



**7<sup>TH</sup> INTERNATIONAL SYMPOSIUM ON  
AGRICULTURAL SCIENCES**



**AGRORES**

**2018**

# **BOOK OF ABSTRACTS**



February 28 - March 2, 2018  
Banja Luka, Republic of Srpska, Bosnia and Herzegovina



**BOOK OF ABSTRACTS**



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**2018**

7<sup>th</sup> INTERNATIONAL SYMPOSIUM ON  
AGRICULTURAL SCIENCES

February the 28<sup>th</sup> – March the 2<sup>nd</sup>, 2018  
Banja Luka, Bosnia and Herzegovina

## BOOK OF ABSTRACTS



7<sup>th</sup> International Symposium on Agricultural Sciences "AgroReS 2018"  
February the 28<sup>th</sup> – March the 2<sup>nd</sup>, 2018; Banja Luka, Bosnia and Herzegovina

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February the 28<sup>th</sup> – March the 2<sup>nd</sup>, 2018  
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2018

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# **SYMPOSIUM PROGRAM**

	Wednesday, February the 28 <sup>th</sup> , 2018
	Banski Dvor Cultural Centre, Banja Luka

<i>Time</i>	<i>Activities</i>
11:45 – 12:00	Press conference
12:00 – 12:10	Introductory speech and The National Anthem
12:10 – 12:20	Welcome speech: <ul style="list-style-type: none"> <li>- Prof. Nikola Mičić, Dean of Faculty of Agriculture, University of Banja Luka</li> <li>- Prof. Radoslav Gajanin, Acting Rector, University of Banja Luka</li> </ul>
12:20 – 12:25	Musical break 1
12:25 – 12:30	Dane Malešević, PhD, Minister of Education and Culture of Republic of Srpska
12:30 – 12:35	Musical break 2
12:35 – 13:05	Awards and recognitions <ul style="list-style-type: none"> <li>- address of the awarded officials</li> </ul>
13:05 – 13:35	Cocktail and refreshment break
13:35 – 14:45	Awarding students of Faculty of Agriculture, University of Banja Luka
14:45 – 15:00	Official Symposium's opening <ul style="list-style-type: none"> <li>- president of the Organizing committee</li> <li>- Minister of Science and Technology, to be confirmed</li> </ul>
	Plenary Lectures
15:00 – 15:20 [PL1]	Dragi Dimitrievski, Emil Erjavec, Miroslav Rednak, Tina Volk <i>MONITORING OF AGRICULTURAL POLICY DEVELOPMENTS IN THE WESTERN BALKAN COUNTRIES</i>
15:20 – 15:40 [PL2]	Nada Dragović, Ratko Ristić, Helga Puezl, Bernhard Wolfslehner, Genti Kromidha, Miriam Ndini, Bruno Marić, Mihajlo Marković, Sabina Hadžiahmetovic, Jugoslav Brujić, Qazim Kukalaj, Avdullah Nishori, Ivan Blinkov, Makedonka Stojanovska, Žarko Vučinić, Momčilo Blagojević, Branko Stajić, Boris Radić, Tijana Vulević <i>NATURAL RESOURCE MANAGEMENT IN SOUTHEAST EUROPE: ASSESSMENT AND RECOMMENDATIONS</i>
15:40 – 16:00 [PL3]	Ordan Cukaliev, Pandi Zdruli <i>AREAS WITH NATURAL CONSTRAINTS IN SOUTH-EAST EUROPE: ASSESSMENT AND POLICY RECOMMENDATIONS</i>

16:00 – 16:20 [PL4]	Mladen Todorović <i>INNOVATIVE TOOLS AND TECHNOLOGIES FOR SUSTAINABLE WATER MANAGEMENT</i>
16:20 – 16:40	Plenary lectures discussion

	Thursday, March 1 <sup>st</sup> , 2018
	Faculty of Agriculture
08:20 - 12:00	Registration of participants

	SECTION: HORTICULTURE	Room 39, 1 <sup>st</sup> Floor
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08:30 – 09:40	<b>Oral Presentations 1<sup>st</sup> Part</b>	Working Committee: Tjaša Jug, Geza Bujdošo, Silva Grobelnik-Mlakar
08:30 – 08:45 [HO1]	Mekjell Meland, R. Cerović, F. Gasi, Milica Fotirić –Akšić <b>'CELINA' - A RED BLUSHED NORWEGIAN PEAR WITH INTERNATIONAL POTENTIAL</b>	
08:45 – 08:55 [HO2]	Emel Kaçal <b>DISTRIBUTION OF FRUIT QUALITY TRAITS IN APPLE BREEDING POPULATIONS DERIVED FROM SOME CROSSES</b>	
08:55 – 09:05 [HO3]	Ferenc Takács <b>NEW ORCHARD DESIGN USES AT DIFFERENT FRUIT SPECIES IN CENTRAL EUROPE</b>	
09:05 – 09:15 [HO4]	Milica Fotirić Akšić, Uroš Gašić, Tomislav Tosti, Jasminka Milivojević, Vlado Ličina, Živoslav Tešić, Mekjell Meland <b>POMOLOGICAL CHARACTERISTICS OF THE RASPBERRY CULTIVAR `WILLAMETTE` PRODUCED ORGANICALLY IN WESTERN SERBIA</b>	
09:15 – 09:25 [HO5]	Miljan Cvetković, Gregory Lang <b>SWEET CHERRY PRODUCTION IN THE USA: FROM SCIENCE TO PRACTICE</b>	
09:25 – 09:40	1 <sup>st</sup> Part - Discussion on Presentations	

09:40 – 10:45	<b>Oral Presentations 2<sup>nd</sup> Part</b>	Working Committee: Mekjell Meland, Nikita Fajt, Emel Kaçal
09:40 – 09:50 [HO6]	Géza Bujdosó INNOVATIONS IN THE STONE AND SHELL FRUIT BREEDING AT NARIC FRUITCULTURE RESEARCH INSTITUTE	
09:50 – 10:00 [HO7]	Ivana Kolečka, Rodoljub Oljača, Vida Todorović, Borut Bosančić, Senad Murtić THE EFFECT OF GRAFTING ON CALCIUM INFLUX IN TOMATO HYBRIDS UNDER SALT STRESS CONDITIONS	
10:00 – 10:10 [HO8]	Ivana Kolečka, Rodoljub Oljača, Dino Hasanagić, Senad Murtić, Borut Bosančić, Vida Todorović GRAFTING INFLUENCE ON THE COPPER CONCENTRATION IN TOMATO FRUITS UNDER ELEVATED SOIL SALINITY	
10:10 – 10:20 [HO9]	Mariana Radulović, Snježana Hrnčić, Zorica Đurić, Gordana Đurić, Duška Delić POTENTIAL VECTORS OF GRAPEVINE YELLOW PHYTOPLASMAS IN VINEYARDS OF BOSNIA AND HERZEGOVINA	
10:20 – 10:30 [HO10]	Sanja Lazić, Dragana Šunjka, Slavica Vuković DETERMINATION OF CYANTRANILIPROLE RESIDUES IN TOMATOES	
10:30 – 10:45	2 <sup>nd</sup> Part - Discussion on Oral Presentations	
10:45 – 11:45	Coffee Break - 1 <sup>st</sup> Floor	
11:45 – 12:25	<b>Oral Presentations 3<sup>rd</sup> Part</b>	Working Committee: Miljan Cvetković, Milica Fotirić-Akšić, Ferenc Takács
11:45 – 11:55 [HO11]	Silva Grobelnik-Mlakar SITUATION OF ORGANIC FARMING IN SLOVENIA	
11:55 – 12:05 [HO12]	Tjaša Jug, Radojko Pelengić, Denis Rusjan, Andreja Škvarč ACIDIFICATION OF MUST – YES OR NO?	
12:05 – 12:15 [HO13]	Petar Nikolić, Bojana Šukalo, Milovan Čučić, Milijana Vukomanović, Mirko Jokić, Igor Tomašević, Borko Međedović, Jadranka Bojić, Nenad Ljubojević, Branimir Nježić PROGRAM OF SPECIAL SUPERVISION OVER THE PRESENCE OF SPOTTED WING DROSOPHILA (DROSOPHILA SUZUKII MATSUMURA) IN REPUBLIC OF SRPSKA IN 2017 - RESULTS AND OBSERVATIONS	
12:15 – 12:25 [HO14]	Zlatan Ristić, Sanda Stanivuković, Gordana Đurić THE EFFECT OF HYDROCOOLING TREATMENT OF SWEET CHERRY (PRUNUS AVIUM L.) ON SOLUBLE SOLID CONTENT OF FRUITS AFTER COLD STORAGE	

12:25 – 12:45	<b>Poster Presentations and Discussion</b>
[HP1]	Jelena Golijan, Bojan Dimitrijević ANALYSIS OF CHANGES IN AREAS UNDER ORGANIC ORCHARDS IN SERBIA
[HP2]	Nikita Fajt, Tjaša Jug CORRELATIONS BETWEEN SWEET CHERRY QUALITY PARAMETERS AND METEOROLOGICAL DATA
[HP3]	Nada Zavišić, Jelena Davidović Gidas, Borut Bosančić, FRUIT-BEARING AND QUALITATIVE SEED CHARACTERISTICS OF WILD PEAR ACCESSIONS FROM AN IN SITU POPULATION
[HP4]	Turan Karadeniz THE RECLAMATION OF THE GENOTYPES OF STRAWBERRY TREE (ARBUSUS UNEDO) CULTIVATED AROUND KARASU, SAKARYA
[HP5]	Turan Karadeniz THE IMPORTANCE AND PRACTICE OF SELECTION BREEDING IN WALNUT
[HP6]	Tatjana Jovanović-Cvetković, Momir Trubarac, Rada Grbić, Ivana Radojević PRODUCTIVE CHARACTERISTICS OF RIESLING CLONES IN THE UKRINA WINE-GROWING REGION
[HP7]	Tijana Banjanin, Zorica Ranković-Vasić, Saša Matijašević TECHNOLOGICAL CHARACTERISTICS OF VRANAC AND CABERNET SAUVIGNON GRAPEVINE VARIETIES IN THE CONDITIONS OF THE TREBINJE VINEYARD
[HP8]	Danijel Milinčić, Dušanka Popović, Aleksandar Kostić, Slađana Stanojević, Miroljub Barać, Mirjana Pešić THE CONTENT OF MONOMERIC ANTHOCYANINS IN DRIED RED GRAPE SKINS OF AUTOCHTHONOUS AND INTERNATIONAL VARIETIES
[HP9]	Dušanka Popović, Danijel Milinčić, Aleksandar Kostić, Slađana Stanojević, Miroljub Barać, Mirjana Pešić SPECTROPHOTOMETRIC DETERMINATION OF TOTAL FLAVONOIDS IN GRAPE SEEDS USING DIFFERENT STANDARDS
[HP10]	Aleksandra Govedarica-Lučić, Alma Rahimić, Goran Perković, Jelena Plakalović THE EFFECT OF DIFFERENT DOSES OF NITROGEN ON THE YIELD AND THE QUALITY OF CARROT
[HP11]	Jelena Golijan, Dimitrije Marković APPLICATION OF COMPOST AND BACTERIAL BIOFUELS IN THE ORGANIC PRODUCTION OF MEDICINAL AND AROMATIC PLANTS

[HP12]	Jelena Golijan, Dimitrije Marković THE BENEFITS OF ORGANIC PRODUCTION OF MEDICINAL AND AROMATIC PLANTS IN INTERCROPPING SYSTEM	
[HP13]	Dragan Kajkut, Svjetlana Zeljković, Vida Todorović, Jelena Davidović Gidas INFLUENCE OF PLANTING DEPTH ON THE MORPHOLOGICAL CHARACTERISTICS OF TULIPS (TULIPA 'VAN EIJK' AND TULIPA 'GIUSEPPE VERDI')	
12:45 – 13:15	General Discussion	
13:15 – 14:15	Lunch	
20:00	Social Dinner	Restaurant "Aquana"

		<b>SECTION: CROP SCIENCE AND NATURAL RESOURCES</b> Room 60, 2 <sup>nd</sup> Floor
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09:00 – 10:20	<b>Oral Presentations</b>	Working Committee: Danijela Kondić, Vesna Markoska, Mihajlo Marković
09:00 – 09:20 [CSNRO1]	Desimir Knežević, Aleksandra Yu. Dragović, Aleksandr M. Kudryavcev, Danijela Kondić, Gordana Branković VARIABILITY OF GRAIN QUALITY OF WHEAT (TRITICUM AESTIVUM L.)	
09:20 – 09:35 [CSNRO2]	Dušan Urošević, Veselinka Zečević, Danica Mićanović, Adriana Radosavac, Danijela Kondić, Mirela Matković, Vlado Kovačević, Gordana Dozet, Desimir Knežević VARIABILITY OF TILLERING POTENTIAL IN WHEAT (TRITICUM AESTIVUM L.)	
09:35 – 09:50 [CSNRO3]	Mira Pucarević, Nataša Stojić, Biljana Panin, Jelena Filipović NEW ENVIRONMENTAL EMERGING SUBSTANCES AS A FOOD CONTAMINANTS	
09:50 – 10:05 [CSNRO4]	Milica Balaban, Maja Stanisavljević, Nataša Sladojević, Zorana Popović, Suzana Gotovac Atlagić IMPACTS OF NEW NANOMATERIALS AND POLYMERS ON DEVELOPMENTS IN AGRICULTURE	
10: 05 - 10:20 [CSNRO5]	Tihomir Pređić PHYTOTOXIC EFFECTS OF ALUMINUM ON DISTRYC CAMBISOL AND PSEUDOGLEY	
10:20 – 11:00	Discussion on oral presentations and the general discussion	
11:00 – 12:00	Coffee break and Poster Presentations	
	<b>Poster Presentations</b> <b>2<sup>nd</sup> Floor</b>	Working Committee: Danijela Kondić, Vesna Markoska, Mihajlo Marković

[CSNRP1]	Borislav Petković, Novo Pržulj, Vojo Radić, Milenko Šarić VARIABILITY OF YIELD AND QUALITY OF SMALL GRAIN CEREALS ON MANJAČA LOCALITY
[CSNRP2]	Mirela Kajkut Zeljković, Sonja Rašeta, Gordana Đurić, Marina Antić INFLUENCE OF SUCROSE CONCENTRATION ON GROWTH AND MICROTUBERIZATION PROCESS OF POTATO (SOLANUM TUBEROSUM) IN THE IN VITRO CONDITIONS
[CSNRP3]	Dalibor Tomić, Ranko Koprivica, Vladeta Stevović, Dragan Đurović, Nikola Bokan, Milomirka Madić, Jasmina Knežević FORAGE YIELD OF BIRDSFOOT TREFOIL GENOTYPES IN THE THIRD YEAR OF CULTIVATION IN THE SOIL BASE REACTION
[CSNRP4]	Jelena Golijan, Aleksandar Ž. Kostić, Radivoj Petronijević, Dejana Trbović, Slavoljub Lekić FATTY ACIDS CONTENT IN MAIZE SEEDS PRODUCED UNDER DIFFERENT GROWING CONDITIONS
[CSNRP5]	Jelena M. Golijan, Aleksandar Ž. Kostić, Biljana P. Dojčinović, Slavoljub S. Lekić DETERMINATION OF ZN AND FE CONTENT IN ORGANIC AND CONVENTIONALLY GROWN SEEDS USING INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION SPECTROMETRY (ICP-OES)
[CSNRP6]	Željko Dolijanović, Dušan Kovačević, Snežana Oljača, Milena Simić, Srđan Šeremešić WEEDINESS OF MAIZE IN DIFFERENT CROP ROTATION
[CSNRP7]	Svetla Kostadinova, Živko Todorov, Ivan Velinov CONCENTRATION OF NITROGEN, PHOSPHORUS AND POTASSIUM IN SORGHUM PLANTS GROWN AT DIFFERENT LEVELS OF NITROGEN NUTRITION
[CSNRP8]	Jelena Filipović, Marija Bodroža Solarov, Vladimir Filipović, Mira Pucarević SCORE ANALYSIS OF SPELT CULTIVARS AS RAW MATERIAL FOR PREDICTING FOOD QUALITY
[CSNRP9]	Vladeta Stevović, Dalibor Tomić, Dragan Đurović, Rade Stanisavljević, Mirjana Petrović, Vladimir Zornić SEED GERMINATION OF RED CLOVER CULTIVARS CULTIVATED ON ACID SOIL
[CSNRP10]	Borislav Petković, Novo Pržulj, Vojo Radić, Milenko Šarić EVALUATING OF SMALL GRAIN CEREAL YIELDS IN MARGINAL GROWING CONDITIONS
[CSNRP11]	Borislav Petković, Novo Pržulj, Bogdan Šormaz, Mišo Vejin BUCKWHEAT (FAGOPYRUM ESCULENTUM L.) PRODUCTION IN MOUNTAIN AREA CONDITIONS

