTOKA U VOJVODINI - PRIMER VODOTOKA TATARNICA

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U radu se analizira stanje kvaliteta vode i sedimenata kanalisnog vodotoka Tatarnica. Ovaj vodotok predstavlja i glavni kanal jednog od sistema za odvodnjavanje, koji je lociran dvadesetak kilometara zapadno od Novog Sada (Vojvodina, Srbija). Kvalitet vode i sedimenta ovog vodotoka, pored ostalog, značajan je zbog toga što se njegove vode koriste za navodnjavanje povrtarskih kultura na okolnim obradivim površinama ali i zbog toga što se uliva u Dunav u zoni akvatorije posebne ekološke vrednosti, parka prirode Begečka jama. Na osnovu mesečnog uzorkovanja vode i analize relevantnih indikatora kvaliteta, tokom perioda 2006-2012. godine, prikazani su rezultati sedmogodišnjeg monitoringa kvaliteta vode i sedimentata. Prema većini relevantnih parametara kvaliteta, u najvećem broju uzoraka, voda ima dobar ekološki potencijalu. Međutim, konstatovana je i povremena pojava vode neodgovarajućeg kvaliteta, najčešće kada je u pitanju organsko zagađenje iskazano preko povećanih vrednosti biološke potrošnje kiseonika - BPK<sub>5</sub> (~60% uzoraka) i smanjene koncentracije rastvorenog kiseonika - O<sub>2</sub> (~35% uzoraka). Sastav sedimentata, po svim razmatranim parametrima, uglavnom je u granicama koje nemaju negativne posledice na životnu sredinu u kanalu i njegovom okruženju.

Ključne reči: ekološki potencijal, indikatori kvaliteta, zagađenje, kanal, odvodnjavanje

## AWARENESS OF THE POPULATION IN BITOLA, R. MACEDONIA WITH THE ARTIFICIAL SWEETENER ASPARTAME

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Aspartame is an artificial sweetener which is 200 times sweeter than sugar. It is GM substance, because it is not created naturally, and arises from the combination of two natural amino acids (phenylalanine and asparginska) which are produced by two different types of bacteria, one of which is genetically modified to improve the taste. The aim of the research in this paper is to see how the population is familiar with this artificial sweetener, which is used as a substitute for sugar. The research was conducted in Bitola. On a random sample of 100 respondents to a questionnaire method. From the results it can be concluded that 90% of respondents were not aware that there is such a sweetener, and only 10% had heard of this sweetener, and that is used as an additive in soft drinks, but all respondents (100%) are not aware that it is present in other low-calorie food products without sugar. Comparative analysis of studies by other researchers is made, which describes the adverse effects on the health of animals and humans (brain, nervous system and behavior or cognitive functions). Aspartame is present on the market, but its harmful impact on the population in the municipality of Bitola and beyond in R. Macedonia is not sufficiently informed. From the obtained results of the study we concluded that it is needed more information to the public through education, TV and print media.

Keywords: GM aspartame, sweetener, health.

## STUDY OF THE PRESENCE OF INVASIVE WEED SPECIES IN THE RUDERAL AREA OF PANČEVAČKI RIT (BELGRADE)

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As the number of invasive species is increasing worldwide, habitats under strong anthropogenic influence, i.e. urban and industrial areas and ruderal habitats, are characterised by high levels of invasion. Due to strong anthropogenic influence, ruderal areas are prone to sudden floristic changes, and support a high proportion of invasive species. The aim of our research was to determine the presence of invasive weed species in the area of Pančevački rit, in order to pinpoint the long term tendencies for changes and set the foundations for future research of invasive plant species in this area. Field research in the area of Pančevački rit was carried out in the summer-autumn period of 2013. The phytocoenological research followed the standard Braun-Blanquet methodology, and was performed on transects positioned alongside roads bordering the agricultural areas. The georeferencing of chosen sites was done using a hand-held GPS navigator. Weed species were considered invasive if they were recognised as such by the Preliminary list of invasive species in Serbia. The presence of 14 invasive weed species was registered: 8 very invasive, 6 potentially invasive and 1 sporadically invasive species (*Sorghum halepense*). In the studied sites, the most represented of the invasive species (in over 50% of transects) was *Amaranthus retroflexus*, a potentially invasive species. Of the very invasive species, the most abundant were *Amorpha fruticosa*, *Echinochloa crus-galli*, *Conyza canadensis* and *Solidago gigantea*, with a presence registered on 37%, 30%, 27% and 23% of transects, respectively. Also, when compared to the results previously published for this area, the presence of two new invasive species was observed - *Ailanthus altissima* (very invasive) and *Eleusine indica* (potentially invasive). It is also important to highlight that a significant cover was also registered for certain invasive weed species (e.g. cover of >75% for *S. halepense* in two sites). Knowing that plant species from ruderal, nonagricultural areas show a tendency to spread into arable land, a more detailed research of the invasive species' presence in this ruderal area is necessary, with a special focus on the susceptibility of certain ruderal phytocoenoses to plant invasions.

Key words: Invasive plant species, Weeds, Ruderal area, Pančevački rit

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*Section 3. Agricultural Economics and Rural  
Development*

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## VEGETABLES PRODUCTION TENDENCIES IN THE EU COUNTRIES

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The paper analyzes the areas, yields and total productions of major vegetables in some countries in the European Union - the most important producers, in the period of 13 years (2000-12). It analyzes the production of 7 kinds of vegetables: peas, beans, tomatoes, peppers, carrots, onion and cabbage & kale. For each kind, six leading EU countries are analyzed. The analysis included 13 different countries: Bulgaria, Greece, Spain, France, Italy, Hungary, Romania, UK, Germany, Holland, Belgium, Poland and Portugal. Production characteristics were statistically analyzed and based on established rates of changes defined as the tendencies of areas, yields and total productions in the future. We used the official statistics EUROSTAT. Descriptive statistical analysis included the computation: the average and extreme values occurrence, variation coefficient and rate of change. The results showed the following:

1. On the basis of defined tendencies can be predicted decrease in area under vegetables in Poland, Italy, Greece, Bulgaria, Hungary and Belgium, and the increase in the Netherlands, Spain and Portugal.
2. Quantitative analysis indicates that the present development of technology in the production of vegetables, because in only three (of 42 surveyed) involving a negative rate of change of yield (peas and carrots in the UK and cabbage in Italy).
3. In contrast to the yield, with annual production of certain types of vegetables in some countries, nearly half (20 of 42) have negative tendencies! Tendencies to decrease in production of peas are present in 3 of the 6 leading countries (France, UK, Belgium). The same is the case with beans (UK, Germany, Poland) and carrots (Poland, France, Italy). When cabbage negative tendencies production even have 4 of 6 major countries! This suggests that the improvement of production technology and yield may not be accompanied by an increase in total production.

Key words: vegetables, productions, tendencies, European Union

## TENDENCIJE POVRTARSKÉ PROIZVODNJE U ZEMLJAMA EVROPSKE UNIJE

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U radu su analizirana površine, prinosi i ukupna proizvodnja značajnijih vrsta povrća u u pojedinim zemljama Evropske Unije - najznačajnijim proizvođačima, u periodu od 13 godina (2000-12). Analizirane su proizvodnje 7 vrsta povrća: graška, pasulja, paradajza, paprike, mrkve, crnog luka i kupusa i kelja. Za svaku vrstu analizirano je šest najznačajnijih zemalja EU. Analiza je obuhvatila ukupno 13 zemalja: Bugarsku, Grčku, Španiju, Francusku, Italiju, Mađarsku, Rumuniju, UK, Nemačku, Holandiju, Belgiju, Poljsku i Portugal. Analizirana obeležja proizvodnje su statistički obrađena i na osnovu utvrđene stope promene definisane su tendencije površina, prinosa i ukupne proizvodnje u budućem periodu. Korišćeni su zvanični statistički podaci EUROSTAT-a. Deskriptivna statistička analiza obuhvatila je izračunavanje: prosečnih i ekstremnih vrednosti pojava, koeficijent varijacije i stopu promene. Rezultati istraživanja pokazali su sledeće:

1. Na osnovu definisanih tendencija, može se predvideti smanjivanje površina pod povrćem u Poljskoj, Italiji, Grčkoj, Bugarskoj, Mađarskoj i Belgiji, a povećanje u Holandiji, Španiji i Portugalu.
2. Kvantitativna analiza ukazuje da je prisutan razvoj agrotehnike u proizvodnji povrća, jer je samo u tri (od posmatranih 42) slučaja, prisutna negativna stopa promene prinosa, i to kod graška u UK i mrkve i kupusa u Italiji.
3. Za razliku od prinosa, kod godišnje proizvodnje pojedinih vrsta povrća u pojedinim zemljama, gotovo polovina (20 od 42) ima negativne tendencije! Tendencije smanjenja proizvodnje graška prisutne su u 3, od 6 vodećih zemalja (Francuska, UK, Belgija). Isti je slučaj i sa pasuljem (UK, Nemačka, Poljska) i mrkvom (Poljska, Francuska, Italija). Kod kupusa negativne tendencije proizvodnje imaju čak 4, od 6 vodećih zemalja! Ovo ukazuje da unapređenje tehnologije proizvodnje i prinosa ne mora biti praćeno i povećanjem ukupne proizvodnje.

Ključne reči: povrće, proizvodnja, tendencije, Evropska Unija

## MAKING SENSE OF COMMODITY MARKETS: FAPRI-MU OUTLOOK AND POLICY IMPLICATIONS

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Declining prices have followed two recent price spikes in 2007/08 and 2010/11 to 2012/13 that brought an era of higher and more volatile commodity prices that is quite different from the prior years of depressed prices. Declining petroleum prices have combined with excellent global harvests to bring the lowest market prices in many years. Are current policies tuned to these market conditions? We begin with a review of past policy evolution that took place in the European Union (EU) and United States (US), and then look at recent reforms and prospects for policy changes in the context of likely changes in the global market and policy environment over the next decade. Since agricultural policies generally evolve in response to internal and external pressures in a political economy context, we explore how the outlook for commodity markets may influence the directions of policies and the decision environment for farmers.

Key words: European Union, United States, agricultural policy, CAP, commodity markets outlook

## PROBABILITY OF BANKRUPTCY OF COMPANIES IN AGRICULTURAL - FOOD SECTOR IN SERBIA

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The solvency of the company is an important indicator and the basic information when ownership changes in the capital structure of the company. Knowledge of solvency contributes in objective valorization of enterprise value in the financial market. The calculation of solvency can be made via simple indicators or complex methods which can be used also to predict future business. In this paper Z-score was calculated according to data from the final accounts for the period from 2008 to 2012. In this way, the changes of the given indicators are presented in the period of the global economic crisis occurrence till today. According to the calculations presented in this paper it is possible to draw following conclusions: 1) the financial condition of enterprises in agricultural-food industry whose shares are listed on the stock market is not favorable for individual companies or for the study group, 2) in accordance with this we should be particularly careful in interpretation of the results when the Z-score method is applicated on businesses in Serbia. This model is established based on the data of companies whose business is conducted within the framework of the developed economies of the USA. In line with that observed model is very rigorous and a literal interpretation of the results could give unjustified adverse conclusions.

Key words: solvency, agricultural - food sector, Z - score.

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## STATUS OF RURAL WOMEN IN REPUBLIC OF SRPSKA

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Rural women are a large group of the population in the Republic of Srpska, whose needs and problems, although numerous, are almost "invisible" and defined by some different factors that cause multiple marginalization of women in the countryside. Although women are a vital factor of which the revival of villages and rural development as a whole mostly depends on, their unfavorable position and the problems they face, of their basic needs, to the long-term interests in the context of sustainable development, remain a marginal issue in the process and policies, of the entity to the local level. The advancement of women in rural areas has significant meaning for the Republic of Srpska, in terms of: the demographic revival of the village, the economic empowerment of the village, through the development of agriculture and rural development in general, and the development of rural tourism, improving standards and living conditions in rural areas, reduction of generational poverty in the countryside. The aim of the research was to analyze the status of women in the countryside using the method of survey on a sample of 800 households in the whole territory of the Republic of Srpska. Analysis of the results of the research conducted is presented on the total sample, and classified according to the five regions: mediterranean, mountains, highlands, hills and plains. The indicators used to analyze the status of rural women included the following elements: participation in the work in agriculture and other business activities on the farm, ownership of resources, participation in training, problem analysis for the development of business activities, analysis of the problem of quality of life, analysis of measures for the advancement of women in rural areas. The research results show statistically significant differences between the regions on the basis of certain indicators.

Key words: rural women, indicators, the situation of women in the countryside

## POLOŽAJ ŽENA NA SELU U REPUBLICI SRPSKOJ

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Žene na selu su velika grupa stanovništva u Republici Srpskoj, čije potrebe i problemi su gotovo „nevidljivi“, iako su brojni i određeni različitim faktorima koji uzrokuju višestruku marginalizaciju žena na selu. Iako su žene vitalni faktor od kojih najviše zavisi oživljavanje sela i ruralni razvoj u cjelini, njihov nepovoljan položaj i problemi sa kojima se suočavaju, od osnovnih životnih potreba, pa do dugoročnih interesa u okviru održivog razvoja, ostaju marginalna tema u procesima i politikama, od entitetskog do lokalnog nivoa. Unapređenje položaja žena na selu ima višestruki značaj za Republiku Srpsku, u smislu: demografskog oživljavanja sela, ekonomskog osnaživanja sela, putem razvoja poljoprivrede i ruralnog razvoja u cjelini, te razvoja turizma na selu, unapređenja standarda i uslova života u seoskim sredinama, smanjenja generacijskog siromaštva na selu. Cilj istraživanja bio je u analizi položaja žena na selu korištenjem metode anketiranja na uzorku od 800 gazdinstava na cijeloj teritoriji Republike Srpske. Analiza rezultata istraživanja obavljena je na ukupnom uzorku, te prema geografskoj pripadnosti gazdinstva jednom od pet rejona: mediteranski, planinski, brdsko-planinski, brdski i ravničarski. Indikatori korišteni za analizu položaja žena na selu obuhvatili su sledeće elemente: učešće u radu u poljoprivredi i drugim poslovnim aktivnostima na gazdinstvu, vlasništvo nad resursima, učešće u obukama, analiza problema za razvoj poslovnih aktivnosti, analiza problema kvaliteta života, analiza mjera za unapređenje položaja žena na selu. Rezultati istraživanja pokazuju statistički značajne razlike između regiona po osnovu pojedinih indikatora.

Ključne riječi: žene na selu, indikatori, položaj žena na selu

## THE METHODOLOGY OF ASSESSMENT OF LOCAL RURAL LABOR MARKETS

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Modern practice of economic justification of administrative decisions demands new approaches to the analysis and forecasting of rural labor market development, development of employment assistance programs, tools for assessment of the situation in rural local labor markets. In the article the methodology of assessment of local rural labor markets are offered. The main research methods were economic and mathematical methods, the method of expert estimates, ranking method. The following results are obtained: 1. scientifically proved and developed the methodology of assessment of local rural labor markets, which includes three stages. Unlike other methodologies, along with allocation of the main elements (indicators of social and economic development) of local rural labor markets (I stage), it provides the assessment of differences in social and economic development of local rural labor markets (II stage), as well as evaluating the degree of heterogeneity of the local rural labor markets (III stage). 2. The indicators evaluation characterizing the differences within the region been held; the relationship between the level of socio-economic development of the local rural labor market and its location is revealed; approaches to regulation of rural labor market are proved. In particular, the system of measures proposal to ensure the conditions for evenly regional development, in order to "pull" the lagging local rural labor markets to the average level of socioeconomic development. 3. At the present stage strategic interests of economic development of the republic, in particular increase of the rural employment and income, require attention to the small towns and rural settlements, programs of economic development taking into account the revealed local features and rational use of the available resource potential. The developed methodology can be used as the tool of describing and diagnostic of the situation on the local rural labor markets; for identifying the obstacles to restructuring and steady production increase, improvement of social, economic and demographic situation in rural areas; for the justification of the directions of rural employment development; for the correction of public administration in the sphere of rural employment.

Key words: rural local labor markets, social-economic development, assessment of rural labor market.

## THE RECENT LEGISLATURE IN THE REPUBLIC OF SERBIA IN AREA OF INCENTIVES AND FINANCING OF AGRICULTURE AND RURAL DEVELOPMENT

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The paper analyzes recent legislation in the field of the agriculture and rural development financing in the Republic of Serbia. Legislative policy in this area is conditioned by the need to be established the market-based instruments and to be improved the financing segment of agriculture and rural development, as well as by the need for harmonization with EU legislation and the rules of the World Trade Organization with which the Republic of Serbia negotiating the conditions for membership. In the Republic of Serbia it is in preparation or effective set of laws aimed at establishing a financing instruments, trading instruments, as well as risk management instruments operating in the agricultural sector. In the area of the agriculture and rural development financing it is of paramount importance the *Law on incentives in agriculture*, which defines the conditions for eligibility for subsidies. The *Law on financing agricultural production* and the *Law on public warehouses for agricultural products* have enabled farmers to use a certificate of pre-harvest financing as well as warehouse receipts as collateral to secure the short-term loans. The *Draft Law on commodity exchanges* aims to improve the daily flow of spot market and establishment of derivative trading (futures and option contracts) which allows to the agricultural producers the hedging prices of agricultural products in the future while products are still on the field. In the research and analysis there were used several methodological procedures, such as the desk research method, the methods of analysis and synthesis, deduction method and methods of descriptive statistics. A chronic lack of funding for agriculture and rural development are one of the basic problems of agrarian sector in the Republic of Serbia. The paper concluded that it is necessary to increase the funds available for these areas. One of the ways to do that requires accreditation of institutions such as the Directorate of Agricultural Payments and the Ministry of Finance, which is a prerequisite for the use of EU IPARD funds. Furthermore, one of the paper conclusions is that the transition to EU models and subsidy programs in the area of the agriculture and rural development financing should be adapted to the local conditions and needs. Finally, the results in the paper showed that the amount of subsidies was not significantly increased in recent years despite the announcements, which is a negative trend, while it could be assessed as a positive trend an adoption of the legal frameworks that establish the market instruments which are of great importance to reduce risk and increase the competitiveness of Serbian agriculture.

Key words: agriculture, risk management, financing of agriculture, agricultural subsidies

## NAJNOVIJA ZAKONSKA REGULATIVA U REPUBLICI SRBIJI U OBLASTI PODSTICAJA I FINANSIRANJA POLJOPRIVREDE I RURALNOG RAZVOJA

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U radu je analizirana najnovija zakonska regulativa u oblasti podsticanja finansiranja poljoprivredne proizvodnje i ruralnog razvoja u Republici Srbiji. Zakonodavna politika u ovoj oblasti uslovljena je potrebom za uspostavljanjem tržišnih instrumenata i unapređenja segmenta finansiranja poljoprivrede i ruralnog razvoja, kao i potrebom za usklađivanjem sa EU zakonodavstvom i pravilima Svetske trgovinske organizacije sa kojom Republika Srbija pregovara uslove za prijem u članstvo. U Republici Srbiji je u pripremi ili na snazi set zakona čiji je cilj uspostavljanje instrumenata za finansiranje, instrumenata trgovanja, kao i instrumenata za upravljanje rizikom poslovanja u poljoprivrednom sektoru. Za oblast finansiranja poljoprivrede i ruralnog razvoja od najvećeg značaja je *Zakon o podsticajima u poljoprivredi* koji definiše uslove za ostvarivanje prava na subvencije. *Zakon o finansiranju i obezbeđenju finansiranja poljoprivredne proizvodnje* kao i *Zakon o javnim skladištima za poljoprivredne proizvode* omogućili su poljoprivrednicima korišćenje potvrde o predžetvenom finansiranju i robnog zapisa kao kolaterala za obezbeđenje kratkoročnih kredita. Nacrt *Zakona o robnim berzama* ima za cilj unapređenje dnevnog spot tržišta kao i uspostavljanje terminskog trgovanja (fjučers i opcioni ugovori) koje poljoprivrednim proizvođačima omogućavaju osiguranje cene poljoprivrednih proizvoda u budućem periodu dok je poljoprivredni proizvod još na njivi. U istraživanju i analizi je korišćeno više metodoloških postupaka, kao što su metod istraživanja za stolom, metodi analize i sinteze, metod dedukcije i metodi deskriptivne statistike. Hroničan nedostatak sredstava za finansiranje poljoprivredne proizvodnje i ruralnog razvoja su jedan od osnovnih problema agrara u Republici Srbiji. U radu je zaključeno da je neophodno da se povećaju sredstava namenjena ovim oblastima. Jedan od načina da se to učini zahteva akreditovanje institucija kao što su Uprava za agrarna plaćanja i Ministarstvo finansija, što je preduslov za korišćenje IPARD sredstava EU. Nadalje, u radu je iznet zaključak da prelazak na EU modele i programe subvencija u oblasti finansiranja agrara i ruralnog razvoja treba prilagoditi domaćim uslovima i potrebama. U radu je takodje pokazano da se visina subvencija i pored najava nije bitno povećala u prethodnim godinama što se smatra negativnim, dok se pozitivnim može oceniti donošenje zakonskih okvira koji uspostavljaju tržišne instrumente koji su od izuzetnog značaja za smanjenje rizika i povećanje konkurentnosti srpske poljoprivrede.

Ključne reči: poljoprivreda, upravljanje rizikom, finansiranje poljoprivrede, subvencije u poljoprivredi

## THE COMPETITIVENESS OF AGROINDUSTRY SECTOR OF THE REPUBLIC OF SRPSKA IN INTERNATIONAL TRADE

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International trade agreements concluded between Bosnia and Herzegovina, Western Balkans and EU countries had a major impact on the active involvement of the domestic agroindustry sector to markets of these two country groups. The aim of this paper consists in defining the position of the agroindustry sector of the Republic of Srpska in relation to the markets of CEFTA and EU countries, on the basis of calculated indicators for the analysis of comparative advantages and the level of specialization in intra-industry trade. Indicators for the identification of comparative advantages and measuring level of specialization in intra-industry trade are derived on the basis of data on total foreign trade in agroindustry products, as well as the value of trade of product groups between the Republic of Srpska, CEFTA and EU countries for the period of time 2000 - 2014. Research results for the reference period indicates that the value of RCA indicator of agroindustry sector of Republic of Srpska in relation to total trade with CEFTA and EU countries shows the lack of comparative advantages. The liberalisation of trade in agricultural products between the Republic of Srpska and CEFTA countries has affected significantly the intensity of two-way trade, while with EU is noticeable from the moment of application of the Stabilisation and Association Agreement (SAA). The share of intra-industry trade of agroindustry sector of the Republic of Srpska in relation with CEFTA and EU countries during the research period was less than 50%.

Key words: agroindustry, comparative advantages, intra-industry trade, Republic of Srpska

## KONKURENTNOST AGROINDUSTRIJSKOG SEKTORA REPUBLIKE SRPSKE U MEĐUNARODNOJ RAZMJENI

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Međunarodni trgovinski sporazumi zaključeni između Bosne i Hercegovine i zemalja zapadnog Balkana i Evropske Unije imali su veliki uticaj na aktivno uključivanje domaćeg agroindustrijskog sektora na tržišta navedenih grupa zemalja. Cilj ovog rada se sastoji u definisanju položaja agroindustrijskog sektora Republike Srpske u odnosu na tržišta CEFTA i EU zemalja, na osnovu izračunatih pokazatelja za analizu komparativnih prednosti i nivoa specijalizacije u intraindustrijskoj razmjeni. Indikatori za utvrđivanje komparativnih prednosti i mjerenje nivoa specijalizacije u intraindustrijskoj razmjeni izvedeni su na osnovu podataka o ukupnoj spoljnotrgovinskoj razmjeni u agroindustrijskim proizvodima, kao i vrijednosti razmjene po grupama proizvoda između Republike Srpske i zemalja CEFTA i EU za period od 2000 – 2014. godina. Rezultati istraživanja za posmatrani period ukazuju da vrijednosti RCA pokazatelja za sektor agroindustrije Republike Srpske u odnosu na ukupnu razmjenu s zemljama CEFTA i EU ukazuje na nedostatak komparativnih prednosti. Liberalizacija trgovine u agroindustrijskim proizvodima između Republike Srpske i CEFTA zemalja uticala je na znatno podizanje intenziteta dvosmjerne razmjene, dok sa EU je primjetno od trenutka primjene Sporazuma o stabilizaciji i pridruživanju (SAA). Učešće intraindustrijske razmjene agroindustrijskog sektora Republike Srpske u odnosu na zemlje CEFTA regiona i EU tokom istraživanog perioda bila je manja od 50%.

Ključne riječi: agroindustrija, komparativne prednosti, intraindustrijska razmjena, Republika Srpska

## DYNAMICS AND STABILITY OF SOYBEAN PRICES IN SERBIA

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Agricultural producers in Serbia are less supported by the government than producers in the EU Member States. In such circumstances, the economic position of each production is under the direct influence of the actual prices on the market. The authors of this paper analyze the market prices, as an important incentive, but also a limiting factor for the development of production. The aim of the study is to analyze the level, stability and tendencies of soybean market prices, in order to show the possibilities of further development of this crop. The analysis is limited to the market prices of soybeans realized on the Commodity Exchange in Novi Sad in the period 2009-2014. The analysis was done for the production and not the calendar year. Thus, starting from the usual time of soybeans harvest in AP Vojvodina, which is the dominant area for the cultivation of this crop in Serbia, a price series has been formed from the beginning of September of the current period to the end of the next year August. The study results show that the average annual price of soybeans in the period September 2009 - August 2014 was 0.41 €/kg and exerts a growth rate of 13.61%. The average monthly price in the observed period ranged from 0.28 €/kg (September 2010) to 0.60 €/kg (August 2012). Production year has been characterized by some seasonal fluctuations in the soybean prices. In average, during the harvest (September) and especially immediately after it (October and November), there is a price-drop, after which the price rises until the next harvest, with the exception of March, in which there is a short-term reduction in prices. The pace of growth and the level of realized prices of soybean production in the second half of the year were significantly influenced by a forecast of the crop condition and expected yields. Manifested price trends on one hand and their seasonal variability, on the other hand, indicate the need for constant price monitoring in order to make rational business decisions in terms of the time of sale, in order to achieve the best possible economic result with the current level of inputs, which is a significant motivational factor for further expansion of this crop, both in Vojvodina and in Serbia.

**Key words:** soybean, market prices, seasonal variability of prices, Republic of Serbia

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## DINAMIKA I STABILNOST CENA SOJE U REPUBLICI SRBIJI

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Poljoprivredni proizvođači u Srbiji imaju manju podršku države u odnosu na onu koju dobijaju proizvođači u zemljama članicama EU. U takvim uslovima ekonomski položaj svake proizvodnje je pod direktnim uticajem ostvarenih cena na tržištu. Autori u ovom radu analiziraju tržišnu cenu, kao bitan podsticajni, ali ujedno i ograničavajući faktor razvoja svake proizvodnje. Cilj rada je da sagleda nivo, stabilnost i tendencije kretanja tržišnih cena soje, kako bi se ukazalo na mogućnosti daljeg razvoja ovog useva. Analiza je ograničena na tržišne cene soje ostvarene na produktnoj berzi u Novom Sadu u periodu 2009-2014. godine. Analiza je rađena za proizvodnu, a ne kalendarsku godinu. Tako je, polazeći od uobičajenog vremena žetve soje u AP Vojvodini, koja je dominantno područje za gajenje ovog useva, serija cena formirana na bazi perioda 1. septembar tekuće - 31. avgust naredne godine. Dobijeni rezultati istraživanja pokazuju da je prosečna godišnja cena soje u periodu od septembra 2009. do avgusta 2014. godine na nivou od 0,41 €/kg i ispoljava rast po stopi od 13,61%. Prosečna mesečna cena u posmatranom periodu se kretala u intervalu od 0,28 €/kg (septembar 2010) do 0,60 €/kg (avgust 2012). Proizvodnu godinu karakterišu određena sezonska kolebanja cena soje. Prosečno posmatrano, u žetvi (septembar), a posebno neposredno posle žetve (oktobar i novembar) dolazi do pada cena, nakon čega cena raste do naredne žetve, sa izuzetkom marta, u kom dolazi do kratkoročnog smanjenja cene. Tempo rasta i nivo ostvarene cene soje u drugoj polovini proizvodne godine pod značajnim je uticajem prognoza stanja useva i očekivanog novog roda zrna soje. Ispoljena kretanja rasta cena, s jedne i njihova sezonska varijabilnost, s druge strane, ukazuju na potrebu konstantnog prećenja cena u cilju donošenja racionalnih poslovnih odluka u pogledu vremena realizacije, kako bi pri postojećem nivou ulaganja ostvarili povoljniji ekonomski rezultat u proizvodnji soje, što je značajan motivacioni faktor daljeg širenja ovog useva, kako u Vojvodini, tako i na području Srbije.

**Ključne reči:** soja, tržišne cene, sezonska kolebanja cena, Republika Srbija

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## ECONOMIC JUSTIFICATION FOR USE OF MULCH IN WINTER PRODUCTION OF LETTUCE

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Economic analysis winter produce of lettuce applicable only to the four production method which is based on localized drip irrigation and planting of seedlings with roots protected but differentiate according to the applied mulch: a) uncovered land; b) mulching with black PVC foil; c) covering with agrotextile weight of 17 g; d) a combination of black plastic mulch and agro textile. Experiment was done in winter (2009, 2010 and 2011) in the greenhouse without additional heating, which is located on the experimental field of the Agricultural University of East Sarajevo. The research was done in the following varieties: Santoro RZ. Dependence of the observed traits, the results show certain variations, where the combination of mulch and agro textile proved to be the most acceptable.

Key words: winter production of lettuce, mulching, effectiveness, efficiency, greenhouse.

## EKONOMSKA OPRAVDANOST UPOTREBE MALČA U ZIMSKOJ PROIZVODNJI SALATE

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Ekonomska analiza proizvodnje zimske salate odnosi se na četiri tehnologije uzgoja koje se temelje na lokaliziranom navodnjavanju kapanjem i sadnji sadnica sa zaštićenim korjenom, a razlikuju se prema primijenjenom malču: a) nepokriveno zemljište; b) malčiranje crnom PVC folijom; c) prekrivanje agrotekstilom mase 17 g; d) kombinacija crnog PVC malča i agrotekstila. Istraživanja su obavljena u zimskom periodu (2009, 2010. i 2011. godina) u plasteniku bez dodatnog grijanja lociranom na oglednom polju Poljoprivrednog fakulteta Istočno Sarajevo. Istraživanje je provedeno na sorti Santoro RZ. Zavisno od posmatranih parametara, rezultati pokazuju određena variranja, gdje se kombinacija malča i agrotekstila pokazala kao najprihvatljivija.

Ključne riječi: zimska proizvodnja salate, malčiranje, efektivnost, efikasnost, zaštićeni prostor.

## GLOBAL TRENDS OF FOOD PRODUCTION

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The projected world population of 9 billion in 2050 require plan of development chain and net of producers, processors and consumers. The main reason is to stop hungry on the world as well protect environment i.e. make seed and food available at reasonable prices, decrease waste and use of harmful chemicals in agricultural production. Food production in agriculture involve about 70% of all working children worldwide. This fact require revision of instruction in agricultural production at the each phase, especially how to apply pesticides, fertilizers and other chemicals. In agricultural production chemical fertilizers influence to minimize returning of phosphate to the field because of decreasing application of phosphates via animal excreta and accelerate exploitation of global phosphate deposits. Artificial fertilizers damaged eco-systems because a small part of the nitrogen utilize the plants – the major part contaminates soil as well water. Also, today livestock farming is possible only with chemical fertilizer and animals whereby animals ingest proteins in their diet and excrete much of the nitrogen which emitted to the atmosphere in the form of nitrous oxide and damaging to the climate. For production of food for the raising human population and protection environment is necessary develop net of producers, processors and consumers which in cooperation can realize main aims as well as seed and food security, protection of environment, social justice. It's very important considering who is owner of food, seed, pesticides, fertilizer etc. on world market. The development of new form of chain in which farmers will more efficient to produce and be able to sell in advance at the price set by big corporation or investment institution. Especially is necessary support family farms to become more productive to ensure global food security and environmental protection, as well innovate in ways that promote sustainable of production and improvements in rural livelihoods by developing strong cooperation with research institution, to incorporate innovative technologies and management as well plan of finance for production.

Key words: food, environment, farming, rural, production.

## RURAL DEVELOPMENT OF THE REPUBLIC OF SRPSKA UNTIL 2015 AND DIRECTIONS FOR FUTURE DEVELOPMENT

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Rural Development Policy of the Republic of Srpska until 2015 is defined by the Strategic Plan of Rural Development of the Republic of Srpska covering the period from 2010 to 2015 and under responsibility of the Ministry of Agriculture, Forestry and Water Management. This strategic plan envisions that the rural development policy is implemented under three strategic objectives: improving the competitiveness of agriculture and forestry, sustainable management of natural resources and improvement of living conditions and the introduction of greater diversity in generating income in the rural economy. The aim of this study is to analyzing the five-year period of implementation of rural development policy in the Republic of Srpska get answers to the following questions: what was the amount of funds reserved annually in the public budget of the Republic of Srpska for the implementation of rural development policy, which is the degree of implementation of measures for achieving the strategic goals, is the partnership of public, business and civil sector in the implementation of rural development policy achieved, is the coordination on horizontal level within the public sector for the implementation of rural development policy accomplished. To analyze the level of funds allocation, a budget analysis method was used, as well as methods of descriptive statistics and direct comparisons, while for the analysis of other elements a method of structured interviews of selected representatives of public, business and civil sectors is used. Based on the results of the analysis for the period 2010-2015, some conclusions and recommendations for the foundation of a new strategic approaches and directions of rural development policy in the future, are produced.

Key words: rural development policy, strategic plan, implementation

## RURALNI RAZVOJ REPUBLIKE SRPSKE DO 2015. GODINE I PRAVCI BUDUĆEG RAZVOJA

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Politika ruralnog razvoja Republike Srpske do 2015. godine definisana je Strateškim planom ruralnog razvoja Republike Srpske za period 2010-2015. godine za čije provođenje je zaduženo Ministarstvo poljoprivrede, šumarstva i vodoprivrede. Strateškim planom je predviđeno da se politika ruralnog razvoja provodi u okviru tri strateška cilja: unapređenje konkurentnosti poljoprivrede i šumarstva, održivo upravljanje prirodnim resursima i poboljšanje uslova života i uvođenje veće raznolikosti kod ostvarivanja prihoda u ruralnoj ekonomiji. Cilj ovog rada je da analizirajući petogodišnji period implementacije politike ruralnog razvoja u Republici Srpskoj dođe do odgovora na sledeća pitanja: koliki je bio obim sredstava rezervisan na godišnjem nivou u javnom budžetu Republike Srpske za implementaciju politike ruralnog razvoja, koji je stepen realizacije mjera za dostizanje strateških ciljeva, da li je ostvareno partnerstvo javnog poslovnog i civilnog sektora u provođenju politike ruralnog razvoja, da li je ostvarena koordinacija na horizontalnom nivou unutar javnog sektora za provođenje politike ruralnog razvoja. Za analizu nivoa izdvajanja korišten je metod budžetske analize, metod deskriptivne statistike i neposrednog upoređivanja, dok je za analizu ostalih elemenata realizacije korišten metod strukturiranog intervjua odabranih predstavnika javnog poslovnog i civilnog sektora. Na osnovu rezultata analize za period 2010-2015. godine izvedeni su zaključci i date preporuke za postavljanje osnova novog strateškog pristupa i pravaca politike ruralnog razvoja u budućem periodu.

Ključne riječi: politika ruralnog razvoja, strateški plan, implementacija

## BEHAVIOR AND ATTITUDES OF FISH CONSUMERS

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Fish production in the Republic of Srpska has decreasing trend since 2009, but nevertheless of that this branch of agriculture has a high degree of coverage of import by export. Data of the Republic of Srpska Institute of Statistics show a decrease in fish consumption per capita from 7.2 kg (2004) to 4.96 kg (2011). The survey of consumer attitudes and preferences in fish consumption was conducted in three cities in the Republic of Srpska (Banja Luka, Prijedor and Bijeljina) through structured questionnaire with 25 questions of which 2 were open questions. In total were interviewed 108 randomly selected consumers. The aim of research was to declare consumers' attitudes about fish consumption. The field data processing was performed by mathematical-statistical methods. All analyzes were done using SPSS statistical program. The survey shows that 89.8% respondents consume fish, and most buy and consume fish once to twice a month (35.2%). In our area most consumers buy fresh freshwater fish. As the dominant factors influencing the purchase of fish are mentioned nutritional significance (29.6%). Personal standard (26.9%) is the limiting factor in buying fish, which confirms also answer to the question of the fish price were nearly 4/5 respondents consider that the price of fish is high. The survey data show also to the need of more intensive promotion of freshwater fisheries (56.5%) with the objective of introducing consumers with products of freshwater fisheries and advantages in nutrition.

Key words: consumer attitudes, fish, market.

## PONAŠANJE I STAVOVI POTROŠAČA RIBE

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Proizvodnja ribe u Republici Srpskoj od 2009. godine ima trend pada, ali i pored toga ova grana poljoprivrede ima visok stepen pokrivenosti uvoza izvozom. Podaci Republičkog zavoda za statistiku Republike Srpske pokazuju pad potrošnje ribe po glavi stanovnika sa 7,2 kg (2004) na 4,96 kg (2011). Istraživanje stavova potrošača i preferencija o konzumaciji ribe provedeno je u tri grada Republike Srpske (Banja Luka, Prijedor i Bijeljina), putem strukturiranog anketnog upitnika sa 25 pitanja od kojih su bila 2 otvorena pitanja. Ukupno je anketirano 108 slučajno odabranih potrošača. Cilj istraživanja je bio utvrditi stavove potrošača o konzumaciji ribe. Obrada prikupljenih podataka na terenu izvršena je matematičko - statističkim metodama. Sve analize su urađene korišćenjem statističkog programa SPSS. Istraživanje pokazuje da 89,8% anketiranih konzumira ribu u ishrani, a najveći broj kupuje i konzumira ribu jednom do dva puta mjesečno (35,2%). Na našem području potrošači najviše kupuju svježiu slatkovodnu ribu. Dominantan faktor koji utiče na kupovinu ribe je njen nutritivni značaj (29,6%). Lični standard (26,9%) predstavlja limitirajući faktor kupovine ribe, što potvrđuje i odgovor na pitanje o visini cijene ribe gdje skoro 4/5 ispitanika smatra da je cijena ribe visoka. Anketni pokazatelji ukazuju i na činjenicu neophodnosti intenzivnijeg promovisanja slatkovodnog ribarstva (56,5%) a s ciljem upoznavanja potrošača sa proizvodima slatkovodnog ribarstva i prednostima u ishrani.