[CSNRP12]	Grozi Delchev INFLUENCE OF LATE TREATMENT WITH ANTIBROADLEAVED HERBICIDES DURING STEM ELONGATION STAGE OF DURUM WHEAT ON SOWING CHARACTERISTICS OF SEEDS
[CSNRP13]	Galia Panayotova, Svetla Kostadinova AGRONOMIC RESPONSE OF DURUM WHEAT TO NITROGEN RATES IN A LONG-TERM FERTILIZING EXPERIMENT
[CSNRP14]	Borislav Petković, Novo Pržulj, Bogdan Šormaz, Mišo Vejin THE IMPACT OF MINERAL FERTILIZER ON THE HAY YIELD OF NATURAL MEADOW TYPE AGROSTIETUM VULGARIS
[CSNRP15]	Slavica Vuković, Sanja Lazić, Dragana Šunjka, Antonije Žunić USE OF INSECTICIDES IN OILSEED RAPE PROTECTION FROM POLLEN BEETLES ( <i>MELIGETHES AENEUS</i> F.)
[CSNRP16]	Mirsad Ičanović, Husnija Kudić, Mihajlo Marković THE DEGREES OF SOIL SUITABILITY, MEASURED WITHIN THE BORDERS OF THE MUNICIPALITY OF BUŽIM, FOR THE PURPOSE OF CULTIVATING PLUMS ( <i>PRUNUS DOMESTICA</i> )
[CSNRP17]	Jovana Draginčić, Atila Bezdán, Borivoj Pejić COMPARISON OF SPEI INDICES CALCULATED USING THE DIFFERENT EVAPOTRANSPIRATION EQUATIONS
[CSNRP18]	Vlado Ličina, Svetlana Antić Mladenović, Mirjana Kresović THE MONITORING OF SOIL ORGANIC CARBON (SOC) IN THE CENTRAL PARTS OF SERBIA
[CSNRP19]	Petar Petrov, Vesna Markoska, Bojan Mitrovski, Daniela Belichovska THE IMPACT OF SOIL AND FOLIAR FERTILIZATION ON THE CONTENT OF MACROBIOGEN ELEMENTS IN CAULIFLOWER ( <i>BRASSICA OLERACEA</i> VAR. <i>BOTRYTIS</i> )
[CSNRP20]	Vesna Markoska, Petar Petrov, Daniela Belicovska, Bojan Mitrovski APPLICATION OF PERLITE AS SUBSTRATE FROM THE REPUBLIC OF MACEDONIA FOR IMPROVEMENT ON SOME PHYSICAL PROPERTIES OF CLAY SOILS
[CSNRP21]	Gordana Đurić, Sunčica Bodružić, Nikola Travar, Jelena Davidović Gidas PRESENTATION OF DENDROLOGICAL COLLECTION IN THE BOTANICAL GARDEN OF THE PROTECTED AREA PARK ARCHITECTURE MONUMENT 'UNIVERSITY CITY'*

[CSNRP22]	Ljubica Šarčević - Todosijević, Milan Šarčević TAXONOMIC AND BIOGEOGRAPHICAL ANALYSIS OF BRYOPHYTA IN THE COASTAL AREA OF THE RIVER UKRINA	
[CSNRP23]	Sunčica Bodružić, Marko Bodružić, Gordana Đurić SOME TAXONOMIC AND DENDROMETRIC CHARACTERISTICS OF TWO MOST PRESENTED BROAD-LEAVED AND CONIFEROUS GENUS IN THE PROTECTED AREA „UNIVERSITY CITY“ BANJA LUKA	
[CSNRP24]	Biljana Panin, Snežana Šrbac, Mira Pucarević, Nataša Stojić, Nataša Žugić Drakulić, Dunja Savić AWARENESS OF AGRICULTURAL PRODUCERS ABOUT THE IMPACT OF FERTILIZERS OVERUSE ON THE ENVIRONMENT	
[CSNRP25]	Ljubomir Radoš, Tanja Krmpot CHARACTERISTICS OF THE FRUIT OF AUTOCHTHONOUS SWEET CHERRY CULTIVARS (PRUNUS AVIUM L.) OF THE BANJALUKA REGION	
[CSNRP26]	Jelena Davidović Gidas, Borut Bosančić, Gordana Đurić PHENOTYPING TOOLS FOR ASSESSMENT OF SOME LEAF MORPHOLOGICAL TRAITS IN EUROPEAN HORNBEAM (CARPINUS BETULUS L.)	
[CSNRP27]	Nikola Travar, Gordana Đurić, Sunčica Bodružić INTEGRATED WASTE MANAGEMENT - PROTECTED AREA "UNIVERSITY CITY" MANAGING BASELINE	
[CSNRP28]	Zlatan Kovačević, Biljana Kelečević, Siniša Mitrić ECOLOGICAL ANALYSIS OF WEED FLORA IN VINEYARDS OF BOSNIA AND HERZEGOVINA	
[CSNRP29]	Zoran Maličević, Milan Jugović, Borislav Raičić, Dragoljub Mitrović THE SIGNIFICANCE OF TRANSVERSAL DISTRIBUTION DURING THE APPLICATION OF PLANT PROTECTION BY BOOM SPRAYER	
12:00 – 12:30	Discussion on Poster Presentations and General Discussion	
13:15 – 14:15	Lunch	
20:00	Social Dinner	Restaurant "Aquana"

	<b>SECTION: ANIMAL SCIENCES</b>	Room 46, 2 <sup>nd</sup> Floor
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09:00 – 10:20	<b>Oral Presentations</b>	Working Committee: Vesna Gantner, Daniel Falta, Goran Mirjanić
09:00 – 09:20 [ASO1]	Vesna Gantner, Božo Važić, Maja Gregić <b>THE CHALLENGES OF ACCESSION TO EUROPEAN UNION</b>	
09:20 – 09:35 [ASO2]	Monika Stojanova, Olga Najdenovska, Jovana Najdenovska, Dejan Taneski <b>THE INFLUENCE OF SOME STARTER CULTURES ON THE COLOR AND LIPID OXIDATION IN INDUSTRIALLY PRODUCED MACEDONIAN TRADITIONAL SAUSAGE</b>	
09:35 – 09:50 [ASO3]	Ivana Jožef, Maja Gregić, Tina Bobić, Božo Važić, Vesna Gantner <b>DETERMINATION OF THE EFFECT OF DAILY PRODUCTION LEVEL OF PRIMIPAROUS HOLSTEIN COWS ON RESPONSE TO HEAT STRESS CONDITIONS (THI THRESHOLD) IN EASTERN CROATIA</b>	
09:50 – 10:05 [ASO4]	Midhat Glavić, Amir Zenunović <b>QUALITY OF CORN SILAGE, GRASS SILAGE, HAY AND CONCENTRATE ON THE FARMS OF DAIRY COWS IN THE MUNICIPALITY KALESIJA AND ZIVINICE</b>	
10:05 – 10:20 [ASO5]	Saša Lovrić, Milenko Šarić, Đorđe Savić <b>THE EFFECT OF DIFFERENT TREATMENTS OF UDDER SANITATION ON THE REDUCTION OF THE NUMBER OF BACTERIA ON TEATS AND IN MILK</b>	
10:20 – 11:00	Discussion on oral presentations and the general discussion	
11:00 – 12:00	Coffee break and Poster Presentations	
[ASP1]	<b>Poster Presentations</b> <b>2<sup>nd</sup> Floor</b>	Working Committee: Vesna Gantner, Daniel Falta, Goran Mirjanić
	Antonya Stoyanova <b>ENERGY NUTRITION OF WHEAT FOR NON RUMINANT ANIMALS.</b>	
[ASP2]	Miloš Petrović, Radojica Đoković, Milun D. Petrović, Vladimir Kurčubić, Marko Cincović, Branislava Belić, Zoran Ž. Ilić, Neđeljko Karabasil <b>IMPORTANCE OF INTRACELLULAR AND EXTRACELLULAR PROTEIN HSP70 IN PERIPARTAL PERIOD IN DAIRY COWS</b>	

[ASP3]	Stanislav Navrátil, Daniel Falta, Matěj Benešovský THE EFFECT OF ENVIRONMENTAL COOLING RATE AND TEMPERATURE-HUMIDITY INDEX ON THE MILK YIELD OF HOLSTEIN CATTLE ON SPECIFIC FARM	
[ASP4]	Tina Bobić, Pero Mijić, Maja Gregić, Mirjana Baban, Vesna Gantner MEASUREMENTS OF MICROCLIMATE PARAMETERS ON THE ROBOTIC DAIRY FARM IN CROATIA	
[ASP5]	Gjoko Bunevski, A. Klincarov, Jelena Nikitović, Z. Saltamarski BIODIVERSITY PROGRAM OF BUSHA CATTLE IN THE REPUBLIC OF MACEDONIA	
[ASP6]	Maja Gregić, Mirjana Baban, Tina Bobić, Vesna Gantner MARE'S MILK WITHIN THE EUROPEAN UNION	
[ASP7]	Mikavica, Dragan, Savić, Nebojša BODY WEIGHT AND MASS OF EGGS SEXUALLY MATURE FEMALES OF RAINBOW TROUT (ONCORHYNCHUS MYKISS) IN THE FARM "UGARSKI BRZACI" KNEŽEVO	
[ASP8]	Savić, Nebojša, Mikavica, Dragan AQUACULTURE IN BOSNIA AND HERZEGOVINA	
[ASP9]	Marko Lazić, Aleksandar Stamenković, Zvonko Spasić, Jelena Nikitović, Bratislav Pešić, Nikola Stolić THE IMPACT OF THE ENVIRONMENT ON THE CONSERVATION OF ANIMAL GENETIC RESOURCES	
12:00 – 12:30	Discussion on poster presentations and the general discussion	
13:00 – 14:00	Lunch	
20:00	Social Dinner	Restaurant "Aquana"

	<b>SECTION: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT</b>	Room 25, 1 <sup>st</sup> Floor
09:00 – 10:50	<b>Oral Presentations</b>	Working Committee: Nebojša Novković, Željko Vaško, Stanislav Minita
09:00 – 09:20 [AERDO1]	William H. Meyers, Kateryna G. Schroeder, David Sedik FOOD SECURITY IN TRANSITION: SUCCESSES, FAILURES, AND NEW CHALLENGES FOR SOUTHEASTERN EUROPE	
09:20 – 09:30 [AERDO2]	Gordana Radovanović, Gordana Đurić SLOW FOOD ART OF TASTE AND PRESIDIO PROJECTS AS MODEL OF SUSTAINABLE AGRICULTURE, SUCCESS STORIES AND PROBLEMS FACED BY SLOW FOOD TREBINJE, HERCEGOVINA FOOD COMMUNITY	

09:30 – 09:40 [AERDO3]	Gordana Rokvić, Ljiljana Drinić, Ostoja Šinik ANALYSIS OF DEMOGRAPHIC CHANGES IN RURAL AREAS OF THE REPUBLIC OF SRPSKA	
09:40 – 09:50 [AERDO4]	Stanislaw Minta PROCESSES OF CONCENTRATION IN AGRIBUSINESS ON EXAMPLE OF THE POLISH MILK MARKET	
09:50 – 10:00 [AERDO5]	Nebojša Novković, Mile Peševski, Ljiljana Drinić, Beba Mutavdžić, Šumadinka Mihajlović COMPARATIVE ANALYSIS OF PEPPER PRODUCTION CHARACTERISTICS IN SERBIA, MACEDONIA AND THE REPUBLIC OF SRPSKA	
10:00 – 10:10 [AERDO6]	Tihomir Novaković, Beba Mutavdžić, Nataša Vukelić, Miljojko Junaušević THE IMPORTANCE OF AGRICULTURAL PRODUCTS IN DEFINING THE CONSUMER PRICE INDEX	
10:10 – 10:20 [AERDO7]	Lilia Lechner ORGANIC FARMING IN POLAND	
10:20 – 10:30 [AERDO8]	Szymon Godyla, Stanislaw Minta SUPPORT SYSTEMS FOR REGIONAL AND TRADITIONAL PRODUCTS IN POLAND	
10:30 – 10:40 [AERDO9]	Michał Pol OPINIONS OF POLISH CONSUMERS ABOUT THE INNOVATIVE COFFEE DRINK	
10:40 – 10:50 [AERDO10]	Monika Kowalczyk COMPARATIVE ANALYSIS OF PRESSED APPLE JUICES BASED ON THE OPINIONS OF POLISH CONSUMERS	
10:50 – 11:30	Discussion on oral presentations and the general discussion	
11:30 – 12:30	Coffee break and Poster Presentations	
	<b>Poster Presentations Viewing, 2<sup>nd</sup> Floor</b>	Working Committee: Nebojša Novković, Željko Vaško, Stanislaw Minita
[AERDP1]	Tamara Stojanović, Ljiljana Drinić FINANCIAL POSITION ANALYSIS OF LIVESTOCK PRODUCTION COMPANIES IN THE REPUBLIC OF SRPSKA	
[AERDP2]	Shreena Pradhan COMPARATIVE ANALYSIS OF TRADITIONAL FARMING AND IPM IN RAMPUR, CHITWAN	
[AERDP3]	Michael Adedotun Oke THE CASE STUDIES OF A TYPICAL SAWMILLING BUSINESS IN GWAGWALADA AREA COUNCIL OF THE FEDERAL CAPITAL TERRITORY, ABUJA, NIGERIA	
[AERDP4]	Jelena Golijan, Bojan Dimitrijević GLOBAL ORGANIC FOOD MARKET	

[AERDP5]	Željko Vaško INFLUENCE OF EXTRA FUEL EXCISE TAX ON THE COST OF PRODUCTION IN AGRICULTURE	
[AERDP6]	Ljubiša Ševkušić ASSESSMENT OF THE LONG-TERM FINANCIAL POSITION OF AGRICULTURAL ENTERPRISES	
[AERDP7]	Nemanja Jalić COMPARATIVE ADVANTAGES AND INTRA-INDUSTRY TRADE FOR MILK AND DAIRY PRODUCTS BETWEEN BOSNIA AND HERZEGOVINA AND SERBIA	
[AERDP8]	Aleksandar Ostojić, Nikola Bulović THE ROLE OF ECONOMIC PROMOTION IN BUYING WINE	
[AERDP9]	Miroslav Nedeljković, Boro Krstić APPLICATION OF THE MULTI-CRITERIA DECISION-MAKING METHODS FOR SUPPLIER SELECTION IN AN AGRICULTURAL ENTERPRISE	
13:15 – 14:15	Lunch	
20:00	Social Dinner	Restaurant "Aquana"

	Friday, March 2 <sup>nd</sup> , 2018
	Faculty of Agriculture

10:00 – 15:30	23 <sup>rd</sup> Conference of Agricultural Engineers of Republic of Srpska Room 46, 2 <sup>nd</sup> Floor
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## WORKING PROGRAM

<b>Section: Animal Production</b>	
Working Committee: Milanka Drinić, Nebojša Savić, Jasenko Nedinić	
10.00 – 10.20	Goran Mirjanić BRAVE STEPS OF COUNCELING AGRONOMIST AS AID TO BEEKEEPERS IN REPUBLIC OF SRPSKA
10.20 – 10.40	Željko Lakić USAGE OF ADITIVES IN MAKING OF DIFFERENT FORAGE PLANTS SILAGE
10.40 – 11.00	Nebojša Savić TYPES OF BREEDING POOLS IN RAINBOW TROUT FISHERIES – ADVANTAGES AND LACKS

11.00 – 11.20	Stojan Kozomara, Ministry of Agriculture, Forestry and Fisheries of Republic of Srpska IMPORTANCE AND PERSPECTIVES IN JOINING OF MILK PRODUCERS
11.20 – 11.30	Presentations of Agricultural Companies
11.30 – 11.55	Coffee break and Discussion

<b>Round Table</b> CHALLENGES OF <i>IPARD</i> AND HOW TO BE READY FOR THEM?	
12:00 – 13.00	Moderator: Dragan Brković, MSc

<b>Section: Plant Production</b>	
Working Committee: Dragan Zarić, Danijela Kondić, Jasenko Nedinić	
13.00 – 13.20	Siniša Mitrić PLANT PROTECTION AGENTS – VIEW TO FUTURE
13.20 – 13.30	Dalibor Dončić, SYNGENTA Company SAFE USAGE OF PESTICIDES
13.30 – 13.50	Branimir Nježić <i>DROSOPHILA SUZUKII</i> - THREAT TO BERRIES AND NUTS IN REPUBLIC OF SRPSKA
13.50 – 14.00	Siniša Šišić, BASF Company MANAGEMENT OF PESTICIDE RESIDUES
14.00 – 14.20	Zoran Maličević CONTROLLED APPLICATION OF PESTICIDES
14.20 – 14.30	Milan Vujanović, AGRIMATCO PALLAS 75 WG – NEW SYSTEMIC HERBICIDE OF DOW AGROSCIENCES COMPANY FOR SUPPRESSION OF MAIN NARROW AND WIDE-LEAF WEEDS IN CROPS
14.30 – 14.50	Mirko Jokić, Ministry of Agriculture, Forestry and Fisheries of Republic of Srpska PROGNOSTIC MODELS IN AGRICULTURE
14.50	Coffee break and Discussion



# **PLENARY LECTURES**

PL1

## MONITORING OF AGRICULTURAL POLICY DEVELOPMENT IN THE WESTERN BALKAN COUNTRIES

Dragi Dimitrievski<sup>1</sup>, Emil Erjavec<sup>2</sup>, Miroslav Rednak<sup>3</sup>, Tina Volk<sup>3</sup>

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<sup>2</sup>University of Ljubljana, Biotechnical Faculty, Ljubljana, Slovenia

<sup>3</sup>Agricultural institute of Slovenia, Ljubljana, Slovenia

The paper shows the results of the WB Agricultural Economists Network, leading by national agricultural economists and informally coordinated by Slovenian team (since 2003). Cooperation comes through: different bilateral and multi-lateral projects (EU FPs, FAO, JRC), and since 2010 within the frame of SWG activities. The activities are based on the OECD type of work: experts' studies and discussion with ministerial representatives. The main objectives of the work are: 1. Present the main characteristics of agriculture and agricultural policy in WB and 2. Elaborate some key policy issues regarding the approximation towards EU CAP, and process of IPARD programming and implementation. Project results are based on work of national academic experts and own analysis in the field of: agricultural statistics (national and EUROSTAT), Ag Policy documents (programming and legal frame) and budgetary transfers to agriculture. The agricultural statistics database has been compiled for the period 2005-2015 based on a common template organized in a set of predefined tables for specific data topics covering: key general (macroeconomic) indicators, all the main fields of agricultural statistics (farm structure, agricultural land use and production, agricultural prices, economic accounts for agriculture), and agro-food trade. Elaboration of the key policy issues is based on the analyzing of the development of the Agricultural and rural development policy. The main issue in this part is the budgetary transfers to agriculture. To make comparable of the data between countries the APM (Agricultural policy measures) tool was developed. The tool classified budgetary transfers according to CAP program transfers (EU pillars and measures), and OECD criteria for defining the lowest level of classification. The results about situation and trends in the Western Balkan economies showed some positive developments. Increasing the GDP, low level of inflation rates, but still unemployment rate is high in all WB countries. Agriculture remains an important economic sector for the national economy. In 2015, the proportion of total gross value added (GVA) generated from the agriculture, forestry and fishing sectors was about 22 % in Albania and between 8 % and 13 % in the other WB countries.

All WB countries are characterized by large variations in crop production over time, driven predominantly by weather conditions. Livestock production is generally less volatile than crop output. Developments in animal outputs were predominantly positive in Albania, Montenegro and Serbia, predominantly negative in Macedonia and Kosovo<sup>1</sup>, and with no clear overall trend in Bosnia and Herzegovina. The agro-food sector has an important role to the country's total external trade for both exports and imports, as well as to the countries' overall trade balances. Western Balkan countries have made significant progress in the last few years in aligning their long-term programming documents and administrative infrastructures with EU requirements. Between 2013 and 2015, new strategic documents for agriculture and rural development were adopted, which

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<sup>1</sup> Kosovo (in line with UNSCR 1244/99 and the ICJ Opinion on the Kosovo declaration of independence)

mainly cover the period to 2020 (up to 2019 for the Federation of Bosnia and Herzegovina and up to 2024 for Serbia). In all countries, the trends in the total levels of support for agriculture are unstable, although there was generally increasing trend. The relative level of support measured per hectare of UAA varies greatly between countries. In 2015, the total budgetary support for agriculture per hectare of UAA amounted to EUR 37 in Albania, EUR 55 in Bosnia and Herzegovina, EUR 62 in Serbia, EUR 90 in Montenegro, EUR 101 in Macedonia and EUR 143 in Kosovo. While there have been changes in total budgetary support for agriculture, no significant changes in its composition have been observed in WB countries in recent years. However, in most countries, the proportion of first pillar funds has increased slightly. All countries dealing with the IPARD pre-accession assistance seriously. Only Macedonia has experiences with implementation, but has low absorptions. There were several reasons, generally lays between country (mainly in programming and experience of administration), and EU contextual deficiencies (IPARD is not desired for the majority WBs farms, no real development patterns). The extensive quantitative and qualitative analyses of the facts and data pertaining to the WB countries have allowed to made some conclusions and recommendations regarding the development of agriculture and agricultural policy. This has been done at the regional level.

Key words: agriculture, Ag policy, rural development, Western Balkan

PL2

## NATURAL RESOURCE MANAGEMENT IN SOUTHEAST EUROPE: ASSESSMENT AND RECOMMENDATIONS

Nada Dragović<sup>1</sup>, Ratko Ristić<sup>1</sup>, Helga Puezl<sup>2</sup>, Bernhard Wolfslehner<sup>2</sup>, Genti Kromidha<sup>3</sup>, Miriam Ndini<sup>4</sup>, Bruno Marić<sup>5</sup>, Mihajlo Marković<sup>6</sup>, Sabina Hadžiahmetović<sup>7</sup>, Jugoslav Brujić<sup>8</sup>, Qazim Kukulaj<sup>9</sup>, Avdullah Nishori<sup>10</sup>, Ivan Blinkov<sup>11</sup>, Makedonka Stojanovska<sup>11</sup>, Žarko Vučinić<sup>12</sup>, Momčilo Blagojević<sup>13</sup>, Branko Stajić<sup>1</sup>, Boris Radić<sup>1</sup>, Tijana Vulević<sup>1</sup>

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<sup>9</sup> AFA Consulting Company National Resource Solution, Prishtina, Kosovo\*

<sup>10</sup> Regional Environmental Centre REC, Prishtina, Kosovo\*

<sup>11</sup> University St. Cyril and Methodius, Faculty of Forestry, Skopje, Republic of Macedonia

<sup>12</sup> NGO UROS, Podgorica, Montenegro

<sup>13</sup> Water Management Directorate, Podgorica, Montenegro

The main objectives of the study were: assessing the current situation and trends of natural resources, management, governance including the identification of gaps in the national contexts; assessing the national compliance with the EU aquis communautaire including the identification of gaps; comparing national results to be able to give political guidance; identifying key issues and challenges that need policy intervention and formulation of policy recommendations. The analytical approach pursued was based on three functionalities: screening and comparing natural resources, their management and governance in each of the six countries/territories; evaluating the current state of compliance with EU regulations and strategies; and identifying gaps, key issues and challenges that need policy intervention. The total area covered by forests and forest land in the SEE countries/territories have been established within the National Forest Inventory. SEE is dominated by broadleaf and deciduous forests. The most common species in this region are beech and oak. The collection of data and the monitoring of the forest status are dispersed to different institutions. The contribution of the forestry sector to the economic development of the SEE countries is limited. Wood is the most important product and nonwood forest products provide significant revenues for the rural population.

The trade balance is positive for B&H, Serbia, and Montenegro and negative for Albania, Macedonia and Kosovo\*. Processed wood materials are the main export/import products. Illegal logging is perceived as one the major issues in relation to forestry in the SEE. River basin management in SEE countries is influenced by structural and political organization in certain countries, on the basis of national Law on Waters and EU Directives. The surface and groundwater water quality are relatively good but quite uneven. Water quality assessments need classification systems based on EU-WFD characterization. The SEE region is affected mainly by torrential and river floods, as well as erosion processes and landslides. Generally flood protection in the region is still not at satisfactory level and shows a weak institutional support and organization. Preparation of

flood risk management plans it is still in an initial stage in the SEE region. Early warning systems were established just at a few watercourses in the region. In most of the SEE countries soils were classified according to the FAO soil classification compliant with World Reference Base for Soil Resources (WRB) criteria (except Albania, Serbia). A functional system for soil monitoring in countries SEE, however, has not yet been established. A soil information system was not established in most SEE countries/territories (only Macedonia). Water erosion is dominant in the whole area. There is a trend of decreasing agricultural and forest areas in all countries. Regards to EU forest-related legislation, some progress is made on the harmonization of EU timber regulation requirements in Albania, B&H and Kosovo\*. All countries have adopted and implement regulations related to phytosanitary aspects and forest reproductive material. The transposition of EU water related Directives is an ongoing process in all countries of the region. Progress varies from limited in Montenegro and Kosovo\*, to advanced in Macedonia. Except Serbia, no soil protection related legislation is in place so far. Monitoring the status and quality of soil is not being performed regularly at national scale in all the countries. The main results this study are recommendations for integrated management of natural resources in SEE, which comprise the following directions: pathways towards developing the natural resource sector; towards new approaches of land use planning; ecosystem services as a role play for integrated natural resource use; towards new level of business development; private land owners in the focus; resilience is an integral concept to natural resource use; institutional framework matters; capacities and education.

Key words: forest, soil, water, assessment, recommendation

PL3

## **AREAS WITH NATURAL CONSTRAINTS IN SOUTH-EAST EUROPE - ASSESSMENT AND POLICY RECOMMENDATIONS**

Ordan Chukaliev<sup>1</sup>, Pandi Zdruli<sup>2</sup>

<sup>1</sup> *University St. Cyril and Methodius, Skopje, Republic of Macedonia*

<sup>2</sup> *International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), Mediterranean Agronomic Institute of Bari, Italy*

The Areas with Natural Constrains (ANC) are areas facing natural constraints such as difficult climatic conditions, steep slopes, or soil quality. These less favorable conditions for agricultural production may lead to the land abandonment and thus a possibility of desertification, loss of biodiversity, and valuable rural landscape. The aim of this activity was to provide the scientific background information and agronomic rationale for bio-physical criteria identifying natural constraints to agriculture in SEE. The guiding objectives was identifying the current set of criteria stemmed from Regulation (EU) No 1305/2013 (Art. 32 (b)). Moreover, the goal was to develop a methodological approach and guidance materials on characterization and mapping of the ANC and to provide policy assessment and policy recommendations on characterization and mapping of areas with natural constrains in the SEE countries compatible with the EU methodology and standards. Data availability: soil, climate, and GIS. Serbia, Macedonia, Montenegro, Albania, R. Srpska are better placed compared with B&H federation and especially Kosovo. This last is missing information, especially soil and climate data. The 30-year baseline climatic period is available, but daily data are missing and their acquisition is costly. GIS data are largely available. The land use/cover data are available from the CORINE land cover. Digital Terrain Models (DTM) with required resolution are largely available. At country level, various sources of information are available, but they are scattered among Governmental institutions and not within easy access, thus the coordination and support to provide data needed to the relevant experts is required. The institutional setup for the establishment of the ANC system and its further updates should be maintained by the Ministries of Agriculture. This should serve not only to display the location of these areas but also to define the rural development policies and the support payment schemes that may be allocated in the future for the farmers operating in those constrained zones. The interdependence between the socio-economic and environmental factors and the multi-faceted relationship between agriculture, rural communities and environment in the SEE is the best testimony that the region needs rather sooner than latter an adequate ANC policy. The existing ANC policies in the region are poorly developed, or in the process of development. Their status is different from county to country (for instance, by 2018 the Republic of Srpska is expected to start implementing ANC policies while Montenegro with World Bank funding will start the process of ANC delineation and mapping).

Guidelines for ANC implementation should be developed for each county. They should consider policy, legal recommendations, institutional setup, step by step introduction into the rural development policy, system for support of the implementation and enforcement, and continuous monitoring and evaluation. The ANC Policy should be part of the national Rural Development Policies. Stronger collaboration in ANC mapping and harmonized policy implementation is recommended to all participating countries/territories in the ANC project. ANCs are strongly represented in all the SEE countries and are facing some demographic and social problems (depopulation, rural poverty). Governmental support at all levels is needed to support and mitigate problems of the ANC areas.

Keywords: areas with natural constrain (ANC), Southeast Europe (SEE), delineation, policy recommendation

PL4

## **INNOVATIVE TOOLS AND TECHNOLOGIES FOR SUSTAINABLE WATER MANAGEMENT**

Mladen Todorović

*CIHEAM – Mediterranean Agronomic Institute of Bari, Valenzano (BA), Italy*

Nowadays, the application of new technologies for control and automation of irrigation is receiving growing attention. This is due to: i) maturity of the technologies for acquisition of real-time digital weather, soil and crop data, ii) improved methodologies for estimation crop water requirements and irrigation scheduling; iii) improved reliability and effectiveness of sensors used for measurements of the soil-plant-atmosphere system; iv) easier access to data describing soil-plant-atmosphere continuum from remote sites through wireless connections; v) increased communication options offered by telemetry/remote control systems, being installed both in collective pressurized systems and in individual farms; vi) the cost-effectiveness of these technologies in developed countries when compared to labor costs. A particular attention is given to new automatized decision support systems (DSS), which integrates the results of scientific achievements and technological innovations in the fields of crop water requirements and irrigation scheduling, on-field data acquisition, transmission and management, and application of web and app tools for real-time irrigation management. Such systems combine agronomic, engineering, environmental and economic aspects of water management and aim to promote the eco-efficiency of agricultural water use. In most cases, they can be applied at both farm and irrigation district scale using the advanced technological solutions for the continuous sensor-based monitoring of the soil-plant-atmosphere continuum and the remote control of irrigation supply networks. One of such systems, BLULEAF, is presented. 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. As such, it 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 species, biometric and phenological characteristics. 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 three to seven forthcoming days. A dynamic multi-crop/multi-plot/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. BLULEAF 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.

BLULEAF is used at numerous farms in Italy and other Mediterranean countries for irrigation management of peach and olive orchards, wine and table grapes, vegetables and field crops. The overall results indicated the satisfaction of the farmers and irrigation managers emphasizing the relevant saving of water, energy and time, the increase of water productivity, revenue and eco-efficiency. This has confirmed that water engineers, farmers, and decision and policy makers effectively require the innovative management tools. The on-going efforts focus on the inclusion of the last generation of satellite data (e.g. Sentinel 2) which permits continuous remote sensing of agricultural land and evaluation of adopted management practices over large areas.

Keywords: water balance modelling, irrigation management, decision support system, automation, precision irrigation, remote sensing.



# **Section: PLANT SCIENCE**

## **Subsection: Horticulture**

### **Oral Presentations**

HO1

## **'CELINA' - A RED BLUSHED NORWEGIAN PEAR WITH INTERNATIONAL POTENTIAL**

Mekjell Meland<sup>1</sup>, Radoslav Cerović<sup>2</sup>, Fuad Gaši<sup>3</sup>, Milica Fotirić Akšić<sup>4</sup>

<sup>1</sup>*Norwegian Institute of Bioeconomy Research – NIBIO Ullensvang, Norway*

<sup>2</sup>*Innovation Centre of the Faculty of Technology and Metallurgy, University of Belgrade, Serbia*

<sup>3</sup>*Faculty of Agriculture and Food Sciences, University of Sarajevo, FB&H, B&H*

<sup>4</sup>*Faculty of Agriculture, University of Belgrade, Zemun-Belgrade, Serbia*

The Norwegian newly bred pear cultivar, Celina/QTee®, which was launched in 2010, has been released from the Norwegian breeding program Graminor. It derived from the combination 'Colorée de Juillet' x 'Williams'. It has large attractive fruits with red blush. Traits such as good fruit quality (smooth texture), good storability and good shelf life make this cultivar very promising. Significant acreage of the Celina cultivar is planted in other countries, mainly Europe. The cultivar has European Plant Variety Rights and entitled parties are ABCz Group and Fruithandel Wouters, both Belgium. Different strategies are tested to improve the fruit set, and the biology of fertilization is studied. At the genetic side different pear genotypes from Norway were genotyped using SSR markers (simple sequence repeats) for S genotyping. Parentage analysis using microsatellites or SSRs revealing the female and male parents of the plant and crosspollination with different fathers as potential pollinators are studied. Further, the frequency of flowering of different potential pollinizer cultivars are registered, cross pollination with different pollinizers included open pollination and self pollination, pollen tube growth - pollen-pistil incompatibility reactions and pollen viability are investigated. Celina grafted on dwarfing quince rootstocks and different training systems are tested in field trials. The aim is to select the most suitable pollinizer in order to recommend to the fruit growers which cultivars should be planted within the same orchard to provide high, stable and annual yields. Overview and preliminary results from the different experiments will be presented.