Ključne riječi: stavovi potrošača, riba, tržište.

## VALUE CHAIN OF DAIRY SECTOR IN BOSNIA AND HERZEGOVINA AT YEAR 2013

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The value chain of milk production in Bosnia and Herzegovina (BH) from farm to fork includes eight (8) phases: production of food for cows, production of fresh raw milk, transport of raw milk, milk processing, packaging, distribution, retail and consumer. First and the most important phase, where the biggest problems in the production of raw milk are identified, is the production of forages for cows. Farmers produce forages either on their own or leased parcels/land and usually they manage to produce sufficient quantities of forage, but the quality of it is not appropriate for the production potential of the cows. Production of fresh raw milk is carried out on farms that are mainly fragmented. Namely, 81.42% of farms poses up to five dairy cows in the herd. Transport of raw milk is organized in the following way: milk is purchased directly from farmers or from organizations that organize milk buy up/purchase of milk, and in the special vehicles for the transport of milk is than transported to the dairy's. Processing of milk: seven large dairies purchases and processes 82.17% of the total purchase of milk. In BH, there are 36 registered milk producers. The breakdown of processing structure is 55% of UHT milk, 23% fermented products and 22% cheese, spreads, etc. Packaging is typical for each milk processor. Usually it is a cartons packing (tetrapak) or plastic packaging. The packaging is designed in a way that the milk products in the packaging are clean, fresh, healthy and safe for consumption. The distribution of packaged milk products from processors to the supermarkets, retail shops, etc. is organized in a specialized vehicles for the transport of packaged dairy products (cold storage). Almost all retail market facilities have to offer dairy products. Dairy products are always placed in an appropriate manner, in order to preserve freshness, cleanliness and health safety of dairy products. Consumers, milk and dairy products provide nine essential nutrients for children and adults, and provides health at all stages of life.

Key words: milk, the number of cows, buy up/purchasing, processing.

## LANAC VRIJEDNOSTI SEKTORA MLIJEKARSTVA U BOSNI I HERCEGOVINI 2013. GODINE

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Lanac vrijednosti proizvodnje mlijeka u Bosni i Hercegovini od polja do stola uključuje osam (8) faza: proizvodnja hrane za krave, proizvodnja svježeg sirovog mlijeka, transport svježeg sirovog mlijeka, prerada mlijeka, pakovanje, distribucija, maloprodaja i potrošač. Prva i najzanačajnija faza u kojoj su identifikovani i najveći problemi u proizvodnji svježeg sirovog mlijeka jeste proizvodnja kabaste hrane za krave. Kabastu hranu poljoprivrednici proizvode na vlastitim ili iznajmljenim parcelama i uglavnom obezbijeduju dovoljne količine kabaste hrane, ali kvalitet kabaste hrane nije primjeren proizvodnom potencijala krava. Proizvodnja svježeg sirovog mlijeka se obavlja na mini farmama. Tako, 81,42% farmi ima do 5 muznih krava u stadu. Transport svježeg sirovog mlijeka se vrši na sledeći način. Mlijeko se otkupljuje direktno od farmera ili organizatora otkupa mlijeka, i u vozilima specijalnim za transport mlijeka se odvozi do mlijekara. Prerada mlijeka se obavlja tako da 7 velikih mlijekara otkupi i preradi 82,17% ukupnog otkupa mlijeka. U BiH ima 36 registrovanih proizvođača mlijeka. Procijenjena struktura prerade je takva da 55% čini UHT mlijeko, 23% fermentisani proizvodi i 22% sir, namazi i dr. Pakovanje je tipično za svakog prerađivača. Obično je to pakovanje tetrapak ili plastična ambalaža. Ambalaža je dizajnirana tako da su mliječni proizvodi u ambalaži čisti, svježi i zdravstveno bezbjedni. Distribucija upakovanih mliječnih proizvoda od prerađivača do marketa, trgovina i dr. se vrši u specijalizovanim vozilima za transport upakovanih mliječnih proizvoda (hladnjače). Gotovo svi malprodajni objekti imaju u ponudi mliječne proizvode. Mliječni proizvodi su uvijek smješteni na odgovarajući način, da bi se očuvala svježina, čistoća i zdravstvena ispravnost mliječnih proizvoda. Potrošači, mlijeko i mliječni proizvodi obezbijeduju devet esencijalnih hranljivih materija za djecu i odrasle, i obezbijeduje zdravlje u svim fazama života.

Ključne riječi: mlijeko, broj krava, otkup, prerada.

## TRENDS IN PRODUCTION AND CONSUMPTION OF POULTRY MEAT IN THE WORLD AND BOSNIA AND HERZEGOVINA

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There is an increasing trend of production and consumption of poultry meat over the last years in the world and Bosnia and Herzegovina. The main purpose of this paper is to present a literature review in this field, and give prediction of production and consumption of poultry meat in the future. The largest producer of poultry meat in 2013 was the US with 19.8 million tons followed by China (17.4), Brazil (13.0) and the EU-28 (12.8). The total production of poultry meat in the world is 107.4 million tons. The most poultry are fattened in China, the US, Indonesia, Brazil and the EU. Consumption of poultry meat has been increased in the world per capita over the last ten years from 10.4 kg in 2003 to 13.2 kg in 2013. According to statistical data and estimates of Organization for Economic Co-operation and Development, Food and Agriculture Organization of the United Nations (OECD FAO) consumption of poultry meat has increased in the past decade to 42.7%. It is expected that consumption of poultry meat in 2023 will be 134.3 million tons, which represents increasing for additional 25.3% compared to 2013, but its average consumption per capita could be about 14.9 kg. The most of poultry meat per capita and per year is consumed in the US (44.3 kg), than in Malaysia (43.1 kg) and Brazil (40.6 kg), while the EU-28 average in 2013 was 21.2 kg. According to statistics, poultry fattening in Bosnia and Herzegovina has also a growing trend showing that the number of poultry and the quantity of meat produced in the last ten years are doubled. In 2004, 9.4 millions of poultry was fattened, while in 2013 it was fattened about 24.7 million. The number of poultry in the Republic of Srpska has increased by 140% and in the Federation of Bosnia and Herzegovina by 207%. Net weight of poultry meat in Bosnia and Herzegovina, excluding imports and exports in 2013 was 41,548 tons, what represents 10.96 kg per capita.

Key words: poultry meat, trends in production and consumption, prediction.

## TRENDOVI U PROIZVODNJI I POTROŠNJI MESA PERADI U SVIJETU I BOSNI I HERCEGOVINI

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U proteklom periodu je primjetan trend povećanja proizvodnje i potrošnje mesa peradi u svijetu i Bosni i Hercegovini. Cilj ovog rada je predstaviti pregled literature u tom području i dati predviđanja proizvodnje i potrošnje mesa u narednom periodu. Najveći proizvođač mesa peradi u 2013. godini su SAD sa 19,8 miliona tona nakon čega slijede Kina (17,4), Brazil (13,0) i EU-28 (12,8). Ukupna proizvodnja mesa peradi u svijetu je iznosila 107,4 miliona tona. Najviše peradi tovi se u Kini, SAD, Indoneziji, EU i Brazilu. Potrošnja mesa peradi u svijetu po stanovniku u zadnjih deset godina je porasla sa 10,4 kg u 2003. godini na 13,2 kg u 2013. godini. Prema statističkim podacima i procjenama Organizacije za ekonomsku saradnju i razvoj, organizacija za hranu i poljoprivredu ujedinjenih nacija (OECD FAO) potrošnja mesa peradi u posljednjih deset godina je porasla za 42,7%. U 2023. godini se očekuje potrošnja od 134,3 miliona tona, što će biti povećanje za dodatnih 25,3% u odnosu na 2013. godinu, dok će njena prosječna potrošnja po stanovniku iznositi 14,9 kg. Prema podacima iz 2013. godine najviše mesa peradi po stanovniku godišnje troši se u SAD 44,3 kg, Maleziji 43,1 kg i Brazilu 40,6 kg, dok je u EU-28 prosjek 21,2 kg. Prema statističkim podacima tov peradi u BiH ima također rastući trend, a u posljednjih deset godina broj peradi i količina proizvedenog mesa su udvostručeni. U 2004. godini u tovu je bilo 9,4 miliona, a u 2013. godini 24,7 miliona peradi. U RS-u je broj peradi porastao za 140%, a u FBiH za 207%. Neto težina mesa peradi u BiH, ne računajući uvoz i izvoz, u 2013. godini iznosila je 41.548 tona, odnosno 10,96 kg po glavi stanovnika.

Ključne riječi: meso peradi, trendovi u proizvodnji i potrošnji, predviđanje.

## COMPARISON OF STRUCTURE OF BUDGETARY SUPPORT TO AGRICULTURAL PRODUCERS (PSEB) AT THE LEVEL OF THE REPUBLIC OF SRPSKA AND EUROPEAN UNION

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The aim of this paper is the determination of harmonisation of agricultural policy measures in the Republic of Srpska with the Common Agricultural Policy of the EU, based on comparison of structure of budgetary support to producers (PSE<sub>b</sub>). The structure of PSE<sub>b</sub> in the Republic of Srpska and EU was analysed on the basis of implementation criteria and on the degree of commodity specificity for the period 2000-2013. By applying the methods of comparative analysis of PSE<sub>b</sub> structures for the Republic of Srpska and the EU derives the existence of significant differences in the support system to agriculture and rural development, as well as on the scope of budgetary support that is realized through certain types of groups of payment. The estimated incompatibility between the national system of support to agriculture and rural development and that of the EU is induced by the introduction of specific system solutions, inherent of the reforms of the Common Agricultural Policy (CAP).

Key words: budgetary support to agricultural producers, agricultural policy, Republic Srpska, European Union

## KOMPARACIJA STRUKTURA BUDŽETSKE PODRŠKE POLJOPRIVREDNIM PROIZVOĐAČIMA (PSEB) NA NIVOU REPUBLIKE SRPSKE I EVROPSKE UNIJE

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Cilj ovog rada predstavlja utvrđivanje usklađenosti mjera agrarne politike Republike Srpske s Zajedničkom agrarnom politikom EU na osnovu komparacije struktura budžetske podrške proizvođačima ( $PSE_b$ ). Struktura  $PSE_b$ u Republici Srpskoj i EU analizirana je po osnovu *kriterijuma implementacije i specifičnosti proizvoda* za period od 2000 - 2013.godina. Primjenom metode kompartivne analize struktura  $PSE_b$  za Republiku Srpsku i EU proizilazi postojanje signifikantne razlike kako u sistemu podrške poljoprivredi i ruralnom razvoju tako i u pogledu obima budžetskih izdvajanja koja se realizuju kroz određene vrste ili grupe plaćanja. Izražena nekompatibilnost između domaćeg sistema podrške poljoprivredi i ruralnom razvoju i EU indukovana je uvođenjem određenih sistemskih rješenja svojevrsna reformama Zajedničke agrarne politike (CAP).

Ključne riječi: budžetska podrška poljoprivrednim proizvođačima, agricultural policy, Republika Srpska, Evropska Unija

## MARKETING CHANNELS OF FRESH STRAWBERRIES – A CASE STUDY OF PRODUCERS FROM OBREŽ, VARVARIN MUNICIPALITY, REPUBLIC OF SERBIA

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Due to increased domestic and foreign demand for fresh strawberries, production of this fruit in the Republic of Serbia in recent years has been achieved significant growth. The production is principally engaged in small and medium farmers and in a few larger ones. Specialization in strawberry production resulted in increased yields. According to the literature, the losses of fresh fruits and vegetables along the marketing channels range from 40% to 50% of the total production. Fresh strawberries are a product that poorly can be stored and very sensitive to transport, resulting in losses up to 50%. In Obrež, Varvarin municipality fruit and vegetable production is important agricultural activity, especially the production of fresh strawberries. The choice of marketing channels depends on product characteristics and on the market circumstances. This paper aims to analyze the marketing channels of fresh strawberries, to indicate the position of participants in marketing channels, to analyze strengths and weaknesses, as well as to describe the threats and opportunities that come from the environment. Data for this study were collected through interviews with selected producers. In the paper trade calculations and a SWOT analysis was conducted. The research results show that producers often choose indirect marketing channels. Position of primary producers depends on traders - intermediaries - who store fresh strawberries in a short term, and the latest from wholesalers. The main weak side of the producers is diversity of varieties of strawberries, understanding of responsibility for functioning of the marketing channels and a perception of quality. A great opportunity represents foreign demand, but is also a great threat when big customers come from only one country.

Key words: marketing channels, strawberry, Republic of Serbia

## MARKETINŠKI KANALI SVEŽIH JAGODA – PRIMER PROIZVOĐAČA IZ OBREŽA, OPŠTINA VARVARIN, REPUBLIKA SRBIJA

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Zbog povećane domaće i inostrane tražnje za svežim jagodama, proizvodnja ovog voća u Republici Srbiji poslednjih godina beleži značajan rast. Proizvodnjom se najviše bave mali i srednji poljoprivredni proizvođači i nekoliko većih. U izboru sorti jagoda, proizvođači se takođe prilagođavaju zahteva tržišta. Specijalizacija proizvodnje jagode je donela povećanje prinosa po jednini površine. Od ukupne proizvodnje, prema literaturi, gubici za voće i povrće se kreću i intervalu od 40% do 50%. Sveže jagode su proizvod koji se slabo može uskladištiti i veoma je osetljiv na transport, zbog čega se može smatrati u marketinškim kanalima svežih jagoda nastaju gubici od 50%. U Obrežu, opština Varvarin je razvijena voćarska i povrtarska proizvodnja, a naročito proizvodnja svežih jagoda. Na izbor kanala marketinga, osim karakteristike proizvoda utiču i situacija na tržištu tražnje i ponude. Ovaj rad ima za cilj, da analizira marketinške kanale sveže jagode, da ukaže na položaj pojedinih učesnika u kanalima marketinga, da analizira njihove jake i slabe strane, kao i da opiše pretnje i šanse koje dolaze iz okruženja. Podaci za ovo istraživanje su prikupljeni metodom intervjua sa izabranim proizvođačima. U radu je sastavljane trgovačke kalkulacije i urađena SWOT analiza. Rezultati istraživanja pokazuju da se proizvođači najčešće odlučuju za indirektno kanale marketinga. Položaj primarnih proizvođača zavisi od trgovaca - posrednika - koji kratkoročno skladište sveže jagode, a ovih od trgovaca na veliko. Osnovna slaba strana proizvođača je različitost sorti jagoda, poimanje odgovornosti za funkcionisanje kanala marketinga i shvatanje kvaliteta. Veliku šansu predstavlja inostrana tražnja, ali je istovremeno i pretnja kada veliki kupci dolaze samo iz jedne zemlje.

Ključne reči: kanali marketinga, jagode, Republika Srbija



*Section 4. Animal Sciences*

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## PROBLEMS IN THE IMPLEMENTATION OF LAYING HEN WELFARE REGULATION IN SERBIA

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By Regulation on Conditions for Animal Welfare (Official Gazette of RS 6/10) keeping laying hens in battery cages in Serbia is prohibited from January 1, 2012. However, after only two years of its validity it is recognized that such a ban was hasty adopted and that period given to producers for the transition is unrealistic. Therefore, the Regulations have been amended in June 2014, i.e. keeping hens in battery cages allowed until 2020. By this, sector has got an additional six years to (better) prepare itself for the production in allowed systems. The research was conducted to determine the reasons that have led to modifications of the Regulation, in order to avoid repeating the mistakes of the past. The results of the conducted survey show that farmers are very poorly informed. Over 60% of them do not know about the ban. Lack of awareness is particularly high among the smaller producers, which dominate in Serbia. Even when they obtain such information, farmers do not show concern. Namely, none of the respondents think that this ban in practice has been implemented as intended. Situation is not much better when it comes to the future. Almost half of the respondents think that the ban will be implemented only after the prospective entry to the EU, while 15.6% of them think that even then will not be applied. Only 40% of farmers are ready to continue production within the allowed systems, if the ban on battery cages became a reality. Others will leave sector (28.9%) or they had not yet thought about it (31.1%). The EU experience shows that the transition to the eligible systems must be accompanied by certain state measures. That means, among others, that import of battery cages has to be banned, financial assistance for the purchase of new equipment provided, system of egg labelling (in terms of housing system) and inspection developed, but first of all it is necessarily to have far better informed both producers and consumers, whose willingness to support this transition, through higher prices, is extremely important. Despite the fact that ban postponement brought instant relief to a large number of producers in Serbia, farmers must be aware of the seriousness of the situation and the risk of waiting and persuading themselves that after 2020 the deadline for transition will be delayed again and /or keeping hens in prohibited battery cages tolerated.

Key words: laying hens, welfare, regulation, Republic of Serbia

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## PROBLEMI U PRIMENI REGULATIVE ZA OBEZBEĐENJE DOBROBITI NOSILJA U SRBIJI

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Pravilnikom o uslovima za dobrobit životinja (Sl. Glasnik RS 6/10) držanja nosilja u baterijskim kavezima u Srbiji je zabranjeno od 1.01.2012. godine. Međutim, već posle dve godine važenja ovog Pravilnika prepoznato je da je ovakva zabrana bila ishitrena, a dvogodišnji rok dat proizvođačima za tranziciju nerealan. Zato je on u junu 2014. godine izmenjen, odnosno držanje u baterijskim kavezima je dozvoljeno do 2020. godine. Ovim je sektoru dato dodatnih šest godina da se (bolje) pripremi za proizvodnju u dozvoljenim sistemima. Istraživanje je sprovedeno sa ciljem da se utvrde razlozi koji su doveli do izmene Pravilnika, kako bi se izbeglo ponavljanje grešaka iz prošlosti. Rezultati sprovedene ankete pokazuju da su proizvođači izuzetno loše informisani, odnosno da ih preko 60% uopšte ne zna za zabranu držanja u baterijskim kavezima. Neinformisanost je posebno velika među manjim proizvođačima, kakvih je u Srbiji najviše. Čak i kada tu informaciju dobiju, proizvođači ne pokazuju veliku zabrinutost. Niko od anketiranih ne misli da se ta zabrana u praksi sprovodila kako je bilo predviđeno, a nije mnogo bolja situacija ni kada je budućnost u pitanju. Skoro polovina ispitanika misli da će se zabrana primenjivati tek nakon (eventualnog) ulaska zemlje u EU, dok 15,6% smatra da se neće primenjivati čak ni tada. Samo 40% proizvođača je spremno da nastavi proizvodnju u dozvoljenim sistemima, ukoliko stvarno dođe do potpune zabrane držanja u baterijskim kavezima. Ostali će ili napustiti proizvodnju (28,9%) ili o tome još nisu ni razmišljali (31,1%). Iskustvo EU pokazuje da tranzicija na dozvoljene sisteme držanja nosilja mora biti urađena uz stalne konsultacije sa predstavnicima sektora i praćena određenim merama države. Tu se, pre svega, misli na zabranu uvoza baterijskih kaveza, finansijsku pomoć za nabavku nove opreme, razvoj sistema obeležavanja jaja (u pogledu sistema držanja), jačanje inspeksijskog nadzora, ali svakako i daleko bolje informisanje, kako proizvođača, tako i potrošača, čija je spremnost da kroz cene podrže ovaj prelazak izuzetno važna. Ma kako da je odlaganje zabrane velikom broju proizvođača u Srbiji donelo trenutno olakšanje, proizvođači moraju biti svesni ozbiljnosti situacije i rizika čekanja i računanja da će i posle 2020. godine biti odlaganja rokova i/ili tolerisanja rada mimo zakona.

**Ključne reči:** nosilje, dobrobit, regulativa, Republika Srbija

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## SUSTAINIBILITY AND EFFICIENCY OF DAIRY FARMS BIOSECURITY PLANS

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Basic principles of biosecurity plans creation and implementation were given in this review paper. This include goals wanted to be acheived related to specificities of dairy farm technology, selection of measures that have to be included, order and manner of measures description, implementation, as well as failures in plan execution. Efficiency and further sustainability of biosecurity plans implementation could be measured through differences between biosecurity level before and after plans application established by questionnaire about biosecurity indicators, such as: 1. isolation of the farm and its organization, 2. quarantine and newly purchased cows policy, 3. visitors policy, 4. attitude towards equipment use, 5. pest control, 6. sanitation efficacy and 7. farm impact on environment. The stakeholders have to define and develop plan to keep potential pathogens for dairy herd health and production away in cooperation with the veterinarian and the other professionals advising on organisation and production technology. At least once a year, it is necessary to reconsider the plan and supplemented by new practical experience and scientific knowledge.

Key words: biosecurity, dairy farms, efficiency, plan

## THE HEALTH STATUS OF BREEDING BOARS FOR NATURAL AND ARTIFICIAL INSEMINATION, REGULATORY COMPLIANCE IN SERBIA: ARE WE CLOSER OR FURTHER AWAY EUROPEAN UNION?

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Diagnostic and health condition control procedures of breeding boars in Serbia are in accordance with Regulation on the establishment of animal health care measures for 2014 year. Diagnostic tests for breeding boars in centres for artificial insemination are performed on each breeding animal twice a year, and those include tests for brucellosis (*B. abortus*, *B. suis*); tuberculosis (bovine tuberculin); Aujeszky's disease; leptospirosis and PRRS. On the other hand, as an example of EU regulations, we shall mention compulsory measures in Czech Republic about the obligation of examination of swine. These are following: for Brucellosis it refers to breeding boars before movement to the quarantine of the semen collection center, breeding boars in the quarantine of the semen collection center at least 15 days after the start of the quarantine, breeding boars in the semen collection center 1x per year. The health status in relation to Aujeszky's disease involves examination of breeding pigs older than 3 months moved from extra-EU states, breeding boars before movement to the quarantine of the semen collection center, breeding boars in the semen collection center 1x per year, breeding boars in the quarantine of the semen collection center at least 15 days after the start of the quarantine. In relation to mentioned legal framework and de facto situation in pig production in Serbia, we would recommend thoroughly planned control and primarily to make evidence of boars used for breeding of sows and gilts in rural areas. It is also referred to illegal stations („centres“) for artificial insemination of swines which are not registered for production and trade of boar semen. However, it should be considered that for effective implementation of regulations in regard to boar semen production and trade, and the future implementation of EU regulations, it is not enough just to intensify control and penalty provisions for particular violations. On the contrary, raising awareness about the importance of these measures for animal and human health should be a prerequisite, and education of all participants (farmers, animal owners and veterinarians) is practically an obligatory part of it.

Key words: boar, semen, legislative, West Balkan, EU

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## THE EGGS QUALITY FROM ORGANIC AND CONVENTIONAL PRODUCTION

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In recent years egg producers pay more attention on the quality of consume egg to fulfill requirement in achieving good placement and price. On the other hand consumers pay more attention to the housing system in which the eggs are produced. One of the important factors that affect egg quality traits is housing system. The aim of this study was to determine the internal and external egg quality from two different housing systems - conventional and organic production. In a sample of 30 eggs for each housing system we investigated internal and external egg quality. For the exterior egg quality traits were examined: egg mass, shape index, cleanness of egg, shell color, shell breaking force, shell thickness and the internal qualities: height of egg white, Haugh unit and yolk color. The results showed a significant effect of housing system on the internal and external egg quality. Housing system significantly influenced the egg mass, shape index, cleanness of egg, shell breaking force, shell thickness, height of egg white, Haugh unit and yolk color in favor of eggs from conventional production. Generally eggs from conventional production showed better egg quality compared to eggs from organic production.

## KVALITET JAJA IZ ORGANSKE I KONVENCIONALNE PROIZVODNJE

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Kvalitetu konzumih jaja proizvođači posvećuju sve veću pažnju jer je on značajan uslov da ostvare dobar plasman i cenu, dok potrošači sve više obraćaju pažnju na sistem držanja u kome su jaja proizvedena. Jedan od značajnih faktora koji utiče na osobine kvaliteta jaja jeste sam sistem držanja živine. Cilj ovog rada je bio da prikaže unutrašnji i spoljašnji kvalitet konzumih jaja iz dva različita sistemima držanja – konvencionalna i organska proizvodnja. Na uzorku od po 30 jaja za svaki sistem držanja vršeno je ispitivanje unutrašnjeg i spoljašnjeg kvaliteta jaja. Od spoljašnjih osobina kvaliteta jaja ispitani su: masa jajeta, indeks oblika, boja ljuske, čistoća ljuske, čvrstoća ljuske i debljina ljuske a od unutrašnjih osobina: visina gustog belanca, Hogove jedinice i boja žumanca. Dobijeni rezultati pokazuju da sistem držanja ima značajan efekat na unutrašnji i spoljašnji kvalitet konzumnih jaja. Sistem držanja je imao statistički značajan uticaj na masu jajeta, indeks oblika, čistoću ljuske, čvrstoću ljuske, debljinu ljuske, visinu gustog belanca, Hogove jedinice i boju žumanca u korist jaja iz konvencionalne proizvodnje. Generalno se može zaključiti da su jaja iz konvencionalne proizvodnje pokazala bolji kvalitet u odnosu na jaja iz organske proizvodnje.

Ključne reči: kvalitet jaja, konvencionalna proizvodnja, organska proizvodnja

## ANALYSIS PRODUCTION RESULTS CHICKEN OF MEAT TYPE HYBRIDS

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Modern broiler production is based on the exploitation of the production potential of meat type hybrids, which are characterized by a very intensive growth. Countries with developed poultry production have to offer a greater number of heavy line hybrids in accordance with this fact, there is often a need to define that hybrid grown in the circumstances. The aim of this study was to determine the production results the two met type hybrids on the market Cobb 500 and Ross 308. The experiment was conducted at the Experimental farm Faculty of Agriculture University of Novi Sad. The test involved 912 broiler chickens with twelve repetitions per hybrid. Each repetition consisted of 38 broiler chickens. The experiment used a standard pelleted feed for broiler chickens (starter 21% crude protein (CP) for three weeks, grover 20% CP for a period of two weeks and finisher 19% CP for a period of one week). Compositions of all mixtures were according broiler requests. During the experiment weekly gain, food consumption on a weekly basis, mortality and health were determinated. At the end of experiment 12 male and 12 female chickens average weight were sacrificed to investigate the slaughter results of the tested hybrids. Carcass quality classic processing, ready for roasting and ready for grill, and the content of abdominal fat in carcass were determinated as slaughter results. The mass of certain body parts wings, drumsticks, breasts and the mass of edible offal of sacrificed chickens were measured. At the and of the experiment performance index for both the tested hybrid were calculated. The results were analyzed in a statistical software Statistics 12. The results indicate higher body mass Cobb 500 (2,434 g) compared with Ross 308 hybrid (2,274g). Lower conversion and mortality achieved Cobb500, which resulted in a higher value of production index. Production index of Cob500 hybrid was 313 index points and at Ross 308 hybrid was 282 index points. In our experimental conditions better production results was at Cobb 500 hybrid.

Keywords: broiler chickens, production results, production index, conversion

## ANALIZA PROIZVODNIH REZULTATA PILIĆA TEŠKIH LINIJSKIH HIBRIDA

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Savremena proizvodnja brojlera se zasniva na iskorišćavanju proizvodnih potencijala teških linijskih hibrida, koji se odlikuju izuzetno brzim porastom. Zemlje sa razvijenim živinarstvom imaju u ponudi veći broj teških linijskih hibrida i u skladu sa ovom činjenicom često postoji potreba da se definiše koji hibrid gajiti u datim uslovima. Cilj rada je bio da se utvrde proizvodni rezultati dva najzastupljenija teška linijska hibrida na našem tržištu Cobb 500 i Ross 308. Ogljed je izveden na Ogljednom dobru Poljoprivrenog fakulteta u Novom Sadu. U ogled je bilo uključeno 912 brojlerskih pilića sa dvanaest ponavljanja po hibridu. Svako ponavljanje se sastojalo od 38 brojlerskih pilića. U ogledu je korišćena standardna peletirana hrana za ishranu brojlerskih pilića (starter 21% sirovih proteina (SP) u trajanju tri nedelje, grover 20% SP u trajanju od dve nedelje i finišer 19% SP u trajanju od jedne nedelje). Smeše su zadovoljavale potrebe brojlerskih pilića u energiji, proteinima, vitaminima i mineralnim materijama Tokom ogleđa praćeni su nedeljni prirasti, utrošak hrane na nedeljnom nivou, mortalitet i zdravstveno stanje. Po završetku ogleđa žrtvovano je 12 muških i 12 ženskih pilića prosečne mase kako bi se ispitali klanični rezultati testiranih hibrida. Od klaničnih rezultata rađen je kvalitet trupa klasična obrada (KO), spremno za pečenje (SZP) i spremno za roštilj (SZR), kao i sadržaj abdominalne masti u trupovima. Merene su mase pojedinih delova trupa krila, bataci, belo meso kao i mase jestivih iznutrica žrtvovanih pilića. Po završetku ogleđa izračunate su vrednosti proizvodnog indeksa za oba testirana hibrida. Dobijeni rezultati obrađeni su u statističkom paketu Statistika 12. Dobijeni rezultati ukazuju na veće telesne mase hibrida Cobb 500 (2.434 g) u odnosu na Ross 308 (2.274 g). Nižu konverziju i mortalitet ostvario je Cobb500, što je rezultiralo i većom vrednošću proizvodnog indeksa koja je kod ovog hibrida iznosila 313 indeksnih poena u poređenju sa hibridom Ross 308 kod koga je vrednost proizvodnog indeksa iznosila 282 indeksna poena. Rezultati ovog ogleđa ukazuju na bolje proizvodne rezultate hibrida Cobb 500 u datim uslovima testa.

Ključne reči: brojlerski pilići, proizvodni rezultati, proizvodni indeks, konverzija

GENETIC RESOURCES OF INDIGENOUS BREEDS OF  
DOMESTIC ANIMALS IN THE REPUBLIC OF SRPSKA  
– FROM CONSERVATION TO SUSTAINABLE USE

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Genetic diversity means differences of gene pool contained in different types of domesticated animals through the long process of ethnogenesis, while the term animal genetic resources means all species and breeds that have scientific, cultural and economic importance to the community. Extremely wealth gene pool is reflected in the different breeds of horses, cattle, sheep, goats, pigs, dogs and birds, while game represents a separate gene pool of our area. The vulnerability of certain breeds and decline of their number usually are the result of the intensification of agricultural production, modification strategies and agricultural practices, but also socio-political changes. One of the factors that contribute to the disappearance of native breeds of domestic animals is non-existent or incomplete legal framework regulating at identifying, assessing vulnerability, silvicultural measures and conservation of animal genetic resources, and, according to the data collected, this paper highlights justification for the adoption of the Programme of protection of animal genetic resources of the Republic of Srpska, its concept, purpose and goals. In addition to the lack of a legal framework, practical protection of animal genetic resources is not regulated, there is no database, system identification and characterization, assessment of animal populations and their monitoring, gene bank, or decorated ex situ and in situ conservation. Effective in situ conservation involves the identification of potentially endangered breeds and assessment of the conservation status, and the formation of the Red List of endangered species at the entity level, because the existing entity Red List does not cover the area of genetic resources of indigenous breeds of animals, as it is in neighboring countries.

Keywords: animal genetic resources, conservation, sustainable use

## GENETIČKI RESURSI AUTOHTONIH RASA DOMAĆIH ŽIVOTINJA U REPUBLICI SRPSKOJ – OD OČUVANJA DO ODRŽIVE UPOTREBE

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Genetička raznovrsnost podrazumijeva raznovrsnost genofonda sadržanog u različitim vrstama gajenih životinja kroz dugi proces etnogeneze, dok termin animalni genetički resursi označava sve vrste i rase koje imaju naučni, kulturni i ekonomski značaj za zajednicu. Izuzetno bogatsvo genofonda ogleda se u različitim rasama konja, goveda, ovaca, koza, svinja, pasa i golubova, dok poseban genofond naših prostora čini divljač. Ugroženost pojedinih rasa i opadanje brojnosti najčešće su rezultat intenziviranja poljoprivredne proizvodnje, izmjene strategija i poljoprivrednih praksi, ali i društveno-političkih promjena. Jedan od faktora koji doprinose nestajanju izvornih rasa domaćih životinja jeste nepostojeći ili nepotpun pravni okvir koji reguliše identifikaciju, procjenu ugroženosti, uzgojne mjere i očuvanje animalnih genetičkih resursa, pa se prema prikupljenim podacima u radu ističe opravdanost donošenja Programa zaštite animalnih genetičkih resursa Republike Srpske, njegov koncept, svrha i ciljevi. Pored nedostatka pravnog okvira nije regulisana ni praktična zaštita animalnih genetičkih resursa, ne postoje baze podataka, sistem identifikacije i karakterizacije, procjene životinjskih populacija i njihov monitoring, banka gena, niti uređena *ex situ* i *in situ* zaštita. Efikasna *in situ* konzervacija podrazumijeva identifikaciju potencijalno ugroženih rasa kao i procjenu konzervacijskog statusa, odnosno formiranje Crvene liste autohtonih rasa na entitetskom nivou, jer postojeće entitetske Crvene liste ne pokrivaju oblast genetičkih resursa autohtonih rasa životinja, kao što je to slučaj u zemljama u okruženju.

Ključne riječi: animalni genetički resursi, očuvanje, održivo korišćenje

## SPEED OF FOOD CONSUMPTION OF SUMMER BEES IN ORDER TO GREATER PRODUCTIVITY OF BEE COLONIES

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Speed of bee's food consumption is very important in the bee-keeping from the point of settling their physiological needs, litter feeding, as well as the timely creation of high-quality winter food supply. The aim of the study was to examine the rate of intake of different types of food in the summer bees. The average food consumption per bee during the summer ranged from 0.026 to 0.039 g / bee / day. The lowest average food consumption was observed in bees fed with honey, while the highest average consumption was found in bees fed with sugar syrup with the addition of yeast. Any addition of protein or stimulants in food additionally strains their digestive tract and slows food consumption. In the summer bee food is quickly consumed and processed, and thus indirectly affects the quality of overwintering winter bees.

Keywords: food, bees, food, honey, yeast

## BRZINA KONZUMIRANJA HRANE KOD LJETNIH PČELA U CILJU VEĆE PRODUKTIVNOSTI PČELINJIH DRUŠTAVA

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Brzina konzumiranja hrane od strane pčela je u pčelarstvu veoma bitno sa aspekta podmirivanja njihovih fizioloških potreba, ishrane legla, kao i pravovremenog stvaranja kvalitetnih zimskih zaliha hrane. Kao cilj istraživanja, ispitana je brzina uzimanja različitih vrsta hrane kod ljetnih pčela. Pri tome se prosječna potrošnja hrane po pčeli u ljetnom periodu kretala u rasponu 0,026 – 0,039 gr/pčeli/dan. Najmanja prosječna konzumacija hrane bila kod ishrane pčela sa medom, dok je najveća prosječna konzumacija bila kod ishrane pčela sa šećernim sirupom uz dodatak kvasca. Svako dodavanje proteinskih ili stimulativnih sredstava u hranu za pčele dodatno opterećuje probavni trakt pčela i usporava konzumaciju. U ljetnom periodu pčela hranu što brže konzumira i prerađuje, te time indirektno utiče na kvalitet prezimljavanja zimskih pčela.

Ključne riječi: hrana, pčela, ishrana, med, kvasac

## INSULIN RESISTANCE IN COWS AFFECTED WITH FATTY LIVER

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The aim of this study was to analyse the relationship between insulin resistance and fatty liver in dairy cows. Sixteen early lactated cows, at day 14 after calving, were chosen from the commercial dairy herd and included in the study. Cows were divided into two groups of equal size based on the degree of lipid accumulation in the liver: cows with mild fatty liver (< 10 % fat, n=8) and cows with moderate fatty liver (from 10 to 30 % fat, n=8). Liver percutaneous biopsies were obtained using biopsy instrument and liver tissue lipid content was determined by pathohistological determination. Blood samples were taken by jugular venepuncture from each animal. Concentrations of glucose, insulin and non-esterified fatty acids (NEFA) were measured in blood samples. For estimation of insulin resistance „Revised Quantitative Insulin Sensitivity Check Index“ (RQUICKI) was calculated. A low index value indicated decreased insulin sensitivity and disposition to insulin resistance. Average liver fat content in cows with mild fatty liver was  $3.75 \pm 1.01\%$  while in cows with moderate fatty liver was  $20.00 \pm 2.10\%$ . Blood glucose was significantly higher ( $p < 0.05$ ) in cows with moderate fatty liver ( $3.38 \pm 0.23$  mmol/L) than in cows with mild fatty liver ( $2.81 \pm 0.09$  mmol/L). There was no significant difference in insulin concentrations between cows with mild ( $9.59 \pm 1.02$  IU/l) and cows with moderate ( $14.39 \pm 2.76$  IU/l) fatty liver. Also, there was no significant difference in NEFA concentrations between cows with mild ( $0.66 \pm 0.07$  mmol/L) and cows with moderate ( $0.78 \pm 0.13$  mmol/L) fatty liver. RQUICKI was significantly lower ( $p < 0.01$ ) in cows with moderate fatty liver ( $0.29 \pm 0.01$ ) than in cows with mild fatty liver ( $0.36 \pm 0.01$ ) indicate that cows with moderate fatty liver are predisposed to insulin resistance. There was significant negative correlation between lipid content in hepatocytes and RQUICKI ( $r = -0.56$ ,  $p < 0.05$ ). These results indicate that cows with fatty liver syndrome in early lactating period are disposed to insulin resistance.

**Keywords:** dairy cows, fatty liver, insulin resistance.

**Acknowledgement:** Results presented in this summary are part of research done within scientific Project entitled: „Effect of insulin receptor and glucose transporter protein expression in pregnant cows tissues on newborn calves' vitality ” funded by Ministry of Science and Technology, Republic of Srpska Government

## INSULINSKA REZISTENCIJA KOD KRAVA OBOLELIH OD MASNE JETRE

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Cilj ovog rada je bio da se ispita povezanost insulinske rezistencije i zamašćenja jetre kod krava. Šesnaest krava u ranoj laktaciji, 14. dana posle teljenja, je izabrano iz stada na jednoj farmi komercijalnog tipa i uključeno u studiju. Krave su podeljene u dve grupe jednake veličine, a na osnovu stepena zamašćenja jetre: krave sa slabim stepenom zamašćenja jetre (< 10 % masti, n=8) i krave sa umerenim stepenom zamašćenja jetre (od 10 do 30 % masti, n=8). Perkutana biopsija jetre izvedena je specijalno izrađenim instrumentom za biopsiju, a sadržaj masti u jetri je određen patohistološki. Uzorci krvi uzeti su punkcijom vene jugularis od svake jedinke. Koncentracije glukoze, insulina i neesterifikovanih masnih kiselina (NEFA) su određene u uzorcima krvi. Za utvrđivanje insulinske rezistencije, izračunat je „Revised Quantitative Insulin Sensitivity Check Index“ (RQUICKI). Nizak indeks ukazuje na smanjenu insulinsku senzitivnost i sklonost ka insulinskoj rezistenciji. Prosečan sadržaj masti u jetri krava sa slabim zamašćenjem jetre je bio  $3,75 \pm 1,01\%$ , dok je kod krava sa umerenim zamašćenjem bio  $20,00 \pm 2,10\%$ . Glikemija je bila značajno viša ( $p < 0,05$ ) kod krava sa umerenim zamašćenjem jetre ( $3,38 \pm 0,23$  mmol/l) u odnosu na krave sa blagim zamašćenjem jetre ( $2,81 \pm 0,09$  mmol/l). Nije bilo značajnih razlika u koncentracijama insulina između krava sa blagim ( $9,59 \pm 1,02$  IU/l) i krava sa umerenim ( $14,39 \pm 2,76$  IU/l) zamašćenjem jetre. Takođe, nije bilo značajnih razlika u koncentracijama NEFA između krava sa blagim ( $0,66 \pm 0,07$  mmol/l) i krava sa umerenim ( $0,78 \pm 0,13$  mmol/l) zamašćenjem jetre. RQUICKY je bio značajno niži ( $p < 0,01$ ) kod krava sa umerenim zamašćenjem jetre ( $0,29 \pm 0,01$ ) u odnosu na krave sa blagim zamašćenjem jetre ( $0,36 \pm 0,01$ ), što ukazuje na to da su krave sa umerenim zamašćenjem jetre predisponirane za pojavu insulinske rezistencije. Utvrđena je značajna negativna korelacija između sadržaja lipida u hepatocitima i RQUICKI ( $r = -0,56$ ,  $p < 0,05$ ). Ovi rezultati ukazuju na to da su krave sa sindromom masne jetre tokom perioda rane laktacije sklone pojavi insulinske rezistencije.

**Ključne reči:** mlečne krave, masna jetra, insulinska rezistencija.

Napomena: rezultati prikazani u ovom radu su deo istraživanja sprovedenih u okviru naučno-istraživačkog projekta pod nazivom: „Uticaj ekspresije proteina insulinskog receptora i transportera za glukozu u tkivima gravidnih krava na vitalnost njihove teladi“, a koji je finansiran iz sredstava Ministarstva nauke i tehnologije Vlade Republike Srpske.

## SIGNIFICANCE OF CORTISOL DETECTION IN MILK OF DAIRY COWS WITH DIFFERENT MILK YIELD

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Cortisol promotes the mammary gland growth, lactogenesis, and maintenance of lactation in dairy cows. It is also reliable indicator of stress in dairy cows. Cortisol is usually measured in blood. Unfortunately, collecting blood samples can disturb an animal. Thus, non-invasive methods for the determination of cortisol have become increasingly popular. Above all, milk samples offer the advantage that can be collected easily. The aim of our study was to determine the apparent mammary uptake and release of cortisol in lactated cows with different milk yields by comparing its concentrations from blood samples taken simultaneously from the jugular and mammary veins. We have selected forty cows at day 30 of lactation and divided them into two groups of equal size, based on milk yield. The first group consisted of low yielding cows (LY, up to 40 liters per day). The second group included high yielding cows (HY, more than 41 liters per day). Milk yields were measured at the morning and evening milking. Milk samples were taken at morning milking. Blood samples were taken simultaneously from the jugular and mammary veins. Cortisol levels were measured in blood and milk samples. Our results showed that there was no significant difference in jugular vein cortisol concentrations between two examined groups. Nevertheless, the mammary vein cortisol was significantly lower in HY than LY cows with no different in milk cortisol concentrations between two groups. The difference in cortisol level between two veins was significantly higher in HY than LY group. There was no significant correlation between milk and jugular vein blood cortisol level, but significant negative correlation between milk and mammary vein blood cortisol level. There was significant positive correlation between milk yield and difference in cortisol levels between two veins. Based on our results, we assumed that milk cortisol level mainly depend on the level of apparent uptake and release of cortisol from mammary gland. Additionally, milk yield of cows from same breed have no influence on cortisol concentration in jugular vein and milk, meaning that increased milk production is no stressful for animals that are genetically predisposed for high milk production.

**Keywords:** cortisol, blood, milk, dairy cows.

**Acknowledgement:** Results presented in this summary are part of reserach done within scientific Project entitled: „Stress assessment in cows by monitoring glucocorticosteroids in biological samples obtained by non-invasive techniques” funded by Ministry of Science and Technology, Republic of Srpska Government

## ZNAČAJ ODREĐIVANJA KONCENTRACIJE KORTIZOLA U MLEKU KRAVA SA RAZLIČITOM PROIZVODNOM MLEKA

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Kortizol obezbeđuje rast mlečne žlezde, laktogenezu i održavanje laktacije kod mlečnih rasa krava. On je takođe pouzdan indikator stresa. Koncentracija kortizola se obično meri u krvi. Na žalost, uzorkovanje krvi može da bude stresno za životinju. Zbog toga su neinvazivne tehnike za određivanje koncentracije kortizola sve popularnije. Prevažadno uzorci mleka imaju prednost jer se mogu sakupiti vrlo jednostavno. Cilj ovog rada bio je da se odredi pretpostavljajući stepen preuzimanja i oslobađanja kortizola iz mlečne žlezde krava u laktaciji sa različitim nivoom proizvodnje mleka, i to poređenjem njegove koncentracije iz uzoraka krvi uzetih istovremeno iz *vene jugularis* i *vene subcutanea abdominis*. Odabrali smo četrdeset krava 30. dana laktacije i podelili ih u dve grupe jednake veličine, na osnovu mlečnosti. Prvu grupu obuhvatale su krave niske mlečnosti (NM, do 40 litara na dan). Drugu grupu su obuhvatale krave visoke mlečnosti (VM, više od 40 litara na dan). Mlečnost je merena u jutarnjoj i večernjoj muži a uzorci mleka su uzeti u jutarnjoj muži. Uzorci krvi su uzeti istovremeno iz jugularne i mamarne vene. U uzorcima krvi i mleka merena je koncentracija kortizola. Naši rezultati su pokazali da nije bilo značajne razlike u kortizolemiji određenoj u jugularnoj veni između dve ispitivane grupe. Ipak, kortizolemija u krvi mamarne vene je bila značajno niža kod VM nego kod NM grupe, dok nije bilo značajne razlike u koncentraciji kortizola u uzorcima mleka dobijenih od dve grupe krava. Razlika u kortizolemiji, između dve ispitivane vene, je bila značajno viša kod VM nego NM grupe. Nije bilo značajne korelacije između nivoa kortizola u mleku i krvi uzorkovane iz jugularne vene, ali je utvrđena značajna negativna korelacija između nivoa kortizola u mleku i krvi uzorkovane iz mamarne vene. Postojala je značajna pozitivna korelacija između mlečnosti i razlike u kortizolemiji između dve vene. Na osnovu dobijenih rezultata, pretpostavili smo da nivo kortizola u mleku uglavnom zavisi od pretpostavljenog preuzimanja i oslobađanja kortizola iz mlečne žlezde. Dodatno, proizvodnja mleka kod krava iste rase nije imala uticaja na koncentraciju kortizola u jugularnoj veni i mleku, ukazujući da porast mlečnosti nije stresogeni činilac kod životinja genetski predisponiranih za visoku proizvodnju mleka.

**ključne reči:** kortizol, krv, mleko, mlečne krave.

Napomena: Rezultati prikazani u ovom radu su deo istraživanja sprovedenih u okviru naučno-istraživačkog projekta pod nazivom: „Procena stresa kod krava utvrđivanjem koncentracije glukokortikosteroida iz bioloških uzoraka dobijenih neinvazivnim tehnikama“, a koji je finansiran iz sredstava Ministarstva nauke i tehnologije Vlade Republike Srpske.

## ESTIMATION A GLUCOSE UTILIZATION BY PERIPHERAL TISSUE ON THE BASIS BLOOD CHANGES OF GLUCOSE, INSULIN AND INORGANIC PHOSPHORUS IN HEALTHY AND KETOTIC COWS DURING AN INTRAVENOUS GLUCOSE TOLERANCE TEST

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The aim of the present study was to estimate of blood glucose utilization by peripheral tissue on the basis of changes in blood concentrations of glucose, insulin and inorganic phosphorus (iP) in healthy (n=8) and ketotic cows (n=7) during an intravenous glucose tolerance test (IVGTT). After intravenous infusion of a total of 500 ml of 50% of glucose solution, glucose and insulin blood values in both groups of cows increased significantly within 10 and 30 minutes of the experiment ( $P < 0.05$ ). After intravenous infusion of glucose, it was established that values of iP were decreased in blood ( $P < 0.05$ ) in both groups of cows. Increasing in insulin and glucose concentrations and decreasing in iP concentration (30 minut - 0 minut) was statistically higher in healthy cows compared with ketotic cows. In this experiment, were established a strong correlation ( $P < 0.01$ ) between blood glucose, insulin and iP levels in both groups of cows, but with significant ( $P < 0.01$ ) higher changes in those blood parameters in healthy cows than in ketotic cows. We can concluded that there is a higher degree of blood glucose utilization by peripheral tissues in healthy cows during an intravenous glucose tolerance test.

Key words: ketosis, glucose utilization, glucolytic pathway, peripheral tissue

## NUTRITION VALUE OF IMPORTED FEEDSTUFFS WHO USED IN ANIMAL NUTRITION IN R. MACEDONIA

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Different nutrients and feed meals of the domestic animals contain different substances, which in during of metabolism in animal organism need to be transformed into specific products (milk, meat, eggs, wool, etc.). The aim of feeding of the animals is to enable more efficient conversion of feed into different products, useful for human consumption. Therefore, knowledge of the chemical composition and nutritive value of different feedstuffs represents the basis for the practical application of knowledge in food preparation and formulation of meals. In this paper were taken 400 samples of feed from multiple manufacturers of the same. All samples of feed and feed mixtures were analyzed according to AOAC (1980) procedures Weende analytical method and presents the results of chemical composition (moisture, ash, protein, cellulose, fat, Ca and P). Established significant deviations in quality at the official Regulations on the quality of animal feed in the Republic of Macedonia. Based on the above can be concluded that the necessary permanent control of concentrated nutritional value of feed, especially those who come from imports in order to have a profitable livestock production.

Key words: animal nutrients, proteins, cellulose, fats, minerals, nutrition

## HRANIDBENA VREDNOST STOČNIH HRANIVA IZ UVOZA KOJE SE KORISTE U ISHRANI ŽIVOTINJA U R. MAKEDONIJI

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Različita hraniva i obroci domaćih životinja sadrže različite materije, koje u toku metabolizma u organizmu životinja treba da se transformišu u određene proizvode (mleko, meso, jaja, vunu i dr.). Cilj ishrane domaćih životinja je da omogući sto efikasniju konverziju hraniva u različite proizvode, korisne za ishranu čoveka. Zbog toga poznavanje hemijskog sastava i hranljive vrednosti različitih hraniva predstavlja osnovu za praktičnu primjenu znanja u pripremi hrane i formulaciji obroka. U radu uzeti su 400 uzoraka stočnih hraniva od više proizvođača istih. Svi uzorci krme i krmne smeše su analizirani prema AOAC (1980) analitičkim postupcima Weende metodom i prikazani su rezultati hemijskog sastava (vlaga, pepeo, proteini, celuloza, masti, Ca i P). Utvrđena su značajna odstupanja u kvalitetu po oficijalnom Pravilniku o kvalitet stočne hrane u Republici Makedoniji. Na osnovu sprovedjenih istraživanja može se zaključiti da je neophodna permanentna kontrola nutritivne vrednosti koncentrovanih stočnih hraniva, posebno onih koji dolaze iz uvoza kako bi imali profitabilnu stočarsku proizvodnju.

Ključne riječi: stočna hraniva, proteini, celuloza, masti, minerali, ishrana





# ***POSTER PRESENTATION***

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*Section 1. Plant Sciences*

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*Subsection: Crop Science*



## EFFECT OF THE FOLIAR APPLICATION OF BORON, PHOSPHORUS AND POTASSIUM ON THE GRAIN YIELD OF FORAGE PEAS ON ACID SOIL

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Soil acidity is one of the factors that limits growth of many legumes, because in such conditions certain nutrients are less available to plants. As forage pea (*Pisum sativum ssp. arvense* L.) has often been grown on acid soils, special attention should be paid to proper mineral nutrition. The aim of the study was to estimate the effect of foliar fertilization with boron, phosphorus and potassium on plant growth, grain yield and yield components (number of nodes with pods per plant, number of pods per plant, number of grains per plant) on forage peas, on acid soil. The experiment was set up in pots (15 L volume, one plant per pot) filled with soil substrate (Glaysol type,  $\text{pH}_{\text{KCl}}$  4.8) in the 2013. Cultivar of forage peas Javor (Institute of Field and Vegetable Crops, Novi Sad) was sown in five replications. Treatments with foliar fertilizers included: control (without fertilization), boron (Bor-feed, Haifa, Israel at the concentration of 0.1%) and phosphorus and potassium ( $\text{P}_{52}\text{K}_{34}$ , Haifa, Israel at the concentration of 1%). Foliar treatment are carried out two times: at the beginning of intensive growth and two weeks after. Significantly higher plant height was recorded at phosphorus and potassium treatment (72.6 cm) compared to boron (60.4 cm) ( $P < 0.05$ ). Foliarly applied boron positively affected the yield components, especially grain number per plant, so that grain yield in that treatment was significantly higher (0.64 g) compared to control (0.36 g) and treatment with phosphorus and potassium (0.45 g). Positive results on individual plants suggested the need to investigate the effect of foliar application of these elements in field conditions.

Key words: peas, foliar fertilization, boron, phosphorus, potassium, grain yield.

## UTICAJ FOLIJARNE PRIMENE BORA, FOSFORA I KALIJUMA NA PRINOS ZRNA STOČNOG GRAŠKA NA KISELOM ZEMLJIŠTU

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Kiselost zemljišta jedan je od faktora koji ograničava gajenje mnogih leguminoznih biljaka, jer su u takvim uslovima pojedina hraniva manje dostupna biljkama. Kako se usevi krmnog graška (*Pisum sativum ssp. arvense* L.) često zasnivaju na kiselim zemljištima, posebnu pažnju treba posvetiti pravilnoj mineralnoj ishrani. Cilj rada bio je da se na kiselom zemljištu analizira uticaj folijarne prihrane borom, fosforom i kalijumom na porast biljaka, prinos zrna i komponente prinosa (broj rodnih kolenaca po biljci, broj mahuna po biljci, broj zrna po biljci) na pojedinačnim biljkama krmnog graška. Eksperiment je zasnovan u 2013. godini u saksijama (zapremine 15 L, jedna biljka po saksiji) napunjenih zemljišnim supstratom (Pseudoglej,  $\text{pH}_{\text{KCl}}4,8$ ). Sorta krmnog graška Javor (Institut za ratarstvo i povrtarstvo, Novi Sad) posejana je u pet ponavljanja. Primenjena su tri folijarna tretmana: kontrola (bez đubrenja), bor (Bor-feed, Haifa, Izrael u koncentraciji od 0,1%) i fosfor i kalijum ( $\text{P}_{52}\text{K}_{34}$ , Haifa, Izrael u koncentraciji od 1%). Folijarna prihrana izvršena je u dva navrata: na početku intenzivnog porasta i dve nedelje nakon toga. Folijarni tretmani nisu značajno uticali na visinu biljaka u odnosu na kontrolnu varijantu, ali je značajno veća visina biljaka zabeležena na tetmanu sa fosforom i kalijumom (72.6 cm) u odnosu na tretman sa borom (60.4 cm) ( $P<0,05$ ). Folijarna prihrana borom pozitivno je uticala na komponente prinosa, posebno na broj zrna po biljci, tako da je prinos zrna na ovoj varijanti bio značajno veći (0.64 g) u odnosu na kontrolu (0.36 g) i tretman sa fosforom i kalijumom (0.45 g). S obzirom na pozitivne rezultate na pojedinačnim biljkama, uticaj folijarne primene ovih elemenata bi trebalo proveriti i u poljskim uslovima.

Ključne reči: krmni grašak, folijarna prihrana, bor, fosfor, kalijum, prinos zrna.

## QUALITATIVE AND QUANTITATIVE CHARACTERISTICS OF CLOVER-GRASS MIXTURES IN HIGHLAND AREA

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Production of forage in sufficient quantities is a fundamental prerequisite for successful livestock production. The largest part of the territory of the Republic of Srpska belongs to the hilly-mountainous area which is characterized by low fertile, acidic and shallow soils. On such soils it is very important to choose the appropriate plant species for cultivation in order to obtain better results in the production of feed. The aim of the study was that in the highland area examine the qualitative and quantitative characteristics of two clover-grass mixtures, as well as individual species that are part of those mixtures. Examined first clover-grass mixture was composed with red clover and italian ryegrass and second clover-grass mixture was composed with birds trefoil and red fescue. The experiment was established as randomized block design in four replications at locality Manjača in 2012. The highest yield of green mass was achieved with red clover (16 556 kg ha<sup>-1</sup>) and lowest with the clover-grass mixture of birds trefoil and red fescue (12 578 kg ha<sup>-1</sup>). The highest protein content was determined also in red clover (13,38%). The results indicate that there are significant qualitative and quantitative disparities between selected clover grass mixtures and between individual plant species. In selecting the most productive forage clovers and grasses, as well as their mixtures for growing in mountainous area we should take into consideration their suitability for the agro-ecological conditions in which they achieve their specific productivity.

Key words: clovers, grasses, mixtures, hilly-mountainous area, forage

## THE RESPONSE OF MAIZE LINES TO HERBICIDES AND FOLIAR FERTILIZER

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Herbicide application could have stressful impact on crops. In some crops like maize lines crop, herbicide application is one of most important cropping practice. On the other hand, maize lines are less tolerant to herbicides than hybrids. Also, maize lines have slower growth, they are smaller, what allows higher weed infestation. Herbicides could cause temporary or permanent stress in plants. As one of strategy which can help plants to overcome stress is application of foliar fertilizers parallel with herbicides. To test effects of four herbicides and one foliar fertilizer on five maize line, an experiment was set up on Maize Research Institute field for three years (2010-2012). Examined maize lines have different origin: one line is Lancaster, two lines are BSSS and two are from independent source. Two triketone herbicides (mesotrione and topramezone) and two sulfonylureas ( rimsulfuron and foramsulfuron) were applied in experiment. Foliar fertilizer Activeg was also applied with herbicides when plant develop 5-6 leaves. Fresh mass of plants was measured in period of 2-3 weeks after treatments. Grain yield was measured at the end of growing cycle. The most sensitive line was grown under control conditions to test effects of foramsulfuron (as the less selective herbicide) and Activeg. Fresh mass was measured seven days after herbicides and fertilizer application. Treatments with foliar fertilizers + herbicides have higher fresh mass content compared with herbicides treatments only in period of 2-3 weeks after application. Grain yield was also higher in all maize lines when foliar fertilizer was applied with herbicides. According to R statistics, maize line was more tolerant to foramsulfuron when fertilizer was applied in experiment under controlled conditions.

Key words: maize lines, herbicides, foliar fertilizer

## ANALYSIS OF SEEDS QUALITY OF DIFFERENT VARIETIES OF WHEAT

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The paper presents the results of tests of Novi Sad eight wheat varieties (NS 40S, Zvezdana, Janja, Cipovka, Rapsodija, Pobeda, Simonida, Renesansa) threshing on small experimental plots. The process of threshing is an integral part of the harvesting wheat seed, and was conducted at the experimental plots immediately after the manual cutting of the crop. In examining for each variety were determined following qualitative traits: seed moisture, 1000 grain weight, test weight, germination energy and germination. Samples were taken in the process of threshing wheat in the experimental fields, and then in the laboratory of the Institute of Forage Crops in Kruševac-Globoder subsequently allocated for each variety clean and broken seeds, other types of inert matter and weeds. The most important role in human nutrition belongs wheat that has properties of proteins unique among grains. Wheat bread contains vitamin B complex (B1, B2, PP, etc.), Important compounds of calcium, phosphorus and iron for which occupies first place in the human diet. The chemical composition of wheat is of such a nature (nitrogen and nitrogen free extracts-NFE), that can, if necessary, and maintain the human body itself. Wheat contains: 16-17% protein, 77-78% carbohydrates, fat 1.2-1.5%. Additionally characterized by good digestibility. In cattle feeding, wheat is used in the form of bran, then mixed with pulses (leguminous plants), used and chaff and straw for a litter for a heating as biofuel in the form of pressed straw bales. To achieve high yields of wheat is necessary to use high quality seed with seed quality is determined by legal norms. Selection of wheat varieties in production is a very important measure. In doing so, it must comply with certain principles. The varieties must be high yielding, different maturity, good resistance to temperature extremes, the major pathogens and good quality seed. Since the varieties changed periodically, as new varieties obtained by selection, it is necessary to choose varieties holders of production, as well as those which will gradually replace them.

Key words: wheat seeds, germination energy, seed germination, broken seeds

## ANALIZA KVALITETA SEMENA RAZLIČITIH SORATA PŠENICE

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U radu su prikazani rezultati ispitivanja pri vršidbi osam novosadskih sorata pšenice (NS 40S, Zvezdana, Janja, Cipovka, Rapsodija, Pobjeda, Simonida, Renesansa) na malim oglednim parcelama. Proces vršidbe je sastavni deo ubiranja semenske pšenice i obavljen je na oglednim parcelama odmah nakon ručnog košenja useva. Pri ispitivanju za svaku sortu određena su sledeća kvalitativna svojstva: vlažnost semena, masa 1000 zrna, hektolitarska masa, energija klijanja i klijavost. Uzorci su uzimani u procesu vršidbe pšenice na oglednim poljima, a zatim u laboratoriji Instituta za krmno bilje u Globoderu-Kruševcu naknadno je za svaku sortu izdvojeno čisto i polomljeno seme, druge vrste, inertne materije i korov. Najznačajnija uloga u ljudskoj ishrani pripada pšenici koja je po osobinama proteina jedinstvena među žitima. Pšenični hleb sadrži vitaminski kompleks B (B<sub>1</sub>, B<sub>2</sub>, PP i dr.), važna jedinjenja kalcijuma, fosfora i gvožđa zbog čega zauzima prvo mesto u ishrani ljudi. Hemijski sastav pšenice je takve prirode (azotne i bezazotne materije-BEM), da može u slučaju potrebe i sama održavati ljudski organizam. Pšenica sadrži: 16-17% belančevina, 77-78% ugljenih hidrata, 1.2-1.5% masti. Pored toga odlikuje se dobrom svarljivošću. U ishrani stoke, pšenica se koristi u vidu mekinja, zatim u smeši sa mahunjačama, upotrebljava se i pleva i slama za prostirku, za zagrevanje kao biogorivo u vidu presovane slame u balama. Za postizanje visokih prinosa pšenice potrebno je koristiti seme visokog kvaliteta pri čemu je kvalitet semena određen zakonskim normativima. Izbor sorte pšenice u proizvodnji je veoma značajna mera. Pri tome se moraju ispoštovati određeni principi. Sorte moraju da budu visokoprinosne, različite dužine vegetacije, dobre otpornosti na temperaturne ekstreme, na važnije patogene i dobrog kvaliteta semena. Pošto se sorte periodično menjaju, jer se selekcijom dobijaju nove sorte, potrebno je izabrati sorte nosioce proizvodnje, kao i one koje će ih postepeno zamenjivati.

Ključne reči: seme pšenice, energija klijanja, klijavost semena, polomljeno seme

## YIELD OF WINTER BARLEY DEPENDING ON FERTILIZING SISTEM OF ACID SOILS

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The goal of this paper was to investigate the effect of applying of mineral fertilizer, lime and manure on pseudogley (pH 4.34) and yield of winter barley on it. Investigations were carried out on the outskirts of Kraljevo during the 2011-2013. In the experiment, beside two varieties of barley (NS-565 and Rekord), 10 variants of various combinations of fertilizations were included (3 variants of mineral feeds, 4 variants of mineral feeds with lime added, as well as 3 variants of mineral and lime fertilizers combined with a manure). Results of the investigations shows that fertilization caused multiple increasing of yield in regard to control variant. Considering it is about of acid soils, the effect of applying of fertilizers, especially combination of mineral and lime fertilizers combined with a manure, was very apparent in increasing of winter barley yield. There was no statistical significance in grain yield difference at any of investigated varieties, no matter what variant of fertilization was used. With the use of mineral fertilizers, yield was rising from the lowest to the highest dose. So, variants with increased content of N, P and K had significantly bigger yield in regard to the variant with lower content of N, P and K. Using the combination of mineral and lime fertilizers, higher yield was achieved on a very significant level, compared with those achieved only with mineral fertilizers. Combination of a manure, mineral and lime fertilizers gave a bigger yield, which was statistically very significant, than using of only mineral fertilizers, that is using a combination of mineral and lime fertilizers. Also, using of this combination, but only with increased dose of mineral fertilizers, gave a bigger yield than a combination with lower dose of mineral fertilizers, on a statistically very significant level. The biggest yield (4520 kg ha<sup>-1</sup>) gave variety Rekord with using of combination of mineral fertilizers with higher dose of manure and lime fertilisers. The lowest yield (2180 kg ha<sup>-1</sup>) gave variety NS 565 with using of the lowest dose of mineral fertiliser.

Ključne reči: winter barley, manure, mineral and lime fertilisers, yield.

## GRAIN YIELD OF WINTER WHEAT IN DIFFERENT CROPPING SYSTEMS

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This paper deals with effect of two-, three-, four- and six-crop rotation on the grain yield compared with continuous cropping of the winter wheat. Grain yield are measurement in frame crop rotations of field on the experimental field „Radmilovac“ of Faculty of Agriculture (University of Belgrade) during 2005/06 - 2012/13. In two crop rotation are included maize and winter wheat, in three-crop rotation: maize, soyabean, and winter wheat and in four-crop rotation are included maize, winter wheat, red clover and spring barley+red clover. Winter wheat cultivar “Pobeda”, in dry farming water regime were investigated on chernozem luvic soil type. The area of each field crop rotation and field of continuous cropping was 1000 m<sup>2</sup>. In average, the greatest yield of winter wheat is obtained in 2011/12. (4.30 t/ha) and the smallest grain yield in dry 2006/07 (3.59 t/ha). Grain yield of winter wheat in continuous cropping system (3.27 t/ha) was statistical very significant lower compared with grain yield in two- (3.74 t/ha), three- (3.88 t/ha), four crop rotation (4.27 t/ha) and six crop rotation (4.31 t/ha). The difference in grain yield between investigation crop rotation were statistical significant. The difference in grain yield between the four-crop rotation and six-crop rotation was no statistical significant. In the future cropping system, especially in extensive low-input technology production, sustainable agriculture and in organic farming have a great importance.

Key words: crop rotation, continuous cropping, yield of grain, winter wheat.

## ANALYSIS OF TRIALS WITH SOYBEAN IN EXTREME WEATHER CONDITIONS IN 2013 AND 2014

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In the paper are analysed the results of the varietal macro trials on soybean in 2013 and 2014 at the location Aleksandrovac, the micro trial with fertilizers at the location Aleksandrovac in 2014, the micro-trial with fertilizer at the location Banja Luka in 2013 and the trial with the sowing dates in Aleksandrovac in 2014. Both vegetation seasons have been characterised with very extreme weather conditions. Achieved yields in the varietal macro-trial in very dry vegetation season 2013 (536 - 1.216 kg ha<sup>-1</sup>) were significantly lower than the yields in very rainy season in 2014 (2.711 - 4.133 kg ha<sup>-1</sup>). The traits of permeable, alluvial soil had dominant influence on the yield results in Aleksandrovac in the both years. The micro trials with the fertilizers were performed on the variety Sonja. Raising doses of fertilizer (MAP 100-200-300 kg ha<sup>-1</sup>, N<sub>10</sub>:P<sub>30</sub>:K<sub>20</sub> 200-300-400 kg ha<sup>-1</sup> and N<sub>15</sub>:P<sub>15</sub>:K<sub>15</sub> 200-400-600 kg ha<sup>-1</sup>) in 2014 did not result with economically justified grain yield increase. Similar results were obtained at the location Banja Luka in the previous year, what impose the need for more detailed study of this agrotechnical operation in the future. In the trials with sowing dates, the tested varieties (Sonja and Milica) achieved significantly higher yields in the first sowing date. Field research activities will be continued in 2015 and 2016.

Key words: soybean, trial, variety, fertilizer, sowing date, extreme conditions

## ANALIZA OGLEDA NA SOJI U EKSTREMNIM VREMENSKIM USLOVIMA U 2013. I 2014. GODINI

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U radu su analizirani rezultati sortnih makroogleda na soji u 2013 i 2014. godini na lokalitetu Aleksandrovac, mikroogleda sa đubrenjem na navedenom lokalitetu u 2014. godini, mikroogleda sa đubrenjem na lokalitetu Banja Luka u 2013. godini, te makroogleda sa rokovima sjetve u Aleksandrovcu u 2014. godini. Obje vegetacijske sezone karakterisale su vrlo ekstremne vremenske prilike. Ostvareni prinosi zrna u sortnom makroogledu u vrlo sušnoj 2013. godini ( $536 - 1.216 \text{ kg ha}^{-1}$ ) bili su značajno niži u odnosu na prinose u izuzetno kišnoj 2014. godini ( $2.711 - 4.133 \text{ kg ha}^{-1}$ ). Osobine propusnog, aluvijalnog zemljišta imale su presudan uticaj na prinose zrna u Aleksandrovcu u obje godine. Ogleđi sa đubrivima praćeni su na banjalučkoj sorti Sonja. Rastuće doze đubriva ( $\text{MAP } 100\text{-}200\text{-}300 \text{ kg ha}^{-1}$ ,  $\text{N}_{10}\text{:P}_{30}\text{:K}_{20} \text{ } 200\text{-}300\text{-}400 \text{ kg ha}^{-1}$  i  $\text{N}_{15}\text{:P}_{15}\text{:K}_{15} \text{ } 200\text{-}400\text{-}600 \text{ kg ha}^{-1}$ ) u 2014. godini nisu dovele do ekonomski opravdanog povećanja prinosa zrna u odnosu na kontrolu. Slični rezultati dobijeni su i u prethodnoj godini na lokalitetu Banja Luka, što upućuje na neophodnost detaljnijeg proučavanja ove agrotehničke mjere u budućnosti. U ogleđu sa rokovima sjetve, ispitivane sorte (Sonja i Milica) ostvarile su značajno veći prinos zrna u prvom roku sjetve. Poljska istraživanja se nastavljaju u 2015 i 2016. godini.

Ključne riječi: soja, ogled, sorta, đubrenje, rok sjetve, ekstremni uslovi

## YIELD COMPONENTS AND PROTEIN CONTENT IN TWO SPELT WHEAT CULTIVARS (*Triticum spelta* L.)

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In modern times it shows a increase in the consumption of alternative grains, primarily because of their nutritional functional characteristics that have a positive effect on human health. By growing long history in less favorable agro-ecological and soil conditions of these crops have developed a natural system sustainability and tolerance to abiotic stress, which is today more important as a result of global climate change. The subject of this investigation are two-year study (2011 and 2012) the variability of morphological and productive characteristics of spelt wheat grown on brown forest soil type in the Republic of Serbian, without the use of NPK nutrients. Investigated two cultivars of spelt wheat: Hungarian cultivar Eco 10 and Serbian cultivar Nirvana. The trials were randomized block design with three replications. Morphologically productive traits: plant height, spike length, 1000 kernel weight and test weight and protein content, were investigated. Samples of 10 spikes from each experimental plot were taken before harvest and determined their values, and protein content was determined by N-min method. The results showed that weather conditions, or the amount and distribution of precipitation, have a significant influence in the investigation traits, and that both tested cultivars have a high genetic yield potential. Cultivar Nirvana had higher average values for plant height (158 cm), spike length (8.8 cm), 1000 kernel weight (46.7 g) and test weight grain (80.08 kg) compared with the Hungarian variety Eco 10 which is had a higher protein content spears has averaged about (16.8%) in both years. Therefore, intensification of production of spelt gaining importance in the production of high-quality and safe food in our region.

Key words: alternative small grains, spelt, cultivar, yield components, protein

## KOMPONENTE PRINOSA I SADRŽAJ PROTEINA KOD DVE SORTE PŠENICE KRUPNIK (*Triticum spelta* L.)

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U savremeno doba se beleži nagli rast potrošnje alternativnih žita prvenstveno zbog njihovih nutritivnih funkcionalnih karakteristika koji deluju pozitivno na ljudsko zdravlje. Gajenjem tokom duge istorije u manje povoljnim agroekološkim i zemljišnim uslovima ova žita su razvila prirodan sistem održivosti i tolerantnosti prema abiotičkom stresu koji je u današnje vreme sve izraženiji kao posledica globalnih klimatskih promena. Predmet ovih ispitivanja su dvogodišnja istraživanja (2011. i 2012.) varijabilnosti morfoloških i produktivnih osobina alternativnog žita krupnik gajenog na zemljištu tipa gajnjača u Republici Srpskoj, bez upotrebe NPK hraniva. Ispitivane su dve sotre krupnika i to: mađarska sorta *Ekö 10* i srpska sorta *Nirvana*. Ogledi su postavljeni po slučajnom blok sistemu u tri ponavljanja. Proučavane su sledeće morfološko-produktivne osobine: visina biljke, dužina klasa, apsolutna i hektolitarska masa zrna i sadržaj proteina. Uzorci po 10 klasova sa svake ogledne parcele uzimani su pre žetve i određivane su njihove vrednosti, a sadržaj proteina je određen N-min metodom. Rezultati su pokazali da vremenski uslovi, odnosno količina i raspored padavina, imaju značajnu ulogu na ispitivane osobine, te da obe ispitivane sorte imaju visok genetički potencijal rodosti. Sorta *Nirvana* imala veće prosečne vrednosti za visinu biljaka (158 cm), dužinu klasa ( 8,8 cm), apsolutnu masu (46,7 g) i hektolitarsku masa zrna (80,08 kg) u poređenju sa mađarskom sortom *Ekö 10* koja je imala veći sadržaj proteina kopji je iznosio u proseku oko (16,8%) u obe godine istraživanja. Stoga, intenziviranje proizvodnje krupnika dobija sve veći značaj u proizvodnji kvalitetne i zdravstveno bezbedne hrane i na našim prostorima.

Ključne reči: alternativna žita, krupnik, sorta, komponente prinosa, proteini

## THE EFFECT OF SOWING DATE, SEEDING RATES AND NITROGEN RATES ON PRODUCTION AND TECHNOLOGICAL CHARACTERISTICS OF CULTIVARS OF SPRING OATS "SANA"

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A new variety of spring oats of the Agricultural Institute of the Republic of Srpska is recognized in the Republic of Serbia in 2012. This is the first new variety of oats of the Agricultural Institute of the Republic of Srpska, Banja Luka. It has good productivity and flexibility, as it shows a small deviation in terms of grain yields growing at multiple locations. It belongs to the group of early varieties, with excellent tolerance to lodging. It has large, well-filled grain, 1000 kernel weight is about 33g, and a volume weight of 50 kg hl<sup>-1</sup>. The grain is golden yellow. Grain protein content is about 14.5%. All these properties were tested in a single year in relation to the most important cultural practices such as sowing (four sowing dates: January 10; February 11; March 11; April 1), the amount of seed per unit area (400, 500 and 600 viable grains) and the quantities of pure nitrogen as the main carrier of yield (50, 60 and 70 kg ha<sup>-1</sup>). The experiment was conducted in three replications at the trial field of the Institute. Among the tested treatments, significant differences in yield and quality were achieved. The highest yield of 5.76t ha<sup>-1</sup> was achieved with the sowing in the second sowing date, i.e. on February 11, seeding rates with 500 viable seeds and the amount of pure nitrogen of 60 kg ha<sup>-1</sup>. The lowest yield was achieved by sowing in the fourth sowing date (April 1) with a yield of 3.56 t ha<sup>-1</sup> and with seeding rates of 600 viable grains per m<sup>2</sup> and nitrogen amount of 50 kg ha<sup>-1</sup>. According to the Commission for registration of varieties, "Sana" variety grain contains about 14.52% of crude protein which is significantly higher comparing to "Sjavuj" variety, which achieved 11.69% protein content during the study.

Keywords: oat (*Avena sativa* L.), yield, cultivar, cultural practices, quality.

## UTICAJ ROKA SJETVE, SJETVENE NORME I KOLIČINE AZOTA NA PROIZVODNE I TEHNOLOŠKE OSOBINE SORTE PROLJETNE ZOBİ „ SANA“

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Nova sorta jarog ovasa (zobi) Poljoprivrednog instituta Republike Srpske, priznata u Republici Srbiji 2012. godine. Ovo je prva priznata sorta zobi Poljoprivrednom institutu Republike Srpske, Banja Luka. Posjeduje dobru produktivnost i prilagodljivost, jer pokazuje mala odstupanja u pogledu ostvarenih prinosa gajenjem na više različitih lokacija. Pripada grupi ranih sorti, odlične je otpornosti prema polijeganju. Ima krupno, dobro naliveno zrno, masa 1000 zrna je oko 33g, a zapreminska težina oko  $50\text{kg}\text{hl}^{-1}$ , zrno je zlatno žute boje. Sadržaj bjelančevina u zrnu je oko 14,5%. Sve navedene osobine testirane su u jednoj godini u odnosu prema najvažnijim agrotehničkim faktorima kao što su rok sjetve, ( četiri roka sjetve 10. 01; 11.02; 11.03; i 01. 04), količina sjemena po jedinici površine ( 400, 500 i 600 kljavih zrna ) i količine čistog azota kao glavnog nosioca prinosa ( 50, 60 i  $70\text{kg}\text{ha}^{-1}$  ). Ogled je izveden na ekonomiji instituta u tri ponavljanja,. Između ispitivanih tretmana ostvarene su značajne razlike kako u pogledu prinosa tako i kvaliteta. Najveći prinos od  $5,76\text{t}\text{ha}^{-1}$  ostvaren je sjetvom u drugom roku odnosno 11.februara, sjetvenom normom sa 500 kljavih zrna i količinom čistog azota od  $60\text{kg}\text{ha}^{-1}$  . Najmanji prinos ostvaren je sjetvom u četvrtom roku (1 aprila) sa prinosom od  $3,56\text{t}\text{ha}^{-1}$  sa sjetvenom normom od 600 kljavih zrna po  $\text{m}^{-2}$  i količinom azota od  $50\text{kg}\text{ha}^{-1}$  . Prema rezultatima Komisije za priznavanje sorti zrno sorte Sana sadrži oko 14,52% sirovih proteina što je značajno više u odnosu na sortu Sjavuj koja je tokom ispitivanja imala 11,69% sadržaj proteina.