Keywords: *Pyrus communis* L., genetic diversity, pollen tubegrowth.

HO2

## **DISTRIBUTION OF FRUIT QUALITY TRAITS IN APPLE BREEDING POPULATIONS DERIVED FROM SOME CROSSES**

Emel Kaçal

*Fruit Research Institute, Eđirdir, Isparta, Turkey*

This study is aimed to determine parent performances of some apple varieties in apple breeding program. The first crosses were made in 2008 with eight hybridization combination at Fruit Research Institute, Eđirdir, Isparta. Jersey mac, Golden Delicious, Braeburn, Priscilla and William's Pride hybrids were selected from within the breeding population. Sensory evaluations were performed over 2 years for each fruited genotype. Unipolar hedonic scale of 1-9 (1: no liking, 9: very satisfied) and bipolar intensity scales of 0-9 (0: no, 9: many) were used. Harvested fruits were also evaluated for some phenotypic characteristics such as ground color, over colour, fruit flesh color, fruit shape, aperture of locules etc. Harvest time of genotypes changed from August to October. Mostly of Jersey mac offspring's were similar shape and taste with it. Braeburn was the most efficient parent on fruit quality among the parents.

Keywords: *Malus x domestica*, hybridization, taste.

HO3

## **NEW ORCHARD DESIGN USES AT DIFFERENT FRUIT SPECIES IN CENTRAL EUROPE**

Ferenc Takács

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Fruit production is constantly increasing in the world, resulting in deepened competition and crisis in the fresh fruit market. It is especially true for the cultivation of cherries and walnut. There is only one way out of the crisis, high quality fruit production in new, modern orchards. The most important advantages of HDP in comparison with other training systems are: early coming into bearing, higher labor productivity, higher picking and pruning performance, and lower costs for material and machinery. The establishment of a modern orchard involves a great many decisions, which ones have a long-term impact on the success of the operation. There is a wide spectrum of issues that have to be analysed carefully like soil, climate, rootstock, variety etc. To choose the suitable training system that suits the conditions of the region had become of primary importance. Negative aspects are seen in the high cost of establishing an HDP orchard and the high degree of care needed. Orchardists with a traditional concept have difficulties in converting from extensive to intensive plantings, mainly for psychological reasons. In our study rootstocks play a more and more important role because of this part of the tree the only one which can ensure the adaptation in different climatic and soil conditions. This survey provides a first-hand view of the various techniques aimed at improving HDP orchard designs.

Keywords: HDP, fruit, orchard.

HO4

## **POMOLOGICAL CHARACTERISTICS OF THE RASPBERRY CULTIVAR `WILLAMETTE` PRODUCED ORGANICALLY IN WESTERN SERBIA**

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Raspberry commercial importance for Serbia is great because it is mostly exported, with average income of about 105 million USD. Serbia has a large raspberry production and is ranked as a fourth country in the world for the production of fresh raspberries with average production being around 80-96,000 MT per year. The total acreage of raspberry production in the Republic of Serbia is about 15000 ha, where only 2% is organic production. However, the last two years this organic acreage has doubled. In the municipality of Krupanj (village Kržava), Western Serbia a pomological study was conducted at an organic raspberry farm. The whole production was certified, which means that no mineral fertilizers were applied and pest control was done in accordance to the organic production guidelines. The aim was to analyse several morphologic and chemical traits of the cultivar 'Willamette' grown organically and compared with conventional production system. Organically grown raspberries were collected from ten different farms, and the average results were used in this study. Yields per area in the organic production were 30-50% lower than in the conventional production. The average fruit weight and fruit length (3.7 g and 21.06 mm, respectively) were higher than in conventional production (3.5 g and, 19.98 mm, respectively). Organic fruits were more elongated (index of fruit shape was 1.08) compared to conventional, 1.03). The total polyphenolic content (TPC), total sugars and total acids were higher in organic fruits compared to conventional, while the amount of vitamin C was at the same level for both production systems. The content of ellagic acid, which is the most important polyphenolic component in fruit of raspberry, was 3.5 folds higher in the organic fruits.

Keywords: *Rubus idaeus*, vitamin C, polyphenolics.

HO5

## **SWEET CHERRY PRODUCTION IN THE USA: FROM SCIENCE TO PRACTICE**

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Cherry production in the US geographically is mainly located in the Northwest (Washington state, California, Oregon) and partly in the Midwest (Michigan). Cherries as a highly valuable food and high profitability product has expanded dramatically in the past 20 years and has gained importance in the production structure of fruit species in the US. Increasing use of new dwarfing rootstock selections, comparative trials over the whole country, improvement in crop protection strategies to reduce rain-induced cracking and diseases, training systems for labor efficiency and high-quality fruit combined with precision management are the main characteristics of a modern and science-based approach to cherry production. Research on the most appropriate training system for particular conditions based on physiological knowledge is presented through on-going trials located in respective research institution as well as in cooperation with local farmers. New results based on research are very often available to the farmer through various ways of interaction (one-day training workshops combining theoretical and practical aspects, different types of written instructions and results in scientific journals and industry magazines, orchard tours, personal communication with farmers, etc.). Modern communication methods, e.g., social media and information technologies, are being utilized increasingly by farmers, and the advantages are becoming a very important part of knowledge transfer. Different materials are easily available to farmers through extension-service websites, specialized webinars, YouTube video material on specific production techniques, and an increasing number of very modern and useful applications for tablet computers and smartphones. The transfer path from science to practice nowadays is more efficient than ever.

Keywords: production, transfer of knowledge.

HO6

## **INNOVATIONS IN THE STONE AND SHELL FRUIT BREEDING AT NARIC FRUITCULTURE RESEARCH INSTITUTE**

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The National Research and Innovation Centre Fruitculture Research Institute was found in 1950. The Institute bred and domesticated 197 fruit cultivars approved by the state (61 apple cultivars, 1 pear cultivar, 25 sweet cherry cultivars, 19 tart cherry cultivars, 20 apricot cultivars, 9 European plum cultivars, 8 Persian walnut cultivars, 6 almond cultivars, 6 European chestnut cultivars, 2 hazelnut cultivars, 10 strawberry cultivars, 7 raspberry cultivars, 4 blackberry cultivars, 2 black and 2 red currant cultivars, 6 quince cultivars, 3 medlar cultivars, 5 gooseberry cultivars and 1 black chokeberry cultivars) and further 20 rootstocks cultivars, which are mainly stone and shell fruit cultivars. These varieties are base of the Hungarian fruit industry. Nine of our cultivars are under patent in the territory of the European Union, Chile and Australia. Our main breeding aims are production safety, increasing tolerance / resistance to diseases, pests and stress factors, as well as to produce fruits having outstanding taste, aroma and market value. Our breeding activities supported by our ex-site gene bank collection, science tools, ex-situ trials maintained by the local growers, orchard system and rootstock trial, agricultural trials (incl. irrigation, plant fertilization, plant protection) and post-harvest trials help to have more information about our novelties. Beside the breeding activities there is a virus-free nuclear stock plantation at the Institute, which is base of the Hungarian nursery production. Maintenance and development of the plantation is a national interest, which is realised by micropropagation and virus elimination laboratories of woody plant species found at the Institute. Our success is related to unique genetic background and various fruit site conditions. Our partners are mainly from the countries located in the Carpathian Basin and in the European Union, but there is no partner from the non-EU member Balkan countries.

Keywords: breeding program, new varieties.

HO7

## **THE EFFECT OF GRAFTING ON CALCIUM INFLUX IN TOMATO HYBRIDS UNDER SALT STRESS CONDITIONS**

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Calcium plays an essential role in the processes of preserving the structural and functional integrity of the cell membrane, enzyme activity in the cell wall and membrane, stabilizing the cell wall structure, regulation of ionic transport and selectivity, as well as controlling the ion exchange. Two commercial tomato cultivars were used to determine whether grafting could prevent decrease of Ca<sup>2+</sup> concentration under salt stress conditions. The cultivars Buran F1 and Berberana F1 were grafted onto rootstock "Maxifort" and grown under three levels of elevated soil salinity (S1- EC 3.80 dS m<sup>-1</sup>, S2- 6.95 dS m<sup>-1</sup> and S3- 9.12 dS m<sup>-1</sup>). Ca<sup>2+</sup> concentration of non-grafted and grafted plants of both examined hybrids was lower (about 15 to 25 %) at S2 salinity level in comparison to the control. Salt stress at the third salinity level (EC 9.12 dS m<sup>-1</sup>) induced the highest alteration of Ca<sup>2+</sup> concentration of both grafted and non-grafted plants (about 30%). The possibility of grafting tomato plants to improve influx of Ca<sup>2+</sup> salt in salt stress conditions is discussed.

Keywords: tomato, grafting, salt stress.

HO8

## **GRAFTING INFLUENCE ON THE COPPER CONCENTRATION IN TOMATO FRUITS UNDER ELEVATED SOIL SALINITY**

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Salinity is currently one of the most severe abiotic factors, limiting agricultural production and grafting has been proposed as an interesting strategy that improves the responses of plants exposed to elevated soil salinity. Copper is an essential metal for normal plant growth and development. Copper participates in numerous physiological processes and is an essential cofactor for many metalloproteins. Copper concentration in two commercial tomato cultivars (grafted and non-grafted Buran F1 and Berberana F1) was examined. Elevated soil salinity decreases Cu concentration approximately for 40% in non-grafted and 23% in grafted tomato plants.

Keywords: copper, tomato, salinity, grafting.

HO9

## POTENTIAL VECTORS OF GRAPEVINE YELLOW PHYTOPLASMAS IN VINEYARDS OF BOSNIA AND HERZEGOVINA

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Grapevine yellows (GY) is a term for phytoplasma diseases occurring on *Vitis vinifera* and inducing the same or very similar symptoms and causing severe losses worldwide. The most widespread grapevine related phytoplasma diseases in Europe are 'Candidatus Phytoplasma solani' (bois noir, BN) and 'Candidatus Phytoplasma vitis' (flavescence dorée, FD) associated respectively with phytoplasmas belonging to the 16SrXII and 16SrV groups. Both diseases are spreading by sap feeding hemipteran insect vectors. BN is mainly transmitted by *Hyalesthes obsoletus* Signoret, a planthopper residing in weeds. FD is epidemically transmitted by the grapevine leafhopper *Scaphoideus titanus* Ball. The results of the surveys explore presence of 'Ca. P. solani' in grapevine as well as presence of alternative hosts in Herzegovina vineyards. Further, in *Clematis vitalba* and *Alnus glutinosa* was identified phytoplasma belonging to 16SrV-C subgroup. Previous monitoring was carried to presence and distribution of grapevine yellows GY phytoplasmas in vineyards, but information about insect vectors in vineyards is still lacking. Therefore, since 2011 to 2017 an extended survey was conducted in Herzegovina vineyards to provide further insight into GY epidemiology in Bosnia and Herzegovina vineyards. During July 2011 in two vineyards hemipteran insects were collected using sweep nets and mouth-aspirators from grapevine and weeds present in vineyards inter-rows and borders. *Reptalus quinquecostatus* Dufour and *Dictyophara europaea* Linnaeu were identified on the basis of morphological characteristics using taxonomic keys. During 2016 a survey for *H. obsoletus* was conducted in and around three vineyards in the Herzegovina. *H. obsoletus* were collected using sweep net and mouth aspirator from *Convolvulus arvensis* and *Vitex agnus-castus*. The identity of the caught adults was checked using morphological characters of adults and male genitalia and employing molecular methods such as PCR/RFLP on COI and ITS2 region and sequence analyses. In 2017 insects were collected in 5 locations during July and September which were captured on yellow sticky traps placed inside the vineyards plots. Identifications of collected leafhoppers were using identification keys. In period from middle of July to beginning of September *S. titanus* specimens were identified captured on yellow sticky traps. Distribution of BN disease is increasing also on those areas where *H. obsoletus* is not be, therefore identified *R. quinquecostatus* and *D. europaea* could act as potential vectors of BN phytoplasma in Herzegovina vineyards. Extensive research is needed on wild hosts of GY phytoplasmas and new insect vectors of BN and FD phytoplasmas for the better understanding of their epidemiology.

Keywords: BN, FD, *H.obsoletus*, *S.titanus*.

HO10

## **DETERMINATION OF CYANTRANILIPROLE RESIDUES IN TOMATOES**

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One of the most important problems in vegetable production is the appearance of greenhouse whitefly (*Trialeurodes vaporariorum*), which is the most frequently occurring indoor, and lately more and more often causes damage to the production of vegetables in the field. Recently, in protection against the named pest ryanoids insecticide cyantraniliprole is introduced. The objective of this study was to develop and validate analytical method for the determination of cyantraniliprole residues in tomato. Its residues were extracted and cleaned using QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) based method. Residue analysis was performed with Agilent Technologies 1100 Series high-performance liquid chromatographic system equipped with a diode array detector (HPLC-DAD) and a C18 column (250 × 4.6 mm, 1.8 μm). The mobile phase was (0.1% formic acid/MeCN, 30:70, v/v), with a flow rate of 0.55 ml/min and detection wavelength of 210 nm. Data analysis was performed using ChemStation software. The optimized analytical conditions were evaluated in terms of recovery, linearity, limits of detection (LOD) and quantification (LOQ), precision, as well matrix effect of tomato sample. The accuracy of the method, evaluated by recovery studies at three fortification levels (0.03, 0.3 and 0.45 mg/kg) in blank tomato samples, ranged from 76.41-89.42%. Within a concentration range from 0.03-0.9 μg/ml, cyantraniliprole showed linear calibration with correlation factor (R<sup>2</sup>) of 0.998. LOD and LOQ were 0.01 and 0.03 mg/kg, respectively. Precision value was evaluated through repeatability and expressed as RSD (0.75%) of the peak areas. The matrix effect, i.e., signal suppression or enhancement, of the studied insecticide in the tomato matrix, was evaluated. A value of 101.5% indicates that there is no effect of tomato matrix on the determination of cyantraniliprole residues. The achieved values of the validation parameters of the applied method are completely in accordance with SANTE/11945/2015 criteria. The obtained results confirm that proposed method is applicable for the routine laboratory analysis of cyantraniliprole residues in real tomato samples.

**Keywords:** cyantraniliprole, tomato, residues, determination, HPLC-DAD.

This research is a part of the Bilateral Serbian-Slovak joint research project III46008, funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia and SK-SRB 2016-0006.

HO11

**SITUATION OF ORGANIC FARMING IN SLOVENIA**

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Due to relatively unfavourable natural and structural conditions, Slovenia is a net importer of food. It is one of the most forested countries in Europe (more than 60.0% territory), protected areas (national park, regional and natural parks, natural monuments) represents about 12.5%, special protection areas (Natura 2000) more than 37%, and water protection zones occupy around 17% of the whole national territory. Utilised agricultural area (UAA) accounted for less than one quarter of the land area (477,683 ha), in the structure predominate permanent grassland (57.8%), arable land represents 36.4% and permanent crops 5.8% of UAA. Moreover, around 73% of agricultural land is situated in the less favourable areas (LFAs) for agriculture, and the majority of farms is small (6.9 ha in average). Regarding conditions for agriculture, increased consumer concerns about conventional agricultural practices, and growing demand for (domestic) organic products and foods, organic farming has a high potential in Slovenia. This contribution presents history and current situation of organic production and market in Slovenia, key sector institutions and certification bodies, labelling of the products, and sector support under the EU rural development programme.

Keywords: Slovenia, agriculture, organic farming, rural development programme 2014-2020.

## ACIDIFICATION OF MUST – YES OR NO?

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In vintage 2017, grapevine was exposed to extreme climate conditions in terms of extremely high air temperatures causing heat and draught stresses. Such conditions usually reduce sugar evolution due to the decrease of the photosynthetic activity, while the total acidity decreases anyway. The disbalance in sugar and acidity ratio impacts the chemical and sensorial wine quality, therefore the wine producers should be keeping in mind the possibility of must enrichment and acidification. To the present days, oenological improvements have not been used in the grapevine clonal selection process, therefore we have been forced to a more detailed monitoring of organic acids content from grape to wine. The study was conducted on 13 clonal candidates of 'Istrska Malvazija' (*Vitis vinifera* L.) variety produced in two locations. The grape was harvested at technological ripeness without any symptoms caused by heat or drought stress. The wine from the grapes of the individual candidates has been produced in 50 L vessels by same vinification using selected yeasts of *Saccharomyces cerevisiae* and *Saccharomyces bayanus*. Taking into account the total acidity, studied vines were classified into two groups resulting the two terroirs. Musts in the first group showed a significantly higher total acidity (6.3 – 6.8 g/L) and potassium content (1530 – 1670 mg/L), in which the total acidity in wine decreased (5.3 – 6.1 g/L). In the musts of the second group, a significantly lower total acidity (3.7 – 4.9 g/L) and potassium content (1200 – 1370 mg/L) were measured. On the contrary, the wine analyses of the second group revealed from 1.5 to 2.0 g/L higher total acidity reaching 5.2 – 6.3 g/L. Total acidity increase can be explained by the already knownfact, that lower acidity stimulates succinic acid formation and consequently higher total acidity in wine – as confirmed in our study. Despite the fact, that in vintages, characterised by the lower total acidity in grape, the must acidification is not always necessary. According to the new climate conditions and more frequent stress impacts on the grapevine, the formation of succinic acid should be taken into account.