Ključne riječi: ovas (*Avena sativa* L.), prinos, sorta, agrotehnika, kvalitet.



*Subsection: Plant Protection*



## DISTRIBUTION OF PLUM POX VIRUS IN COMMERCIAL NURSERIES IN REPUBLIC OF SRPSKA

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*Plum pox virus* (PPV) causes devastating sharka disease of stone fruits (plums, peaches, nectarines, apricots and almonds). In addition, wild and ornamental *Prunus* species are also susceptible to this virus. Eight PPV strains were characterised worldwide so far: PPV-M, PPV-D, PPV-Rec, PPV-EA, PPV-C, PPV-W, PPV-T and PPV-CR. In Bosnia and Herzegovina (B&H) PPV is present for long time and PPV-M, PPV-D, PPV-Rec were identified on plums, peaches and apricots. Natural spread of PPV occurs in a nonpersistent manner by several aphid species, while long-distance spread occurs largely through the movement of infected nursery stocks. In order to reduce the spreading of the sharka disease, in 2013 and 2014 " Plant protection program" was conducted where motherplants were tested for PPV presence. Inspection samples of plum and peach were collected from Banjaluka, Doboј, Bijeljina, Prijedor and Trebinje commercial nurseries and transferred to the Faculty of Agriculture in Banjaluka for laboratory testing. Immunocapture Reverse Transcription-PCR, (IC-RT-PCR) was used for PPV identification and characterization of the samples. In total, out of 44 tested, 19 samples were positive on PPV presence. Positive plum and peach samples tested in 2014 were additionally submitted for PPV strain typisation. It resulted in identification of PPV-M and PPV-Rec strains in infected motherplants. Information obtained from two years monitoring of PPV in nurseries of Republic of Srpska indicates that the quality of nursery production is significantly threatened. According to the official legislative (Sl. Glasnik Republike Srpske, number 75, from 26.08.2014.) all infected motherplants as well seedlings originated from them, should be eradicated. Strategy for reduction of PPV should be identified as well as beginning of production of certified planting material (viruses free/tested). Also, the effectiveness of stylet mineral oil treatments in order to reduce PPV infection and spreading in nursery blocks by aphids need to be evaluated.

Key words: PPV, IC-RT-PCR, Republic of Srpska, commercial nurseries.

## BEETLE FAUNA (COLEOPTERA) IN HONEY BEE HIVES WITH SPECIAL REFERENCE TO SMALL HIVE BEETLE *Aethina tumida* MURRAY IN SERBIA

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The small hive beetle, *Aethina tumida* Murray 1867 (Coleoptera: Nitidulidae), is a destructive pest of honey bee colonies. It feeds on honey, pollen, bee brood causing comb destruction, brood death and fermentation of honey. Heavy infestations may cause the bees to abandon their hive. *A. tumida* is native to sub-Saharan Africa but it is introduced to North America, Australia and Europe became invasive pest with negative impact on the apiculture. In Europe, according to official data, it is present only in southern Italy (Calabria region), where was an outbreak recorded during the year 2014. Presence of *A. tumida* in near surrounding, such as Italy, requires strict precautionary measures and intensive monitoring of beetle fauna in bee hives in order to prevent introduction or facilitate early detection of this pest in Serbia. One of the methods of early detection, besides the inspection of combs and the hive lid, is inspection of the bottom board. During the two beekeeping seasons, in the period 2013.-2014. detritus from the bottom boards of honey bee hives was collected in order to determine the composition of beetle fauna (Insecta, Coleoptera). Samples were taken from two private, stationary apiaries near the Mount Avala (Belgrade) as well as the stationary part of the apiary placed on experimental agricultural plot "Radmilovac" (Faculty of Agriculture, University of Belgrade). One of samples that also was sent to Faculty of Agriculture for analysis, was from the private apiary located near the town of Lajkovac. According to this survey the presence of 6 Coleoptera species was detected, 1 species from the family Dermestidae (apiary on "Radmilovac"), 4 species form family Lathrididae (two apiaries near the Mount Avala) and 1 species form family Tenebrionidae (apiary located near the town of Lajkovac). The presence of the Small hive beetle in Serbia was not confirmed yet.

Key words: beetles, beehive, honey bee, *Aetina tumida*, Serbia, Italy

FAUNA TVRDOKRILACA (COLEOPTERA) U KOŠNICAMA  
MEDONOSNE PČELE SA POSEBNIM OSVRTOM NA  
MALU KOŠNICINU BUBU *Aethina tumida* MURRAY  
U SRBIJI

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Mala košnicina buba *Aethina tumida* Murray (Coleoptera: Nitidulidae), je destruktivna štetočina pčelinjih društava. Hrani se medom, polenom i pčelinjim leglom pri čemu razara saće, izaziva uginuće legla i fermentaciju meda. Visoki intenzitet napada može dovesti do napuštanja košnice od strane pčela. *A. tumida* je poreklom iz područja podsaharske Afrike ali je introdukovana u Severnu Ameriku, Australiju i Evropu gde predstavlja invazivnu štetočinu i ima negativan uticaj na pčelarsku proizvodnju. U Evropi je, prema zvaničnim podacima, prisutna samo u Italiji i to u južnoj oblasti Kalabrija gde je tokom 2014. godine zabeležena njena masovna pojava. Prisustvo *A. tumida* u bliskom okruženju kao što je Italija zahteva visok nivo predostrožnosti i konstantno praćenje sastava faune tvrdokrilaca u košnicama medonosne pčele kako bi se na vreme sprečio unos ili omogućilo rano otkrivanje ove štetočine u Srbiji. Jedna od metoda ranog otkrivanja prisustva *A. tumida* u košnici, pored pregleda saća i poklopca košnice, jeste i pregled podnjače. Tokom dve pčelarske sezone, u toku 2013. i 2014. godine, sakupljan je detritus iz košnica medonosne pčele sa ciljem da se utvrdi sastav faune tvrdokrilaca (Insecta, Coleoptera) kao i eventualno prisustvo *A. tumida*. Uzorci su uzimani sa dva privatna, stacionarna pčelinjaka u blizini planine Avala (Beograd), kao i sa stacionarnog dela pčelinjaka smeštenog na oglednom dobru "Radmilovac" (Poljoprivredni Fakultet, Univerzitet u Beogradu). U pregled je uključen i uzorak insekata sa privatnog pčelinjaka u okolini Lajkovca koji je upućen Poljoprivrednom fakultetu na analizu. Pregledom sakupljenog materijala, utvrđeno je prisustvo 6 vrsta tvrdokrilaca i to 1 vrsta iz familije Dermestidae (pčelinjak na oglednom dobru "Radmilovac"), 4 vrste iz familije Lathrididae (dva pčelinjaka u blizini planine Avala) i 1 vrsta iz familije Tenebrionidae (pčelinjak u okolini Lajkovca). Prisustvo male košnicine bube u Srbiji za sada nije utvrđeno.

Ključne reči: tvrdokrilci, košnica, medonosna pčela, *Aetina tumida*, Srbija, Italija

## BARK BEETLES ON SPURCE TREES IN PARK COMPLEX OF PROTECTED AREA „UNIVERSITY CITY“ BANJA LUKA

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In park complex of the protected area "University City", there are 100 woody and bushy species, 26 of which are coniferous and 74 are deciduous. Most numerous of coniferous species trees are Norway spruce - *Picea abies* (L.) H.Karst., with 131 trees, and blue spruce - *Picea pungens* Engelm, with 133 trees. The trees are planted as groups or individually. In last three years dieback of individual branches and whole trees caused by the bark beetles (*Coleoptera*, *Curculionidae*, *Scolitinae*) has been registred. In accordance with the recommendations given by the study "Health Assessment of dendrofond of the "University City" park and the proposed sanation measures" (Genetic Resources Institute, 2011), the Theyson pheromone traps, with feromone Ipsowit and Chalcowit (Witasek Austria), were set in 3 locations in the park complex in 2012, in order to control the presence of bark beetles. In 2013 five traps of the same type and same pheromone preparations were used. Inspection of traps was conducted every 15 to 20 days, starting from February and finishing in October. Considering the overall ill condition of spruce trees and presence of two most important species of bark beetles, *Ips typographus* L. and *Pytiogenes chalcographus* L., the number of traps was increased, and in the end of February 2014, 13 Theyson traps with pheromone ampoule Chalcoprax and Pheroprax (BASF Austria) were placed in the park. Replacing of the ampoules was performed every 6 to 8 weeks, and traps were inspected in intervals of 7 to 10 days. The first trap inspection was conducted on March 10<sup>th</sup>, and the last on September 17<sup>th</sup>. For *I. typographus* all present individuals were counted, and for *P. chalcographus* volumetric method of number of individuals per gram was used. During all 3 years the presence of both *I. typographus* and *P. chalcographus* was registered. In 2012 and 2013 the number of individuals of both species was low, and in all trap inspections during 2014, the presence of both species was significantly high. The largest number (103.814, or 7.986 individuals per trap) of *P. chalcographus* was recorded on June 18<sup>th</sup>, and for *I. Typographus* (3.367, or 259 individuals per trap) on April 9<sup>th</sup>. This paper presents population flight dynamics for both bark beetle species.

Keywords: pheromone traps, *Ips typographus*, *Pytiogenes chalcographus*, number.

POTKORNJACI NA SMRČAMA U PARKOVSKOM KOMPLEKSU  
ZAŠTIĆENOG PODRUČJA „UNIVERZITETSKI GRAD“  
BANJA LUKA

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U parkovskom kompleksu zaštićenog područja „Univerzitetski grad“ Banja Luka nalazi se ukupno 100 vrsta, od čega su 26 četinari i 74 lišćari. Od stabala četinara posebno su zastupljene obična smrča - *Picea abies* (L.) H.Karst. sa 131 stablom i bodljikava smrča - *Picea pungens* Engelm. sa 133 stabla. Stabla su raspoređena u gustim grupacijama ili pojedinačno. U posljednje tri godine konstatovano je sušenje pojedinih grana i cijelih stabala koje je uzrokovano prisustvom potkornjaka (Coleoptera, Curculionidae, Scolitinae). U skladu sa preporukama iz studije “Ocjena zdravstvenog stanja dendrofonda parka „Univerzitetski grad“ i prijedlog mjera sanacije“ (Institut za genetičke resurse, 2011), u cilju kontrole prisustva potkornjaka, 2012. godine, na 3 lokacije u parkovskom kompleksu postavljene su klopke tipa Theyson (Kunststoff, Njemačka), sa feromonima Ipsowit i Chalcowit (Witasek Austrija). U 2013. godini, postavljeno je 5 klopki istog tipa. Pregledi su vršeni na 15 do 25 dana u periodu od februara do oktobra. S obzirom na opšte stanje stabala smrče u parku i prisustvo dvije vrste potkornjaka *Ips typographus* L. i *Pytiogenes chalcographus* L., u toku 2014. povećan je broj klopki i krajem februara postavljeno ih je 13 sa feromonima Chalcoprax i Pheroprax (BASF Austrija). Zamjena feromona vršena je na 6 do 8 nedjelja, a klopke su pregledane u intervalima od 7 do 10 dana. Prvi pregled je urađen 10.03., a posljednji 17.09. Za *I. typographus* vršeno je prebrojavanje svih jedinki, a za *P. chalcographus* je korišćena volumetrijska metoda brojnosti uhvaćenih jedinki u 1 gramu. Tokom sve tri godine, u svim pregledima, konstatovano je prisustvo obje vrste potkornjaka. U toku 2012. i 2013. godini brojnost jedinki obje vrste bila je niska (najveći broj jedinki *P. chalcographus* bio je 298, a jedinki *I. Typographus* 398 po klopki). Tokom 2014. godine najveći broj ukupno uhvaćenih jedinki *P. chalcographus* (103 814), odnosno 7 986 jedinki po klopki utvrđen je 18.06., a *I. typographus* ukupno 3367, odnosno 259 jedinki po klopki 09.04. U radu je prikazana dinamika leta za obje vrste potkornjaka.

Ključne riječi: Potkornjaci, *Ips typographus*, *Pytiogenes chalcographus*, smrče, brojnost

THE WESTERN CORN ROOTWORM *Diabrotica virgifera virgifera* LeConte (COLEOPTERA: CHRYSOMELIDAE) -  
CURRENT STATUS IN MONTENEGRO

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The western corn rootworm *Diabrotica virgifera virgifera* Le Conte originates from North America. This is the most important pest of maize, particularly those which is grown without crop rotation. Both adults and larvae attack maize, but the most serious damages cause larvae feeding on the root. *D. virgifera virgifera* was detected in Europe for the first time in Serbia in 1992 and now is present in most of European counties. In the EU it is listed in Council Directive 2000/29/EC, Annex I, Part A, Section II. The pest can spread through natural migration, as well through transportation. It was first detected in Montenegro in 1998 around city of Bijelo Polje (northern part of the country) in two localities near the main road to Serbia. In period from 2010 to 2013 pheromone traps Csalomon® (PAL) were used for monitoring of the pest. Traps were set up in maize production areas in northern part of Montenegro (around cities Bijelo Polje and Berane) as well in southern part in zetsko-bjelopavlička plain (around cities Podgorica and Danilovgrad). Out of four inspected localities in northern part, three were maize crops grown without crop rotation and one was in rotation with wheat. In southern part traps were placed in three localities where maize is grown without crop rotation. Traps were set up during June and checked in intervals from 15 to 20 days. During July and August maize plants were also visually inspected on presence of 'gooseneck' symptoms. Our results showed presence of *D. virgifera virgifera* in all localities in northern part. First adults are detected during July and last captures were in mid October. Typical 'gooseneck' symptoms were registred only in 2012 in the end of July in one locality in northern part where maize is grown without crop rotation. In area of zetsko-bjelopavlička plain presence of the pest was detected only in 2013 in area around city of Danilovgrad.

Key words: *Diabrotica virgifera virgifera*, maize, monitoring, symptoms

DISTRIBUTION OF THE NORTHERN ROOT-KNOT  
NEMATODE *MELOIDOGYNE HAPLA* IN  
REPUBLIC OF SRPSKA

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One of the most common plant-parasitic nematode in temperate region is the northern root-knot nematode *Meloidogyne hapla*. It has wide host range among agricultural crops what makes the nematode even more important. Two closely related species of the northern root-knot nematodes in terms of hosts and habitat preferences are quarantine species *Meloidogyne chitwoodi* and *Meloidogyne fallax*. An official survey of potato fields on presence *Meloidogyne chitwoodi* and *Meloidogyne fallax* in Republic of Srpska has been done from 2013. The survey is performed annually in alignment with requirements of European Union for potato export to EU market. 120 soil samples through Republic of Srpska predominantly from ware and seed potato fields were taken in 2014. The samples were processed by Oostenbrink elutriator. Identification to genus level was based on morphological characters of juveniles stage 2. The characters were confirmed by dissection microscope. Species identification was determined by classical PCR. No quarantine nematodes were detected. Multiple primers application allows detection of the northern root-knot nematode *Meloidogyne hapla* in one reaction too. The nematode was identified in 53 % of samples from potato and non potato fields. Geographical distribution and importance of *M. hapla* were discussed.

Key words: nematode survey, *Meloidogyne hapla*, northern root-knot nematode, distribution

## RESULTS OF HERBICIDE EFFICIENCY IN SOYA CROP OF COOPERATIVE PROGRAM DANUBE – SOYA

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Signing the cooperative program BiH with Danube Soybean Association, PI Agriculture institute of Republic of Srpska - Banja Luka took an active role in implementing and intensifying research programs production of genetically unmodified soya, among with a program of protection against weeds is of great importance. Therefore, the main objective of the study was to test effectiveness of different variants of herbicides on weed populations in soybean in the Banja Luka region. Experiment of herbicides efficacy was carried out in 2014 at the experimental field of the Agricultural Institute of RS - Banja Luka in Lijeve polje (locality Maglajani) in a randomized complete block design according to EPPO standards (EPPO, 1998; EPPO, 1999; EPPO 2012). A total four herbicide variants were tested, but only one variant pendimethalin (Zanat) + metribuzin (Lord) + linuron (Galolin mono) was applied pre sowing and pre.em. Three different herbicide variant were applied as pre.em linuron (Galolin mono) + metribuzin (Lord), linuron (Galolin mono) + metribuzin (Lord) in different dose and metribuzin (Lord) + S-metolachlor (Dual gold 960 EC). Beside them two corrective post.em. different herbicide variant were applied on all four above mentioned treatments. First corrective variant were imazamox (Pulsar 40) applied in trifoliolate leaf and fluazifop-p-butyl (Fusilade forte 150 EC) applied seven days after Pulsar 40. The second corrective variant was oxasulfuron (Dynox 75 WG) + tifensulfuron-methyl (Harmony DF) applied two days after Pulsar 40 and fluazifop-p-butyl (Fusilade forte 150 EC) applied two days after Pulsar 40. Efficiency assessment was done after 42, 74 and 87 days after applications. Considering a huge amount of rainfall during 2014 in BiH agro-ecological conditions, as well as in the Banja Luka region, final result was constantly weed emergence through the vegetation period of soybean. Even with the use of corrective treatment, which operate not only on a broader spectrum of weed populations, but also on the weed species that are springing up over a longer period or from deeper soil layers, the most selected combination showed satisfactory efficiency.

Key words: Cooperative program, soy, herbicide, efficiency

## REZULTATI ISPITIVANJA EFIKASNOSTI HERBICIDA U USJEVU SOJE KOOPERATIVNOG PROGRAMA DUNAV- SOJA

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Potpisivanjem kooperativnog programa BiH sa Dunav-Soja asocijacijom, JU Poljoprivredni institut Republike Srpske – Banja Luka zauzeo je aktivnu ulogu u implementaciji i intenziviranju istraživačkih Programa proizvodnje genetički nemodifikovane soje, među kojima je Program zaštite od korova od izuzetnog značaja. Samim tim, osnovni cilj rada je bio da se ispita efikasnost različitih varijanti herbicida na korovsku populaciju u usjevu soje na području banjalučke regije. Eksperimentalni ogled ispitivanja efikasnosti herbicida izveden je 2014. godine na oglednom polju Poljoprivrednog instituta RS - Banja Luka u Lijeve polju (lokalitet Maglajani) po slučajnom blok sistemu prema EPPO standardima (OEPP 1998; OEPP 1999; OEPP 2012). Ispitivana je efikasnost ukupno četiri varijante herbicida od kojih je samo jedna varijanta na bazi aktivnih materija: 1) pendimetalina (Zanat) + metribuzina (Lord) + linurona (Galolin mono) primjenjena prije i poslije sjetve a prije nicanja soje. Preostale tri varijante herbicida primjenjene su poslije sjetve a prije nicanja soje, i to na bazi aktivnih materija: 2) linurona (Galolin mono) + metribuzina (Lord), 3) linurona (Galolin mono) + metribuzina (Lord) u drugoj dozi i 4) metribuzina (Lord) + S-metolahlora (Dual gold 960 EC). Osim navedenih izvršena su i dva korektivna tretmana preparatom na bazi imazamoksa (Pulsar 40) primjenjenim u fazi formiranja treće troliske soje (V-4) i preparatom na bazi fluazifop-p-butila (Fusilade forte 150 EC) primjenjenog sedam dana nakon aplikacije sa Pulsarom 40. Drugi korektivni tretman je obavljen je kombinacijom preparata na bazi oksasulfurona (Dynox 75 WG) + tifensulfuron-metila (Harmony DF) primjenjenog dva dana nakon aplikacije sa Pulsarom 40 i preparatom na bazi fluazifop-p-butila (Fusilade forte 150 EC) primjenjenog dva dana nakon aplikacije sa Pulsarom 40. Ocjene efikasnosti izvršene su nakon 42, 74 i 87 dana od izvedenih aplikacija. Kako su tokom 2014. godine u agroekološkim uslovima BiH, pa samim tim i na području banjalučke regije, zabilježene ogromne količine padavina krajnji rezultat bio je konstantno nicanje korovskih vrsta tokom cijelog vegetacionog perioda soje. Čak i uz primjenu korektivnih tretmana, kojim djelujemo ne samo na širi spektar korovske populacije već i na korovske vrste koje niču u dužem vremenskom periodu ili iz dubljih slojeva zemljišta, većina odabranih kombinacija pokazale su zadovoljavajuću efikasnost.

Ključne riječi: Kooperativni program, soja, herbicidi, efikasnost





*Subsection: Vegetable Growing*



## CROP COEFFICIENT OF MELON GROWN UNDER MULCH AND NON MULCH CONDITIONS IN POLICORO (SOUTHERN ITALY)

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A melon crop was cultivated under mulch and non-mulch conditions during spring summer period in 1999. The experiment on melon (cv. *Campero*) evapotranspiration has been done in Southern Italy, Policoro at the experimental station “E. Pantenelli” of Bari University and CNR-Bari in 1999. The measurements of the main weather parameters and crop growing data of melon for 1999 were collected from the meteorological station at Policoro. The crop evapotranspiration was measured by weighing lysimeter while  $ET_o$  was estimated using Penman-Monteith equation (FAO 56) with input data from the neighbouring meteorological station. Crop coefficients were determined as the ratio of  $ET_c$  to  $ET_o$ . The main purpose of the experiment was to test the variability of the crop evapotranspiration ( $ET_c$ ) measured and estimated with and without mulching. The mulching management practices affected daily  $K_c$  values. Leaf area index was higher with mulching and, accordingly,  $K_c$  values were higher. The both management practices started on May 11<sup>th</sup>. Melon under mulch finished the season on July 17<sup>th</sup>, having 69 days for the growing period, and melon without mulch reached the maturity 15 days later, on August 2. Finally, the mulch accelerated the growth rate considerably.

Key words: crop coefficient, mulch, non-mulch, Mediterranean, melon (cv. *Campero*)

## ANTIMICROBIAL, ANTIOXIDANT ACTIVITIES AND PHYTOCHEMICAL SCREENING OF THE VEGETABLE EXTRACTS

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This study aimed to examine the total polyphenol and flavonoid content in activities of vegetable extracts (*Daucus carota* L., *Lycopersicon esculentum* Mill. and *Allium porrrum* L.) grown in Serbia, their antimicrobial and antioxidant activity, and also to identify and quantify the phenolic components. Antioxidant activity is consistent with the results of total quantity of phenolic compound. Results showed that the vegetable extracts possessed the large antioxidant activity. IC<sub>50</sub> values were determined: 10.28±1.02 µg/mL for DPPH free radical scavenging activity for extract *Allium porrrum* L., 15.45±0.55 µg/mL for extract *Daucus carota* L., and 17.41±0.32 µg/mL for extract *Lycopersicon esculentum* Mill. Antimicrobial activity was tested using broth dilution procedure for determination of minimum inhibitory concentration (MIC). MICs were determined for 8 selected indicator strains. All of the extracts showed strong to moderate strong antimicrobial activity. The phenolic composition of extracts (*Daucus carota* L., *Lycopersicon esculentum* Mill. and *Allium porrrum* L.) was determined by HPLC method. The dominant phenolic compound was quercetin.

Key words: vegetable extracts, phenolic compounds, HPLC, antimicrobial activity, antioxidant activity.

## CHANGES IN ACTIVITIES AND ISOENZYME PROFILE OF SUPEROXIDE DISMUTASE IN THE CELLS OF ROOT AND LEAVES OF BEANS (*Phaseolus vulgaris*) UNDER THE INFLUENCE OF HIGH CONCENTRATIONS OF Cu AND Zn

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This paper studies the effect of copper (Cu, 100  $\mu$ M and 200  $\mu$ M) and zinc (Zn, 5  $\mu$ M and 50  $\mu$ M) on growth, concentration of photosynthetic pigments, protein content and activity of superoxide dismutase (SOD, EC 1.15.1.1) in the leaf and the roots of bean (*Phaseolus vulgaris*). The results showed that both metals have an inhibitory effect on the growth of roots and shoots, whereby in 100  $\mu$ M Cu mostly inhibited the root growth (54% in comparison to control), and 50  $\mu$ M of Zn mostly inhibited shoot growth (75% in comparison to control). Also, in the leaves of treated plants there was the increase in the concentration of total chlorophyll, carotenoids and soluble proteins. In the root Cu induced increase and Zn decrease in content of total soluble proteins. Native electrophoresis separated SOD isoforms in samples of leaves and roots of control and treated plants. From the results it can be concluded that Cu had a greater impact on SOD activity in the root unlike Zn which in the treated bean plants produced greater changes in SOD activity in the leaf. Zinc at a concentration of 50  $\mu$ M induced the synthesis of a new isoform of SOD with Rf value of 0.37. Increased SOD activity and significant morphological changes of the treated plants show that the Zn concentration of 50  $\mu$ M is extremely toxic to plants of beans, which is not the case of Cu in concentrations of 200  $\mu$ M.

Key words: copper (Cu), zinc (Zn), *Phaseolus vulgaris*, superoxide dismutase (SOD), oxidative stress.

PROMJENE U AKTIVNOSTI I IZOENZIMSKOM PROFILU  
SUPEROKSID DISMUTAZA U ĆELIJAMA KORIJENA I LISTA  
PASULJA (*Phaseolus vulgaris*) POD UTICAJEM POVIŠENIH  
KONCENTRACIJA Cu I Zn

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U radu je ispitivan uticaj bakra (Cu, 100  $\mu$ M i 200  $\mu$ M) i cinka (Zn, 5  $\mu$ M i 50  $\mu$ M) na rast, koncentraciju fotosintetičkih pigmenata, sadržaj proteina i aktivnost superoksid dismutaza (SOD, EC 1.15.1.1) u listu i korijenu pasulja (*Phaseolus vulgaris*). Rezultati su pokazali da oba metala djeluju inhibitorno na rast korijena i izdanka, pri čemu je 100  $\mu$ M Cu najviše inhibirao rast korijena (54 % u odnosu na kontrolu), a 50  $\mu$ M Zn je najviše inhibirao rast izdanka (75 % u odnosu na kontrolu). Takođe, kod tretiranih biljaka u listovima je došlo do povećanja koncentracije ukupnog hlorofila, karotenoida i solubilnih proteina. U korijenu je Cu indukovao povećanje, a Zn smanjenje sadržaja ukupnih solubilnih proteina. Nativnom elektroforezom su razdvojene SOD izoforme u uzorcima lista i korijena kontrolnih i tretiranih biljaka. Iz dobijenih rezultata se može zaključiti da je Cu imao veći uticaj na aktivnost SOD u korijenu za razliku od Zn koji je kod tretiranih biljaka pasulja izazvao veće promjene SOD aktivnosti u listu. Zink je u koncentraciji od 50  $\mu$ M indukovao i sintezu nove SOD izoforme sa Rf vrijednošću 0,37. Povećana SOD aktivnost kao i značajne morfološke promjene kod tretiranih biljaka ukazuju na to da je koncentracija Zn od 50  $\mu$ M izrazito toksična za biljke pasulja, što nije slučaj za Cu i u koncentracijama od 200  $\mu$ M.

Ključne riječi: Bakar (Cu), cink (Zn), *Phaseolus vulgaris*, superoksid dismutaza (SOD), oksidativni stres.



*Subsection: Fruit Growing*



## EFFECT OF POLLENISER ON INITIAL AND FINAL FRUIT SET OF APPLE CULTIVARS

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Modern trends in setting up apple orchards imply securing high and regular yields with a minimum number of cultivars planted within a single orchard. An adequate knowledge of the various aspects contained within the domain of pollination biology of diverse cultivars therefore serves a direct function in controlling the issue of productivity. An appropriate selection of combinations of compatible cultivars and their optimum arrangement based on mutual fructification interaction, are a base for achieving high yields. The aim of the paper was to highlight the impact made by the polliniser on the level of initial and final fruit set in newly introduced apple cultivars, using it as a base for determining and recommending cultivar combinations conducive to planting within a single orchard. The research was conducted over a three-year period, at the Preljinsko brdo facility of the FRI in Čačak. The examination included the flowering phenophase, pollen germination *in vitro*, as well as the initial and final fruit set in the 'Gala Must', 'Red Elstar', 'Rajka' and 'Topaz' cultivars, depending on the pollinator. The research was conducted in compatible combinations of cross-pollination of the cultivars under consideration, as well as in the open pollination. A total of 14 combinations was applied. The average earliest flowering was recorded in the 'Rajka' cultivar (08. 04.), whereas the latest average flowering occurred in the 'Red Elstar' cultivar (10. 04.). Based on the percentage of the fruit set, it can be concluded that neither cultivar proved itself as the universal polliniser for the other cultivars. The best percentage of the initial and the final fruit set for the 'Gala Must' cultivar was recorded in the open-pollination variant, while the best fructification results for the 'Red Elstar' cultivar occurred in the combinations with the 'Topaz' cultivar. The best results in initial and final fruit set in the 'Rajka' and 'Topaz' cultivars were achieved with the 'Gala Must', i.e. the 'Rajka' cultivar as the polliniser.

Key words: apple, cultivar, flowering, fruit set

## UTICAJ OPRAŠIVAČA NA INICIJALNO I FINALNO ZAMETANJE PLODOVA SORTI JABUKE

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Savremeni trendovi zasnivanja zasada jabuke podrazumevaju obezbeđenje visoke i redovne rodnosti uz istovremeno najmanji broj sorti u zasadu. Stoga je poznavanje aspekata u oblasti biologije oplodjenja različitih sorti u neposrednoj funkciji rešavanja problema kontrole rodnosti. Adekvatan izbor kombinacija kompatibilnih sorti i njihov najbolji raspored prema međusobnim odnosima oplodjenja osnova su postizanja visokih prinosa. Cilj rada je bio da se na osnovu uticaja oprašivača na stepen inicijalno i finalno zametnutih plodova novointrokovanih sorti jabuke, utvrde i preporuče pogodne kombinacije sorti u zasadu. Ispitivanja su obavljena u trogodišnjem periodu na objektu Preljinsko brdo Instituta za voćarstvo u Čačku. Proučavane su fenofaze cvetanja, klijavost polena *in vitro*, kao i inicijalno i finalno zametanje plodova sorti 'Gala Must', 'Red Elstar', 'Rajka' i 'Topaz' u zavisnosti od oprašivača. Ispitivanje je obavljeno u kompatibilnim kombinacijama unakrsnog oprašivanja navedenih sorti, kao i u varijanti slobodnog oprašivanja. Sprovedeno je ukupno 14 kombinacija. Prosečno najranije cvetanje ustanovljeno je kod sorte 'Rajka' (08. 04.), dok je najkasnije bilo kod sorte 'Red Elstar' (10. 04.). Na osnovu procenta zametnutih plodova može se zaključiti da se ni jedna sorta nije pokazala kao univerzalni oprašivač za sve ostale sorte. Najbolji procenat inicijalnog i finalnog zametanja sorte 'Gala Must' ostvaren je u varijanti slobodnog oprašivanja, dok je kod sorte 'Red Elstar' najbolje zametanje utvrđeno u kombinaciji sa sortom 'Topaz'. Sorte 'Rajka' i 'Topaz' su najbolje rezultate u pogledu inicijalnog i finalnog zametanja postigle sa sortom 'Gala Must', odnosno sortom 'Rajka' kao oprašivačem.

Ključne reči: jabuka, sorta, cvetanje, zametanje plodova

## DISTRIBUTION OF LENTICELS ON THE FRUIT OF OLD APPLE CULTIVARS

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Distribution and morphology of lenticels is associated with the duration of fruit storage as well as browning of the epidermis around the lenticels during the fruit storage. During fruit growth and development to its physiological and technological maturity, the epidermis is subject to transformation in accordance with the physiological processes in the fruit itself, which is reflected primarily in the formation of lenticels and other anatomical changes in the structure of the cuticle, epidermal and sub-epidermal cells. According to the morphology and biogenesis of the formation of pores for transpiration in apple fruit, two basic types can be distinguished: 1) lenticels, which replace stomata or trichomes in the epidermis and 2) epidermal cracks that occur due to changes in the chemical composition and structure of the second cuticular layer and physiological changes in the function of epidermal cells. In apples and pears, anatomy, form and distribution of lenticels on the fruit are considered varietal characteristics. The number of lenticels on apple fruits remains constant during the development of the fruit, while their density per unit area decreases with the increase in fruit size. The size of lenticels varies depending on the development and position on the fruit and they can be more or less open. This paper analyses the distribution of lenticels on the epidermis of the physiologically mature fruit of 15 apple cultivars originating from the plantation in Srebrenik (plantation in the full fruit-bearing period) during 2012. The number of lenticels was determined by counting lenticels on the fruit surface area of 1 cm<sup>2</sup> as shown on the digital images of the fruit epidermis. The images were taken at four points of the equatorial region of 10 fruits of each apple cultivar with the digital camera Olympus E-620 (Macro objective Zuiko Digital 50 mm 1:2). The average number of lenticels on the fruit of the observed apple cultivars ranged from 4.43 to 17.2 per 1 cm<sup>2</sup> of the fruit epidermis. According to the literature data, the number of lenticels of grown apple varieties ranges from 2 to 10 per 1 cm<sup>2</sup>. The results obtained in this research indicate a correlation between the distribution of lenticels on the fruit and fruit ripening time of the examined apple cultivars and their storage ability after harvest.

**Key words:** cuticle, epidermis, number of lenticels.

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## ZASTUPLJENOST LENTICELA NA PLODU STARIH SORTI JABUKE

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Zastupljenost i morfologija lenticela dovodi se u vezu sa dužinom čuvanja plodova kao i pojavom posmeđenja pokožice oko lenticela tokom skladištenja plodova. Rastom i razvojem plodova do njihove fiziološke, odnosno, tehnološke zrelosti, epidermis je podložan transformacijama u skladu sa fiziološkim procesima u samom plodu, a što se ogleda pre svega u formiranju lenticela i drugih anatomskih promena u strukturi kutikule, epidermalnih i subepidermalnih ćelija. Prema morfologiji i biogenezi nastanka otvora za transpiraciju ploda jabuke, mogu se razlikovati dva osnovna tipa: 1) lenticela, koje nastaju u epidermisu gdje su bile stome ili trihome; i 2) epidermalne pukotine, koje nastaju usljed promjena u hemijskom sastavu i strukturi drugog kutikularnog sloja i fizioloških promjena u funkciji epidermalnih ćelija. Kod jabuke i kruške, anatomija, oblik i zastupljenost lenticela na plodu smatraju se sortnom karakteristikom. Broj lenticela na plodu jabuke ostaje stalan tokom razvoja ploda dok se njihova gustina na jedinici površine smanjuje povećanjem ploda. Veličina lenticela varira u zavisnosti od razvoja i pozicije na plodu i one mogu biti manje ili više otvorene. U ovom radu je analizirana zastupljenost lenticela na pokožici fiziološki zrelog ploda 15 starih sorti jabuke porijeklom iz kolekcionog zasada u Srebreniku (zasad u periodu punog plodonošenja) u toku 2012. godine. Broj lenticela je utvrđen brojanjem na 1cm<sup>2</sup> površine ploda na digitalnim fotografijama pokožice ploda. Fotografisanje je izvršeno na četiri strane ekvatorijalne zone 10 plodova svake sorte jabuke, digitalnim fotoaparatom Olympus E-620 (Macro objective Zuiko Digital 50 mm 1:2). Prosječan broj lenticela na plodovima posmatranih sorti jabuke kretao se od 4,43 do 17,2 po 1 cm<sup>2</sup> pokožice ploda. Prema literaturnim podacima, broj lenticela gajenih sorti jabuke kreće se od 2 do 10 po 1 cm<sup>2</sup>. Rezultati dobijeni u ovom istraživanju ukazuju na korelaciju između zastupljenosti lenticela na plodu i vremena sazrijevanja plodova ispitivanih sorti jabuke, odnosno njihove sposobnosti čuvanja nakon berbe.

**Ključne riječi:** kutikula, pokožica, broj lenticela.

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## MORPHOLOGICAL AND ANATOMICAL CHARACTERISTICS OF APPLE ROOTSTOCK SHOOTS

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The rootstock for grafting fruit trees is an essential modifier of growth and development of cultivars. The influence of the rootstock on the characteristics of growth and development of the cultivar is reflected primarily in its influence on vigour, fruiting start, productivity and fruit quality. However, the soil substrate together with agro-ecological conditions prevailing in a given area largely affect the characteristics of growth and development of the rootstock itself. This paper presents the results of the analyses of anatomical and morphological characteristics of 10 apple rootstock shoots: 5 clones of M9 (Pajam®1 Lancep, Pajam®2 Cepiland, T337 Nakb, B984, Fleuron 56); Mark (MAC 9), M26; MM106, Supporter 4 and Jork 9, cultivated in a defined soil substrate in the area of Banja Luka in 2013 and 2014. The analyses were performed on shoots of 10 parent plants of the examined rootstocks, namely the diameter and cross-sectional area at a height of 25 cm from the base, based on which the proportion of bark in the cross-section of the shoot was calculated. The analysis of the rootstock section was performed by photo documenting (with the camera Olympus E-620; Macro-objective Zuiko Digital 50mm 1:2). Afterwards the images were processed by software and biometrics analysis. In the two years of research, the average difference in the diameter at 25 cm from the base of the examined rootstocks is 1.5 mm. Based on the analysis performed at the level of 0.5 mm, all rootstocks can be classified into two groups: 1) rootstocks with the average diameter of shoot from 9 to 9.5 mm ( Jork 9, Fl56, Supporter 4, B984, T337, Pajam®1 Lancep and Mark); and 2) rootstocks with the average diameter of shoot over 9.5 mm (Pajam®2 Cepiland, M26 and MM106). The average difference in the average percentage of bark in the cross-section of the shoot of the examined apple rootstocks in the years of research ranges up to 6 %. If the grouping of the rootstocks is performed at the level of 5 %, the analyzed rootstocks can be classified into three groups: 1) rootstock with bark proportion in the cross-section up to 25% ( B984, Pajam®2 Cepiland); 2) rootstocks with bark proportion in the cross-section from 25 to 30% (Pajam®1 Lancep, Supporter 4, Fl56, M26, NY9, Mark and MM106) and 3) rootstocks with bark proportion in the cross-section of more than 30 % (T337). The results of the research show a tendency of inversely proportional relationship between the shoot diameter and the bark percentage in the cross-section of the shoot. This tendency suggests that advantage in the evaluation of the quality of rootstocks for grafting should be given to the bark proportion in the cross-section as compared to the thickness of the shoot.

Keywords : diameter and cross-sectional area, bark and wood relation.

## INFLUENCE OF TRAINING SYSTEM ON YIELD AND FRUIT QUALITY OF APPLE CV. 'BRAEBURN'

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The influence of different training systems (slender spindle, northern Holland spindle, solax and 'V' system) on the productivity of the apple cultivar 'Braeburn' have been evaluated. Research was conducted at two experimental orchard located in Skopje and Resen during 4 consecutive years. The planting distance was different and according to the training system. For slender spindle and solax the planting distance was 4 x 1.5 m (1667 trees/ha) and for northern Holland spindle and 'V' system 4 x 1 m (2500 trees/ha). The results showed statistically significant differences between location and between different training systems. Concerning the productivity, the tree grown under the slender spindle system has the highest yield, whereas the ones from the "V"-system had the lowest. Shown in per hectare, the northern Holland spindle system is mostly productive. The solax system had the lowest yield per ha. The trees on solax training system have the highest yield efficiency, the lowest was observed on slender spindle system. The highest value for the fruit weight was obtained at northern Holland spindle whereas the ones from the solax training system were with the lowest value for the fruit weight.

Key words: apple, training system, productivity, braeburn.

## TEMPERATURE AND ITS INFLUENCE ON FERTILITY IN SOME CULTIVARS OF APPLES

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The aim of the research was that the three-year periods investigate the effect of temperature and precipitation on the yield and determine the differences between the cultivars. Significant the oscillation of in the values of mean daily temperature were significantly affected by fertility in the three-year period, which is manifested in the demonstrated differences in yield between the cultivars. The differences in yield were noted research period. The results showed that the influence cultivar of factors, age, and their interactions in the studied trait was highly statistically significant.

Keywords: temperature, cultivar, fertility.

## TEMPERATURA VAZDUHA I NJEN UTICAJ NA RODNOST KOD NEKIH SORTI JABUKE

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Cilj rada je bio da se u trogodišnjem periodu ispita uticaj temperature vazduha i padavina na prinos i utvrde razlike između proučavanih sorti. Značajnija kolebanja u vrijednostima srednjih dnevnih temperatura vazduha u trogodišnjem periodu uticala su značajno na rodnost, koja se manifestovala u ispoljenim razlikama u prinosu između proučavanih sorti. Razlike u prinosu su utvrđene i po proučavanim godinama. Rezultati ispitivanja potvrdili su da je uticaj faktora sorte, godine, kao i njihove interakcije na proučavano obilježje bio statistički visoko značajan.

Ključne riječi: temperatura vazduha, sorta, rodnost.

## CHANGE SKIN COLOR OF PEAR (*Pyrus communis* L.) DURING STORAGE

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Color is one of the most important sensory attributes which influence the consumer's decision to consume certain types or varieties. The ripening is followed by change skin color of pear fruit and it is very important characteristics for harvest of fruits intended for storage. Very important natural antioxidants, such as phenols and flavonoids, are located in the vacuoles in the skin of the fruit, and it is known that the antioxidant capacity affects to the length of storage of fruits. During 2010 and 2011 changes of skin color was monitored for 4 varieties of pear: Santa Maria, Williams, Abate Fetel and Packams Triumph. The studies were made in the period of fruit ripening and after refrigeration with normal atmosphere. Fruit color is determined by colorimeter brand Konika Minolta CR type 400 in the *Lab* color system. The values of the parameters *L* (the lightness coefficient) was from 47.64 to 73.25, parameter *a* (the intensity of the green and red color) from -13.63 to 5.73 while the parameter *b* (the intensity of the yellow and blue color) from 30.13 to 45.73. In year 2010 were recorded increase in the value of the parameters *a* and *b* during storage, while there were not significant changes in observing the parameter *L*. However, in 2011 the change of color lightness is significant for all studied varieties except for variety Packams Triumph. In variety Santa Maria a supplementary fruit skin color is defined whose intensity was increased after storage, especially watching the parameter *a*, the relation of the color spectrum from negative green to positive red.

Keywords: colorimetric measurements, skin color, storage of fruits

## PROMJENA BOJE POKOŽICE PLODA KRUŠKE (*Pyrus communis* L.) TOKOM SKLADIŠTENJA

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Boja je jedan od najvažnijih senzornih atributa koja utiče na odluku potrošača za konzumaciju određene vrste odnosno sorte. Sazrijevanje plodova prati promjena boje pokožice ploda i veoma je bitna karakteristika pri berbi plodova namjenjenih za skladištenje. Vrlo značajni prirodni antioksidansi, kao što su fenoli i flavonoidi, smješteni su u vakuolama u pokožici ploda, a poznato je da antioksidativni kapacitet utiče na dužinu skladištenja plodova. Tokom 2010. i 2011. godine praćena je promjena boje pokožice plodova 4 sorte kruške: Santa Marija, Viljamovka, Fetelova i Pakams Trijumf. Istraživanja su vršena u periodu dozrijevanja plodova i nakon skladištenja u hladnjači sa normalnom atmosferom. Boja plodova određena je kolorimetrom marke Konika Minolta tip CR 400 u *Lab* sistemu boja. Vrijednosti parametara  $L$  (svjetlosnog koeficijenta) su se kretale u rasponu od 47,64 do 73,25, parametra  $a$  (intenziteta zelene i crvene boje) od -13,63 do 5,73 a parametra  $b$  (intenziteta žute i plave boje) od 30,13 do 45,73. U toku 2010. godine zabilježeno je povećanje vrijednosti parametara  $a$  i  $b$  tokom skladištenja, dok nije bilo značajnih promjena posmatrajući parametar  $L$ . Međutim, u 2011. godini promjena količine svjetla u boji je značajna kod svih ispitivanih sorti osim kod sorte Pakams Trijumf. Kod sorte Santa Marija definisana je i dopunska boja pokožice plodova čiji se intenzitet povećao nakon skladištenja, naročito posmatrajući parametar  $a$ , odnosno relaciju spektra boja od negativne zelene do pozitivne crvene.

Ključne riječi: kolorimetrijska mjerenja, boja pokožice, skladištenje plodova

PHENOLOGICAL PROPERTIES OF CORNELIAN CHERRY  
(*Cornus mas* L.) VARIETIES AND SELECTIONS UNDER THE  
CONDITIONS OF GORNJE POLIMLJE REGION

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The aim of this study was, by identifying the time of flowering and ripening of Cornelian cherry (*Cornus mas* L.) varieties and selections in Gornje Polimlje Region, to enable their proper selection for commercial cultivation in this area. In the two-year period of the study, the phenological characteristics of six Cornelian cherry introduced varieties and selections (*apatinski rani*, *bačka*, *krupnoplodni NS*, *era*, *lukjanovski* and *kišinjevski žuti*) were examined and four local (*kosten 1*, *kosten 2*, *kosten 3* and *boro*) selections in the conditions of Gornje Polimlje Region. Growth stage of flowering was followed from the beginning, through the full flowering until and of flowering. In addition to the period of full maturity the beginning date and the end of ripening were recorded as well. The studied varieties and selections bloom and achieve full flowering in March and flowering by the end of the first week of April. The earliest flowering was determined in the variety *apatinski rani* on 7<sup>th</sup> of March and the latest in selection *kosten 3* on 20<sup>th</sup> of March. Average duration of growth stages of flowering ranged from 18 (*kosten 1* and *kosten 3*) to 25 days (*apatinski rani*). Different timing of fruit ripening of Cornelian cherry results in first fruits coming to market on 23<sup>rd</sup> August of variety *apatinski rani*, and the last on 04<sup>th</sup> October of selection *kosten 2*, thus the consumption of fresh is possible in the period of a month and a half. Growth stages of fruit ripening is lasted 22 days on average, with variations of 18 (*apatinski rani* and *kišinjevski žuti*) to 28 days (*kosten 3*). Selections *kosten 2* and *kosten 3*, as well as varieties of *era* and *lukjanovski* according to the time of maturity can be classified as late.

Key words: Cornelian cherry, phenological properties, varieties, selections, Gornje Polimlje

## FENOLOŠKE OSOBINE SORTI I SELEKCIJA DRIJENA (*Cornus mas* L.) U USLOVIMA GORNJEG POLIMLJA

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Cilj ovog rada je da se utvrđivanjem vremena cvjetanja i zrenja sorti i selekcija drijena (*Cornus mas* L.) u Gornjem Polimlju omogući njihov pravilan izbor radi komercijalnog gajenja u ovom području. U dvogodišnjem periodu je izvršeno ispitivanje fenoloških osobina šest introdukovanih sorti i selekcija drijena (*apatinski rani*, *bačka*, *krupnoplodni NS*, *era*, *lukjanovski* i *kišinjevski žuti*) i četiri lokalne selekcije drijena (*kosten 1*, *kosten 2*, *kosten 3* i *boro*) u uslovima Gornjeg Polimlja. Fenofaza cvjetanja je praćena od nastupanja početka, preko punog cvjetanja pa do precvjetavanja. U okviru fenofaze zrenja, osim perioda pune zrelosti, evidentirani su i datumi početka i kraja zrenja. Proučavane sorte i selekcije imaju početak i puno cvjetanje u martu, a precvjetavaju do kraja prve sedmice aprila. Najraniji početak cvjetanja utvrđen je kod sorte *apatinski rani* (07.03), a najkasniji kod selekcije *kosten 3* (20.03). Prosječno trajanje fenofaze cvjetanja je iznosilo od 18 (*kosten 1* i *kosten 3*) do 25 dana (*apatinski rani*). Različito vrijeme zrenja ploda uslovljava da prvi plodovi sorte *apatinski rani* pristižu na tržište 23. avgusta, a poslednji selekcije *kosten 2* 04. oktobra, tako da je svježja konzumacija moguća u periodu od mjesec i po. Fenozaza sazrijevanja ploda je prosječno trajala 22 dana, sa varijacijama od 18 (*apatinski rani* i *kišinjevski žuti*) do 28 dana (*kosten 3*). Selekcije *kosten 2* i *kosten 3*, kao i sorte *era* i *lukjanovski* se prema vremenu zrenja mogu svrstati u kasne.

Ključne riječi: drijen, fenološke osobine, sorte, selekcije, Gornje Polimlje

## TECHNOLOGICAL VALUE OF DIFFERENT VARIETIES OF CHERRY FOR COMPOTE PRODUCTION

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Cherry is a widespread fruit species that has the advantage of early fruiting and attractive shape and color of the fruit epidermis. The fruit of the cherry is mainly used for consumption as fresh (over 85%), and is used as a raw material for the production of sweet, compotes, jams and candied fruits. For the consumption of fresh cherries pomological fruit characteristics, firmness and color of flesh and satisfying taste are significant. These excellent properties also affect the appearance and quality of products made from cherries. The chemical composition of the fruit, and above all the following: the dry matter content, sugar content, total acidity, the ratio of sugar and acid significantly affects the taste and quality of products. Quality compote defines a number of properties, and primarily: taste, color, smell, condition of the product and fruits consistency. Our aim with this work was to point out that, in addition to the varieties of cherry fruit with a lighter color, variety with darker epidermis color and colored fruit flesh may also be of quality raw material for compote preparation. The trials were conducted at the Department of Experimental farm farming, horticulture and landscape architecture of the Faculty of Agriculture Novi Sad in 2007, where the collection of cherries was established. Thus far, the collection it is in the eighth year of growth and all varieties are grafted on magriva (*Prunus mahaleb* L.). The distance is 5 x 4 meters, and the shape of the crown pyramidal. During the trial, cherry varieties in IV weeks of ripening were tested as follows: Summit, Germerzdovska, Durone nero III, Lambert, Sunburst, Sue, Merton crone, Durone nero I, Melitopoljska crna, Vega, Compact van, Starking Hardy Giant and Imperial. The following pomological characteristics were determined: fruit weight, the weight of fruit flesh, seeds and stems, as well as flesh and stone ratio. Regarding the chemical characteristics examined were: dry matter content, acidity (% malic acid), ash, fiber, Ca-pectate and sugar content. Production-technological value of sweet cherry cultivars was determined on the basis of grades according to a scale for individual trait of compote. The following traits of compote were evaluated: color, smell, taste, balance and consistency of fruit products and total maximum number of points for a single cultivar was 20. The varieties of cherries with a darker skin color and colored flesh are suitable for making compote. In our study, compote with these varieties received higher marks for taste and consistency of the fruit comparing to the varieties Vega and Sue, who are bright skin color.

Keywords: variety, cherry compote, sensory evaluation.

## TEHNOLOŠKA VRIJEDNOST RAZLIČITIH SORTI TREŠNJE ZA PRERADU U KOMPOT

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Trešnja je široko rasprostranjena voćna vrsta koja ima prednost zbog svoga ranog plodonošenja i atraktivnog oblika ploda i boje pokožice. Plod trešnje se uglavnom upotrebljava kao stono voće, (preko 85%), a služi kao sirovina za proizvodnju slatka, kompota, džema i kandiranog voća. Za potrošnju trešnje u svježem stanju značajne su pomološke karakteristike ploda, čvrstoća i boja mesa i zadovoljavajući ukus. Pomenute osobine takođe utiču na izgled i kvalitet prerađevina od trešnje. Hemijski sastav ploda, a prije svega: sadržaj suve materije, sadržaj šećera, ukupnih kiselina, odnos šećera i kiselina značajano utiče na ukus i kvalitet prerađevina. Kvalitet kompota određuje niz osobina, a prije svega: ukus, boja, miris, stanje proizvoda i konzistencija plodova. Ovim radom smo htjeli ukazati da pored sorti trešnje sa svijetlijom bojom ploda, sorte tamnije pokožice i obojenog mesa takođe mogu biti kvalitetna sirovina za pripremu kompota. Ispitivanja su obavljena 2007. godine, na oglednom dobru Departmana za voćarstvo, vinogradarstvo, hortikulturu i pejzažnu arhitekturu Poljoprivrednog fakulteta u Novom Sadu na Rimskim Šančevima, gdje je podignuta kolekcija trešanja. Zasad se nalazi u osmoj godini starosti i sve sorte su kalemljene na magrivi (*Prunus mahaleb* L.). Rastojanje je 5 x 4 metra, a oblik krune je piramidalni. U ogledu su ispitane sorte IV nedelje zrenja trešnje i to: Summit, Germerzdovska, Durone nero III, Lambert, Sunburst, Sue, Merton crone, Durone nero I, Melitopoljska crna, Vega, Compact van, Starking Hardy Giant i Imperial. Od pomoloških osobina određene su: masa ploda, masa mesa, koštice i peteljke, kao i odnos mesa i koštice. Od hemijskih osobina ispitivani su: sadržaj suve materije, sadržaj kiselina (% jabučne kiseline), pepeo, celuloza, Ca-pektat i sadržaj šećera. Proizvodno-tehnološka vrijednost sorti trešanja je određivana na osnovu ocjene kompota prema skali bodova za pojedinu osobinu kompota. Od osobina kompota ocjenjivana je: boja, miris, ukus, stanje proizvoda i konzistencija plodova i ukupan maksimalan broj bodova za pojedinačnu sortu je iznosio 20. Sorte trešanja sa tamnijom bojom pokožice i obojenim mesom su pogodne za spravljanje kompota. U našem istraživanju kompot ovih sorti dobio je višu ocjenu za ukus i konzistenciju plodova u odnosu na sortu Vega i Sue, koje su svijetle boje pokožice.

Ključne riječi: sorta, trešnja, kompot, senzorska ocjena.





## STATE OF AND CONDITIONS FOR VITICULTURE DEVELOPMENT IN BOSNIA AND HERZEGOVINA

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Viticulture is an important branch of agriculture in Bosnia and Herzegovina (BiH). The structure of viticulture and the wine sector in BiH has profoundly changed in the post-civil war period. This paper presents the state-of-the-art of viticulture development in BiH. Research is based on an extensive literature review. A number of secondary data sources have been consulted. BiH has good soil and climate conditions for grape growing and the country has a large number of native varieties. The vineyards area in BiH has increased in recent years. Viticulture in BiH is characterized by the dominance of small family owned vineyards (up to 2ha) and the sector still faces many problems hampering its full development. One of the main problems is also the lack of vineyard cadastre. Selection of appropriate grape varieties is crucial in modern viticulture. In older plantations there are mainly autochthonous cultivars while in new vineyards there is a modern cultivar assortment. Quality planting material is an important prerequisite for the success of grape production. Although BiH has a good potential and excellent conditions for viticulture, wine imports are almost five times higher than exports. Therefore, there is a need for better cooperation of professional, scientific and government institutions with grapevine growers and wineries in order to modernize production process, with the ultimate aim of achieving a better quality of grapes and grape products. This cooperation is essential especially in organizing the production of virus-free propagation material, during the introduction of new cultivars and for preserving autochthonous varieties in the vineyards of BiH.

Keywords: viticulture development, varieties, vineyard area, Bosnia and Herzegovina.

## FERTILITY CHARACTERISTICS OF NEWLY INTRODUCED INTERSPECIES GRAPEVINE VARIETIES IN KOZARA VINEYARDS REGION

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Before the introduction in to the wider production of newly introduced varieties there is a need for examination since their characteristics are greatly susceptible to the influence of climate and soil environmental factors of a growing region. The paper analyzes five new introduced interspecies grapevine varieties in Kozara vineyards region. The investigations included wine varieties Medina, Gecej, Crystal, Podarok, Zlatni luc and Chardonnay as a comparative variety. Investigated interspecific varieties have been created in recent decades, by crossing different species of the genus *Vitis*. The aim of this paper is to analyze the characteristics of interspecific varieties by following main parameters of fertility: coefficient of fertility, cluster mass, yield per vine and grape quality. The experimental part was performed in the collection orchard of grapes in Sjeverovci, municipality of Banja Luka. The vineyard was established in 2008. Training sistem is a single Guyot with planting space 3x1m. The highest fertility coefficient of the tested varieties had variety Zlatni luc (2.5), and the smallest variety Medina (1.23). The highest average bunch weight was recorded in variety Podarok (180,33 g), and the lowest average weight in variety Chardonnay (114.18g). The highest yield per vine had variety Podarok (2.39 kg / vine), and the smallest varieties Medina (0.87 kg/vine) and Chardonnay (0.61 kg/vine). The sugar content of the grapes was the largest in the variety Chardonnay (21.19%) and Medina (21%) and the lowest in cultivar Crystal (15.96%). Based on the data of the cluster mass depending of the position on the bearing shoot it can be concluded that tested varieties in growing conditions can be successfully pruned as a long spur. The achieved results represent a segment of information on the characteristics of the tested varieties in Kozara vineyards region and along with other parameters should define recommendations for their further expansion.

Key words: grapevine, interspecies cultivars, cluster mass, yield

## KARAKTERISTIKE RODNOSTI NOVO INTRODUKOVANIH INTERSPECIES SORTI VINOVE LOZE U USLOVIMA KOZARAČKOG VINOGORJA

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Pre uvođenja u širu proizvodnu praksu introdukovane sorte treba ispitati s obzirom da su njihove osobine u velikoj meri podložne uticaju klimatskih i zemljišnih faktora sredine u kojoj se uzgajaju. U radu se analizira pet novih introdukovanih interspecies sorti vinove loze u uslovima Kozaračkog vinogorja. Ispitivanjima su obuhvaćene vinske sorte Medina, Gečej, Kristal, Podarok, Zlatni luč i sorta Šardone kao komparativna sorta. Ispitivane interspecies sorte stvorene su poslednjih decenija, ukrštanjem različitih vrsta iz roda *Vitis*. Cilj rada je analiza karakteristika interspecies sorti praćenjem osnovnih pokazatelja rodnosti: koeficijent rodnosti, masa grozda, prinos po čokotu i kvalitet grožđa. Eksperimentalni deo ogleda obavljen je u kolekcionom zasadu u Sjeverovcima, opština Kozarska Dubica. Zasad je podignut 2008. godine. Uzgojni oblik je Gijo jednogubi sa razmakom sadnje 3x1m. Najveći koeficijent rodnosti od ispitivanih sorti imala je sorta Zlatni luč (2,5), a najmanji sorta Medina (1,23). Najveća prosečna masu grozda zabeležena je kod sorte Podarok (180,33 g), a najmanja prosečna masa kod sorte Šardone (114,18g). Najveći prinos po čokotu imala je sorta Podarok (2,39 kg/čokotu), a najmanji sorta Medina (0,87 kg/čokotu) i Šardone (0,61 kg/čokotu). Sadržaj šećera u grožđu je bio najveći kod sorte Šardone (21,19%) i Medine (21,0%), a najmanji kod sorte Kristal (15,96%). Na osnovu podataka o zavisnosti mase grozda od položaja koljenca na rodnom lastaru može se zaključiti da se ispitivane sorte u ispitivanim uslovima gajenja mogu uspešno rezati na duže kondire. Dobijeni rezultati predstavljaju segment informacija o karakteristikama ispitivanih sorti u uslovima Kozarčkog vinogorja i zajedno sa ostalim parametrima treba da definišu preporuku za njihovo dalje širenje.

Ključne riječi: vinova loza, interspecies sorte, masa grozda, prinos.





*Section 2. Sustainable Management of Natural Resources*

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## THE CONTENT OF HEAVY METALS IN THE SOILS IN THE NORTHEASTERN AREA OF BOSANSKA KRAJINA

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During the research conducted on agricultural soils of the northeastern area of the Bosanska Krajina, a specific total content of heavy metals (Cu, Ni, Pb and Zn) in these soils, as well as basic soil properties that affect their bioavailability (organic matter content and cation exchange capacity (CEC) and pH) were determined - all with the goal of determining the extent of soil contamination with the heavy metals. Seventy-eight (78) samples of soil were taken at 8 macro-locations, where the soil was sampled from two layers (depth): arable (0-25 cm), and sub-arable (25-50 cm). Total metal contents were determined by atomic absorption spectrophotometry after digestion the soil with concentrated nitric acid (HNO<sub>3</sub>). The content of organic matter, CEC and pH were determined by the standard agrochemical methods. The total nickel content in 48.7% of samples tested higher than the maximum content of unpolluted soil (50 mg/kg). The content of zinc in 16.7% of the analyzed samples was higher than the maximum allowed (100 mg/kg), while the content of copper and lead were lower than the maximum allowed in all samples. The vertical distribution of the investigated metals indicates the homogeneity of the layout and content of metals in the depth of the soil which leads to the conclusion that they are of dominant geochemical origins i.e. natural sources. The high degree of correlation between the total content of certain metals (Cu, Ni, Pb and Zn), indicates their common origins in the same area. In 35.9% of the examined soil samples the acidic soil reaction (pH <5.5) was measured, which furthermore could cause an increase of the bioavailability of metals. The high content of nickel, zinc and acid soil reaction suggests the necessity for additional tests in order to determine the extent of the potential risk of their soil transfer increase, and the involvement in the food chain through plants.

Key words: heavy metals, soil, total content

## SADRŽAJ TEŠKIH METALA U ZEMLJIŠTIMA SJEVEROISTOČNOG DIJELA BOSANSKE KRAJINE

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Tokom istraživanja provedenog na poljoprivrednim zemljištima sjeveroistočnog dijela Bosanske krajine, određeni su ukupni sadržaji teških metala (Cu, Ni, Pb i Zn) u ispitivanim zemljištima, kao i osnovna svojstva zemljišta koja utiču na njihovu biopristupačnost (sadržaj organske materije, kapacitet za adsorpciju katjona u zemljištu i pH), sa ciljem utvrđivanja stepena zagađenosti zemljišta ispitivanim metalima. Ispitano je 78 uzoraka zemljišta sa 8 makrolokacija, na kojima je zemljište uzorkovano iz dva sloja (dubine): oraničnog (0-25 cm) i podoraničnog (25-50 cm). Ukupni sadržaji metala određeni su metodom atomske apsorpcione spektrofotometrije, nakon kiselinske digestije zemljišta koncentrovanom azotnom kiselinom (HNO<sub>3</sub>). Sadržaj organske materije, kapacitet za adsorpciju katjona i rN su određeni standarnim agrohemijским metodama. Utvrđeni ukupni sadržaji nikla su u 48,7% ispitanih uzoraka viši od maksimalno dozvoljenog sadržaja za nezagađena zemljišta (50 mg/kg). Sadržaj cinka je u 16,7% analiziranih uzoraka viši od maksimalno dozvoljenog (100 mg/kg), dok su sadržaji bakra i olova niži od maksimalno dozvoljenog u svim ispitanim uzorcima. Vertikalna distribucija ispitivanih metala ukazuje na homogenost u rasporedu i sadržaju metala po dubini zemljišnog profila što upućuje na zaključak o njihovom dominantnom porijeklu iz geohemijskih, prirodnih izvora. Visok stepen korelacije utvrđen između ukupnih sadržaja pojedinih metala (Cu i Ni, Pb i Zn), ukazuje na njihovo zajedničko porijeklo na ispitivanom području. U 35,9% ispitanih uzoraka zemljišta izmjerena je kisela reakcija zemljišta (rN<5,5), koja može da utiče na povećanu biopristupačnost metala. Visoki sadržaji nikla i cinka i kisela reakcija zemljišta upućuju na neophodnost dodatnih ispitivanja, da bi se utvrdio stepen rizika od njihovog mogućeg povišenog transfera iz zemljišta i uključivanja u lanac ishrane preko biljaka.

Ključne riječi: teški metali, zemljište, ukupan sadržaj

IN VITRO CONSERVATION OF POTATO  
(*Solanum tuberosum*) ACCESSIONS IN  
THE GENE BANK OF REPUBLIC OF SRPSKA

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Activities on the conservation of plant genetic resources in the Republic of Srpska are implemented through Program of conservation of plant genetic resources, adopted by National Assembly (Official Gazette of Republic of Srpska, No. 59/08). Within Program, Working group for industrial plants is established and her main tasks are implementation various activities for conservation of autochthonous genotypes of industrial plants from total losing. That activities are implementing through inventory, collecting, characterization and conservation. Larger part of the territory of the Republic of Srpska is inventoried, and activities for accessions conservation are started. Potato accessions, Glamočki and Rogatički which are inventoried and collected in the municipality Ribnik were used for the *in vitro* culture introduction. As explants for introduction in culture are used germs of potato tubers. After surface sterilization procedures, explants were inoculated on MS (Murashige&Skoog, 1962) without hormones. Introduced accessions were exposed to the following regime: 8 hours of darkness, 16 hours of light at the temperature of 22-25 °C. Development of the explants was followed by five weeks and then were done selecting of survived and developed explants. Number of survived and developed explants was 70% for accession of Glamočki potato, and for accession of Rogatički potato was 40%. Developed explants were used for next passage procedure. Although accession of Rogatički potato had lower percentage of survival explants, but through passage, number of explants is increased. After passage, number of survived and developed explants for accession of Glamočki potato was 90%, and for accession of Rogatički potato was 75%. All multiplied explants were again exposed to temperature regime of 22-25°C and 16 hours of light and 8 hours of darkness. By introduction of accessions of Rogatički and Glamočki potato in *in vitro* culture, starting material for short-term, medium-term and long term conservation, characterization, and for getting virus-free material was obtained.

Key words: MS media, Glamočki and Rogatički potato

## IN VITRO KONZERVACIJA PRINOVA KROMPIRA (*Solanum tuberosum*) U BANCI GENA REPUBLIKE SRPSKE

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Aktivnosti na očuvanju biljnih genetičkih resursa u Republici Srpskoj sprovode se kroz Program očuvanja biljnih genetičkih resursa koji je usvojila Narodna Skupština (Službeni glasnik RS, broj 59/08). U okviru Programa, formirana je Radna grupa za industrijsko bilje čiji je zadatak sprovođenje različitih aktivnosti u cilju očuvanja autohtonih genotipova industrijskih biljaka od potpunog gubitka. Te aktivnost se realizuju kroz inventarizaciju, kolekcionisanje, karakterizaciju i konzervaciju. Veći dio teritorije Republike Srpske je inventarisan, a započete su aktivnosti u cilju konzervacije prinova. Prinove krompira, Glamočki i Rogatički koje su inventarisane i kolekcionisane na području opštine Ribnik su korištene za uvođenje u *in vitro* kulturu. Kao eksplantat za uvođenje u kulturu korištena je klica krtole krompira. Poslije procedure površinske sterilizacije, eksplantati su inokulisani na MS podlogu (Murashige & Skoog, 1962) bez hormona. Uvedene prinove su bile izložene sljedećem režimu: 8h tama i 16h svjetlo, pri temperaturi od 22-25°C. Razvoj eksplantata je praćen kroz pet sedmica a potom je izvršeno izdvajanje preživjelih i razvijenih eksplantata. Veći broj preživjelih i razvijenih eksplantata je bio kod prinove Glamočkog krompira, ukupno 70% dok je kod prinove Rogatičkog krompira bio manji, ukupno 40%. Razvijeni eksplantati su potom korišteni za naredni pasaž. Iako je prinova Rogatičkog krompira imala manji procenat preživjelih eksplantata, pasažom su umnoženi, te se na taj način uvećao broj eksplantata. Poslije pasaža, broj preživjelih i razvijenih eksplantata je kod prinove Glamočkog krompira iznosio 90% a kod prinove Rogatičkog krompira iznosio je 75%. Svi umnoženi eksplantati su ponovo izloženi temperaturnom režimu od 22-25°C i 16h svjetla a 8h tame. Uvođenjem prinova Glamočkog i Rogatičkog krompira u *in vitro* kulturu, dobijen je polazni materijal za kratkoročnu, srednjeročnu i dugoročnu konzervaciju, karakterizaciju, te za dobijanje bezvirusnog materijala.

Ključne riječi: MS podloga, Glamočki i Rogatički krompir

## UTILIZATION OF PLANT GENETIC RESOURCES IN PEANUT BREEDING PROGRAM OF BULGARIA

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Based on study of some morphological indices, responsible for productivity in 97 breeding lines *Arachis hypogea L.* with Bulgarian origin, it was established a linear regression model of the plant, that is characterized with high seed yield. Breeding program requires the identification of direct and indirect effects on productivity. By application of the Path coefficient Analysis it has been found that the higher yield plants must have low and extensive bush ( $i > 2,0$ ). The local accessions of peanuts are characterized by a lower index of the bush ( $i < 2,0$ ). For this purpose, 399 genotypes with a different geographical origin were introduced from USDA (USA) in 2008. Based on the evaluation of foreign accessions by height and width of the plant, seed yield from one plant and resistance to *Fusarium*, four genotypes were selected. They were included in crosses with Bulgarian varieties and lines of Valencia type. The heterosis expressions and some genetic effects of progenies were studied. The results show that heterosis effect in  $F_1$  at some of the progenies in connection with yield of the fruit and seeds are inherited without epistatic effect. The inbred depression in  $F_2$  is an indication of homozygosity in respect of allelic pairs defining yield.

Key words: *Arachis hypogea L.*, introduction, breeding, model of plant, hybrids

## IMPACT OF EXTREME WEATHER ON CORN FIELD IN SEMBERIJA IN YEARS 2007, 2010, 2012. AND 2014.

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This paper work presented the results of impact of extreme weather during the last years on the maize fields in Semberija. The analyzed years are 2007 and 2012-as drought periods, year 2010-as rainy and 2014 as the year of the floods. Also, we presented the results of applying the model IRRFIB-on on maize fields in the region Semberije for the year 2012. Using this model (with the definition of assumptions: the type and structure of soil, phenol-phase of crops and evapotranspiration) we can assume the necessary amount and mode of irrigation. Also using the LAF model, we can see impact of weather conditions on the region Semberije, on the vegetation cover, with the prior definition of parameters of the years observed. The results show that it is possible, using the model IRRFIB with forecasting of rainfall during the growing season, to predict the amount and mode of irrigation, with the aim of avoiding drought stress of crops and optimization of water for irrigation. With this approach we achieves a higher corn product of maize yield. From the results we see that maize suffered drought stress during the period from June 2012, and the corn were unable to recover even by the end of the growing season. In this period, the corn had to be irrigated nearly 20 times and the required amount of water for irrigation was 396.2 mm. Also on the graph Index Lai for Bijeljina, we can see drying of vegetation layer in the period after July 2012. After that corn could not recover due to the lack of rainfall in late August and very high temperatures. All this has caused the drying of plants and very high damage on corn in the fields of Semberija. Also, extreme weather conditions during 2014. contributed, in the period of May, due to severe flooding, lack of vegetation cover in the area of maize fields in Semberija. Thereafter, corn recovered slightly, mainly due to the application of measures-flare recommended by Ministry of Agriculture, Forestry and Water Management of the Republic of Serbian.

Key words: drought, stress, optimization, irrigation, vegetation

## UTICAJ EKSTREMNIH VREMENSKIH PRILIKA NA KUKURUZ NA PODRUČJU SEMBERIJE ZA 2007, 2010, 2012. I 2014. GODINU

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U radu su predstavljeni rezultati ponašanja kukuruznog polja na području Semberije za nekoliko posljednjih ekstremnih godina. Godine koje su analizirane su 2007. i 2012. godina-kao sušni periodi, 2010. godina-kao kišna i 2014. godina kao godina poplava. Predstavljeni su i rezultati primjene modela IRRFIB-a na polje kukuruza u regionu Semberije za 2012. godinu. Primjenom ovog modela (uz definisanje polaznih pretpostavki: vrste i strukture zemljišta, feno-faza kulture i evapotranspiracije) može se pretpostaviti neophodna količina i režim navodnjavanja. Takođe primjenom Laf modela grafički je predstavljen uticaj vremenskih prilika na region Semberije, na vegetacioni omotač, uz prethodno definisanje godina koje se posmatraju. Dobijeni rezultati pokazuju da je moguće primjenom modela IRRFIB uz prognozu padavina u toku vegetacionog perioda, prognozirati količinu i režim navodnjavanja, a sve u cilju izbjegavanja sušnog stresa biljaka i optimizacije vode za navodnjavanje. Ovim pristupom postiže se veći prinos poljoprivredne kulture, u ovom slučaju kukuruza. Iz primjenjenih parametara se vidi da je kukuruz pretrpio sušni stres u periodu od juna 2012. godine, te se kukuruzna polja nisu mogla oporaviti ni do kraja vegetacionog perioda. U ovom periodu kukuruz je bilo potrebno navodnjavati 20 puta, a neophodna količina vode iznosila je 396,2 mm. Isto tako na grafičkom prikazu Indexa Lai za Bijeljину, vidi se sušenje vegetacionog omotača u periodu nakon jula 2012.godine. Nakon toga kukuruz nije mogao da se oporavi usljed nedostatka padavina krajem avgusta i jako visokih temperatura. Sve to je uzrokovalo sušenje biljaka i jako velike štete na kukuruzu u području Semberije. Takođe, ekstremne vremenske prilike i tokom 2014.godine uticale da već u periodu maja, usljed jakih poplava, dođe do nedostatka vegetacionog prekrivača na području polja kukuruza u Semberiji. Nakon toga, kukuruz se blago oporavio, uglavnom usljed primjene mjere-presijavanje preporučene od strane Ministarstva poljoprivrede, šumarstva i vodoprivrede Republike Srpske.

Ključne riječi: suša, stres, optimizacija, navodnjavanje, vegetacija

## POSSIBILITIES FOR SUSTAINABLE USE OF POTATO GENETIC RESOURCES IN MONTENEGRO

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More than 220 years passed since Bishop Petar I Petrović Njegoš brought potatoes in Montenegro. Due to continuous cultivation of potatoes in the same locality, under the influence of local climate and soil conditions, and specific production technologies, specific local populations were created in course of time. With the introduction of new cultivars, old varieties have begun to disappear from the production and from local markets as well. Due to the colder climate, yields of domestic cultivars were significantly lower compared to modern varieties, and this production has become uncompetitive. Although Montenegro, as an ecological and touristic country, decided to build the sustainable development concept, it still hasn't defined plans for sustainable use of agrobiodiversity. In potato production in Montenegro absolute primacy have high-yield imported and domestic varieties. Hardly anything can change in this field. Chance to compensate their economic stagnancy have less developed areas and thus should develop agro tourism and all other following activities. Fragmentation of land properties and weak material base of production is an important limiting factor in the intensification of agriculture, and for this reason, the production of unique high quality product emerges as a real opportunity for development of mountainous regions. One of those opportunities is growing of old potato varieties, especially in areas where cultivation of most other crops would not be profitable. Specific agroecological conditions and old biotechnology (increased use of manure, the specific tillage systems, etc.) give excellent taste to potato (high dry matter content). However, even lower potato yields could be compensated trough higher price in touristic offer. For these reasons an environment of simultaneous development of agricultural and touristic offer should be created. It would be desirable to differentiate "domestic" potatoes from "regular" potatoes (produced by conventional agriculture). This would promote some of most expressive genotypes (high dry matter content, disease and stress resistance, specific color of meat and skin color, etc.) as products with protected geographical origin. These genotypes would be interesting for organic potato production as well.