Keywords: grape, wine, total acidity, succinic acid.

HO13

**PROGRAM OF SPECIAL SUPERVISION OVER THE PRESENCE OF SPOTTED WING DROSOPHILA (DROSOPHILA SUZUKII MATSUMURA) IN REPUBLIC OF SRPSKA IN 2017 - RESULTS AND OBSERVATIONS**

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Spotted Wing Drosophila (SWD) - *Drosophila suzukii* Matsumura is a relatively new but very well known insect pest in Europe. Thanks to the fast development, high number of generations per year and wide host range it belongs to the most significant pests of berries, stone fruit and grapevine. Strong ovipositor enable the female to lay eggs in healthy, unripened fruit which make chemical control measures hard to implement since moment of treatment is close to harvest. Damages on fruits are result of larvae feeding within the fruit (up to 70 larvae/fruit) as well as development of pathogens on the wounds that were made during the oviposition. Presence of SWD in Europe was confirmed in 2008 while in B&H Ostojic et al. found it in 2013. Considering economical importance of production of raspberry, blackberry, strawberry, cherry and grapevine for Republic of Srpska there was a need for detailed analysis of presence of SWD in this area. In 2017 Faculty of Agriculture, University of Banja Luka had realized Program of special supervision over the presence of SWD in Republic of Srpska in order to gain insight into distribution and populations dynamics of this pest. 90 insect traps were set up across RS. Traps were made of plastic bottles with 100 ml apple cyder vinegar as attractant. Examination of traps was conducted every week as well as replacement of attractant. The survey lasted for ten weeks, from July until October. Presence of SWD was confirmed in all regions. The highest number of adults was found in Bratunac and Prijedor where the number of adults was up to 50 per trap. Number of caught adults was higher as the vegetation approaching the end. In Republic of Srpska SWD was found on raspberry, blackberry, cherry, plum, nectarine, kiwi and grapes.

Keywords: spotted wing drosophila, survey, raspberry, Republic of Srpska.

Acknowledgements: Program of special supervision over the presence of SWD in Republic of Srpska in 2017 was realized with the funds of Ministry of Agriculture, Forestry and Water Management of Republic of Srpska.

HO14

## **THE EFFECT OF HYDROCOOLING TREATMENT OF SWEET CHERRY (PRUNUS AVIUM L.) ON SOLUBLE SOLID CONTENT OF FRUITS AFTER COLD STORAGE**

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Cherry fruits are characterized by short storage times. For the purpose of prolonging the storage time, cooling treatment of cherry fruits is carried out in order to reduce the temperature of the same before entering the cold storage. In the course of 2015 and 2016, a sampling of fruits of the commercial variety of the cherry trees Regina was carried out, with two sites, Gradiška and Trebinje. The fruits were divided into three groups, about 400 fruits. The first group was analyzed immediately after harvest. The second group of fruits was subjected to cooling treatment (hydrocooling) at a temperature of 0.9 °C for 10 minutes and a third control group of fruits. The fruits of the other two groups were stored for 15 days in cold storage with normal conditions at a temperature of 1 °C and humidity 85-95%. The soluble solid content (% Brix) was determined after storage in both groups of fruits. A significant difference in soluble solid content was determined, depending on the site. At the site in Gradiška, the fruits of the Regina variety had a significantly higher soluble solid content in control fruits, compared to fruits at the moment of harvest and treated fruits, among which no significant difference was recorded. The site of Trebinje identified a significantly different soluble solid content between all investigated groups. The values of soluble solid content in cellular fruit juice in the Regina variety from the Trebinje site were: 16.56% at the moment of harvest, and after storage, 18.67% (control fruits) and 17.71% (treated fruits). These results indicate that the cooling treatment allows for a longer period of use of cherries, in which case the soluble solid content is changed to a certain level. The treated fruits did not record the percentage growth of the soluble solids content as recorded in the control fruits. The control fruits, which are not treated, continue to be intensified with the process of maturation in cold storage, and they notice an increase in the soluble solids content. Because of faster maturation, that is, spoilage, the accumulation of sugar, anthocyanins and other nutritional components is significantly more intense in control fruits. The performed analyzes indicate that the cooling treatment, had an impact, to a certain extent, on the slowing down of metabolic activity and consequently, on the prolongation of the shelf life of sweet cherries.

Keywords: hydrocooling, %Brix, cv. Regina.



# **Section: PLANT SCIENCE**

## **Subsection: Horticulture**

### **Poster Presentations**

HP1

## **ANALYSIS OF CHANGES IN AREAS UNDER ORGANIC ORCHARDS IN SERBIA**

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Area under organic agricultural production is recording steady growth, both globally and in the Republic of Serbia. The system of organic plant production in Serbia in 2016 took place on an area of 14357.96 ha. With very favorable agroecological conditions, organic fruit growing is very rapidly developing on the territory of entire Serbia, where with an area of 3531.03 ha in 2016, it is on the second place behind prevailing areas under the organic production of cereals. The aim of this paper is to present an analysis of the changes in the areas under organic orchards in the Republic of Serbia in the period 2012-2016 (according to regions and areas). Based on data from the Ministry of Agriculture, Forestry and Water Management, average sizes of areas under organic orchards were calculated, as well as base and chain indices. The largest areas under organic orchards are represented in the Region of Šumadija and Western Serbia (1688.16 ha), followed by Southern and Eastern Serbia (1719.02 ha), Vojvodina 115.64 ha, while the smallest areas are concentrated in the territory of the City of Belgrade (8.2 ha).

Keywords: fruit growing, organic production, areas, regions.

HP2

## **CORRELATIONS BETWEEN SWEET CHERRY QUALITY PARAMETERS AND METEOROLOGICAL DATA**

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Cherry cultivars' evaluation has been monitored on an array of cultivars ('Biggareau Burlat', 'Black star', 'Grace Star', 'Merchant', 'Sweet Early', 'Vigred') for 5 years by looking through correlations between classical parameters such as fruit weight, crop yield, total soluble solids and total acidity and meteorological data (minimal, maximal and average daily temperatures, precipitation, hours of solar irradiation and humidity). For most varieties ('Biggareau Burlat', 'Black star', 'Grace Star', 'Merchant', 'Sweet Early') very strong correlations were found in the period of differentiation. Very good correlations ( $R^2 > 0.8$ ) gave us a potential predicting power in 2016, while 2017 harvest was unfortunately not representative due to the frost. A promising predicting power was found forecasting total soluble solids for 'Merchant': 17,1 °Brix from minimal daily temperatures and 18,8°Brix from average daily temperatures. Since average daily temperatures are influenced by minimal temperatures and there is no correlation with maximal daily temperatures, we believe data from minimal temperatures are a better choice, which is also confirmed by real values: average total soluble solids in 2016 for cv. 'Merchant' were 17,4° Brix. Unfortunately other predictions were not that efficient: total soluble solids predicted from minimal daily temperatures for cultivar 'Sweet Early' were 15,0 °Brix, while in reality it has reached only 12,7° Brix. From averaged daily temperatures predicted total acidity for 'Black star' 791mg/ 100g is not that far away from real data 961 mg/ 100g, but it already has no practical value, while for 'Biggareau Burlat', predicted from humidity, 836 mg/ 100g instead of predicted 345 mg/ 100g puts the purpose of such predictions under a big question and/ or force us to question, what was different in 2016. Apart from quality parameters, we tried to predict also harvest date for cv. 'Grace Star', based on average daily temperature in the differentiation phase. We were not successful, since we have predicted harvest date 10 days earlier than in reality. Anyway, authors believe that correlating quality parameters to meteorological data should be important in the future, although advanced mathematical knowledge, such as multiple regression should be used, especially in forecasting attempts.

Keywords: cherry, correlation, meteorological data, quality.

## **FRUIT-BEARING AND QUALITATIVE SEED CHARACTERISTICS OF WILD PEAR ACCESSIONS FROM AN IN SITU POPULATION**

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Wild pear (*Pyrus communis* var. *piraster* (L.) Ehrh.) is mostly used as a generative rootstock in production of pear plants. Seeds for the production of rootstock seedlings is collected from the mother plants which are selected by fruit quality, fruit bearing regularity, number of seeds per fruit and seed germinability. Aim of this research was to isolate trees from the pre-selected set that meet the requirements to be mother plants. Research comprises wild pear accessions from three localities: Banja Luka, Manjača and Potkozarje, or 33 accessions in total. Fruit bearing regularity of each tree was observed from 2012 to 2016, and the number of seeds per fruit was observed in 2013, 2015 and 2016, depending on the fruit-bearing occurrence in the selected trees. Average number of seeds per fruit was determined on a sample of 50 fruits collected from different positions in the crown. Seed germinability and vitality analysis was carried out in 2015 in 14 accessions that had fruits that year. Germinability of stratified seeds was laboratory tested by using the method of germination in sand for 21 days at an altering temperature of 20-30°C. Seed vitality was determined by the tetrazolium test (TT) in which pre-prepared seeds were coloured in 1% solution of 2,3,5-triphenyl-tetrazolium chloride for 18 hours, and after that the degree of colouring of cotyledons and the tip of hypocotil was recorded. Accessions from Banja Luka bore fruit all 5 years, while accessions from Potkozarje had fruits 4 and 5 years and those from Manjača only 3 years in the observed period. One accession from Banja Luka and one from Manjača had 7.53 and 5.91 formed seeds in each fruit, respectively. Other accessions had average of 3-4 seeds per fruit. Results of the TT show good vitality of tested seeds and support the germinability results. Accession '20' from Manjača had good seed vitality and germinability of 92%, and germinability greater than 40% was recorded in 6 accessions. According to fruit bearing regularity, number of seeds per fruit and seed germinability, accessions marked with '6', '8', '9', '25', '31' and '32' can be used as mother plants in pear rootstock production.

Keywords: mother plant, fruit bearing regularity, germinability, vitality.

HP4

## **THE RECLAMATION OF THE GENOTYPES OF STRAWBERRY TREE (ARBUTUS UNEDO) CULTIVATED AROUND KARASU, SAKARYA**

Turan Karadeniz

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This investigation has been carried out during 2015- 2016 in the settlements of Kuzuluk and Kızılcık, Karasu, Sakarya. The Strawberry Tree (*Arbutus unedo*) has been selected and the investigation has been carried out from the ones that have grown by themselves naturally. In this study of selection each tree has been considered as this type of tree, while examining the species of *arbutus unedo*, historical grading method has been used. In the first year (2015) of the investigation (study), 50 types (species) of *arbutus unedo* have been defined and have to the lack of rendement, only 5 types (species) of fruit have been identified. In the second (2016) year of the investigation, methods of phenological observation, pomological analysis and weighted grading were applied on 50 species. During the investigation years including both 2015 and 2016 approximately 20 samples of the fruit have been picked and the importance of top priority of each species, 10 fruit have been studied, at the end of the study (investigation), it is measured that the weight of the fruit is from 1,70 g to 9,03 g, the width is from 11,42 mm to 30,52 mm, the length is from 10,15 mm to 14,09 mm, the thickness of the stem is from 1,13 mm to 3,29 mm, the number of the fruit in a bunch is from 3 to 8, the amount of resolvable dry substance is from 15 % to 32 %, pH is from 3,02 to 3,66, with all these features 54 KR 08, 54 KR 11, 54 KR 16, 54 KR 44, 54 KR 49 species are superior (dominant) to others.

Keywords: Strawberry tree, *Arbutus unedo*, selection.

HP5

## **THE IMPORTANCE AND PRACTICE OF SELECTION BREEDING IN WALNUT**

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In Turkey, the predominant method of breeding for walnut is selection breeding which is the selection of elite genotypes as practiced in the worldwide. Due to this reason, the method of selection of elite genotypes with the desired agronomic characteristics is a short span and easily practicable. In countries, where the population of walnut is at low scale, hybridization practices are not attempted to acquire desired agronomic characteristics. Since, the hybridization practices are time consuming to get the target genotypes. In walnut varieties improvement programs should include the priority issues such as late leaf foliage, fruiting in the lateral branches, shortening of the vegetation period, early maturity and harvesting, good fruit quality, high yield and resistance to diseases.

Keywords: Walnut, selection, breeding, late foliage.

HP6

## **PRODUCTIVE CHARACTERISTICS OF RIESLING CLONES IN THE UKRINA WINE-GROWING REGION**

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This paper presents the achieved results of examining the impact of five different bud loads on vine (6, 8, 10, 12 and 16 buds) on agro-biological and technological features of cultivars: Cabernet Sauvignon, Petit Verdot and Marselan cultivated in agro-ecological conditions of sub-region of Podgorica. The research was performed during 2013 vintage and the aim was to determine the impact of different pruning and bud load on yield and grape quality of examined cultivars. Yield indicators, mechanical composition of bunch and berry, yield and grape quality were determined during vegetation period within all different bud loads for examined cultivars. Based on achieved results it can be concluded that grape cultivars, Petit Verdot and Marselan, had the highest yield when 16 buds were left for winter pruning, 2.43 kg/vine and 1.16 kg/vine, respectively. Unexpectedly, grape variety Cabernet Sauvignon achieved highest yield (1.43 kg/vine) when only 10 buds were left for winter pruning. Regarding the highest sugar content, within all examined cultivars, different bud load treatments achieved the highest values. For grape cultivar Petit Verdot the load was made of 8 buds, for Cabernet Sauvignon it was 12 buds, while the highest sugar content in grape of Marselan cultivar was achieved when 10 buds were left for winter pruning.

Keywords: bud loads, yield, grape variety, grape quality.

HP7

## **TECHNOLOGICAL CHARACTERISTICS OF VRANAC AND CABERNET SAUVIGNON GRAPEVINE VARIETIES IN THE CONDITIONS OF THE TREBINJE VINEYARD**

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The aim of this paper is to present technological characteristics of Vranac and Cabernet Sauvignon grapevine varieties in the conditions of the Trebinje vineyards during the vegetation 2016 and 2017. Researches of technological characteristics include mechanical compounds of grapes and berries as well as quality of the grapes and berries (sugar, total acid content in the must and pH). Bunch weight, number of berries on the bunch, weight of 100 berries, weight of 100 berries flesh, weight of the berries skin as well as weight of seeds in 100 berries was higher in 2017 for both varieties. Bunch weight of Vranac variety was higher in 2016, and of the Cabernet Sauvignon variety in 2017. Sugar content and acid content in the must of the Vranac variety was higher in 2016, while pH value did not vary. The sugar content of the variety Cabernet Sauvignon was the same in both examined years, the content of the acids was higher in 2016, while the pH value was higher in 2017.

Keywords: technological characteristics, grape, Trebinje vineyards.

HP8

## **THE CONTENT OF MONOMERIC ANTHOCYANINS IN DRIED RED GRAPE SKINS OF AUTOCHTHONOUS AND INTERNATIONAL VARIETIES**

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### **Abstract**

The skin of red grape varieties is a significant source of polyphenols, of which are the most abundant anthocyanins. Anthocyanins can be used as a potential food additives, primarily due to its positive and wide impacts on human health. However, they are very unstable and can easily degrade due to the influence of various factors such as high temperature. So, the aim of these study was to evaluate the total monomer anthocyanins content in dried red grape skins of autochthonous and international varieties by the pH differential method. The calculation of the monomeric anthocyanin content should be on the predominant antocyanin in the sample. In the literature, anthocyanins profile of investigated samples are often unknown and authors commonly expressed their content as cyanidin-3-glucoside (C3G) or malvidine-3-glucoside (M3G) per gram of dry matter (gDM-1). In that reason, the content of monomeric antocyanins in samples analysed in this investigation was expressed as C3G gDM-1 and M3G gDM-1. The significant differences ( $p < 0,05$ ) among the analysed grape varieties were registered in the content of the total monomer anthocyanins in dried grape skins expressed on both anthocyanin glycosides. The dried grape skin of variety Cabernet Sauvignon had the highest content of monomeric anthocyanins, ( $1.34 \pm 0.015$  mgC3G gDM-1 and  $1.413 \pm 0.07$  mg of M3G gDM-1) whereas the dried skin of variety Hamburg had the lowest ( $0.35 \pm 0.015$  mgC3G gDM-1 and  $0.373 \pm 0.024$  mg of M3G gDM-1). It is important to note that dried grape skin can be source of anthocyanins and for their quantification both standards can be used regardless of the predominant anthocyanin glycoside in the sample.