**Key words:** potato, genetic resources, sustainable use

## MOGUĆNOSTI ODRŽIVOG KORIŠĆENJA GENETIČKIH RESURSA KROMPIRA U CRNOJ GORI

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Prošlo je više od 220 godina od kada je Vladika Petar I Petrović Njegoš donio krompir u Crnu Goru. Zbog stalnog gajenja krompira na istom lokalitetu, pod uticajem lokalnih klimatskih i zemljišnih uslova, ali i specifične tehnologije proizvodnje, vremenom je došlo do stvaranja posebnih lokalnih populacija. Sa dolaskom novih kultivara stare sorte su počele da isčezavaju iz proizvodnje, ali i sa lokalnih tržišta. Zbog hladnijeg klimata prinosi domaćih kultivara bili su znatno niži u poređenju sa modernim sortama, pa je ova proizvodnja postala i cjenovno nekonkurentna. Iako se Crna Gora, kao ekološka i turistička država, opredijelila da izgrađuje koncept održivog razvoja ona još uvijek nema definisane planove održivog korišćenja agrobiodiverziteta. U proizvodnji krompira u Crnoj Gori apsolutni primat imaju visokoprinosne sorte iz uvoza i tu se teško bilo šta može promijeniti. Šansu da kompenzuju svoju ekonomsku zaostalost, manje razvijene oblasti trebaju tražiti kroz razvoj agroturizma i svega ostalog što prati ovu djelatnost. Usitnjenost posjeda i slaba materijalna osnova proizvodnje su važan limitirajući faktor intenzifikacije poljoprivrede, pa se iz tih razloga, proizvodnja jedinstvenih (unikatnih) proizvoda visokog kvaliteta javlja kao realna razvojna šansa brdsko-planinskog rejona. Upravo, jedna od takvih mogućnosti je i gajenje starih sorti krompira, naročito u zonama u kojima gajenje većine drugih poljoprivrednih kultura ne bi bilo isplativo. Specifični agroekološki uslovi i stare biotehnologije (povećana upotreba stajnjaka, specifični sistemi obrade zemljišta itd.) daju ovom krompiru izvanredan ukus (visok sadržaj suve materije). Ipak, i niži prinosi krompira iz ove proizvodnje mogli bi se, kroz turističku uslugu, kompenzovati kroz znatno veće prodajne cijene. Iz tih razloga treba kreirati takav ambijent gdje bi se uporedo sa razvojem specifične poljoprivredne proizvodnje razvijala i specifična turistička ponuda, i obrnuto. Takođe, bilo bi poželjno da se "domaći" krompir na neki način učini drugačijim od "običnog" krompira (proizveden u konvencionalnoj poljoprivredi). To bi podrazumijevalo promociju nekih najekspresnijih genotipova (visok sadržaj suve materije, otpornost na bolesti i stresne situacije, specifična boja mesa i pokožice isl.) kao proizvoda sa zaštićenim geografskim porijeklom. Ti genotipovi bi, u isto vrijeme, bili vrlo interesantni i za organsku proizvodnju krompira na istom području.

Ključne riječi: krompir, genetički resursi, održivo korišćenje

## EFFECT OF FERTILIZATION REGIMES ON WINTER WHEAT YIELDS AND SOIL FERTILITY

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In the Republic of Serbia the impact of acid soils of arable land is over 60%. Wheat production in these soils is significantly reduced. The increasing of wheat yield on acid soils is possible by applying adequate fertilization regime (melioration and regular fertilization), as well as the growing of wheat genotypes tolerant to low pH values of these lands. The field experiment was carried out on soil type pseudogley in the Kraljevo locality, where in addition to land reclamation (lime fertilizer - 5 t ha<sup>-1</sup> and manure - 30 t ha<sup>-1</sup>) applied NPK fertilizers with different proportions of nutrients (N 120 kg ha<sup>-1</sup> pure nutrients, P- 60, 80 and 160 kg ha<sup>-1</sup> pure nutrients and K-60 and 80 kg ha<sup>-1</sup> pure nutrient). The four wheat cultivars (Pobeda, Renesansa, Planeta i Nora) were investigated. The results of investigation showed a significant effect of fertilization on soil fertility improvement of soil type of pseudogley, especially in the case when melioration's lime and manure were applied together with the regular use of NPK fertilizers. By this approach pH of soil was increased for more than 1.0 pH unit, as well content of available phosphorus (more than 3.5 mg 100 g<sup>-1</sup>), potassium (more than 1.0 mg 100 g<sup>-1</sup>) and calcium for a few tenth mg, while the content of mobile forms Al in soil decreased from 6-8 mg 100 g<sup>-1</sup> at 0.1-0.8 mg 100 g<sup>-1</sup>. Also, by application of these fertilizers in the land is reduced available forms of iron (30-50 mg kg<sup>-1</sup>), manganese (10-50 mg kg<sup>-1</sup>), copper (0.5-1.0 mg kg<sup>-1</sup>) and insignificantly zinc content. The highest grain yield of all tested cultivars of winter wheat was achieved by applying a common mineral NPK, lime and manure. Cultivar Nora had the highest yield (7:17 t ha<sup>-1</sup>) under combination of melioration's application of lime and manure in the same time of regular application of NPK fertilizers. However, on the control variant (without fertilizer) the Planeta wheat cultivar had the highest grain yield (2.12 t ha<sup>-1</sup>).

Key words: Fertilization, fertility, yield, soil, winter wheat.

## DETERMING THE PRESENCE AND REPRESENTATION OF WILD FRUIT TREES IN THE STARCEVICA FOREST PARK

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Wild fruit trees have a special importance in the context of plant genetic resources and represent a significant potential for genetic selection and breeding, creation of new varieties and rootstocks. The subject of this research is inventory, or the determination of presence and spread of wild species of apple, pear, cherry and service tree in forest park Starčevica. Determining the presence of listed wild fruit trees was done on the basis of representative samples in accordance with one of the basic methods "releve" - taking phytocoenological images on sample surfaces. Selected size of the test area (polygon) is 20 x 20 meters. The presence was determined in a total of 37 polygons. Representation of wild trees of apple, pear, cherry and service trees in the study area was determined using the standard methods of the Swiss-French phytocenological school, Braun-Blanquet's. For each fruit species abundance, cover and degree of presence were determined. On the basis of data collected from the field (GPS coordinates), the map is created. To create the map WinGIS program 2000b was used. This paper describes the characteristics of the site and associated tree species in the community. On 37 polygons in total 1134 trees were identified of which 43 wild apple trees, 27 wild pear trees, 110 wild cherry trees and 3 service trees. Other trees are forest species.

Key words: wild fruit trees, map, phytocenological records

## UTVRĐIVANJE PRISUSTVA I ZASTUPLJENOSTI SAMONIKLIH VRSTA VOĆAKA U PARK ŠUMI STARČEVICA

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Samonikle vrste voćaka imaju poseban značaj u okviru biljnih genetičkih resursa i predstavljaju značajan genetički potencijal za selekciju i oplemenjivanje, stvaranje novih sorti i podloga. Predmet ovog istraživanja je inventarizacija, odnosno utvrđivanje prisustva i zastupljenosti samoniklih vrsta jabuke, kruške, trešnje i oskoruše Park šume Starčevica. Utvrđivanje prisustva navedenih samoniklih vrsta voćaka urađena je na bazi reprezentativnih uzoraka u skladu sa jednom od osnovnih metoda "releve" - uzimanjem fitocenoloških snimaka na probnim površinama. Odabrana veličina probnih površina (poligona) iznosi 20 x 20 metara. Utvrđivanje prisustva je utvrđeno na ukupno 37 poligona. Zastupljenost samoniklih vrsta jabuke, kruške, trešnje i oskoruše na proučavanom području utvrđena je korišćenjem standardne metode švajcarsko-francuske fitocenološke škole Braun-Blanquet-a. Za svaku voćnu vrstu utvrđeni su brojnost, pokrovnost i stepen prisutnosti. Na osnovu prikupljenih podataka sa terena (GPS koordinate), izvršena je izrada karte. Za izradu karte je korišten program WinGIS 2000. U radu su prikazane karakteristike lokaliteta i pratećih drvenastih vrsta u zajednici. Na 37 poligona utvrđena su ukupno 1134 stabla od čega 43 stabla divlje jabuke, 27 stabala divlje kruške, 110 stabala divlje trešnje i 3 stabla oskoruše. Ostala stabla predstavljaju šumske vrste.

Ključne riječi: samonikle vrste voćaka, karta, fitocenološki snimak.

## SOIL FERTILITY OF FAMILY COMMERCIAL FARMS IN THE REPUBLIC OF SRPSKA

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The Ministry of Agriculture, Forestry and Water Management of Republic of Srpska was funded the program "Soil analysis of agricultural land for the purposes of commercial family farms in the Republic of Srpska" during 2014, in order to increase the quantity and quality of yield of cultivated plants per unit area. Selection of beneficiaries and parcels from the registry of family commercial farms was made based on criteria published in the Official Gazette of RS, No. 60/14, Article 55<sup>th</sup>. The planned sample number for 2014 was 3634<sup>th</sup>. Samples were taken at the prescribed procedure by representatives of the Agency for professional services in agriculture. In six regions was taken following number of samples: Prijedor 200, Gradiska 795, Banja Luka 139, Doboje 414, Bijeljina 134, Sokolac 87, Trebinje 107. A total of 1876 samples were taken, i.e. 51,6% of the planned number. Each plot was geosition and inputted data on current usage plots, the method of fertilization and average yields (15 items). The samples were analyzed on basic parameters of soil fertility: reaction (pH in H<sub>2</sub>O, 1N KCl), humus (colorimetric method - K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), physiologically active phosphorus and potassium (AL-method). The results of the analysis with all field data are entered into the GIS database from which it can perform data processing by regions or municipalities depending on the needs and requirements of the Ministry. Based on the results of soil reaction (pH in H<sub>2</sub>O and 1N KCl) it was found that the restrictions in crop production can occur in 56% of the surveyed plots (extremely acid, very acid and acid reaction in 45,4% and base reaction in 10,8% of samples). Low humus content was found in 61,4% of samples, low phosphorus content in 69,2%, a low content of potassium in 16,3% of samples. The results confirm the importance of the program funded by Ministry because it was found that soil fertility is one of the limiting factors to achieve high yields of good quality on plots of family commercial farms. Each beneficiary has received a written report with recommendations for repair of soil fertility (if necessary) and start fertilizing for two crops. The paper will be presented the results by region.

Keywords: soil, fertility, soil control, fertilization

## PLODNOST ZEMLJIŠTA PORODIČNIH KOMERCIJALNIH GAZDINSTAVA U REPUBLICI SRPSKOJ

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U cilju povećanja količine i kvaliteta prinosa gajenih biljaka po jedinici površine Ministarstvo poljoprivrede, šumarstva i vodoprivrede RS je u 2014. godini finansiralo program „Pedološke analize poljoprivrednog zemljišta za potrebe porodičnih komercijalnih gazdinstava u Republici Srpskoj“. Odabir korisnika i parcela iz registra porodičnih komercijalnih gazdinstava izvršen je po osnovu kriterijuma objavljenih u Službenom glasniku RS broj 60/14, član 55. Planirani broj uzoraka za 2014. godinu iznosio je 3634. Uzorke su po propisanoj proceduri, uzimali predstavnici Resora za pružanje stručnih usluga u poljoprivredi MPŠVRS. U šest regija uzet je sledeći broj uzoraka: Prijedor 200, Gradiška 795, Banja Luka 139, Doboj 414, Bijeljina 134, Sokolac 87, Trebinje 107. Ukupno je uzeto 1876 ili 51,6% od planiranog broja. Svaka parcela je geopozicionirana i upisani su podaci o dosadašnjem načinu korištenja, načinu đubrenja i prinosima (15 stavki). U uzorcima su izvršene analize osnovnih parametara plodnosti zemljišta: reakcija (pH u H<sub>2</sub>O, 1N KCl), humus (kolorimetrijska metoda –K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), fiziološki aktivni fosfor i kalijum (AL-metoda). Rezultati analiza sa svim terenskim podacima su unešeni u GIS bazu podataka iz koje se mogu vršiti obrade podataka po regijama ili po opštinama u zavisnosti od potreba i zahtjeva Ministarstva. Na osnovu rezultata kiselosti (pH u H<sub>2</sub>O i 1N KCl) utvrđeno je da se ograničenja u biljnoj proizvodnji mogu javiti na 56% ispitanih parcela (ekstremno, jako kisela i kisela reakcija u 45,4% i bazna reakcija u 10,8% uzoraka). Nizak sadržaj humusa je utvrđen u 61,4% uzoraka, nizak sadržaj fosfora u 69,2%, a nizak sadržaj kalijuma u 16,3% uzoraka. Dobijeni rezultati potvrđuju opravdanost sprovedenog programa Ministarstva jer je utvrđeno da je plodnost zemljišta jedan od ograničavajućih faktora postizanja dobrih i kvalitetnih prinosa na parcelama porodičnih komercijalnih gazdinstava. Svaki korisnik analize je dobio pisani izvještaj sa preporukama za popravku plodnosti zemljišta (po potrebi) i startno đubrenje za dvije poljoprivredne kulture. U radu će biti prezentovani rezultati po regijama.

Ključne riječi: zemljište, plodnost, kontrola, đubrenje

## DEVELOPMENT OF LAND CAPABILITY CLASSIFICATION SYSTEMS IN REPUBLIC OF SRPSKA HARMONISED WITH THE APPROACH IN OTHER COUNTRIES AND THE EU

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Land capability classification or productive capability and land use evaluation, has been known for centuries. Classification of land according to productive capability, with making of the appropriate maps in larger scale, especially for highly valuable land capability classes, allows to determine the best way of use for every land. Applying the geographic information systems (GIS) it is possible to make land capability classification and production of land capability maps, by the delineation of each individual land use category. To obtain land capability classes we use the data about soil, its morphological, physical and chemical properties, climate, relief, steepness slope, with respect to the correction factors, such as: rockiness and stoniness, flooding, tightness or openness of the position, exposure and opacity. Cadastral data are no longer a reliable source for calculation and assessment of possible agricultural production. Existing cadastral classes according to the plants do not offer a real insight into possibilities of exploiting the soil, nor they take care of its proper treatment, preservation and reclamation, which makes this classification one-sided or incomplete, and the role of the cadastre in the domain of the soil use and protection is insufficient. Unlike cadastral classification and typological pedological maps, categorization of soil according to its use value allows us to show relative value of each concrete soil complex and in some basic groups or categories in its practical, simple and understandable way. Land classification according to the productive ability in Republic of Srpska is in starting phase of the development. The goal of this paper is development of methods of land capability classification in Republic of Srpska, which is harmonized with approaches in other countries and the EU. The term "soil bonity", at our country, is similar to the term that is used in the USA "Land capability class" and which mens capability of soil for the agricultural production. It includes 8 classes, where first 4 classes, from I-IV are suitable for agricultural production, and last 4 classes, from V-VIII are suitable for lawns and forests. On that basis, for example, in FBH, the categorization of soils, according to their "soil bonity" was done. It's very important to know land capability classes and by knowing their participation, in certain areas, it is possible to make better plan of land use and protection of the soil resoures, as from the aspect of protection the highly valuable land classes, and from the their rational utilization, especially when it comes to changes from ecological to tehnological soil functions.

Key words: soil, resource, land capability classification, legislation.

## IZRADA METODA BONITIRANJA ZEMLJIŠTA U REPUBLICI SRPSKOJ USKLAĐENIH SA PRISTUPIMA U DRUGIM ZEMLJAMA I EU

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Bonitiranje zemljišta ili procjenjivanje proizvodne sposobnosti i upotrebne vrijednosti zemljišnog prostora poznato je vijekovima. Klasifikacija zemljišta prema proizvodnoj sposobnosti, sa izradom odgovarajućih karata u krupnijoj razmjeri, posebno za kvalitetnije bonitetne klase zemljišta, omogućuje da se svakom zemljištu odredi najbolji način njegovog korišćenja. Primjenom geografskih informacionih sistema (GIS) može se izvršiti bonitetno vrednovanje zemljišta te izraditi bonitetne karte razgraničavanjem pojedinih kategorija korišćenja zemljišta. Bonitet zemljišta se dobija na osnovu podataka za zemljište, prema njegovim morfološkim, fizičkim i hemijskim osobinama, klimu, reljef, nagib terena, uzimajući u obzir korekzione faktore, kao što su: stjenovitost i kamenitost, poplave, zatvorenost ili otvorenost položaja, ekspoziciju i zasjenjenost. Katastarski podaci nisu više pouzdan izvor za proračune i procjenu moguće poljoprivredne proizvodnje. Postojeće katastarske klase po kulturama ne pružaju stvarni uvid u mogućnosti iskorišćavanja zemljišta, niti vode računa o njegovom pravilnom tretmanu, čuvanju i popravljanju, zbog čega je ta klasifikacija jednostrana i nepotpuna, a uloga katastra u domenu korišćenja i zaštite zemljišta nedovoljna. Za razliku od katastarskog klasiranja i tipoloških pedoloških karata, kategorizacija zemljišta na osnovu njegove upotrebne vrijednosti omogućuje da se na praktičan, jednostavan i lako razumljiv način prikaže relativna vrijednost svakog konkretnog zemljišnog kompleksa i to u nekoliko osnovnih grupa ili kategorija. Klasifikacija zemljišta prema proizvodnoj sposobnosti je kod nas u početnoj fazi razvoja. Cilj rada je izrada metoda bonitiranja zemljišta u Republici Srpskoj, usklađenih sa pristupima u drugim zemljama i EU. Termin "bonitet zemljišta", u našoj zemlji, je sličan terminu koji se koristi u SAD pod nazivom "Land capability class" i koji označava sposobnost zemljišta za poljoprivrednu proizvodnju. Obuhvata 8 klasa, gdje su prve 4 klase, od I-IV, prikladne za poljoprivrednu proizvodnju, posljednje 4 klase, od V-VIII, su prikladne za travnjake i šumske kulture. Na toj osnovi je, na primjer, u FBH izvršena kategorizacija zemljišta prema njihovom bonitetu. Veoma je važno poznavanje bonitetnih klasa zemljišta i na bazi saznanja o njihovom učešću, na pojedinom području, moguće je napraviti bolji plan korišćenja i zaštite zemljišnih resursa, kako sa aspekta zaštite najvrijednijih bonitetnih kategorija, tako i njihovog racionalnog korišćenja, pogotovo kada se radi o promjenama iz ekoloških u tehničke funkcije zemljišta.

Ključne riječi: zemljište, resurs, bonitiranje, zakonska regulativa.

## THE EFFECTS OF THE CONDUCTED LAND CONSOLIDATION PROCESS IN THE BASIC CADSTRE UNIT VELIKO SREDIŠTE

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Land consolidation is a measure by which it is possible to achieve effects that will improve conditions for agricultural production with other effects on the area that is being consolidated. Besides, grouping allotments to larger parcels of proper shape, in the process of land consolidation can provide the necessary surface for planning field roads network, a network of canals for drainage or irrigation, as well as, shelterbelts. In addition, during the process of land consolidation existing property-rights issues can be solved. This paper analyzes some of the effects that are achieved during land consolidation process conducted on 4402 ha of the Basic Cadstre Unit (BCU) Veliko Središte. In the analysis, special attention was paid to ensuring the surface network of drainage canals, which protects the land of excess water and the shelterbelts network which protects the soil from the impact of wind erosion. The influence of the planned shelterbelts was determined by calculating the coefficient of ecological stability using three methods. The required spatial analyzes were performed using the Geographic Information System. Application of GIS in spatial analyzes of the BCU Veliko Središte as necessary step required establishing of an appropriate data model. As a result, the process of land consolidation provided 84 ha and 78 km of new drainage canals and 112 ha for 69 km of new shelterbelts. The planned measures increased density and improved spatial distribution non-forest greenery caused increased coefficient of ecological stability (KES1) from 0,174 to 0,205. Results obtained by investigating the effects of proposed measures are shown using GIS cartography.

Key words: Land consolidation, Geographic Information System, Drainage Canals, Shelterbelts, Coefficient of Ecological Stability





*Section 3. Agricultural Economics and Rural  
Development*

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## THE INCLUSION OF AGRO-INDUSTRY SECTOR OF THE REPUBLIC OF SRPSKA IN INTERNATIONAL INTEGRATION

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This paper presents an overview of the process of including agroindustry sector of the Republic of Srpska in international integration, whereby the first part of the paper examines the relationship or connection between the process of globalization and regionalization, globalization and transition, describes the multidimensional character of the globalization process, especially emphasizing the economic dimension, and measures the impact of economic globalization on the competitiveness of domestic economy and agroindustry sector. To measure the impact of economic globalization on the competitiveness of the economy and agroindustry sector of the Republic of Srpska are used OECD indicators: share of trade in GDP of country, propensity to export and import penetration. In the second part of paper, focus is on regional reflexion of division of world economy, which has occurred in the late 80s and 90s of the last century in the countries of the Western Balkans. As a first step in the process of regionalization of the Western Balkans region and assumptions of its approach to wider regional and global integration in the future was the liberalization of international economic relations. In trade liberalization of agricultural products at Bosnia and Herzegovina level, the Republic of Srpska took place through certain stages, in the form of signing and implementation of relevant trade agreements with CEFTA and EU countries, which have garnered significant involvement of the domestic sector in regional and European integration process.

Key words: agroindustry, globalization, regionalization, liberalization, trade agreements

## UKLJUČIVANJE AGROINDUSTRIJSKOG SEKTORA REPUBLIKE SRPSKE U MEĐUNARODNE INTEGRACIJE

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Rad predstavlja uvid u proces uključivanja agroindustrijskog sektora Republike Srpske u međunarodne integracije, pri čemu se u prvom dijelu rada ispituje odnos ili veza između procesa globalizacije i regionalizacije, te globalizacije i tranzicije, opisuje multidimenzionalni karakter djelovanja procesa globalizacije, posebno naglašavajući njegovu ekonomsku dimenziju, i mjeri uticaj ekonomske globalizacije na konkurentnost domaće ekonomije i agroindustrijskog sektora. Za mjerenje uticaja ekonomske globalizacije na konkurentnost ekonomije i agroindustrijskog sektora Republike Srpske primjenjeni su OECD indikatori: učešće trgovine u bruto domaćem proizvodu zemlje, sklonosti ka izvozu i uvozne penetracije. U drugom dijelu rada fokus je na regionalnoj refleksiji podjele svjetske ekonomije, koja se krajem 80-tih i početkom 90-tih godina prošloga vijeka javlja i na području zemalja zapadnog Balkana. Kao prvi korak u procesu regionalizacije područja zapadnog Balkana i pretpostavke njegovog pristupanja širim regionalnim i globalnim integracijama u budućnosti predstavljala je liberalizacija međunarodnih ekonomskih odnosa. Trgovinska liberalizacija agroindustrijskih proizvoda na nivou BiH, Republike Srpske se odvijala kroz određene faze, u vidu potpisivanja i primjene relevantnih trgovinskih sporazuma s zemljama CEFTA i EU, koji su obezbjedili značajnije uključivanje domaćeg sektora u regionalne i evropske integracione procese.

Ključne riječi: agroindustrija, globalizacija, regionalizacija, liberalizacija, trgovinski sporazumi

## CORPORATE GOVERNANCE AND THE PERFORMANCE OF BEVERAGE INDUSTRY IN MONTENEGRO

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During the past twenty years, Montenegro is going through a transition period. Upon completion of the process of defining the status of the property owners in the companies in parallel with the establishment of market infrastructure and the adoption of certain laws, created a good basis for the development of the system of corporate governance. This paper investigates whether some corporate governance variables- board size, institutional shareholding and power separation between board chairperson and chief executive officer have significant impact on the performance of firms in beverage sector of Montenegrin economy. The paper analyzes the influence of corporate management with special reference to the leaders of Montenegrin agro industry, the company 'Plantaže 13 Jul'. The results in this paper show the significant impact of corporate governance on the financial operations of the company.

Key words: corporate governance, beverage sector, shareholders.

## DEGREE OF CADASTER UP TO DATE AND ITS INFLUENCE ON THE AGRAR ECONOMY AND RURAL DEVELOPMENT OF THE RIBNIK MUNICIPALITY

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Cadaster of real estates is public book which represents basic evidence of real estate and legal right on estates. It contains data about: cadaster estate, buildings, special parts of buildings, and ways of use of estates, position, shape and area of estate, cadaster income, and real legal rights on real estate, right bearers and on certain restrictions. Aim of this work is to present insufficient process of updating real conditions of real estates and its handling in the cadaster which has as a consequence insufficient usage of data or its completely wrong usage due to incorrectness of data written in it in process of registration of agrarian estate. Data were collected from archives of Municipal court in Mrkonjić Grad, Republic agency for statistics, Republic office for geodetic and state-legal business of Republic of Srpska, Ministry of agriculture of Republic of Srpska, municipal office of RUGIPP Ribnik Municipality. Inspection method, combined with induction and deduction method, were used. In the Ribnik Municipality questionnaire has been done on the basis of 191 citizens. During the research, many conclusions arose simultaneously with problems. Questionnaire has shown interest of citizens for agricultural production and as one of main problems was identified cadaster of real estate on satisfactory level. More knowledge, effort and resources have to be invested in order to establish cadaster of real estates which would be functional and completely in service to the citizens.

Key words: cadaster of real estates, present state, cadaster income.

## STEPEN AŽURNOSTI KATASTRA NEPOKRETNOSTI I NJEGOV UTICAJ NA AGRARNU EKONOMIJU I RURALNI RAZVOJ OPŠTINE RIBNIK

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Katastar nepokretnosti je javna knjiga koja predstavlja osnovnu evidenciju o nepokretnostima i pravima na njima. Katastar nepokretnosti sadrži podatke o: katastarskim parcelama, zgradama, posebnim dijelovima zgrada, načinu korišćenja katastarskih parcela, položaju, obliku i površini katastarskih parcela, katastarskom prihodu, stvarnim pravima na nepokretnostima, nosiocima prava na nepokretnostima i o teretima i ograničenjima. Cilj rada je prikaz nedovoljnog vođenja računa o faktičkom stanju nepokretnosti i njihovim provođenjem kroz katastar nepokretnosti, koji za posljedicu ima korišćenje nedovoljno ili u potpunosti netačnih i nepreciznih podataka, prilikom registracije poljoprivrednih gazdinstava. Podaci su prikupljeni iz arhiva: Okružnog suda u Mrkonjić Gradu, Republičkog zavoda za statistiku, Republičke uprave za geodetske i imovinsko-pravne poslove, Ministarstva poljoprivrede Republike Srpske, opštinske službe RUGIPP Opštine Ribnik. Korištene metode su metoda pregleda u kombinaciji sa induktivnom i deduktivnom metodom. Uradjena je takođe i anketa u Opštini Ribnik koja je obuhvatila mišljenja 191 građanina. Prilikom istraživanja, nametali su se mnogi zaključci paralelno sa problemima na koje se nailazilo. Anketa je pokazala zainteresovanost građana za poljoprivrednu proizvodnju, a kao jedan od glavnih problema ne angažovanja u poljoprivredi pokazao se, između ostalih i katastar nepokretnosti koji nije na zavidnom nivou. Treba se još mnogo truda, znanja i finansija uložiti da se uspostavi katastar nepokretnosti koji bi bio funkcionalan i u potpunosti u službi građana.

Ključne riječi: katastar nepokretnosti, faktičko stanje, katastarski prihod.

## ANALYSIS OF AGGREGATE BUDGETARY SUPPORT TO AGRICULTURE (PSEB) IN THE REPUBLIC OF SRPSKA

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The subject of research in this paper is the analysis of aggregate budgetary support to agricultural producers (PSE<sub>b</sub>) in the Republic of Srpska for the period 2000-2013. Budgetary transfers to producers beside market price support (MPS) represent second type of transfer for calculation of PSE indicator. Analysis of aggregate budgetary support to producers was done on the basis of criteria of implementation and on the degree of commodity specificity according to data on realized budgetary support of the competent ministry. The research results in this paper indicate that in according to first criteria in the structure PSE<sub>b</sub> dominated are payments based on output (A2) and according to second criteria Producer Single Commodity Transfer (SCT). The calculation of budgetary transfers PSE indicator served for understanding the structure of market-price policy measures, as well as measures of structural policy and rural development within agricultural policy of the Republic of Srpska. In addition, for the level of the Republic of Srpska in this work is calculated another form of PSE<sub>b</sub>, expressed per unit area of agricultural land (PSE<sub>b</sub>/ha).

Key words: budgetary support to agricultural producers, agricultural policy, Republic of Srpska

## ANALIZA AGREGATNE BUDŽETSKE PODRŠKE POLJOPRIVREDNIM PROIZVOĐAČIMA (PSEB) U REPUBLICI SRPSKOJ

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Predmet istraživanja u ovom radu je analiza agregatne budžetske podrške poljoprivrednim proizvođačima (PSE<sub>b</sub>) u Republici Srpskoj za period od 2000 – 2013. godina. Budžetski transferi proizvođačima pored cjenovne podrške tržištu (MPS) predstavljaju drugu vrstu transfera za izračunavanje PSE indikatora. Analiza agregatne budžetske podrške proizvođačima je urađena na osnovu kriterijuma implementacije i stepena specifičnosti proizvoda, prema podacima o realizovanim budžetskim podsticajima nadležnog ministarstva. Rezultati istraživanja u radu ukazuju da su prema prvom kriterijumu u strukturi PSE<sub>b</sub> dominirala plaćanja na bazi obima proizvodnje (A.2), a drugom pojedinačna plaćanja za proizvode (SCT). Izračunavanje budžetskih transfera PSE indikatora poslužilo je i za sagledavanje strukture mjera tržišno – cjenovne politike i mjera strukturne politike i ruralnog razvoja u okviru agrarne politike Republike Srpske. Pored toga, za nivo Republike Srpske u radu je izračunat i drugi oblik PSE<sub>b</sub>, izražen po jedinici površine poljoprivrednog zemljišta (PSE<sub>b</sub>/ha).

Ključne riječi: budžetska podrška poljoprivrednim proizvođačima, agrarna politika, Republika Srpska

## FINANCIAL POSITION ANALYSIS OF AGRICULTURAL ENTERPRISES IN REPUBLIC OF SRSPKA

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Financial position of enterprises can be good, acceptable and bad depending on the status of short-term and long-term financial balance (liquidity), indebtedness, solvency, maintenance of real equity value and reproduction capability. For the purpose of financial position analysis of agricultural industry in Republic of Srpska, this text focuses on the most important indicators of financial position which can be produced from the available financial statements. The analysis encompasses agricultural enterprises registered as companies (stock holding companies, limited liabilities companies, agricultural cooperatives, etc.) from 2010 to 2012 (approximately 300 companies). Results of financial position analysis based on the indicators such as financial balance (liquidity), indebtedness and solvency show that the agricultural industry in Republic of Srpska in general, observed as one entity, has acceptable financial position. This means that the industry as whole meets the requirements of short-term financial balance, partially long-term financial balance, acceptable level of indebtedness (approximately 60%) and good level of solvency. However, 72% of total enterprises has no short-term liquidity, 50% of them has no long-term liquidity, 63% of enterprises has more than 50% of financial sources financed through debt, and 66% of them is insolvent from the banking sector point of view. Therefore, it can be concluded that majority of agricultural companies' financial position is between acceptable and bad. Limiting factor of this analysis is that it does not include farms which are main pillars of agricultural production in Republic of Srpska. Nevertheless, unacceptable financial position of majority of agricultural companies in Republic of Srpska indicates that the whole industry has financial problems and needs systematic measures for overcoming the causes of such position and improving not only financial but the whole economic position of agriculture as industry.

Key words: position, agriculture, liquidity, indebtedness, solvency

## FINANSIJSKA ANALIZA POLOŽAJA PREDUZEĆA IZ POLJOPRIVREDNOG SEKTORA REPUBLIKE SRPSKE

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Finansijski položaj preduzeća može biti dobar, prihvatljiv i loš, što zavisi od stanja kratkoročne i dugoročne finansijske ravnoteže, zaduženosti, solventnosti, održavanja realne vrijednosti sopstvenog kapitala i reprodukcione sposobnosti. U svrhu ocjene finansijskog položaja preduzeća iz poljoprivrednog sektora Republike Srpske, u ovom radu su posmatrani najznačajniji parametri finansijskog položaja koji se mogu utvrditi na osnovu raspoloživih finansijskih izvještaja. Istraživanjem su obuhvaćena preduzeća iz poljoprivrednog sektora koja su registrovana kao privredna društva u periodu od 2010-2012. godine (u prosjeku 300 privrednih društava). Rezultati analize finansijskog položaja, do kojih se došlo na osnovu parametara finansijska ravnoteže, zaduženosti i solventnosti, pokazali su da poljoprivredni sektor Republike Srpske u prosjeku, kada bi se posmatrao kao zaseban subjekt, ima prihvatljiv finansijski položaj, što podrazumijeva: postojanje kratkoročne finansijske ravnoteže, ali bez postojanja dugoročne finansijske ravnoteže za polovinu sektora, prihvatljiv stepen zaduženosti (oko 60%), te zadovoljavajuću solventnost. Međutim, ako uzmemo u obzir da 2/3 ukupnog broja preduzeća iz poljoprivrednog sektora nema ispunjen uslov kratkoročne finansijske ravnoteže, da polovina preduzeća nema ostvarenu dugoročnu finansijsku ravnotežu, da je kod 63% preduzeća struktura izvora finansiranja pomjerena ka tuđim izvorima, te da 66% od ukupnog broja preduzeća nije solventna sa aspekta bankarskog sektora, ocjena finansijskog položaja se pomjera na niže i on bi se mogao procijeniti na granici između prihvatljivog i lošeg za većinu preduzeća. Ograničenost analize se ogleda u tome da su njoj podvrgnuta samo privredna društva iz poljoprivrednog sektora Republike Srpske (ad, doo, zadruge i sl.), dok su nosioci većeg dijela poljoprivredne proizvodnje u Republici Srpskoj zapravo poljoprivredna gazdinstva koja nisu predmet ove analize. Ipak, nezadovoljavajući finansijski položaj većine privrednih društava iz poljoprivrednog sektora Republike Srpske ukazuje na problem poljoprivredne grane kao cjeline, te zahtjeva sistematske mjere za otklanjanje uzroka ovakvog položaja i jačanje kako finansijskog tako i cjelokupnog ekonomskog položaja poljoprivredne djelatnosti.

Ključne riječi: položaj, poljoprivreda, ravnoteža, zaduženost, solventost

## FOOD SELF-SUFFICIENCY OF THE REPUBLIC OF SRPSKA

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Bosnia and Herzegovina has a moderate population density and it is relatively rich in agricultural land per capita. Despite that, BaH was and still is significant food importer and for years has had a negative balance in foreign trade of agricultural and food products. Within the Bosnia and Herzegovina, the Republic of Srpska is in better position because it is under populated and has more arable land compared other entity. The aim of this paper is to give an answer to the question whether the Republic of Srpska overfeed itself? In answering this question were used methods of balancing, calculations and scenarios. Balance of needs (demand) of the Republic of Srpska population is segmented to some agricultural and food products in according to data on average annual consumption from the households budget surveys (data are available for 2004, 2007 and 2011). The annual demand is determined by multiplying the number of population and the average per capita consumption of a particular product. Balance of production (supply) of certain agricultural and food products is determined coming from the statistical data on the quantity of their production, with the recalculation to the net quantity of the basic product, where it was needed. Partial coefficient of food self-sufficiency is calculated as the ratio of domestic production and consumption for each selected product separately. Due to fluctuation in annual food production and consumption coefficient of food self-sufficiency was calculated for three scenarios – basic, based of scope of production in 2013 and scope of consumption in 2011, more favourable (optimistic), based on minimal consumption and maximal production in the last 10 years, and less favourable (pessimistic), based on maximal consumption and minimal production in the last 10 years. The research results show that the Republic of Srpska in most fruits and vegetables has own production sufficient to satisfy the needs of its population. The same applies for milk, eggs, beef, sheep and pork meat. Deficit is present in wheat and poultry and fish meat. In spite of that, reason way are imported significant quantities of food is at a low rate of marketability and processing of domestic raw materials of agricultural origin. On an side they are losing already produced agricultural products or, in some cases, used it as animal feed, while on the other side are imported food products produced from raw materials outside of BiH.

Key words: food production, food consumption, food self-sufficiency.

## PREHRAMBENA SAMODOVOLJNOST REPUBLIKE SRPSKE

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Bosna i Hercegovina ima umjerenu gustinu naseljenosti i relativno je bogata poljoprivrednim površinama po glavi stanovnika. Usprkos tome, BiH je bila i ostala značajan uvoznik hrane i godinama ima negativan saldo u spoljnotrgovinskoj razmjeni poljoprivrednih i prehrambenih proizvoda. U okviru Bosne i Hercegovine Republika Srpska je u povoljnijem položaju jer je rjeđe naseljena, a ima više obradivog zemljišta u odnosu na drugi entitet. Cilj ovog rada je da dá odgovor na pitanje može li Republika Srpska sama sebe (pre)hraniti? U traženju odgovora na postavljeno pitanje korišćene su metode bilansiranja, kalkulacija i scenarija. Bilans potreba (tražnje) stanovništva Republike Srpske raščlanjen je na pojedine poljoprivredne i prehrambene proizvode u skladu sa podacima o prosječnoj godišnjoj potrošnji iz Ankete o potrošnji domaćinstava (dostupni su podaci anketa za 2004, 2007. i 2011. godinu). Godišnja potreba utvrđena je množenjem broja stanovnika i prosječne potrošnje određenog proizvoda po stanovniku. Bilans proizvodnje (ponuda) pojedinih poljoprivrednih i prehrambenih proizvoda utvrđen je polazeći od statističkih podataka o obimu njihove proizvodnje, uz preračunavanje na neto količinu osnovnog proizvoda, tamo gdje je to bilo potrebno. Parcijalni koeficijent prehrambene samodovoljnosti je računat kao odnos domaće proizvodnje i potrošnje za svaki odabrani proizvod posebno. Zbog oscilacija u godišnjoj proizvodnji i potrošnji, koeficijent prehrambene samodovoljnosti računat je za tri scenarija – osnovni, na bazi obima proizvodnje iz 2013. i potrošnje iz 2011. godine, povoljniji (optimističan), na bazi najmanje potrošnje i najveće proizvodnje u zadnjih 10 godina, i nepovoljniji (pesimističan), na bazi najveće potrošnje i najmanje proizvodnje u zadnjih 10 godina. Rezultati istraživanja pokazuju da Republika Srpska kod većine voćnih i povrtarskih vrsta ima vlastitu proizvodnju dovoljnu da podmiri potrebe njenog stanovništva. Isto važi za mlijeko, jaja, goveđe, ovčije i svinjsko meso. Deficit je prisutan kod pšenice i mesa peradi i ribe. Razlog zašto se i pored toga uvoze značajne količine hrane je nizak stepen tržišnosti i prerade domaćih sirovina poljoprivrednog porijekla. Na jednoj strani propadaju već proizvedeni poljoprivredni proizvodi ili se, u pojedinim slučajevima, koriste kao stočna hrana, dok se na drugoj strani uvoze prehrambeni proizvodi proizvedeni od sirovina proizvedenih izvan BiH.

Ključne riječi: proizvodnja hrane, potrošnja hrane, prehrambena samodovoljnost.

## CLUSTERS AS A FACTOR OF SERBIAN ENCLAVES SUBSISTENCE IN KOSOVO

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The agricultural holdings within Serbian enclaves in Kosovo, represent a backbone of subsistence, development and the return of displaced Serbian population. Authors observation method and the method of analysis considers the current economic functioning of agricultural producers, and the method of synthesis in the paper provide a solution to agricultural farms survive in the Albanian environment need to join together to form clusters and contribute to the harmonious development of the enclave and to be the drivers of overall economic prosperity of the Serbian population Kosovo. By means of cluster forming, operating expenses of agricultural holdings would have decreased, throughout consolidated procurements, joint shipments and joint market appearance. That would lead toward connection of the production, education, science (Faculty of Agriculture-Lesak) and the fulfillment of necessary precondition for agricultural development, joint work on innovations, access to new skills and knowledge, support for the partnership, development of marketing strategy, and the branding of products. By cluster development approach, wider economic and social interests of Serbian community would have achieved, from increased employment in rural areas and stimulation of young people to stay in Kosovo, to improvement of agricultural production, environmental protection, and other issues in rural areas.

Key words: agricultural production, local economic development.

## KLASTERI KAO FAKTOR OPSTANKA SRPSKIH ENKLAVA NA KOSOVU

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Poljoprivredna gazdinstva u srpskim enklavama na Kosovu predstavljaju okosnicu opstanka, razvoja i povratka raseljenog srpskog življa. Autori metodom posmatranja i metodom analize sagledavaju trenutno ekonomsko funkcionisanje poljoprivrednih proizvođača, a metodom sinteze u radu daju rešenje da bi poljoprivredna gazdinstva opstala u Albanskom okruženju treba da se udruže u vidu klastera i doprinesu skladnijem razvoju enklava i da budu pokretač ukupnog ekonomskog prosperiteta srpskog stanovništva na Kosovu. Putem formiranja klastera snizili bi se troškovi poslovanja poljoprivrednih gazdinstva, preko objedinjenih nabavki, zajedničkih isporuka i zajedničkog nastupa na tržištu. Došlo bi do povezivanja proizvodnje, obrazovanja, nauke (Poljoprivredni fakultet Lešak) i ispunjenja neophodnog uslova poljoprivrednog razvoja i podsticaja, zajednički rad na inovacijama, pristup novim veštinama i znanjima, podrška za partnerstvo, razvoj marketing strategije i brendiranje proizvoda. Razvojem klastera ostvaruju se širi ekonomski, socijalni i opšti društveni interesi srpske zajednice od povećanja zapošljavanja u seoskim sredinama, stimulacija mladih ljudi za ostanak na Kosovu, do unapređenja poljoprivredne proizvodnje i očuvanja životne sredine kao i drugih aspekata u ruralnim sredinama.

Ključne reči: poljoprivredna proizvodnja, lokalni ekonomski razvoj.

## IMPORTANCE OF FAMILY FARMS FOR DEVELOPMENT OF LOCAL COMMUNITIES IN THE NORTHERN AND MOUNTAINOUS AREAS OF MONTENEGRO

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Agricultural farms are fundamental subjects of agricultural development. According to the last Agricultural Census 2010, the number of family farms is 48824, and that number is 13% higher in comparison to the Census of Population and Housing, which was conducted in 2003. Total population in Montenegro between these two censuses (2003 and 2011) increased by 1.3%, while participation of the agricultural population in the total number increased from 5.3% to 7.5 %. This paper presents a socio - demographic analysis of family farms in six municipalities of north mountainous areas of Montenegro. The analysis indicates that the number of family farms decreased in some municipalities, for example Pljevlja and Žabljak by circa 12.71 % in comparison to 2003, while in some others increased, for example Kolašin by 38.68 % in comparison to 2003. Also, the conducted analysis of farms holders indicates that in Pljevlja is the largest participation of retired people – 38.91 % and the lowest of children, pupils and students, while in Kolašin is the largest participation of farmers and it is about 40%. According to the educational level, municipality of Pljevlja has the largest participation of family farms holders - with primary education about 31%, a similar situation is in Kolašin and their participation is on the level of 32%. The paper presents agricultural family farms, according to the used agricultural land. The main characteristic of an ownership structure on farms in six observed municipalities is greatly fragmented, as well as a significant participation of farms whose possession is less than 3 ha. The potential that farms have in local communities in the north - mountainous areas of Montenegro is significant and it allows their members to be involved in agriculture and have influence on the development and modernization of the local communities. Agricultural production in the future should play a significant role in rural development, because the number of possibilities for food production and greater employment opportunities are increasing.

Key words: local community, agricultural farms, north – mountainous area

## LIFE CYCLE OF COMPANIES - CASE STUDY "SLAVNIĆ LLC"

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Small and medium enterprises (SMEs) are the engine of economic development of any country. Their role is particularly important in the transition countries which are faced with problems of high unemployment, low level of economic activity, lack of competition and lack of investment. All small and medium-sized enterprises are going through different stages of development during its life cycle. There are several theories about the life cycle of enterprises that are partially matched, but it is considered that a special place among them occupies Adize's theory of life cycle of the firm, because it is so far the most comprehensive, detailed elaborated and supported by a host of authentic examples and successfully applied in the territory of the Republic of Serbian as diagnostic tool and guide for the solution of many organizational problems, including a complete reorganization of the firm may. The aim of the research was to determine the phase of the life cycle of enterprises by the aforementioned methodology, as well as identification of problems to be solved in the coming period in order to avoid a critical phase in the development of enterprises. The empirical part consisted of collecting data about the company Slavnić LLC. Data were collected through interviews of business owners. The interview consisted of 30 questions that were related to the life cycle of the company. During the research period the company is in the process of stability, has a secure position in the market and there are no signs in the company that would reflect the aging of the company or, at worst, to his death.

Key words: small and medium enterprises, the life cycle of the company, a case study

## MARKET ANALYSIS OF MEDICINAL AND AROMATIC PLANTS IN SERBIA

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The market of medicinal and aromatic plants (MAP) in Serbia is in the growth. The turnover in this market comes from medicinal raw material and plant products. The specificity of this market is the presence of various factors: pickers (collectors), growers of cultivated plants (agricultural farms), a private company registered for various activities, such as: growing, purchasing, processing, transport of MAP and berries, manufacturing of dietary supplements, manufacturing of pharmaceutical products, production and trade of medicinal plants and essential oils, tea growers, wholesalers, retailers, importers of dietary products, consumers and others. To improve the market it is necessary to undertake a variety of organizational, economic and legal measures, and involve various stakeholders (government institutions, companies from MAP sector, non-governmental and international organizations, individuals, etc.). In addition to weak connections with MAP stakeholders in the sector, there is no connection either with other industries, especially the agricultural sector. Therefore it is necessary to develop MAP sector and to integrate it into the national agricultural development strategy, to develop regional projects for sustainable production and commercialization of medicinal plants and in certain farms to change the structure of production in favor of medicinal plants, to specialize production in companies, to educate people, better horizontal and vertical connection of stakeholders, to use the institutional support of state (financial and regulatory plan) as well as motivate investors (domestic and foreign) to invest in the MAP sector.

Key words: medicinal and aromatic plants, market organization.

## ANALIZA TRŽIŠTA LEKOVITOG I AROMATIČNOG BILJA U SRBIJI

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Tržište lekovitog i aromatičnog bilja u Srbiji je u fazi razvoja. Promet na ovom tržištu čine lekovite biljne sirovine i biljni proizvodi. Specifičnost ovog tržišta je prisustvo različitih aktera: berači (sakupljači), proizvođači gajenog bilja (poljoprivredna gazdinstva), privatna preduzeća registrovana za različite delatnosti, kao što je: gajenje, otkup, prerada, promet LAB-a i šumskih plodova, proizvodnja dijetetskih suplemenata, predmeta opšte upotrebe i medicinskih sredstava, proizvodnja farmaceutskih proizvoda, proizvodnja i promet lekovitog bilja i etarskih ulja, proizvođači čajeva, veleprodaja, maloprodaja, uvoznici dijetetskih proizvoda, potrošači i dr. Za unapređenje tržišta potrebno je preduzeti različite organizacione, ekonomske i zakonske mere, i uključiti različite interesne grupe (državne institucije, preduzeća iz LAB sektora, nevladine i međunarodne organizacije, pojedince itd.). Pored slabe povezanosti aktera u LAB sektoru, ne postoji povezanost ni sa ostalim privrednim granama, pogotovu sa agrarnim sektorom. Iz tog razloga potrebno je razvoj LAB sektora integrisati u nacionalnu strategiju razvoja poljoprivrede, izraditi regionalne projekte za održivu proizvodnju i komercijalizaciju lekovitog bilja, na pojedinim gazdinstvima promeniti strukturu proizvodnje u korist lekovitog bilja, izvršiti specijalizaciju proizvodnje u preduzećima, vršiti edukaciju stanovništva, bolje horizontalno i vertikalno povezivanje aktera, koristiti institucionalnu podršku države (na finansijskom i regulativnom planu) kao i motivisati investitore (domaće i strane) da ulažu u LAB sektor.

Ključne reči: lekovito i aromatično bilje, tržište, organizacija.

## PROJECT FINANCING IN AGRICULTURE

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In a market economy, three models of financing capital investments can be used: public (government) financing, private financing and mixed financing. Under certain conditions, a mixed financing model often represents a public-private partnership, where two levels of partner cooperation become obvious: strategic and operational. Project financing, which is most often used in a mixed model of financing, is characterized by a need for further financial analysis of the grade of profitability and the risk of the investment, while including other specific criteria (the criteria for social responsibility, local or regional impact of the project, etc.). Unlike other forms of investment, project financing is based on the expectation that the return of the investment will be secured from the income rejected by the financed project. At the same time, the property of the project represents the guarantee of payment, with a dispersion of risk for all the project participants. With this, the role and importance of all the participants of an investment is redefined, compared to the traditional debtor-creditor relationship. In economy, project financing can have a special role, considering that the investors are often not creditworthy for classical forms of financing, or cannot efficiently manage the considerable risks of the project. The paper investigates possibility for implementation of project financing in agriculture, with emphasis on risk management in all project phases. Based on analysis of theoretical research in this domain, as well as practical examples, it can be concluded that project financing in agriculture has significant limitations, especially on possibilities of risk distribution to all project participants as a postulate of successful implementation of this model.

Key words: investments, project financing, risk, agriculture

## PROJEKTNO FINANSIRANJE U POLJOPRIVREDI

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U tržišnoj privredi se koriste tri modela finansiranja kapitalnih investicija: javno (državno) finansiranje, privatno finansiranje i mješovito finansiranje. Pod određenim uslovima, mješovito finansiranje često predstavlja neki od modela javno–privatnog partnerstva, gdje do izražaja dolazi saradnja partnera na dva nivoa, strateškom i operativnom. Projektno finansiranje, koje se najčešće koristi u mješovitom modelu finansiranja, karakteriše potreba za detaljnim finansijskim analizama ocjene rentabilnosti i rizičnosti investicije, uz uključivanje i drugih specifičnih kriterijuma (kriterijumi društvene odgovornosti, lokalni ili regionalni značaj projekta i sl.). Za razliku od drugih vrsta finansiranja, projektno finansiranje se zasniva na očekivanju da se povrat uložениh sredstava obezbijedi iz prihoda koje odbacuje finansirani projekat. Istovremeno, imovina projekta predstavlja garanciju otplate, uz disperziju rizika na sve učesnike u projektu. Ovim se redefiniše uloga i značaj svih učesnika investicionog poduhvata u odnosu na tradicionalni dužničko – povjerilački kreditni odnos. Posebno važnu ulogu projektno finansiranje može imati u poljoprivedi, s obzirom da ulagači često nisu kreditno sposobni za klasične oblike finansiranja, ili ne mogu efikasno upravljati značajnijim rizicima projekta. U radu je istražena mogućnost primjene projektnog finansiranja u poljoprivedi, sa naglaskom na značaj upravljanja rizicima u svim fazama projekta. Na osnovu analize teoretskih istraživanja iz ove oblasti, kao i primjera iz prakse, zaključuje se da projektno finansiranje u poljoprivedi ima značajna ograničenja, posebno po pitanju mogućnosti raspodjele rizika na sve učesnike u projektu kao preduslova uspješne primjene ovog modela.

Ključne riječi: investicije, projektno finansiranje, rizici, poljoprivreda.





*Section 4. Animal Sciences*

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## CHEESE YIELD AND CHEESE ABATEMENT

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Milk processing makes its completion in a new product which ensures a higher income to those engaged in this activity. Today, the cheese production is becoming increasingly important especially at the small family farms and this production enables them to secure their livelihood. Milk as the main ingredient has a major role in the process of making the cheese. First of all, this implicates the main components of milk which are casein and milk fat. Cheese yield is influenced by many factors and it is a result of very complex processes, and some of them interact. Due to often primitive or not enough modern technical equipment in the dairy, unequal and lack of professional qualifications, lack of standards, and so on, the harmonization of these factors is not easily solvable problem in our country. Considering everything mentioned, to achieve a high and constant yield of cheese is much more difficult. Cheese yield can be defined as the quantity of cheese (kg) produced out of 100 kg of milk for processing, meaning the milk contained in the container. Another definition says that the cheese yield indicates the amount of milk (kg) required or used to produce one kilo of cheese. The mass loss of cheese during ripening, which is called cheese abatement, is one of the factors of utilization of raw materials (milk), i.e. the yield of cheese. According to this definition, a different name for the cheese yield is yield. This loss of mass in cheese is made under the influence of mechanical procedures which take place during the care and ripening, and primarily as a result of continuous processes that take place between the cheese and its environment where it is ripening. Cheese abatement represents a loss under the influence of various factors, both internal and external.

Keywords: milk, cheese yield, cheese

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Prerada mlijeka čini njegovu finalizaciju u jedan novi proizvod, koji omogućuje veći profit onome koji se bavi ovom djelatnošću. Proizvodnja sira u današnje vrijeme sve više dobija na važnosti naručito kod manjih obiteljskih gospodarstava i omogućuje im da si osiguraju egzistenciju. Mlijeko kao osnovni sastojak igra veliku ulogu u procesu stvaranja sira. Tu prije svega mislimo na sastavne dijelove mlijeka, kazein i mliječna mast. Na randman sira ima utjecaja više čimbenika i on je rezultat vrlo složenih procesa, s tim da neki od njih djeluju uzajamno. Zbog često primitivne ili nedovoljno suvremene tehničke opremljenosti u sirani, neizjednačenih i nedovoljnih stručnih kvalifikacija, nedostatak standarda, itd. usklađivanje tih činitelja kod nas nije lako riješiv problem. Zbog svega navedenog postizanje visokih i konstantnih randmana sireva znatno je otežano. Randman sira se može definirati kao količinu sira (kg) proizvedenog iz 100 kg mlijeka za sirenje, odnosno mlijeka koji se nalazi u kotlu. Druga definicija kaže da je randman sira označava količinu mlijeka (kg) potrebnog ili utrošenog za proizvodnju jednog kg sira. Gubitak mase sira tijekom zrenja, koji se naziva kalo, jedan je čimbenika iskorištenja osnovne sirovine – mlijeka, tj. prinos sira. Po ovoj definiciji drugi naziv za randman sira je prinos. Ovaj gubitak mase u siru nastaje pod uticajem mehaničkih postupaka tijekom njege i zrenja, a prvenstveno kao posljedica kontinuiranih procesa koji se odvijaju između sira i njegove okoline gdje se odvija zrenje. Sam kalo predstavlja gubitak pod dejstvom različitih utjecaja, kako unutrašnjih tako spoljašnjih.

Ključne riječi: mlijeko, randman, sir

## HYGIENIC SCORE OF THE PRODUCTION PROCESS ON THE FARM AND ITS RELATIONSHIP WITH THE PARAMETERS OF QUALITY OF RAW MILK

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The aim of study was to investigate a relationship between hygienic score of the production process on the farm and parameters of quality of raw milk (somatic cell count, SCC and total number of microorganisms,). Total of 25 surveyed farms were divided into three groups (group A, n=5, large farms; groupB, n=10, small farms, and groupC, n=10, individual producers). Values of hygienic score of production process were determined by questionnaires given in the work, and the values of SCC and total number of microorganisms by using Fossomatic™ Minor and Bactoscan™TC50 (Foss, Denmark). Average values of hygienic score were the highest on the group A farms (88.25±3.68points, score verygood, 4/5), and the lowest on farms from GroupC (55.67±4.94points, score unsatisfying, 1/5). SCC was significantly higher on farms from group C compared to ones from groups A and B (505027±89990 vs. 167728±35780, p<0.05, and 236045±38712, p<0.01, respectively). The total number of microorganisms in the tested milk samples was highest on Group C farms (207786±74859), and the lowest in ones from the group B farms (90423±14828). Results of this study indicate a significant effect of regular implementation of hygienic measures in the production process on the parameters of quality of raw milk.

Key words: milk, hygienic score, quality of raw milk

## HIGIJENSKI SKOR PROIZVODNOG PROCESA NA FARMI I NJEGOV ODNOS SA PARAMETRIMA KVALITETA SIROVOG MLIJEKA

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Cilj rada bio je da se ustanovi povezanost rezultata higijenskog skora proizvodnog procesa na farmi i parametara kvaliteta sirovog mlijeka (broj somatskih ćelija i ukupni broj mikroorganizama). Vrijednost higijenskog skora proizvodnog procesa na ukupno 25 ispitanih farmi podijeljenih u tri grupe (grupa A, n=5, velike farme; grupa B, n=10, manje farme, i grupa C, n=10, individualni proizvođači) ustanovljena je uz pomoć upitnika datog u radu, a vrijednosti broja somatskih ćelija i ukupnog broja mikroorganizama uz pomoć aparata Fossomatic™ Minor i Bactoscan™ TC50. Prosječne vrijednosti higijenskog skora bile su najviše na farmama grupe A (88.25±3.68 poena, ocjena vrlo dobar), a najniže na farmama grupe C (55.67±4.94 poena, ocjena ne zadovoljava). Broj somatskih ćelija bio je statistički značajno viši na farmama grupe C u odnosu na grupe A i B (505027±89990 naprema 167728±35780, p<0,05, odnosno 236045±38712, p<0,01). Ukupan broj mikroorganizama u ispitanim uzorcima mlijeka bio je najviši na farmama grupe C (207786±74859), a najniži na farmama grupe B (90423±14828). Rezultati ovog istraživanja ukazuju na značajan uticaj redovnog sprovođenja higijenskih mjera u procesu proizvodnje na parametre kvaliteta sirovog mlijeka.

Ključne riječi: mlijeko, higijenski skor, kvalitet mlijeka

## ANALYSIS OF THE VIEWS OF CITIZENS IN RELATION TO ANIMAL POISONING

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The poisoning of animals is one of the top issues that owners of animals are faced with. The method the poisoning of animals can be intentional or unintentional. In most cases the poisoning of animals is unintentional. The main culprit is the owner of the animal that is careless in the use of chemical, toxic substances or plants that are later ingested by the animals. Deliberate poisoning on the other hand, is caused by people who intentionally poison the food of the animals. In R. Macedonia in January 2008 came into force the Law on Veterinary Health and the Law on Protection and Welfare of Animals (Official Gazette, No.113/2007) in which, among other things, minimum requirements are laid down for veterinary health, protection and animal welfare in various aspects among which is the poisoning of animals. The purpose of this research is to make a comparative analysis of the views of citizens who own animals and those who do not regarding poisoning. The research was conducted in 2014. According to the obtained results it can be concluded that there is a difference in the views between the owners of pets (80% are against the poisoning of animals) and those who are not owners (40% are against the poisoning of animals). From the conducted research we can conclude that there is a need for greater education of the population, especially for those who are not owners of domestic animals with regard to the poisoning of animals, as well as familiarization of the existence and functioning of the Law on the Protection and Welfare of animals in R. Macedonia.

Keywords: poisoning, welfare, owners of animals.

## HYGIENIC SCORE OF THE PRODUCTION PROCESS ON THE FARM AND ITS RELATIONSHIP WITH THE CHEMICAL COMPOSITION OF RAW MILK

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The aim of study was to investigate relationship between hygienic score of the production process on the farm and the chemical composition of raw milk (concentrations of milk fat, protein, lactose and total dry matter). Total of 25 surveyed farms were divided into three groups (group A, n=5, large farms; group B, n=10, small farms, and group C, n=10, individual producers). Values of hygienic score of production process were determined by questionnaires given in the work, and the values of parameters of the chemical composition of raw milk on Milcoscan<sup>TM</sup>FT120 (Foss, Denmark). Average values of hygienic score were the highest on the group A farms (88.25±3.68 points, score very good, 4/5), and the lowest on farms from Group C (55.67±4.94 points, score unsatisfying, 1/5). The concentrations of milk fat, protein and total dry matter were higher on farms with higher hygienic score, while in the concentration of lactose no relation to the values of hygienic score were found. Statistically significant differences were found for the milk fat concentration between farms from groups A and C (4.20±0.06 vs. 3.94±0.04%, p<0.01) and total dry matter content between all tested groups (A:B, 14.87±0.45 vs. 13.80±0.32%, p<0.05; A:C, 14.87±0.45 vs. 13.14±0.18%, p<0.001; B:C, 13.80±0.32 vs. 13.14±0.18%, p<0.05). Results of this study confirmed the beneficial effect of regular and full implementation of hygienic measures on the parameters of the chemical composition of raw milk, and thus its quality and purchase price.

Key words: milk, hygienic score, chemical composition

## HIGIJENSKI SKOR PROIZVODNOG PROCESA NA FARMI I NJEVOV ODNOS SA HEMIJSKIM SASTAVOM SIROVOG MLIJEKA

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Cilj rada bio je da se ustanovi povezanost rezultata higijenskog skora proizvodnog procesa na farmi i parametara hemijskog sastava sirovog mlijeka (koncentracije mliječne masti, proteina, laktoze, ukupne suve materije). Vrijednost higijenskog skora proizvodnog procesa na ukupno 25 ispitanih farmi podijeljenih u tri grupe (grupa A, n=5, velike farme; grupa B, n=10, manje farme, i grupa C, n=10, individualni proizvođači) ustanovljena je uz pomoć upitnika datog u radu, a vrijednosti parametara hemijskog sastava sirovog mlijeka uz pomoć aparata Milcoscan<sup>TM</sup> FT120 (Foss, Danska). Prosječne vrijednosti higijenskog skora bile su najviše na farmama grupe A (88.25±3.68 poena, ocjena vrlo dobar), a najniže na farmama grupe C (55.67±4.94 poena, ocjena ne zadovoljava). Koncentracije mliječne masti i proteina, te sadržaj ukupne suve materije bile su više na farmama sa višim higijenskim skorom, dok je koncentracija laktoze nije pokazivala odstupanja u vezi sa vrijednostima higijenskog skora. Statistički značajne razlike ustanovljene su za koncentraciju mliječne masti na farmama grupe A i C (4,20±0,06 naprema 3,94±0,04%, p<0,01) i sadržaj ukupne suve materije između svih ispitanih grupa (A:B, 14,87±0,45 naprema 13,80±0,32%, p<0,05; A:C, 14,87±0,45 naprema 13,14±0,18%, p<0,001; B:C, 13,80±0,32 naprema 13,14±0,18%, p<0,05). Rezultati ovog istraživanja ukazuju na pozitivan uticaj redovnog i potpunog sprovođenja higijenskih mjera na parametre hemijskog sastava sirovog mlijeka, a time i njegov kvalitet i otkupnu cijenu.

Ključne riječi: mlijeko, higijenski skor, hemijski sastav

POSSIBILITY OF ASSESMENT OF THE TOTAL LENGTH OF  
WILD BOAR (*Sus scrofa* L.) TUSKS BASED ON THE VISIBLE  
PART OF THE TUSKS

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Trophies (tusks) of 43 wild boars were measured in order to obtain total length of honors and rippers and mean length of visible (protruding) part of the tusks. It was determined that mean length of the protruding part of the left ripper is 30.36% of total length and of the right ripper, 33,67%, and that there is a strong correlation between the length of protruding and internal part of the ripper. Mean length of the protruding part of the left honor is 52.15%, and of the right ripper, 46.27%. Similarly, a strong correlation between the length of protruding and internal part of the honor also exists.

Keywords: tusk, length, jaw, visible, wild boar.

## MOGUĆNOST PROCENE UKUPNE DUŽINE SEKAČA I BRUSAČA DIVLJEG VEPRRA (*Sus scrofa L.*) NA OSNOVU VIDLJIVOG DELA

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Merenjem 43 trofeja (kljova) divljih svinja utvrđena je ukupna dužina sekača i brusaca kao i dužine vidljivih delova. Prosečna dužina vidljivog dela levog sekača iznosi 30,36% ukupne dužine, a desnog 33,67%. Utvrđeno je da postoji jaka korelacija između dužine spoljnog i unutrašnjeg dela. Kod levog brusaca utvrđena je prosečna dužina spoljnog dela od 52,15% a desnog od 46,27% od ukupne dužine. I kod brusaca postoji jaka korelacija između spoljog i unutrašnjeg dela.

Ključne reči: kljova, dužina, vilica, vidljivo, divlja svinja

## EFFECT OF AIR TEMPERATURE AND RELATIVE HUMIDITY ON MORTALITY OF RABBITS

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Production of rabbit meat is carried out mainly in intensive rearing systems on farms. If this type of production is to be efficient and profitable, farms used for rabbit breeding should have optimal conditions, including relative humidity and temperature. Frequent rabbit deaths are common in this type of production. Significant variations in temperature and relative humidity act as a predisposing factor for the activity of microorganisms and parasites - the cause of disease, which primarily leads to death. The aim of this study was to analyze mortality of rabbits in respect to air temperature and relative humidity. The research was undertaken in the period between January and June. Daily recordings of air temperature and relative humidity were taken, as well as the number of deaths. Mean values and ranges for air temperature and relative humidity were calculated, as well as the total number of deaths by sexes. Mean air temperature in January was 23.76°C and mean relative humidity was 85.29%. Total number of deaths was 17 (3 bucks and 14 does). Temperature range in the farms during February was from 14.75°C to 25.87°C, and mean temperature was 19.12°C. Mean relative humidity was 75.57%. Most deaths were recorded in this month in total 53 (6 bucks and 47 does). Mean air temperature in March was 20.02°C and mean relative humidity was 76.67%, with a total of 39 deaths (4 bucks and 35 does). Temperature range in the object during April was from 14.62°C to 32.25°C, and mean temperature was 24.69°C. Mean relative humidity was 80.61%. There were 47 deaths (5 bucks and 42 does). There were 40 deaths in May (2 bucks and 38 does), with mean air temperature of 30.69°C, and mean relative humidity of 82.96%. Mean relative humidity in June was 82.95%, and mean air temperature was 29.46°C. There were 35 recorded deaths (1 buck and 34 does). Most deaths were observed in February and April, when fluctuations in mean daily temperatures were most prominent. T-test established that the relation between temperature and number of deaths is highly statistically significant ( $P < 0.05$ ) and the relation between relative humidity and number of deaths is statistically significant.

Keywords: rabbits, temperature, relative humidity, mortality

## UTICAJ TEMPERATURE I RELATIVNE VLAŽNOSTI VAZDUHA NA MORTALITET KUNIĆA

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Proizvodnja mesa kunića uglavnom se obavlja u sistemima intenzivnog gajenja na farmama. Kako bi ovakav vid proizvodnje bio rentabilan i ekonomičan potrebno je stvoriti optimalne uslove u pogledu temperature i relativne vlažnosti vazduha, u objektima u kojima se odgajaju kunići. U ovakvim uslovima uzgoja i proizvodnje česte su uginuća kunića. Značajnija variranja temperature i relativne vlažnosti deluju kao predisponirajući faktor za aktivnost mikroorganizama i parazita – uzročnika bolesti, koji primarno dovode do bolesti i uginuća. Cilj ovog rada je analiza mortaliteta kunića u odnosu na temperaturu i relativnu vlažnost vazduha. Istraživanje je sprovedeno u periodu od januara do juna. Beležene su svakodnevno vrednosti temperature i relativne vlažnosti vazduha, kao i broj uginuća. Izračunate su srednje mesečne vrednosti temperature i relativne vlažnosti vazduha sa intervalom variranja, kao i ukupan broj uginuća po polovima. Prosečna vrednost temperature u januaru je iznosila 23,76 °C, a vlažnost vazduha 85.29%. Tokom ovog meseca zabeleženo je ukupno 17 uginuća (3 mužjaka i 14 ženki). Tokom februara srednje vrednosti dnevne temperature u objektu varirale su od 14,75 do 25,87 °C, a prosečno je iznosila 19,12 °C. Srednja vrednost vlažnosti vazduha na mesečnom nivou je iznosila 75.57%. U februaru je zabeležen i najveći broj uginuća njih 53 (6 mužjaka i 47 ženke). Srednja vrednost temperature u martu je iznosila 20,02 °C, a vlažnosti vazduha 76,67%, kada je evidentirano 39 uginuća (4 mužjaka i 35 ženki). Interval variranja srednje dnevne temperature tokom aprila je 14,62 do 32,25 °C, sa prosekom od 24,69°C. Relativna vlažnost je iznosila 80,61%. U aprilu je zabeleženo 47 uginuća (5 mužjaka i 42 ženke). U maju je zabeleženo 40 uginuća (2 mužjaka i 38 ženki), kada je prosečno srednja dnevna temperatura bila 30,69°C, a relativna vlažnost 82,96%. U junu mesecu zabeležena je prosečna srednja vrednost vlažnosti vazduha od 82.95%, i temperatura od 29,46°C. U ovom mesecu je evidentirano 35 uginuća (1 mužjak i 34 ženke). Najveći procenat uginjavanja je zabeležen tokom februara i aprila meseca kada su i oscilacije u srednjoj vrednosti temperature bile najveće. Primenom T testa je ustanovljena vrlo velika statistička značajnost ( $P < 0.05$ ) za vrednosti temperatura u odnosu na broj uginuća, dok je za relativnu vlažnost konstatovana velika statistička značajnost.

Ključne reči: kunići, temperatura, relativna vlažnost, uginuća

## HEAD LENGTH AND PELVIS LENGTH RATIO IN RELATION TO THE HEIGHT AT WITHERS IN DONKEY FEMALE

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The domesticated donkey (*Equus asinus*) originates from Africa. Its prowess as a working animal is widely known, and there are virtually no geographic areas where donkeys are not used for some type of work, typically transport. The donkey's ability to maintain balance and successfully traverse over even most difficult terrains is almost astounding. The secret of the donkey's stability lies in the biostatistics model of its body. The position of the pelvis and the neck (and thus, the head) determine the location of the barycenter. The research included a morphometric examination of 3 exterior parameters in 19 jennies. The observed parameters were height at withers, head length and pelvis length. Height was measured with Lyditi stick. The research encompassed jennies from three countries (Romania (Sibiu, Turda), Macedonia (Ohrid, Prilep) and Turkey (Eskisehir). Mean values of the observed parameters and index are presented. Statistical significance of differences between the observed parameters, distributed by country, were determined by means of the t-test. Mean height at withers of jennies in Romania was 101.20 cm, in Macedonia 9.70 cm, and in Turkey 103.10 cm. Mean head length of jennies in Romania was 49.10 cm, in Macedonia 50.40 cm, and in Turkey 50.00 cm. Greatest pelvis length was recorded in Turkey (35.80 cm), in Romania it was 35.60 cm, and in Macedonia 34.60 cm. However, no statistically significant difference between parameters observed in all groups was found.

Keywords: donkey, height at withers, head length, pelvis length.

## ODNOS DUŽINE GLAVE I DUŽINE KARLICE U ZAVISNOSTI OD VISINE GREBENA KOD ŽENKI MAGARCA

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Domaći magarac (*Equus asinus*) potiče iz Afrike. Opšte je poznata velika radna izdržljivost magarca. Praktično ne postoje geografski predeli gde ova domaća životinja ne obavlja najrazličitije oblike rada, pre svega transporta. Gotovo je začuđujuća mogućnost kretanja i stabilnost po izuzetno nepristupačnim terenima. Odgovor na ovo pitanje leži u specifičnom biostatičkom modelu građe tela. Položaj karlice, pored položaja vrata, a samim tim i glave, uslovljava položaj, odnosno pomeranje težišta napred ili nazad. U ovom istraživanju izvršeno je morfometrijsko ispitivanje 3 eksterijerna parametara kod 19 ženki magarca. Izvršena su merenja sledećih eksterijernih parametara: visina u grebenu, dužina glave i dužina karlice. Merenje visine je obavljeno Lyditinovim štapom. Jedinke su merene u tri različite zemlje Rumunija (Sibiu, Turda), Makedonija (Ohrid, Prilep) i Turska (Eskişehir). Prikazane su srednje vrednosti merenih parametara i indeksa, Primenom t-testa izračunata je statistička značajnost razlike merenih parametara između jedinki podeljenih u tri grupe prema zemlji gde je obavljeno merenje. Prosečna vrednost visine magarica bila je u Rumuniji 101,20 cm, u Makedoniji 99,70 cm, a u Turskoj 103,10 cm. Dužina glave magarica u Rumuniji prosečno je iznosila 49,10 cm u Makedoniji 50,40 cm, a u Turskoj 50,00 cm. Kada se posmatra dužina karlice najveća je bila kod magarica u Turskoj 35,80 cm, zatim u Rumuniji 35,60 cm, a najmanja u Makedoniji 34,60 cm. Između navedenih grupa nije utvrđena statistička značajnost razlika niti za jedan parametar.

Ključne reči: magarac, visina grebena, dužina glave, dužina karlice.

## OBJECTS OF CLASSIC FISH FARM AND BREEDING SYSTEMS OF SALMONIDS

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Rainbow trout (*Oncorhynchus mykiss*) is one of the most important salmonid fish species that are commercially grown in the Republic of Srpska and Bosnia and Herzegovina, as well as in many countries of the world. Growing salmonid fish species has certain specifics in relation to the cultivation of other freshwater fish species. The concept of fish farms, with aspects of the construction of production objects (fish pond) and breeding system largely determine the success of the production. The area of the Republic of Srpska and Bosnia and Herzegovina is characterized by a significant hydro potential that is not fully utilized. The hydropower potential regarding hydrological regime, physical and chemical composition of water is suitable for the cultivation of salmonids. The existing objects salmonid farms in Bosnia and Herzegovina were built in the past, mostly in the 60s and 70s of the last century. Most of them are not in accordance with the optimal solutions. When it comes to breeding systems of salmonid fish species mainly represented the classic way of the flow, channel pools rectangular, while at low levels cage breeding of rainbow trout. It is not present cultivation in recirculation, reclamation systems and geothermal water.

Key words: objects, salmonid farms, breeding systems

## OBJEKTI KLASIČNIH RIBOGOJILIŠTA I SISTEMI GAJENJA SALMONIDNIH VRSTA RIBA

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Dužičasta pastrmka (*Oncorhynchus mykiss*) jedna je od najznačajnijih salmonidnih vrsta riba koje se komercijalno gaje kako u Republici Srpskoj i BiH, tako i u mnogim zemljama svijeta. Gajenje salmonidnih vrsta riba ima određenih specifičnosti u odnosu na gajenje ostalih slatkovodnih vrsta riba. Konceptija ribogojilišta, sa aspekta gradnje proizvodnih objekata (bazena) i sistema gajenja uveliko određuju uspješnost proizvodnje. Područje Republike Srpske i BiH karakteriše značajan hidropotencijal koji nije dovoljno iskorišten. Taj hidropotencijal i po hidrološkom režimu ali i po fizičko-hemijskom sastavu vode pogoduje uzgoju salmonidnih vrsta riba. Postojeći objekti salmonidnih ribogojilišta u BiH građeni su u ranijem periodu, najviše 60-tih i 70-tih godina prošlog vijeka. Većina njih nije uskladu sa optimalnim rješenjima. Kada je riječ o sistemima gajenja salmonidnih vrsta riba uglavnom je zastupljen klasični način u protočnim, kanalskim bazenima pravougaonog oblika, dok je u manjoj mjeri zastupljen kavezni sistem gajenja dužičaste pastrmke. Nije prisutan uzgoj u recirkulacijskim, hidromelioracionim sistemima i geotermalnoj vodi.

Ključne riječi: objekti, salmonidna ribogojilišta, sistemi gajenja.

## IMPACT OF PESTICIDES ON HEALTH AND BEHAVIOR OF BEES (Fam. Apidae)

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In recent years, in the scientific and professional community there is great concern regarding decline of bee populations in the world, due to their key role in pollination of not only agricultural crops but also the entire natural vegetation and thus maintaining biodiversity and ecosystem balance. One part of the scientific community associate decline of bees' populations with excessive use of chemicals in modern agricultural production, especially pesticides, although other factors are also examined as possible causes this phenomenon. The aim of this paper is to give an overview of the latest research results on the impact of pesticides on health and behavior of bees, conducted in laboratory and field conditions, that is presenting the most important negative effects on members of this economically the most important family of insects. Most of the research referred to the impact of pesticides on bees' health and behavior, with the focus on specific group of insecticides called neonicotinoids. Neonicotinoids are today the most widely used class of insecticides for control of pests' populations on agricultural crops and account for over 25% of the world market insecticides, where its production is constantly increasing. Many laboratory studies have shown that neonicotinoids have lethal and sub-lethal effects on bees, i.e. that they affect bees' memory and learning, collecting of nectar, brood development, hygienic behavior, susceptibility to diseases and so on. Since pesticides cause great stress in the bee's organism causing changes in behavior, it is pointed to the necessity of finding new farming practices to fight pests, that is development and use of substances and technological solutions that will not negatively affect health of these pollinators.