Keywords: grape skin, antocyanins, pH differential.

HP9

## **SPECTROPHOTOMETRIC DETERMINATION OF TOTAL FLAVONOIDS IN GRAPE SEEDS USING DIFFERENT STANDARDS**

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Grape seeds contain significant quantity of biologically active compounds. These wine or grape processing by-products are potentially great raw material for functional food additives, especially because of their antioxidant properties. Polyphenols, which comprise class of flavonoids, have vital role in these properties. The most abundant flavonoids in grape seeds are flavan-3-ols. In the literature, two different spectrophotometric methods are commonly used for determination of total flavonoids content: absorbance measurement of grape seeds phenolic extracts at 280nm and colorimetric assay with aluminium chloride. To check whether the results obtained by two different methods are comparable, the total flavonoids content of seven different grape seed methanol extracts were estimated using D-(+)-catechin as a standard. It was found that higher values were obtained for total flavonoids content by measuring absorbance at 280nm than by colorimetric assay with aluminium chloride. The total flavonoids content were ranged from  $36.62 \pm 0.161$  to  $81.15 \pm 0.161$  mg of catechin equivalents per gram of dry matter (CE gDM-1) by measuring absorbance of phenolic extracts at 280nm. The same content estimated by colorimetric assay was  $20.93 \pm 0.076$  to  $40 \pm 0.159$  mg of CE gDM-1. It could be concluded that values obtained by measuring absorbance of phenolic extracts at 280nm are 1.51 to 2.03 fold higher than those obtained by colorimetric assay. These differences could be due to the presence of significant amount of phenolic acids such as gallic or protocatechuic in grape seed extracts which also absorb UV light at 280nm.

Keywords: grape seed, flavonoids, spectrophotometry.

HP10

## THE EFFECT OF DIFFERENT DOSES OF NITROGEN ON THE YIELD AND THE QUALITY OF CARROT

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Carrot (*Daucus carota L.*) is one of the most important vegetable species that is widely used in human nutrition, especially for children because of the nutritional and medicinal properties, and has a major role in disease prevention. Mineral nutrition and nitrogen fertilization are of great importance for achieving large yields in the technology of carrots growing and, in addition, affect the quality of carrot roots. In order to achieve high yields, the overly nitrogen fertilization is performed, which causes increased nitrate content in plant tissue. The aim of this study was to determine the extent to which the yield and quality of carrot roots depend on growing units of nitrogen. The two-factorial (fertilization x cultivar) in a randomized complete block design on a private plot was set on Debelj locality. The effects of different nitrogen dosing (diameter, 80 kg N / ha 160 kg N / ha 240 kg N / ha), and cultivars (Almaro F1, Chantenay, Flakkee) on the yield and quality of carrot were examined. The results indicate that increasing nitrogen doses have contributed to the increase of yield. The highest yield (817.50 kg/100m<sup>2</sup>), was achieved with the highest dose units of nitrogen, while the lowest yield was recorded in the control treatment (538.95 kg/100m<sup>2</sup>). Chantenay (709.21 kg/100m<sup>2</sup>) and Flakkee (844.37 kg/100m<sup>2</sup>) cultivars achieved statistically significant higher yield as compared to Almaro F1 hybrid (610 kg / 100m<sup>2</sup>). Also, the results indicate that increasing nitrogen had a negative effect on the quality characteristics of carrots. The maximum nitrogen content (0.059%) was recorded at the variant 240 kg N/ha, while minimum content was recorded at the variant 160kg / ha (0.050%). Depending on fertilization the tendency for the potassium content to fall was noticed. The maximum value (0.558%) was recorded in the control treatment, while the minimum value (0.385%) was recorded at the variant with the highest dose of nitrogen units.

Keywords: carrot, fertilization, yield, quality.

HP11

## **APPLICATION OF COMPOST AND BACTERIAL BIOFUELS IN THE ORGANIC PRODUCTION OF MEDICINAL AND AROMATIC PLANTS**

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Areas under the organic production of medicinal and aromatic plants are constantly increasing both at domestic and global level. Since the organic production do not allow application of synthetic fertilizers, special importance is given to organic fertilizers, compost and bacterial biofuels. The aim of this paper is to point out the positive effects of the application of these fertilizers in the production of medicinal and aromatic plants according to organic farming methods. Bacterial biofuels and compost showed not only to have beneficial effects on the productivity of medicinal and aromatic plants by improving the physical and biological properties of the soil, but also affect the quality and increase the content of essential oils and increase the complete "condition" of the plant. Azotobacter increases the germination and plant ability to survive, by producing antifungal compounds that participate in the control of plant pathogens. Its application in the organic cultivation of medicinal and aromatic herbs is indispensable.

Keywords: composting, bacteria, plant species, soil.

HP12

## **THE BENEFITS OF ORGANIC PRODUCTION OF MEDICINAL AND AROMATIC PLANTS IN INTERCROPPING SYSTEM**

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Organic production of medicinal and aromatic plants is harmonized with numerous regulations, and is under strict control. It implies such a production system that will not impair the naturally balanced ecosystems, also taking into account the preservation of all derivatives properties during further processing. The biggest problem in the organic production of medicinal and aromatic plants are weeds, while diseases do not make economically significant damage. Since the use of pesticides is not allowed in the organic production system the application of intercropping in the organic cultivation of medicinal and aromatic plants is the simplest and, in the same time, a very effective way to reduce the appearance of pests and diseases, Plant cultivation in this system, in relation to monoculture, increases biodiversity, better utilizes resources from the natural environment, increases the yield of many plants, reduces the number of weeds and pests, and also, which is very important to emphasize, has a significant impact on quality agroecosystems and plants, which further increase plant resistance to insects and many pathogens.

Keywords: disease control, polyculture, biodiversity, agroecosystem.

HP13

**INFLUENCE OF PLANTING DEPTH ON THE MORPHOLOGICAL CHARACTERISTICS OF TULIPS (TULIPA 'VAN EIJK' AND TULIPA 'GIUSEPPE VERDI')**

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Organic production of medicinal and aromatic plants is harmonized with numerous regulations, and is under strict control. It implies such a production system that will not impair the naturally balanced ecosystems, also taking into account the preservation of all derivatives properties during further processing. The biggest problem in the organic production of medicinal and aromatic plants are weeds, while diseases do not make economically significant damage. Since the use of pesticides is not allowed in the organic production system the application of intercropping in the organic cultivation of medicinal and aromatic plants is the simplest and, in the same time, a very effective way to reduce the appearance of pests and diseases, Plant cultivation in this system, in relation to monoculture, increases biodiversity, better utilizes resources from the natural environment, increases the yield of many plants, reduces the number of weeds and pests, and also, which is very important to emphasize, has a significant impact on quality agroecosystems and plants, which further increase plant resistance to insects and many pathogens.

Keywords: disease control, polyculture, biodiversity, agroecosystem.

## **Section: PLANT SCIENCE**

### **Subsection: Crop Science and Natural Resources**

### **Oral Presentations**

## VARIABILITY OF GRAIN QUALITY OF WHEAT (*TRITICUM AESTIVUM* L.)

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The wheat quality is the complex traits as a score of numerous genetically determined traits, which are influenced by environmental factors. The main role in determining of grain quality belongs to grain storage proteins gliadin and glutenins. The aim of this study was analysis of *Gli-1*, *Gli-2* and *Glu-1* allele composition of winter wheat cultivars and relationships of protein alleles with sedimentation of protein, grain protein content and dry gluten content. The ten winter wheat cultivars (Amur, Bacvanka 1, Beogradjanka, Ducat, Dukat, Mara, Martowasari 1, Partizanka, Omskay, Ravanica) were grown in two year with different weather condition, harvested and grains used laboratory analysis. For determination gliadin alleles used analysis of protein separation by polyacrylamide gel electrophoresis (pH 3.1), and for identification of *Glu-1* alleles used analysis of separated protein by sodium dodecil sulphate gel electrophoresis (pH8.9). Sedimentation of proteins analyzed by method of Zeleny. Grain protein content was determined according to the Kjeldahl's method (N × 5.7). Gluten content was determined by washing the dough with 2% saline solution and weighed on a technical scale. The results showed that different composition of gliadin alleles were present in wheat cultivars. The 21 alleles were identified at the six gliadin loci. At the *Gli-A1* (*a., f., b., k., o.*), at the *Gli-B1* (*b., f., l., g., e.*), at the *Gli-D1* (*b., a., k.*), *Gli-A2* (*b., g., e., o., u.*), at the *Gli-B2* (*b., g., a., h., o.*) and at the *Gli-D1* (*b., e., h., m., n., o., r.*). The *Gli-D1b* allele is identified in the cultivars, while all remain alleles identified at least in one and maximum in four cultivars. Among ten wheat cultivars, the seven different type of glutenin alleles composition were identified. The wheat Bacvanka 1, Beogradjanka and Partizanka possess the same composition of glutenin alleles (*b.c.d*) and other cultivars have different composition of *Glu-1* alleles. The most frequent alleles were *Glu-A1b* (40%), *Glu-B1c* (70%) and *Glu-D1d* (70%). The highest value of sedimentation volume in both year had cultivar Partizanka (42 ml and 46 ml) and lowest had cultivar Mara (32 ml and 32 ml). The highest value of grain protein content in the first year had Partizanka (14.20%) in second year cultivar Beogradjanka (15.0%). On the base of results we can conclude that values of quality parameters are variate depends of genotypes and year of experimental study. Also, quality parameters had higher value in cultivars which possess glutenin subunits 2\*, 7+9, and 5+10 subunits controlled by *Glu-A1b*, *Glu-B1c* and *Glu-D1d* alleles.

Keywords: gliadin, glutenin, alleles, wheat, quality.

## **VARIABILITY OF TILLERING POTENTIAL IN WHEAT (*TRITICUM AESTIVUM* L.)**

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Tiller production determine crop density and number of spike as well forming of wheat yield. Aim of this study is estimation variability of productive and total tillering of geneticaly divergent wheat cultivars grown under different environmental condition. The twenty geneticaly divergent winter wheat cultivars were used for investigation of tillering of wheat during two year (2015-2017). The experiment was performed in randomized block design in three replication on the field in Kraljevo, Serbia. The seeds of varieties were sown at the distance of 0.10m in rows of 1m length among which was the distance of 0.2m. For analysis of number of spikelets per spike were used 60 plants in full maturity stage (20 plants per replication). The significant differences between the average values were estimated by F-test values. The analysis of variance was performed according to a random block system with one factor. The obtained results showed differences among cultivars for both productive and total tillering. In the first year of experiment productive tillering varied between 6.33 (Evropa 90) and 9.08 (Alfa) shoots, and in second between 8.15 (Omega) and 11.68 (Agrounija). The average productive tillering in first year was 7.27 while in second was 8.94. The total tillering in first year of experiment varied in interval of 7.48-11.57 (Evropa 90 -Alfa) with average value 9.22, and in second year varied from 9.10 (Dicna) to 13.55 (Agrounija) with average value 10.82 shoots. In each cultivars the more productive tillers associated with more total initiated tillers. The obtained results showed significant differences in the average values of number of productive and total tillering that determined by genetic diversity of wheat cultivars and environmental factors.

Keywords: wheat, cultivar, variability, tillers, environment.

CSNR03

## NEW ENVIRONMENTAL EMERGING SUBSTANCES AS A FOOD CONTAMINANTS

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Intensive activities in technosphere lead to the emergence of an increasing number of new substances in the environment that further transform into numerous metabolites. A significant contribution to the increasing the number of detected substances is also a consequence of using new sensitive instrumentation and techniques with a lower detection limit. As a result of the 6th Framework Programme, the NORMAN database is created with the list of the currently most frequently reported emerging substances (ES) and emerging pollutants (EP). Emerging environmental substances are not necessarily new chemicals. They are substances that have often long been present in the environment but whose presence and significance are only now being elucidated. Examples from the list are surfactants, flame retardants, pharmaceuticals and personal care products, gasoline additives and their degradation products, biocides, polar pesticides and their degradation products and various proven or suspected endocrine disrupting compounds (EDCs). The NORMAN experts regularly revise the list of emerging substances. The first step in controlling of these ES is the establishment of national monitoring system in all environment compartments. After collecting data, next step is the planning of measures for reducing emissions to the environment. This paper presents the results of the presence of phthalate esters (FE): dibuthylphtalate - DBF, diethylphtalate- DEF, dimethylphtalate-DMF, and flame retardants: eight congeners of polybrominated diphenylethers (PBDE) - (BDE 28, a BDE 47, a BDE 100, BDE 99, BDE 154, BDE 153, BDE 183 and BDE 209) in the soil. FEs were detected in soil samples taken in the factory site, while PBDEs were detected in soil near landfill. It was found that concentrations of FEs are in the range 4,9-522,2 mg/kg, 0,1-6 mg/kg and 0,4-133 mg/kg of absolutely dry soil for DMF, DEF and DBF respectively. That high soil concentration of phthalate esters can be the source for ground water contamination and migration to the other water bodies. The sum of eight PBDEs congeners are ranged from 4,4 to 729 µg/kg of absolutely dry soil. Highest contribution to total sum have BDE 99, BDE 47 and BDE 209. The proven presence of these compounds from the group of ES in the soil can lead to their entry into the food chain.

Keywords: new environmental emerging substances, soil.

CSNR04

## **IMPACTS OF NEW NANOMATERIALS AND POLYMERS ON DEVELOPMENTS IN AGRICULTURE**

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Worldwide food production is facing great challenges with ever-expanding population and even more so with increasing meat consumption. At the same time, mineral resources for fertilization are getting scarce, and new methods for efficient nutrient absorption are necessary in order to maximize the production of plants in general, be it crops, vegetables or fruits. New materials from family of nanomaterials and polymers, or combined from these two classes of materials are becoming everyday support tools for agricultural producers. The areas of new nano and polymeric materials' applications from soil fertilization, to improvement in pesticides applications, soil remediation, planting environment sensor-based control and many more, will be shown and reviewed. Accent in discussion will be on under-explored and still non-exploited zeolites and pyrophyllite and their promising deposits in Bosnia and Herzegovina as potential resources for new agricultural technologies.

Keywords: nanomaterials, polymers, composites, agriculture.

CSNR05

## PHYTOTOXIC EFFECTS OF ALUMINUM ON DISTRIC CAMBISOL AND PSEUDOGLEY

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Among the researchers prevails general agreement that Al-toxicity is a major factor of the limited production of crops on the highly acidic soils. Top of the root is a critical point of the Al-toxicity. Vegetation trial on the two soil types: distric cambisol and pseudogley, with three levels of acid and highly acid reactions ( $pH\ M\ KCl$ : 4,32 – 4,13; 3,87 – 3,77; 3,68 – 3,52), was set up in pots in the open field, where disorders in development of barley (*Hordeum vulgare* sp.) in the first phases of development, caused by different concentrations of mobile Al (2,2 – 6,4; 14,2 – 19,3; 29,1 – 34,5 mg Al/100g, were monitored during the three-year period (until second leaf phase). The experiment was stopped when the symptoms of chlorosis and necrosis affected about 50% of the leaf surface of barley on some of the tested combinations of soil acidity. Methods for chemical analysis of soil: Mobile Al - method by Sokolov, available Mn, extraction with 1M  $CH_3COONH_4$  ( $pH\ 7.0$ ), reading on the AAS.; Analyses of plant material of root and leaf in wet burned sample ( $conc\ H_2SO_4 + H_2O_2 + 450^\circ C$ ): nitrogen (% N): Kjeldahl method, phosphorus (%  $P_2O_5$ ), vanadat - molybdate method; Mn, Zn, Fe, reading on the AAS. Based on the results, it can be established that the disorders in development of the aboveground parts of barley plant on acid and highly acid soils were caused by the disorders in development and performance of the root system affected by different concentrations of mobile Al. Growing, developing and performing disorders of root system are displayed immediately after the emerging, and their intensity depends on the concentrations of mobile Al in the soil. Even small amounts of mobile Al, from 3 – 6 mg Al/100g soil can cause disorders in root system development in barley plants, while the concentrations from 29 – 34 mg Al/100g can lead to a complete stunting of primary root development immediately after emerging. Thus, the "root system" consists of 4 - 5 thickened small roots up to 1 cm long. Disorder symptoms and intensity of the aboveground barley plant parts depend on the extent of root system damage, therefore they can be manifested differently from the appearance on the soil surface (emerging), until the second leaf phase. The symptoms can occur in different forms, but only the dark brown leaf spotting symptom can be attributed to the toxic concentrations of Mn (308 mg Mn/kg). Depending on the extent of root system damage, the other (non-specific) symptoms can be caused by individual, and most probably common effects of all the elements which are in critical (deficiency or excess) concentrations (N, Ca, Mg, Mn, Fe...). In addition to the above mentioned chemical traits of soil, the climate conditions are significant factors which effect the mode and intensity of symptom appearance on the aboveground plant parts of barely significantly.