Keywords: bees' disappearance, neonicotinoids, behavior of bees

## UTICAJ PESTICIDA NA ZDRAVLJE I PONAŠANJE PČELA (Fam. Apidae)

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Poslednjih godina među naučnom i stručnom javnošću prisutna je velika zabrinutost u pogledu smanjivanja brojnosti populacija pčela u svetu, s obzirom na njihovu nezamenljivu ulogu u oprašivanju ne samo poljoprivrednih useva već i celokupne samonikle vegetacije i tako održanju biodiverziteta i ekosistemske ravnoteže. Opadanje brojnosti populacija pčela jedan deo naučne javnosti povezuje sa prekomernom upotrebom hemikalija, pre svega pesticida, u savremenoj poljoprivrednoj proizvodnji, mada se i drugi faktori ispituju kao mogući uzočnici ove pojave. Cilj rada je pregled rezultata najnovijih istraživanja vezanih za uticaj pesticida na zdravlje i ponašanje pčela, obavljenih u laboratorijskim i poljskim uslovima, odnosno prikazivanje najvažnijih ustanovljenih negativnih efekata na pripadnike ove ekonomski najznačajnije familije insekata. Najveći broj istraživanja odnosi se na uticaj pesticida na zdravlje i ponašanje pčela, s akcentom na posebnu grupu insekticida pod imenom neonikotinoidi. Neonikotinoidi su danas najraširenija hemijska grupa insekticida za kontrolu populacija štetocina na poljoprivrednim usevima i čine preko 25% svetskog tržišta insekticida, pri čemu se njihova proizvodnja konstantno povećava. Mnoga laboratorijska istraživanja su pokazala da neonikotinoidi imaju letalno i subletalno dejstvo na pčele, tj. da utiču na učenje i pamćenje pčela, sakupljanje nektara, razvoj legla, higijensko ponašanje, podložnost bolestima itd. Budući da pesticidi izazivaju veliki stres u organizmu pčela uzrokujući promene u ponašanju, ukazano je na neophodnost iznalaženja novih načina poljoprivredne prakse u smislu borbe protiv štetocina, odnosno razvoj i primena supstanci i tehnoloških rešenja koja neće uticati negativno na zdravlje ovih polinatora.

Ključne reči: nestanak pčela, neonikotinoidi, ponašanje pčela

## THE QUALITY OF QUEEN BEES OBTAINED THROUGH TRANSPLANTING OF LARVAE, WITH JENTER'S APPARATUS AND MILLER'S METHOD

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Strength, growth and productivity of a bee colony are primarily conditioned by healthy, young and quality queen bee. Modern and intensive beekeeping as a precondition involves providing queen bees with these characteristics in each colony. Quality of a queen bee largely depends on the technology of their cultivation. This study analyzed the results of three methods of cultivation of queen bees: transplanting, Jenter's apparatus and Miller's method. For each method individually the number of cultivated queen cells was determined, which represents the number of hatched queens. The diameters of a queen cells were measured axially, in the middle and on top, as well as the difference in mass before and after queen cells hatching resulting in an obtained mass of queen bees. Obtained results are compared for the purpose of separation of the method that produces the largest number of the hatched queen bee of the finest quality. Quality is determined by measuring the mass of queen bee. The greatest number of queen bees was obtained from transplanting - 28, a smaller number is obtained by Jenter's method - 21, and the least is obtained by Miller's method, or 19. A method of transplanting provides a higher number of queen bees per cycle compared to Jenter's apparatus and Miller's method, which are uniform by productivity. Queen bees with a maximum mass are obtained by a transplanting method - 0,24 g, queen bees with the lowest mass Miller method - 0.21 g. When Jenter's methods queen bees average weight amounted to 0.22 g. Queen bees obtained by the method of transplanting larvae were significantly better in quality of those obtained by Jenter's and Miller's method. Quality queen bee obtained by Jenter's method is equal to the quality obtained queen bee Miller's method. Using of the diameter of queen cell made not possible the determination of the quality of the queen bee that could be hatched from it. The most suitable method for the production of queen bees is transplanting method, especially for commercial production, while Jenter's and Miller's method beekeepers can use in the production of queen bees for their own needs.

Keywords: queen bee, quality, transplanting, Jenter, Miller

## KVALITET MATICA DOBIJENIH PRESAĐIVANJEM LARVI, JENTEROVIM APARATOM I MILEROVOM METODOM

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Snaga, razvoj i produktivnost pčelinjeg društva su pre svega uslovljeni zdravom, mladom i kvalitetnom maticom. Savremeno intenzivno pčelarenje kao preduslov podrazumeva obezbeđenje matice sa navedenim osobinama u svakom društvu. Kvalitet matice u velikoj meri zavisi od tehnologije njihovog uzgajanja. U ovoj studiji su obrađeni rezultati 3 metode uzgoja matice: presađivanjem larvi, jenterovim aparatom i milerovom metodom. Za svaku metodu ponaosob utvrđivan je broj odnegovanih matičnjaka, što predstavlja broj izleženih matice. Mereni su prečnici matičnjaka u osnovi, sredini i vrhu, kao i razlike u masi matičnjaka pre i posle izleganja matice čime je dobijena masa matice. Dobijeni rezultati su upoređivani u cilju izdvajanja metode koja daje najveći broj izleženih matice najboljeg kvaliteta. Kvalitet je određen merenjem mase matice. Najveći broj matice dobijen je presađivanjem larvi – 28, manji broj je dobijen jenterovom metodom – 21, a najmanje matice je dobijeno milerovom metodom, odnosno 19. Metoda presađivanjem larvi daje veći broj matice u turnusu u odnosu na jenterov aparat i milerovu metodu koje su ujednačene po produktivnosti. Matice sa najvećom masom daje metoda presađivanjem larvi - 0,24 g, a matice sa najmanjom masom milerova metoda – 0,21 g. Kod jenterove metode prosečna masa matice je iznosila 0,22 g. Matice dobijene metodom presađivanja larvi su značajno boljeg kvaliteta od matice dobijenih jenterovom i milerovom metodom. Kvalitet matice dobijenih jenterovom metodom je jednak kvalitetu matice dobijenih milerovom metodom. Pomoću prečnika matičnjaka nije moguće utvrditi kvalitet matice koja će se iz njega izleći. Najprihvatljivija metoda za proizvodnju matice je metoda presađivanjem larvi, naročito za komercijalnu proizvodnju, dok jenterov i milerov metod pčelari mogu koristiti u proizvodnji matice za sopstvene potrebe.

Ključne reči: matice, kvalitet, presađivanje, jenter, miler

## CORRELATION OF BROOD AREA AND PRESENCE OF VARROA IN THREE LINES OF BEES IN TOPLICA REGION

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Varroa is considered to be most deleterious natural bee enemy. It is a constant companion of bee colonies and is impossible to be completely eradicated. Biological, temperatural and chemical aspects of the fight are there only to keep it under control. The above mentioned treatments are not absolutely safe for bees, and especially chemical can contaminate bee products. Selection of bees is heading toward self-defense of bee-colonies from varroa. The infestation of bee colonies, their reaction to the prevalence of this parasite and the survival has been monitored. The observation was carried out on three lines of bees' domestic carnica - *Apis mellifera carnica*. Colony listed in the view from the line: PKV-1-37, PKH-1-14 and PKH-DV-1-8. The study included 19 colonies: 5 from the line PKV-1-37, 6 from the line PKH-1-14 and 8 colonies from the line DV-1-8. In the autumn survey the area under the brood on frames is recorded at each colony individually. The presence of varroa is ascertained on adult bees. Number of mites was compared with the surface of brood, where we examined the correlation between these two values. In line DV-1-8 the surface under the brood ranged from 1.6 to 6.0 with an average of 3.26, while the number of mites ranged from 0.0 to 11.0 with an average of 4.0. In line PKH-1-14 the surface under the brood ranged 3.0 - 5.1 with an average of 3.43, while the number of mites ranged from 2,0 - 8,0 with an average of 5.0. In line PKV-1-37 the surface under the brood ranged from 0.4 to 2.6 with an average of 1.22, while the number of mites ranged from 0.0 to 3.0 with an average of 1.4. On average varroa was mostly in line PKH-1-14, ie 3.43, while the average minimum brood in the line PKV-1-37, ie 1.22. Average maximum varroa was in line PKH-1-14, respectively 5.0, while the average minimum varroa mites were counted in the line PKV-1-37 and 1.4. The colonies with a larger number of varroa in the period before winter foster more brood compared to companies with a smaller number of varroa.

Keywords: mites, tolerance, litter, correlation.

## KORELACIJA POVRŠINE LEGLA I PRISUTNOSTI VAROE TRI LINIJE PČELA U TOPLIČKOM OKRUGU

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Varoa se smatra najpogubnijim prirodnim neprijateljem pčela. Stalni je pratilac pčelinjeg društva i nemoguće ju je potpuno iskoreniti. Biološki, temperaturni i hemijski vidovi borbe je samo drže pod kontrolom. Navedeni tretmani nisu apsolutno bezbedni za pčele u pčelinjem društvu, a neki, naročito hemijski mogu kontaminirati pčelinje proizvode. Selekcija pčela ide sve više u pravcu samoodbrane pčelinjih društava od varoe. Prati se infestiranost pčelinje zajednice, njena reakcija na zastupljenost ovog parazita, kao i njen opstanak. Posmatranje je vršeno na tri linije pčela domaće karnike – *Apis mellifera carnica*. Društva uvrstena u ogled su iz linija: PKV-1-37, PKH-1-14 i DV-1-8. Ukupno je ispitano 19 društava: 5 društava iz linije PKV-1-37, 6 društava iz linije PKH-1-14 i 8 društava iz linije DV-1-8. Pri jesenjem pregledu evidentirana je površina pod leglom na ramovima svakog društva ponaosob. Prisutnost varoe je utvrđivana na odraslim pčelama. Broj varoa je upoređivan sa površinom legla, pri čemu je utvrđivana i korelacija ove dve vrednosti. U liniji DV-1-8 površina pod leglom se kretala od 1,6 – 6,0 sa prosekom od 3,26, dok se broj varoa kretao od 0,0 – 11,0 sa prosekom 4,0. U liniji PKH-1-14 površina pod leglom se kretala od 3,0 – 5,1 sa prosekom od 3,43, dok se broj varoa kretao od 2,0 – 8,0 sa prosekom 5,0. U liniji PKV-1-37 površina pod leglom se kretala od 0,4 – 2,6 sa prosekom od 1,22, dok se broj varoa kretao od 0,0 – 3,0 sa prosekom 1,4. Prosečno legla je bilo najviše u liniji PKH-1-14, odnosno 3,43, dok je prosečno najmanje bilo legla u liniji PKV-1-37, odnosno 1,22. Prosečno najviše varoe je bilo u liniji PKH-1-14, odnosno 5,0, dok je prosečno najmanje varoe izbrojano u liniji PKV-1-37, odnosno 1,4. Društva sa većim brojem varoe, u periodu pred zazimljavanjem neguju više legla u odnosu na društva sa manjim brojem varoe. Ključne reči: varoa, tolerantnost, leglo, korelacija

## EFFECT OF TEMPERATURE AND LENGTH OF STORAGE ON SOME EGG QUALITY PARAMETERS

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The aim of this study was to determine effect of temperature (4°C and 24°C) and length (7, 14 and 21 days) of storage on selected parameters of egg quality: egg weight loss (g, %), albumen height (mm), albumen index, Haugh unit, yolk index, and pH value of albumen and yolk. A total of 180 table eggs obtained from 54 week old hens Isa Brown were used in this study. Eggs were divided into two groups with 90 eggs according to storage temperature. Each group was consisted of three equal subgroups with 30 eggs according to storage length. The obtained data were analyzed by descriptive statistics, and effect of investigated factors on eggs quality parameters were determined using analysis of variance. On the basis of results it can be concluded the following: weight loss, albumen height, Haugh unit, albumen index, and yolk index were under highly significant effect ( $p < 0.001$ ) of storage length and temperature. pH of albumen and yolk had a slight increasing trend with increasing storage length at both storage temperatures. All groups of eggs stored at 4°C had better quality indicators compared to groups stored at 24°C, regardless of storage length. Investigation of effect of storage temperature and length on table egg quality showed that quality preservation depends on values of these two parameters.

Keywords: table eggs, storage, temperature, quality

## UTICAJ TEMPERATURE I DUŽINE SKLADIŠTENJA NA POKAZATELJE KVALITETA KONZUMNIH JAJA

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Cilj rada bio je da se utvrdi uticaj temperature (4°C i 24°C) i dužine skladištenja (7, 14 i 21 dan) na odabrane pokazatelje kvaliteta jaja: gubitak mase jaja (g, %), visinu bjelanca (mm), indeks bjelanca, Haughovu jedinicu, indeks žumanca, pH vrijednost bjelanca i žumanca. U istraživanju je korišteno ukupno 180 konzumnih jaja dobijenih od nosilja provenijencije Isa Brown u uzrastu od 54. nedjelje života. Jaja su podijeljena u dvije grupe po 90 komada prema temperaturi čuvanja. Svaka grupa se sastojala od tri jednake podgrupe po 30 komada jaja prema dužini skladištenja. Dobijeni podaci su obrađeni metodama deskriptivne statistike, a uticaj ispitivanih faktora na pokazatelje kvaliteta jaja određen je analizom varijanse. Na osnovu dobijenih rezultata istraživanja može se zaključiti sljedeće: gubitak mase (g, %), visina bjelanca (mm), Haughova jedinica, indeks bjelanca i indeks žumanca bili su pod statistički visoko značajnim ( $p < 0.001$ ) uticajem dužine i temperature skladištenja; pH vrijednost bjelanca i žumanca imala je blagu tendenciju rasta pri povećanju dužine skladištenja na obje temperature čuvanja. Sve grupe jaja skladištenih na 4°C imale su bolje pokazatelje kvaliteta u poređenju sa grupama skladištenim na 24°C bez obzira na dužinu skladištenja. Ispitivanje uticaja temperature i dužine skladištenja na kvalitet konzumnih jaja pokazalo je da očuvanje kvaliteta jaja zavisi od vrijednosti ova dva parametra.

Ključne riječi: konzumna jaja, skladištenje, temperatura, kvalitet

## EFFECT OF ORGANIC PRODUCTION ON CHEMICAL COMPOSITION OF EGGS

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Organic livestock production in the territory of AP Vojvodina is still at the beginning, and the first poultry organic farm completed the conversion period and received the status of organic farms in 2013. Number of consumers who are interested in buying organic eggs is growing, despite the higher price. This attitude of consumers is usually based on the belief that there is a difference between organic and conventional eggs in their nutritional quality, or chemical composition. The aim of the research is to determine the chemical composition of eggs from organic production and compare it to the chemical composition of eggs from conventional production (cage system). Sampling of eggs was carried out on a certificated organic farm and conventional eggs were taken from the market. Basic chemical composition of eggs (dry matter, protein, fat) was determined and compared between two systems. The results showed that there was no significant difference in the protein content in eggs from organic and conventional production. However, significant difference was established in fat content in yolk between organic eggs (30.27%) and conventional eggs (28.06%). This work confirmed that there are differences in the nutritional quality of eggs from organic compared to conventional production.

Key words: organic production, eggs, quality

## EFEKAT ORGANSKE PROIZVODNJE NA HEMIJSKI SASTAV JAJA

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Organska proizvodnja u stočarstvu na teritoriji AP Vojvodine je još uvek u začetku, te je prva organska farma živine tokom 2013. god. završila period konverzije i dobila status organske farme. Sve je više potrošača koji su zainteresovani za kupovinu jaja iz organske proizvodnje, uprkos višoj ceni. Takav stav potrošača je najčešće baziran na tome da između organskih i konvencionalnih jaja postoji razlika u njihovom nutritivnom kvalitetu, odnosno hemijskom sastavu. Cilj istraživanja je utvrđivanje hemijskog sastava jaja iz organske proizvodnje i poređenje sa hemijskim sastavom jaja iz konvencionalne proizvodnje (kavezni sistem). Uzorkovanje jaja izvršeno je na registrovanoj organskoj farmi, a konvencionalna jaja iz kaveznog sistema uzeta su sa tržišta. Analiza osnovnog hemijskog sastava jaja obuhvatila je određivanje sadržaja suve materije, proteina i masti. Rezultati su pokazali da nema značajne razlike u sadržaju proteina u jajima iz organske i konvencionalne proizvodnje, međutim utvrđena je značajna razlika u sadržaju masti u žumancetu. Naime, jaja iz organske proizvodnje sadržala su veći procenat masti u žumancetu (30,27%) u odnosu na konvencionalna jaja (28,06%). Ovim radom je potvrđeno da postoji razlika u nutritivnom kvalitetu jaja iz organske u odnosu na konvencionalnu proizvodnju.

Ključne reči: organska proizvodnja, jaja, kvalitet

## EFFECT OF AGE OF LIGHT LINE HYBRIDS HENS HENS ON EGG QUALITY TRAITS

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In order to determine the properties of egg quality light line hybrid Lohmann Brown conducted research on a poultry farm private farms "Rakić komerc" doo, Batkovic, Bijeljina Republic of Serbian (BiH). During the production of eggs, special attention is paid to the four main production stages, namely: 20th Sunday - SN20 (start load) 28 Sunday - SN28 ("pixels" - maksimum), 48th Sunday - SN48 (center) and 72. weeks of age hens - SN72 (the end of the production cycle). In these periods, a random sample was taken the appropriate number of hens or eggs for detailed research, analysis and statistical analysis of the data determined for the tested indicators. In addition to the mass determined individual egg quality traits: egg weight (g), the length of the egg (mm), width of the egg (mm), shape index, egg (%), color scales (point), the purity of the shell (points) and yolk color (1-15 rosh, at age hens (SN20, SN28, SN48 and SN72). the results show that differences in the average weight of eggs originating from hens of different ages were statistically significant ( $P < 0.001$ ). Then, the age of the hens was significantly ( $P < 0.001$ ,  $P < 0.05$ ) affected the length or width of the eggs. the largest egg shape index was at egg-laying hens when they have maximum intensity of load (SN28) and compared to the other three groups was statistically significantly higher ( $P < 0.001$ ). the eggs produced by younger hens (SN20 and SN28) were statistically significant ( $P < 0.001$  and  $P < 0.01$ ) was cleaner, shell color is darker and redder yolk color. the weight of the eggs within each age group statistically significant ( $P < 0.001$ ,  $P < 0.01$  and  $P < 0.05$ ) influenced the length and breadth of the egg. in addition, between egg mass and purity shell (SN72), the color of the shell (SN72) and yolk color (SN72 ) identified a statistically significant correlation coefficients ( $P < 0.05$ ;  $P < 0.01$ ;  $P < 0.001$ ), and between the mass of eggs and yolk color (SN20) at the level of  $P < 0.001$ . Analyzed commercial flock of laying hens producing eggs for human consumption, viewed as a whole, achieved satisfactory results in terms of properties of egg quality.

Key words: age, Lohmann Brown, egg quality traits.

## UTICAJ STAROSTI NOSILJA LAKOG LINIJSKOG HIBRIDA KOKOŠI NA OSOBINE KVALITETA JAJA

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U cilju utvrđivanja osobina kvaliteta jaja za konzum lakog linijskog hibrida Lohmann Brown sprovedena su istraživanja na živinarskoj farmi privatnog gazdinstva "Rakić komerc" doo, Batković, Bijeljina Republika Srpska (BiH). U toku produkcije jaja posebna pažnja je obraćena na četiri glavne proizvodne faze, i to: 20. nedelja – SN<sub>20</sub> (početak nosivosti), 28. nedelja - SN<sub>28</sub> („pik“- maksimum), 48. nedelja – SN<sub>48</sub> (sredina) i 72. nedelja starosti nosilja – SN<sub>72</sub> (kraj proizvodnog ciklusa). U navedenim periodima, metodom slučajnog uzorka uzet je odgovarajući broj nosilja, odnosno jaja za detaljna istraživanja, analizu i statističku obradu utvrđenih podataka za ispitivane pokazatelje. Pored mase, utvrđene su pojedine osobine kvaliteta jaja: masa jaja (g), dužina jajeta (mm), širina jajeta (mm), indeks oblika jajeta (%), boja ljuske (poen), čistoća ljuske (poen) i boja žumanca (1-15 Roshe, pri starosnom dobu nosilja (SN<sub>20</sub>, SN<sub>28</sub>, SN<sub>48</sub> i SN<sub>72</sub>). Rezultati istraživanja pokazuju da razlike u prosječnoj masi jaja porijeklom od različite starosti nosilja su bile statistički signifikantne (P<0,001). Zatim, starost nosilja je statistički značajno (P<0,001; P<0,05) uticala i na dužinu, odnosno širinu jaja. Najveći indeks oblika jajeta je bio kod jaja kada su nosilje ostvarile maksimalan intenzitet nosivosti (SN<sub>28</sub>) i u odnosu na ostale tri grupe je bio statistički signifikantno veći (P<0,001). Jaja proizvedena od mladih nosilja (SN<sub>20</sub> i SN<sub>28</sub>) su statistički signifikantno (P<0,001 i P<0,01) bila čistija, boja ljuske je bila tamnija i boja žumanceta crvenija. Masa jaja je okviru svake starosne grupe statistički značajno (P<0,001; P<0,01 i P<0,05) uticala na dužinu i širinu jajeta. Pored toga, između mase jaja i čistoće ljuske (SN<sub>72</sub>), boje ljuske (SN<sub>72</sub>), odnosno boje žumanceta (SN<sub>72</sub>) utvrđeni su statistički signifikantni koeficijenti korelacije (P<0,05; P<0,01; P<0,001), kao i između mase jaja i boje žumanceta (SN<sub>20</sub>) na nivou P<0,001. Analizirano komercijalno jato nosilja u proizvodnji jaja za konzum, posmatrano u cjelini, ostvarilo zadovoljavajuće rezultate kada su u pitanju osobine kvaliteta jaja za konzum.

Ključne riječi: starost, Lohmann Brown, osobine kvaliteta jaja.

## IMPORTANCE OF SMALL GRAIN SILAGE IN DAIRY CATTLE NUTRITION

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Nowadays, considering the intensity of production, dairy cattle breeding for sure may be defined as industrial production. In the region of Balkan, practical activities in dairy cattle breeding, are based on various knowledge, from countries where animal husbandry is very intensive, both regard the choice of cattle breed, as well as considering the choice of some feeds of strategic importance. There are three significant determinations that are similar in aforementioned region and in USA, and it is production based on the holstein breed, as well as nutrition based on corn silage and alfalfa hay or haylage. In our countries, those similarities leads to easier appliance of various solutions in dairy cattle nutrition, which are practically approved and confirmed as positive. However, we are witnessing climate change, which is not suitable to alfalfa and even less for corn, especially in conditions of crop production without irrigation. Production of sufficient amount of high quality corn silage is not going to be easier. Besides, energetic crisis which is going to be much more expressed in decades to come, is prerequisite for one particularly new importance of corn. Already nowadays, corn is precious source for ethanol production, and as such, it is going to be even more important in years to come. Because of that, it is important to find out some other forage crops, suitable for production of high quality silage. That's why researching of possibilities of small grain silage usage, in ruminant nutrition, is getting to be much more important.

Keywords: Ruminants, cattle breeding, nutrition, silage, small grains.

## ZNAČAJ SILAŽE STRNIH ŽITA U ISHRANI GOVEDA

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Savremeno mlečno govedarstvo, uvažavajući intenzitet proizvodnje, opravdano se može okarakterisati kao industrijska proizvodnja. U regionu Balkana, u velikoj meri praktične aktivnosti u mlečnom govedarstvu se zasnivaju se na brojnim saznanjima iz zemalja intenzivnog stočarstva, kako kada je reč o genetskoj osnovi životinja, tako i kada su u pitanju hraniva od strateškog značaja. Postoje tri karakteristične odrednice koje su slične u pomenutom regionu i u SAD, a to su goveda holštajn frizijske rase, ishrana kukurznom silažom, kao i senom odnosno senažom lucerke. U našim zemljama, ove sličnosti olakšavaju mogućnost primene brojnih rešenja u ishrani mlečnih goveda, koja su u praksi proverena i pozitivno potvrđena. Ipak, svedoci smo klimatskih promena koje ne pogoduju lucerki a još manje kukuruzu, naročito u uslovima suvog ratrenja. Sve je teže realizovati proizvodnju dovoljnih količina kvalitetne silaže kukuruza. Pored toga, energetska kriza koja će u decenijama pred nama biti još drastičnija, daje kukuruzu i jedan dodatni značaj. Kukuruz je već sada dragocena sirovina za dobijanje etanola, i u tom smislu biće još i važniji u godinama koje dolaze. To nameće potrebu iznalaženja drugih biljnih kultura pogodnih za proizvodnju kvalitetne silaže. Upravo zato, proučavanje mogućnosti upotrebe silaža strnih žita, u ishrani preživara zato sve više dobija na značaju.

Ključne reči: Preživari, govedarstvo, ishrana, silaža, strna žita.

## CEREAL PROTEINS IN FISH NUTRITION

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Fish meal is the main source of protein in most standard feeds used in the nutrition of commercially important fish species. Stagnation in open water catches and the expansion of aquaculture demand the use of new protein sources for this purpose. Cereals are the basic source of energy in complete fish feeds due to their high carbohydrate content. The protein content in cereals shows high variations (7-15% of grain weight on average), depending on the type of cereals and agroenvironmental conditions during growing. Overall, cereal proteins have a lower biological value compared to some other groups of plants, legumes in particular. This is the result of a low content of essential amino acids (primarily lysine, methionine and tryptophan) and certain inhibitors of proteolytic and amylolytic enzymes (phytates and beta-glucans). The nutritional value of cereals used in fish nutrition is as follows: wheat-triticale-maize-barley-rye. The high carbohydrate content in the cereal grain reduces the digestibility of its proteins. Certain technological operations (primarily extrusion) can be used for the gelatinisation of starch (the predominant carbohydrate in cereal grains) to increase the digestibility of cereal proteins. Experiments concerning the substitution of fish meal with plant proteins in complete feeds used in the nutrition of the commercially most important fish – the carp (*Cyprinus carpio* L.) suggests that it is possible to add up to 35% wheat meal into the feed without any severe negative effects on the growth rate and organoleptic properties of fish meat.

Key words: cereal, proteins, fish, diet, substitution

## EFFECTS QUANTITY OF MEALS AND FREQUENCY OF FEEDING ON COMPENSATORY GROWTH RAINBOW TROUT (*ONCORHYNCHUS MYKISS* WAL.) FRY

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This paper presents the results of the impact of the quantity of meals and frequency of feeding on compensatory growth of rainbow trout fry of the same age. The experiment, lasting 52 days (February-April 2014), was carried out in the laboratory of Aquaculture, Faculty of Agriculture in Banja Luka. The fry of rainbow trout is divided into three groups: group 1 ( $G_1$ ), group 2 ( $G_2$ ) and group 3 ( $G_3$ ) between which is statistically highly significant differences in mean length and body mass ( $P < 0.01$ ). Average initial weight and total body length  $\pm$  standard error of mean (SEM) were as follows:  $1.79 \pm 0.39$  g and  $5.71 \pm 0.44$  cm in  $G_1$ ,  $1.99 \pm 0.40$  g and  $5.92 \pm 0.41$  cm in  $G_2$ ,  $2.49 \pm 0.63$  g and  $6.20 \pm 0.52$  cm in  $G_3$ . It was used the same type of feed in the diet for all groups, and the nutrition norms in the  $G_1$  and  $G_2$  were more (I, II and III of the period:  $G_1$ : 141%, 110% and 106%,  $G_2$ : 127%, 104% and 100%), and in  $G_3$  nutrition during all three periods was 100% (recommendations of feed producers). The frequency of feeding was as follows: three times a day in the  $G_1$ , twice a day in the  $G_2$  and once daily at  $G_3$ . After the first period, increased norms of nutrition in  $G_1$  and  $G_2$  of 41% and 27% is evident compensatory growth and the absence of statistically significant differences in body mass, a more nutrition norms during this period did not affect the health of the fry. Condition factor (CF), specific growth rate (SGR) and thermal units growth coefficient (TGC) were most pronounced in  $G_1$  (CF = 1.38, SGR = 4.31 and TGC = 0.192), although the fry in this group had the lowest initial average length and weight of the body.

Key words: compensatory growth, rainbow trout, fry

## EFEKTI KOLIČINE OBROKA I FREKVENCije ISHRANE NA KOMPENZACIJSKI RAST MLAĐI DUŽIČASTE PASTRMKE (*ONCORHYNCHUS MYKISS WAL.*)

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U radu su prikazani rezultati uticaja količine obroka i frekvencije ishrane na kompenzacijski rast mlađi dužičaste pastrmke iste starosti. Eksperiment, u trajanju od 52 dana, je realizovan u laboratoriji za akvakulturu Poljoprivrednog fakulteta u Banjoj Luci. Mlađ dužičaste pastrmke podijeljena je u tri grupe: grupa 1 ( $G_1$ ), grupa 2 ( $G_2$ ) i grupa 3 ( $G_3$ ) između kojih je utvrđena statistički visoko značajna razlika sredina dužine i mase tijela ( $P < 0.01$ ). Prosječne početne mase i totalne dužine tijela  $\pm$  standardna greška aritmetičke sredine (SEM) iznosile su:  $1,79 \pm 0,39$  g i  $5,71 \pm 0,44$  cm u  $G_1$ ,  $1,99 \pm 0,40$  g i  $5,92 \pm 0,41$  cm u  $G_2$ ,  $2,49 \pm 0,63$  g i  $6,20 \pm 0,52$  cm u  $G_3$ . Korišćen je isti tip hrane u ishrani za sve grupe, a norme ishrane u  $G_1$  i  $G_2$  su bile više (I, II i III period:  $G_1$ : 141%, 110% i 106%,  $G_2$ : 127%, 104% i 100%), dok je ishrana u  $G_3$  tokom sva tri perioda iznosila 100% (preporuka proizvođača hrane). Frekvencija ishrane bila je: tri puta dnevno u  $G_1$ , dva puta dnevno u  $G_2$  i jednom dnevno u  $G_3$ . Nakon prvog perioda, povećanih normi ishrane u  $G_1$  i  $G_2$  od 41% i 27% evidentan je kompenzacijski rast i odsustvo statistički značajnih razlika mase tijela, a više norme ishrane u ovom periodu nisu uticale na zdravstveni status mlađi. Koeficijent kondicije (CF), specifična stopa rasta (SGR) i koeficijent rasta za termičku jedinicu (TGC) najizraženiji su u  $G_1$  (CF = 1.38, SGR = 4.31 i TGC = 0.192), iako je mlađ u ovoj grupi imala najnižu početnu prosječnu dužinu i masu tijela.

Ključne riječi: kompenzacijski rast, dužičasta pastrmka, mlađ

## THE HEALTH STATUS OF BULLS IN ARTIFICIAL INSEMINATION CENTRES: HARMONIZATION OF LEGISLATION IN SERBIA WITH THE EUROPEAN UNION

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Diagnostic and health condition control procedures of bulls in centres for artificial insemination in Serbia are in accordance with Regulation on the establishment of animal health care measures for 2014 year. Serological tests in centres for artificial insemination and bulls, which are used for natural breeding, are performed on each breeding animal twice a year, and those include tests for brucellosis, tuberculosis, enzootic bovine leucosis, campylobacteriosis, trichomoniasis, bovine virus diarrhea, infectious bovine rhinotracheitis, leptospirosis and Schmallenberg disease. Viral examination of bull semen are also conducted for bovine virus diarrhea and Schmallenberg disease every six months, and infectious bovine rhinotracheitis and infectious pustular vulvovaginitis every three months. Preputial lavage is performed for microbiological tests for *Campylobacter fetus* ssp. *venerealis* i *Trichomonas fetus* in bulls every six months. Breeding animals have to be clinical healthy and results of laboratory examination are bound to be negative. As an example of EU regulations, there are measures in Czech Republic about the obligation of examination of cattle in the Veterinary law (1999) and every year in the Official Journal of the Ministry of Agriculture. Furthermore, there are obligations of serology diagnostic tests on brucellosis, infectious bovine rhinotracheitis and bovine enzootic leucosis for bulls in period of 28 days before movement to quarantine of semen collection center, bulls in quarantine of semen collection center, bulls in the semen collection center 1x per year, breeding bulls used in natural mating 1x per year and young bulls before mating also. According the Bovine tuberculosis (tuberculin skin test), diagnostic measures are obligatory for bulls as all mentioned above, but only except the control in the quarantine of semen collection center. Interestingly, related to BVD, serologic testing is compulsory for bulls in period of 28 days before movement to quarantine of semen collection center, bulls in quarantine of semen collection center, serologically negative bulls in the semen collection center 1x per year, but also control of semen from serologically positive bulls before the first collecting of semen. In addition to all listed, there are test for *Campylobacter foetus* ssp. *venerealis* in young breeding bulls intended for natural mating in period of 28 days before the movement to Centre. Having in mind differences in subsidiary legal acts which are applicable in Serbia in relation to the European Union, we believe that their adaptation is necessary in order to protect the health of breeding animals, and prevent the appearance of diseases in cattle. Consequently, we can increase the level of health status of breeding animals and fulfill the conditions for export of bull semen to all countries which except EU exporting certificates as well.

Key words: Bull, semen, legislative, West Balkan, EU

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# ***PROJECT PRESENTATION***

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EUROPEAN CORN BORER AND WESTERN CORN ROOTWORM –  
POSSIBLE INTERACTIONS BETWEEN TWO MAJOR MAIZE PESTSSnežana Tanasković<sup>1\*</sup>, Branka Popović<sup>2</sup>, Sonja Gvozdenac<sup>3</sup>, Slavica Vuković<sup>4</sup>,  
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European Corn Borer (ECB) and Western Corn Rootworm (WCR) are simultaneously present in Serbian maize fields since 1992. It is yet not familiar how these species exist and/or interact at the same host plant and at which level their presence influences maize yield. A field experiment was carried out in Bečej (Vojvodina, Serbia) in 2014 with Serbian cultivar NS-640. We chose and marked 48 pairs of maize plants. Each pair consisted of plants artificially infested with DVV eggs (D) and control plants (C). After injection of DVV eggs (1<sup>st</sup> week), pheromone traps for DVV and ECB were placed in the field (end of Jun). Field inspections (VIII) were conducted every 7 days, from Jun-August. The following was recorded: a number of leaves per plant, plants height, damages and number of ears. Sticky bases of traps were inspected each time. In September we measured total ears mass, mass of kernels and chunk, assessed DVV root damage on all plants and recorded the presence of ECB larvae in stems. The differences between the average number of leaves, plant heights and number of ears on D and C plants were analyzed using T-test of independent samples, for each observation separately until the August (statistical software Statistica 12). DVV imago was present in the field from the end of Jun until September. Also, for the first time in Vojvodina province the ECB-Z strain was determined. The results of T-test indicate that there was no significant difference between the average number of leaves on D and C plants during IV and V observations in Jun ( $t=1.59ns$ ;  $1.94ns$ ,  $p>0.05$ , respectively). However, in VII and VIII observation the average number of leaves on D plants (13.64; 13.83, respectively) was significantly decreased compared to C plants (14.19; 14.19, respectively) ( $t=4.18^{**}$ ;  $t=2.56^*$ ,  $p<0.01$ , respectively). The height of D and C plants did not differ statistically ( $t=0.49ns$ ;  $0.76ns$ ;  $1.25ns$ ,  $p<0.05$ , respectively) during the first three observations. However, the average plant heights were significantly reduced in D (253.37cm) plants compared to C (264.06 cm) during VIII observation ( $t=2.69^{**}$ ,  $p<0.01$ ). The average number of maize ears during VII and VIII observation was significantly lower on D plants compared to the C plants ( $t=2.38^*$ ;  $2.59^*$ ,  $p>0.01$ , respectively).

Key words: *Ostrinia nubilalis*, *Diabrotica virgifera* ssp. *virgifera*, strain, maize

**COST 1104**  
**SUSTAINABLE PRODUCTION OF HIGH-QUALITY CHERRIES**  
**FOR THE EUROPEAN MARKET**

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The main objective of the COST Action FA1104 is to develop innovative strategies to safeguard European cherry production by the adaptation of cherry varieties and cultivation to climate change, the development of sustainable cultivation practices, and the promotion of high-quality fruits. COST FA1104 is a trans-national network within the COST program. COST FA1104 is specifically devoted to find solutions to improve the production of European sweet and sour cherries, which are very appreciated fruits in a large number of European countries. COST FA1104 networks scientists from very diverse fields (e.g., geneticists, breeders, agronomists, phytopathologists, epidemiologists), industry (including grower groups) and governmental representatives (Plant Protection Officers) throughout Europe. A standing Committee of Practitioners is in place to facilitate the transfer of knowledge back-and-forth between scientists and their key stakeholders. The EU funding provides for interaction and exchange of participants. Young scientists and scientists from developing regions within the EU sphere, are encouraged to participate in lab exchanges. Our scientific objectives are reached by networking national funding. Special Task Forces are designed to focus on specific deliverables. COST FA1104 does not directly fund research, but our Action is determined to use the COST platform for accessing external trans-national funding opportunities in FP7. COST FA1104 also will also provide endorsements to individual research proposals to participant national agencies. Please just ask the Action Chair for more information on how to obtain an endorsement.

## DONAU SOJA REGIONAL CENTER IN NOVI SAD – IMPROVING EUROPEAN SOY SUPPLY FOR FOOD AND FEED

Soya has become a central topic in European agriculture and food production: The ca. 35 million tons of soya and soya bean meal per year provide essential protein for the feed industry; 97.5% of which are imported from overseas. In North and South America ca. 20 million hectares are dedicated to soya bean production for European import – a total about 23 million tons of soya bean meal and 11 million tons soya beans per year. The dependence on soya imports thus becomes a challenge for all of Europe. The Danube Soya Initiative was established two years ago in Vienna to effectively meet those challenges: organized as an independent, international, nonprofit, multi stakeholder association. The platform supports and boosts the cultivation of non GM soya in the Danube region. It provides a foundation for the production of high quality, safe origin GMO-free food and feed soya for the Danube region and the Western European market. Regional Center of Excellence in Novi Sad was founded in May 2014, for the area of Serbia, Bosnia and Hercegovina, Croatia and Slovenia. The strategic location of the Regional Center in Novi Sad is intend to facilitate the soya production of the Eastern and South-Eastern-European countries, with big production potential. Activities of the Regional Center are supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and Austrian Development Agency (ADA). The success of Danube Soya is linked to its members and partners – because of this Danube Soya Regional Center is working on protein-partnerships development for the 2015 harvest and beyond. The main activities of the center in next period will be streamlined towards Protein Partnership Project implementation, and will include following areas: Match Making, Knowledge transfer, Quality Assurance. Regional Center in Novi is creating possibility for implementation of the DS quality standard in the region by certification and labeling of domestic production as GMO free and with regional value.







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