Keywords: Al-toxicity, root, barley.

## **Section: PLANT SCIENCE**

**Subsection: Crop Science and Natural Resources**

**Poster Presentations**

CSNRP01

## VARIABILITY OF YIELD AND QUALITY OF SMALL GRAIN CEREALS ON MANJAČA LOCALITY

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Small grain cereals are the most popular crops in the sowing structure in the Republic of Srpska. The appropriate technology of growing and high quality of seeds for planting are prerequisite for high yields achieving. The aim at this research was to study the yield and quality variability of small grain cereals sown on lower soils quality in the two growing season at the Manjaca locality. During the two-year period, 2015-2016, four types of cereals were tested - winter triticale (the variety Oskar), winter wheat (the variety Jelena), winter rye (the variety Octavia) and spring oat (the variety Sana). The highest germination energy and total seed germination of 96.5% had winter triticale in the second growing season. Winter triticale had the highest yield of 4.51 t ha<sup>-1</sup> in the first growing season. The highest 1000 kernel weight of 53.95 g had winter wheat in the first growing season. The smallest 1000 kernel weight of 35.6 g had the rye variety in the second growing season. The smallest germination energy and total germination of 78% and 86%, respectively, and the lowest yield of 1.96 t ha<sup>-1</sup> had oat in the second growing season of the study. In achieving low yields and germination in the second growing season, which still satisfied the legal minimum, the greatest impact had a large amount of precipitation at the time of grain filling, which in the end led to the postponement of the harvest process itself. All types of cereals in both years have met the legal quality parameters. The yield and quality in this research alongside the plant species was conditioned by the period of testing.

Keywords: cereals, variety, yield, quality.

CSNRP02

## **INFLUENCE OF SUCROSE CONCENTRATION ON GROWTH AND MICROTUBERIZATION PROCESS OF POTATO (SOLANUM TUBEROSUM) IN THE IN VITRO CONDITIONS**

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Through the activities of Work group for Industrial plants within the Program for conservation of plant genetic resources in the Republic of Srpska, accession of 'Glamočki' potato has been inventoried and collected. By the introduction of this accession in the in vitro culture, collection of potato was created in the Gene Bank of Republic of Srpska. Accessions of Glamočki potato from in vitro collection were used as initial material for this research. Explants of potato were inoculated on three MS (Murashige and Skoog, 1962) media supplemented with three different sucrose concentrations: 50 g l<sup>-1</sup>, 75 g l<sup>-1</sup> and 100 g l<sup>-1</sup>. 30 explants were inoculated per each media. Growth and development of the explants as well as process of micro tuber formation was monitored for 8 weeks. The results show that the highest length (6.45cm) was recorded in the explants that developed on the medium supplemented with 50 g l<sup>-1</sup> of sucrose. The largest number of micro tubers, 0.5 per explant was formed in explants that developed on a medium supplemented with 75g l<sup>-1</sup> of sucrose. The results showed that sucrose concentration has influence on the growth and development processes and the micro tuber formation process. In the future research, long-term effects of sucrose concentration will be examined.

Keywords: 'Glamočki', collection, gene bank.

CSNRP03

**FORAGE YIELD OF BIRDSFOOT TREFOIL GENOTYPES IN THE THIRD YEAR OF CULTIVATION IN THE SOIL BASE REACTION**Dalibor Tomić<sup>1</sup>, Ranko Koprivica<sup>1</sup>, Vladeta Stevović<sup>1</sup>, Dragan Đurović<sup>1</sup>, Nikola Bokan<sup>1</sup>, Milomirka Madić<sup>1</sup>, Jasmina Knežević<sup>2</sup><sup>1</sup>University of Kragujevac, Faculty of Agronomy, Čačak, Serbia<sup>2</sup>University of Priština, Faculty of Agriculture, Lešak, Serbia

In South-East Europe in less favorable growing conditions especially in terms of climate and soil, in order to produce sufficient protein-rich forages, a special attention is given to the cultivation of the birdsfoot trefoil (*Lotus corniculatus* L.). The birdsfoot trefoil is tolerant in terms of soil reaction requirements and gives good results on acidic soils, up to pH 4. The aim at the study was to analyze forage and hay yield of birdsfoot trefoil in the third year of cultivation on the soil base reaction. Field trial was established in 2014, on soil type fluvisol (pH of H<sub>2</sub>O 7.8) in a randomized block design with three replications and plot size 6 m<sup>2</sup>. Cultivars of birdsfoot trefoil (Zora, K-37 and Bull) was sown at an inter row spacing of 12.5 cm, using 10 kg ha<sup>-1</sup> of seeds. Forage and hay yield were analyzed during 2016. Forage yield was determined by measuring the total mass from the plot immediately after cutting and converted to forage yield in t ha<sup>-1</sup>. After drying the sample at the room temperature, hay yield and dry matter content in the forage was recalculated. The average annual temperature during 2016 was 12.4 °C and total rainfall was 767 mm. The total amount of precipitation during the growing season of 2016 (April-October) were 441.5 mm. The birdsfoot trefoil varieties did not differ significantly among themselves in terms of forage and hay yield in the first and second cuts. The forage yield in the first cut was in the interval of 24.9 t ha<sup>-1</sup> in the Zora variety to 28.4 t ha<sup>-1</sup> in the Bull variety, and in the second cut of 11.1 t ha<sup>-1</sup> in the Zora variety up to 12.6 t ha<sup>-1</sup> for variety K-37. The average hay yield in the first cut was 4,023 t ha<sup>-1</sup>, and in the second cut 1.768 t ha<sup>-1</sup>. The reason for the significantly lower forage and hay yield in the second cut compared to the first is the lower amount of precipitation in the second part of the vegetation period. The obtained results indicate that during the third year of production in the base soil, satisfactory forage and hay yields of birdsfoot trefoil varieties were obtained, that is, this species can be successfully cultivated both on acid and on soil of slightly base reaction.

Keywords: Birdsfoot trefoil, cultivar, forage yield.

CSNRP04

## FATTY ACIDS CONTENT IN MAIZE SEEDS PRODUCED UNDER DIFFERENT GROWING CONDITIONS

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Due to the increased pollution and other harmful effects on the environment and human health, which were brought by conventional agricultural production, the organic production system has become very important and applied all around the world. Officially regulated methods in organic production enable the production of healthy foods with the preservation of the environment, soil, biodiversity, agro- and ecosystems. Fatty acids (FAs), and their content and profile in food, present an important nutrition factor. Since seed contains large amount of lipids the aim of this work was to determine content and similarities/differences in fatty acids present in maize seeds grown under organic conditions during 2015 and 2016 (OS-15 and OS-16) and conventional conditions in 2016 (CS-16). The fatty acid content is determined by the GC capillary method and expressed as % of individual fatty acids relative to the total FAs content. In total, sixteen fatty acids were detected in different varieties of maize seed. There were differences in FAs content among different types of seed. Oleic (35.99%) and eicosadienoic acid (0.04%) were the most and least represented FAs in OS-15. Organic maize seed from 2016 contains 44.94% of linoleic acid as predominant FA while docosapentaenoic acid (0.09%) was detected as the last one. Linoleic acid (42.22%) and eicosadienoic acid (0.03%) were with the highest and the lowest content, respectively, in CS-16. It can be concluded that linoleic acid was the most abundant FA in both types of seed from 2016. Saturated fatty acids (SFAs) content ranged from 16.1% (OS-16) to 18.39% (OS-15). OS-16, CS-16 and OS-15 contains 21.01%, 30.95% and 36.92% of monounsaturated fatty acids (MUFAs), respectively. Polyunsaturated fatty acids (PUFAs) were represented in an amount from 32.35% (OS-15) to 48.15% (OS-16). The highest content of total unsaturated fatty acids (UFAs) was detected in conventionally grown maize seed from 2016 (73.91%).

Keywords: maize, seed, SFAs, MUFAs, PUFAs.

CSNRP05

## **DETERMINATION OF ZN AND FE CONTENT IN ORGANIC AND CONVENTIONALLY GROWN SEEDS USING INDUCTIVELY COUPLED PLASMA-OPTICAL EMISSION SPECTROMETRY (ICP-OES)**

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The health status, nutritional value and food safety of conventional farming methods varies across countries around the world. For this reason, organic farming is gaining in importance, since it represents a system that achieves sustainable and safe food production. Numerous scientific studies have shown that organically produced foods have a higher content of macro- and microelements. The aim of this paper was to examine the content of zinc (Zn) and iron (Fe) as two very important micronutrients in human nutrition in organic and conventionally produced maize, spelt, buckwheat and soybean seeds. All samples were collected during 2015 and/or 2016. Season. The method of Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) was used to determine microelements content. The Zn concentration ranged from 9.06 to 25.05  $\mu\text{g/g}$ , and Fe from 4.37  $\mu\text{g/g}$  to 122.55  $\mu\text{g/g}$ . The highest Zn concentration was detected in organic (19.92  $\mu\text{g/g}$ ) and conventionally (25.05  $\mu\text{g/g}$ ) produced soybean seed from 2016. The highest Fe content was found in the seed of organic (122.55  $\mu\text{g/g}$ ) and conventionally (94.33  $\mu\text{g/g}$ ) grown buckwheat seed from 2016. It can be concluded that the concentration of zinc and iron in the examined seeds varies considerably, not only within the species itself, but also within the organic and conventional production system, as well as in production seasons. It can be caused by mineral composition of growing soil.

Keywords: iron, zinc, content, seed, ICP-OES.

**WEEDINESS OF MAIZE IN DIFFERENT CROP ROTATION**

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Weed seeds in and on the soil are the primary cause of weed infestations in maize. Cropping system diversification through the use of longer rotations of dissimilar species can increase the range of stress and mortality factors that regulate weed population dynamics, and thus can be useful for maintaining effective weed control while reducing the burden of crop protection placed on herbicides. This paper deals with effect of continuous cropping, two-, three- and six crop rotation on the weediness of maize. A trial was settled on the experimental field of the Faculty of Agriculture, in 1992. The following cultivation systems have been observed: maize continuous cropping, maize-winter wheat rotation (two-), maize-soybean-winter wheat rotation (three-) and winter wheat-maize-soybean-spring barley+red clover-red clover-sunflower (six-crop rotation). The common conventional cropping practices specific for maize were applied in systems. Crops are grown in non-irrigation regime, on leached chernozem. Long-term effects of various cropping systems on weed infestation were observed by the one square meter area method in 2015. The 23-year continuous cropping was obviously a respectable period for making unambiguous and precise conclusions. Namely, the number of weed species, and especially the number of plants per weed species, has been increasing in maize continuous cropping over years, but the increasing tendency certainly depended on meteorological conditions in particular years. Maize continuous cropping was characterised by the highest number of weed species and plants per weed species with the dominance of perennial species, due to, first of all, great abundance of plants per species *Sorghum halepense* (L.) Pers and *Convolvulus arvensis* L. The highest number of plants per annual weed species in maize continuous cropping was recorded in species *Solanum nigrum* L., *Chenopodium album* L. and *Amaranthus retroflexus* L. Dominant species in crop rotations were the same as in maize continuous cropping, only the increased distribution of perennial species *Cirsium arvense* (L.) Scop. and *Agropyrum repens* (L.) Beauv. was observed in the six-crop rotation. Crop rotations, especially the three crop rotation, are more effective in suppressing the number of plants per weed species and decreasing fresh biomass of weeds than continuous cropping and the two- and six crop rotation are.

Keywords: crop rotation, continuous cropping, maize.

CSNRP07

## **CONCENTRATION OF NITROGEN, PHOSPHORUS AND POTASSIUM IN SORGHUM PLANTS GROWN AT DIFFERENT LEVELS OF NITROGEN NUTRITION**

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The pot experiment was conducted in a greenhouse to study the effect of nitrogen nutrition 0, 200, 400, 600 and 800 mg N kg<sup>-1</sup> soil on the content of nitrogen, phosphorus and potassium in sorghum plants. Five plants per pot of hybrid EC Alize were grown under optimal water regime in plastic pots with 5L volume. Each pot contained 3.8 kg air-dry soil and drainage. The soil had slight alkaline reaction, low content of mineral nitrogen and it was good supplied with available phosphorus and potassium. The plants were analyzed in 4-5 leaves growth stage by dividing in leaves, stems and roots. The concentration of nitrogen, phosphorus and potassium were determined in each plant part after wet digestion by H<sub>2</sub>SO<sub>4</sub>. It was established that the plants accumulated the highest quantity of dry biomass at the N600 level. It was obtained not significant relationship between nitrogen level and the accumulated dry mass in the plant organs. A strong positive correlation of the plant dry mass and dry mass of leaves ( $r = 0.921 *$ ) and stems ( $r = 0.957 **$ ) was found. The sorghum leaves contained by 4.81% N, the stems contained by 3.89% N and the roots - 2.33% N on average. High levels of N600 and N800 increased the nitrogen content of stems and roots and phosphorus in the all plant parts of sorghum, but it was reduced the leaves nitrogen concentration by 7% compared to N0 variant. The concentration of potassium in the sorghum organs increased with increasing the level of nitrogen nutrition. The higher potassium concentration was observed in the stems 4.59 % K<sub>2</sub>O on average. A strong positive correlation of nitrogen level was proved with nitrogen concentrations of leaves, stems and phosphorus and potassium in plant organs. The relationship of nitrogen level with nitrogen content of the sorghum leaves was negative ( $r = -0.535*$ ).

Keywords: nitrogen nutrition, phosphorus, potassium, sorghum.

CSNRP08

## SCORE ANALYSIS OF SPELT CULTIVARS AS RAW MATERIAL FOR PREDICTING FOOD QUALITY

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In the past few decades there has been a considerable interest in consumption of ancient wheat. Spelt (*Triticum aestivum* ssp. *spelta* (L.) Thell.) is modest with regard to climate and soil, nitrogen utilisation efficiency and resistance to disease. Spelt flour has become increasingly popular due to its superior nutritional properties. The rheological properties of spelt flour dough are essential for the successful manufacturing of spelt cereal food products because they determine its behavior during mechanical handling. Based on different rheological data of spelt cultivars, the convenience of the cultivar for cereal food products (bread, pasta and phyllo) can be predicted. Modern nutritionist viewpoint is that daily meals have to be composed of food enriched with minerals, essential components and fiber, to achieve health balance and improvement. Hence, cereal products are suitable food for nutrition adjustment. Bread and pasta from (*Triticum aestivum* ssp. *vulgare* and *Triticum turgidum* subsp. *durum*) are most used carbohydrate food with average protein content, low fat without cholesterol, while content of dietary fibers depends on kind and type of bread or pasta. Aim of this work was to conduct a comparative evaluation of the rheological composition of three spelt flour cultivars. This paper investigates the dough rheology of three spelt cultivars as a raw material for predicting cereal food quality (bread, pasta and phyllo). The significant differences between spelt flour was confirmed by application of Post-hoc Tukey's HSD test at 95% confidence limit. Score analysis proved to be useful tool for detection of structure in the relationship between measuring rheological data and predict cereal food quality.

Keywords: spelt, cultivar, rheological characteristics, score.

CSNRP09

## SEED GERMINATION OF RED CLOVER CULTIVARS CULTIVATED ON ACID SOIL

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Seed germination is an important stage in the life of each crop and it greatly affects the final yield. The aim at this study was to in field conditions, analyze the seed germination of red clover cultivars from combined production of forage-seed on acid soil. The seeds of red clover cultivars K-17, K-39, Una and Viola were collected at full maturity in July 2011 from two-year-old production fields. Analyses were carrying out two and fourteen month after harvest (so much is the seed old in the coming fall sowing dates). After a chilling treatment for seven days at 5° C, four replicates of 100 seeds were germinated on a sterile substrate, in duration of ten days at the outside temperature. The average germination of the two months old seeds were very low (28.2%). The main reason for low germination are the high proportion of dormancy seeds. Fourteen months after harvest, a significantly higher seed germination was observed (62.5%) compared to seeds two months old, thanks to the lower number of dormant seeds. A possible reason for also low number of ungerminated seeds after fourteen months is poor and insufficient mineral nutrition during the vegetation period, which is a common problem on acid soil. At the seed of the aged two months, Una cultivar had the highest seed germination (37.3%), significantly higher than K-17 (25.3%) and Viola (20%) cultivars. At the seed of the aged fourteen months, K-39 and Una cultivars had significantly higher seed germination (71%) than Viola cultivar (46.7%).

Keywords: germination, red clover, seed.

CSNRP10

## EVALUATING OF SMALL GRAIN CEREAL YIELDS IN MARGINAL GROWING CONDITIONS

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Small grain cereals represent a significant component in animal feeding. It is important to provide sufficient quantities of feed in animal breeding. During two growing seasons 2015 and 2016 at the location of Dobrnja on Manjača Mountain, three types of small grain cereals were tested in macro trials. The soil was of poor quality, with increased acidity. The aim of the study was to evaluate the influence of growing season on grain yield. In the field research there were two winter cereals: the triticale variety Oscar and the rye variety Octavia and one spring oat variety Flämingsregent. In addition to the applied identical production technology for the same crop in both years, yields significantly varied by plant species and year of research. One of the more explicit examples was at triticale which in the first year had a yield higher than 1000 kg/ha in relation to the yield in the second year. The highest yield of 3.16 t/ha had the oat variety Flämingsregent, as well as the highest average in two years 2.70 t/ha. The lowest yield had triticale, 1.88 t/ha in the second year. Triticale had the lowest average yield in both years 2.49 t/ha. The first year was more favorable for the production of triticale and oats, while the other was more favorable for oats in which the yield of rye realized of 2.74 t/ha. Triticale yield of 1.88 t/ha and oats 2.28 t/ha in the second year is not satisfactory. The fertility of the soil affected yield of triticale and oats. These two crops have lower tolerance to acidity of soil unlike rye. An additional problem in oats production in the second year presented a large amount of rainfall in time of ripening, which ultimately led to delay of the harvest process itself. Oats gave the best results at the site Dobrnja in the conditions of our research, due to its tolerance to soil and marginal requirements for conditions of growing.

Keywords: Triticale, rye, oats, yield, growing.

CSNRP11

## **BUCKWHEAT (*FAGOPYRUM ESCULENTUM L.*) PRODUCTION IN MOUNTAIN AREA CONDITIONS**

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Buckwheat production is increasing in the structure of sowing in individual agricultural households. Buckwheat is a plant species that has a diverse application in the bakery industry, besides application for human consumption, it is rich bee grazing, and has a positive influence on the fertility of the soil. During the five year period 2013-2017 at the location Dobrnja on mountain Manjača in conditions without applications of chemical protection measures, the potential for grain yield of the buckwheat variety Čebelica was studied. The aim of the study was to evaluate the influence of year conditions on yield. The third year of research was the most unfavorable for the production of buckwheat, which resulted in complete absence of grain yield, due to relatively late sowing, poor emergence, faster growth of weed species in relation to the main crop and adverse weather conditions. The highest yield of 1200 kg/ha, was achieved in the first year of the research. Second, fourth and fifth year are characterized by low yields from 500-730 kg/ha. Harvest of buckwheat is difficult due to successive maturation, there for it is difficult to determine the adequate harvest time. At the same time, on the same plant we have grains which are mature, to those which are not at milk maturity. At the same time, on the same plant there are both mature grains in filling stage. In addition the low yield, the obtained grain contains a higher percentage of moisture than optimal for storage and small immature grains which during the finishing process, form an integral part of waste which cannot be used for consumption. The production of buckwheat in Dobrnja conditions is difficult without the use of chemical protection, due to presence of ragweed.

Keywords: Buckwheat, yield, growing condition, weeds.

CSNRP12

## **INFLUENCE OF LATE TREATMENT WITH ANTIBROADLEAVED HERBICIDES DURING STEM ELONGATION STAGE OF DURUM WHEAT ON SOWING CHARACTERISTICS OF SEEDS**

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The research was conducted during 2012 - 2014 on pellic vertisol soil type. Under investigation was Bulgarian durum wheat cultivar Victoria (*Triticum durum* var. *valenciae*). A total of 20 antibroadleaved herbicides were investigated: Granstar 75 DF, Granstar super 50 SG, Ally max SG, Arat, Biathlon 4 D, Derby super WG, Mustang 306.25 SC, Weedmaster 646 CL, Sunsac, Secator OD, Logran 60 WG, Lintur 70 WG, Akurat 60 WG, Akurat extra WG, Eagle 75 DF, Herbaflex, Starane 250 EK, Sanafen, Dicotex 400 and Herby 675. All herbicides were treated in 1-st, 2-nd and 3-rd stem node stages of durum wheat. During 1-st stem node stage of durum wheat none of herbicides included in investigation had negative effect on sowing characteristics of durum wheat seeds. During 2-nd and 3-rd stem node stages of durum wheat in seed production crops of durum wheat can be used herbicides Arat, Biathlon, Derby super, Mustang, Secator, Lintur, Akurat and Akurat extra. Regardless of the application period, these herbicides not proved influence on germination energy, seed germination, lengths of primary roots and coleoptile and also waste grain quantity of durum wheat. During 1-st stem node stage of durum wheat can to be used the antibroadleaved herbicides Arat, Biathlon, Derby super, Mustang, Weedmaster, Secator, Lintur, Akurat, Akurat extra, Eagle, Starane, Sanafen, Dicotex and Herby. These herbicides do not have a negative influence on grain yield. During 2-nd stem node stage of durum wheat can to be used the herbicides Arat, Biathlon, Derby super, Mustang, Secator, Lintur, Akurat, Akurat extra, Starane, Dicotex and Herby. During 3-rd stem node stage of durum wheat can to be used only the herbicides Arat, Biathlon, Derby super, Secator, Lintur, Akurat, Akurat extra and Starane.

Keywords: durum wheat, herbicides, late treatment.

CSNRP13

## AGRONOMIC RESPONSE OF DURUM WHEAT TO NITROGEN RATES IN A LONG-TERM FERTILIZING EXPERIMENT

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The agronomic response of durum wheat to nitrogen fertilization was studied in a long-term fertilizing experiment in the Institute of field crops – Chirpan, Bulgaria. The investigation was established in two field crops rotation (cotton – durum wheat) under not irrigation conditions for the period of twenty five growing seasons including years 1990 – 2014. The experimental design consisted of randomized block design with four replications. The harvested size of the plots was 10 m<sup>2</sup>. The treatments were as follows: 0; 40; 80, 120 and 160 kg N.ha<sup>-1</sup>. Nitrogen fertilization in the form of NH<sub>4</sub>NO<sub>3</sub> was applied before sowing (1/3 of the rate) and at early spring (2/3 of the rate). The precursor crop was cotton fertilized by N<sub>80</sub>. The soil type of experimental field was *Pellic vertisols* (FAO) and generally refers to the so called Mediterranean chernozems. Hydro-thermal conditions during the vegetation period of wheat defined four of the harvested years as very unfavorable, eight of the years as unfavorable, and the temperature and precipitations of the rest of the thirteen years as close to the long-term average norm for the region. It was found that without nitrogen fertilization durum wheat was realized the average grain yield of 2336 kg.ha<sup>-1</sup>. The highest grain yield over the period was obtained at a nitrogen rate of 120 kg N.ha<sup>-1</sup>, but without significant difference compared to rates N<sub>80</sub> and N<sub>160</sub>. Partial factor productivity reduced with an increase in nitrogen fertilization from 74.7 kg.kg<sup>-1</sup> (N<sub>40</sub>) to 24.1 kg.kg<sup>-1</sup> (N<sub>160</sub>). No proven differences were found in Agronomic efficiency of nitrogen applying rates N<sub>40</sub> - N<sub>120</sub>. These rates resulted in average Agronomic efficiency of 17.0 - 14.9 kg.kg<sup>-1</sup> over the period. The use of 160 kg N.ha<sup>-1</sup> reduced Agronomic efficiency of nitrogen by 40 % compared to its N<sub>40</sub> values. A strong positive correlation was obtained between nitrogen rates and grain yield ( $r = 0.930^*$ ). The strong negative relationship was proved of nitrogen fertilization and Partial factor productivity ( $r = -0.951^{**}$ ) and Agronomic efficiency ( $r = -0.917^*$ ).

Keywords: nitrogen rates, efficiency, durum wheat.

CSNRP14

## **THE IMPACT OF MINERAL FERTILIZER ON THE HAY YIELD OF NATURAL MEADOW TYPE AGROSTIETUM VULGARIS**

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The total cost of animal breeding mainly relates to the cost of animal feed production, with the aim of increasing the profitability of animal breeding, it is necessary to produce enough quantities of forage. Natural meadows and pastures represent a significant natural resource of the Republic of Srpska, where, with minimal investments, high revenues can be achieved. In order to ensure a sufficient amount of fodder, one of the most important measures is the conservation of natural meadows with mineral fertilizer, since their application increases the yield and quality of hay. The aim at this study was to investigate the effect of the application of different quantities of mineral fertilizer N15: P15: K15 in 2015 growing season on the yield of hay at the Manjača locality at natural meadow in type of *Agrostietum vulgaris*. In this study, the following variants of application of the mineral fertilizer are investigated: a)120 kg/ha, b)180 kg/ha, c)240 kg/ha, d)300 kg/ha, e)360 kg/ha, f)420 kg/ha, g)480 kg/ha and h) control 0 kg/ha. The application of mineral fertilizers was carried out in the first decade of April 2015 and the cutting the meadows and determination of hay yield in the first decade of July. The highest average yield of 4.23 t/ha of hay is found in the variant of application of 420 kg/ha of the fertilizer. The average yield of the hay of control variant were lower by 1.39 t/ha compared to the variant of application 420 kg/ha of the fertilizer. Variant of application 480 kg/ha of the fertilizer gave 0.19 t/ha lower yield of hay and is not justified in relation to the variant of application 420 kg/ha.

Keywords: natural meadows, improvement, yield, hay.

CSNRP15

## USE OF INSECTICIDES IN OILSEED RAPE PROTECTION FROM POLLEN BEETLES (*MELIGETHES AENEUS* F.)

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### Abstract

From sowing to harvest oilseed rape is accompanied by a number of harmful insect species of different economic importance, but also by useful insects, especially pollinators, and therefore, from an ecotoxicological point of view protection of this crop is very significant. Pollen beetles (*Meligethes aeneus* F.) represent the most important pest of this crop in spring, when it reduces the yield up to do 80%. It occurs regularly in different intensity, and chemical control of this pest is performed every year on almost all surfaces on which oilseed rape is grown. In 2017 trials were carried out according to the OEPP methods at localities in Vojvodina (Kovilj and Kać) in oilseed rape crop (hybrid DK Expower). Products based on thiacloprid+deltamethrin (100+10 g a.s./l) in the amount of 0.5-0.75 l/ha, thiacloprid (240 g a.s./l) 0.3 l/ha and deltamethrin (25 g a.s./l) 0.3 l/ha were used. Treatment was foliar and oilseed rape was at a stage BBCH52-55 or in the phase D<sub>2</sub>-E. Insecticide efficacy was determined according to Henderson and Tilton and a significant difference (ANOVA) for a confidence interval of 95%. At locality Kovilj, immediately before the setting of the trial, the average number of pollen beetles was 63.2-76.2 per variant, i.e. 1.3 to 1.5 per inflorescence. A day after the pesticide application, number of pollen beetles was at a significantly lower level in comparison to the control, with the efficacy of 73-81.3%. After four days, the efficacy was 85.9-91.7%, depending on the insecticide, and 81.7-88.9% after eight days. Fifteen days after the insecticide use the efficacy was 72.1-85.7%. At locality Kać, immediately before the treatment, the average number of pollen beetles per variant was 39.0-44.5, i.e. 0.78-0.89 per inflorescence. A day after the treatment, the applied insecticide showed the high efficacy (78.8-87.8%), as well as after three days (87.9-95.6%). Nine days after the use of the insecticides, number of pollen beetles imagoes was at significantly lower, with the efficacy of 82.4-90.3%. Also, 12 days after the treatment number of pollen beetles was still at significantly lower level in regard to the control, although there was a decrease in the number of pollen beetles in control.

Keywords: *Meligethes aeneus*, insekticides, efficacy.

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CSNRP16

**THE DEGREES OF SOIL SUITABILITY, MEASURED WITHIN THE BORDERS OF THE MUNICIPALITY OF BUŽIM, FOR THE PURPOSE OF CULTIVATING PLUMS (PRUNUS DOMESTICA)**

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Abstract

Amateurish and unprofessional handling of agricultural resources has lasting and unprecedented consequences for horticultural production, which is represented through the loss of soil quality, reduction within the yielding of the cultivated horticultures, soil erosion and such alike. Similarly, the soil is often used for purposes outside the agricultural sphere; such as infrastructural purposes (housing, building of public institutions, road construction, coal seams, etc.). The aforementioned factors require that the soil be given its legitimate role, so optimal planning and usage can take place. The main focus of this research was to establish characteristics of the agricultural soil within the municipality of Bužim, according to the FAO method AEZ (agro-ecological zoning), (FAO, 1976), and based on the achieved results, estimate the soil suitability for the purpose of cultivating plums (*Prunus domestica*). The estimation of the soil suitability has led to the conclusion, that a significant portion of the soil (classed S1 to N in quality); out of the total 13.026,27 ha of agricultural area belonging to the municipality of Bužim, is well suited for the production of fruits. The following has been observed; areas with the best rated class S1 make up a total of 1,23% (159,52 ha), the class S2 takes up a total of 5,51% (717,24 ha), the suitable class S3 makes up a total 2,29 % (298,24 ha), and the biggest area totalling 36,68 % (4.772,60 ha) is classified as N, meaning unsuitable soil. The main restraints imposed on intensive plum cultivation within the examined area are lack of nourishment, tilt, depth, rocky-strewn soil and soil reaction.

Keywords: municipality Bužim, soil suitability, plum.

CSNRP17

## COMPARISON OF SPEI INDICES CALCULATED USING THE DIFFERENT EVAPOTRANSPIRATION EQUATIONS

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Drought is a natural phenomenon that occurs all over the world. In Vojvodina region drought occurs frequently and it causes crop yield reductions. Different indices for drought monitoring have been developed and used in various studies. One of the most commonly used indices is the Standardized Precipitation-Evapotranspiration Index (SPEI) that is based on precipitation and evapotranspiration. The original formulation of the SPEI suggests the use of the Thornthwaite equation for estimation of potential evapotranspiration (ET<sub>0</sub>). After several years, the authors of SPEI have generally recommended the FAO-56 Penman-Monteith equation for estimating evapotranspiration. Possibility to use Penman-Monteith equation to calculate ET<sub>0</sub> depends on the availability of relevant data. If the data needed for Penman-Monteith equation are not available, authors of SPEI recommended using the Hargreaves equation as first choice or Thornthwaite equation as second choice. In this study, bearing in mind the dependence of SPEI index results on the used method for calculating ET<sub>0</sub>, we compared the results of SPEI that uses Hargreaves equation and Thornthwaite equation. Based on these two SPEI indices we analyzed the occurrence of drought in Vojvodina using data from nine meteorological stations from 1971 to 2016. SPEI indices are calculated for one and three month timescales because SPEI<sub>1</sub> and SPEI<sub>3</sub> are often used for agricultural drought monitoring. Differences between two indices are analyzed using RMSE (root mean square error), RE (relative error) and R<sup>2</sup> (coefficient of determination). Results show that the maximum value of RMSE is 0.26 for the SPEI<sub>1</sub> and 0.24 for SPEI<sub>3</sub>. Maximum value of RE for SPEI<sub>1</sub> is 0.30 and 0.29 for SPEI<sub>3</sub>. Coefficient of determination R<sup>2</sup> ranges from 0.93 to 0.99 for both indices. These results indicate that both indices generally provide similar results in the Vojvodina region, however, in particular cases significant differences are noticed. In order to present differences between analyzed drought indices maps are created for two chosen characteristic periods of droughts, for Jun 2000 and July 2012. The results of this study emphasize the importance of the proper choice of evapotranspiration calculation method when using SPEI index in order to get more accurate results.

Keywords: SPEI, Thornthwaite, Hargreaves, drought index.

CSNRP18

## **THE MONITORING OF SOIL ORGANIC CARBON (SOC) IN THE CENTRAL PARTS OF SERBIA**

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After the oceans and seas, soil organic carbon (SOC) is the largest organic carbon pool at earth; thus, there is a growing interest in its spatial distribution and potential for carbon sequestration. Numerous studies have reported substantial changes of soil organic carbon (SOC) stocks after its agricultural use, suggesting that agricultural soils might contain higher losses of SOC due to its cultivation, growth of different culture and fertilizer usage. Also, land use effects on SOC storage were strongly affected by soil type, so it is a clear that monitoring of carbon sequestration and humus carbon loss is a matter of constant interest for each agricultural area at the state level. This investigation actually formed a scanning SOC scheme with the soil sampling testing plots over Central regions of Serbia, direction South from Sava and Danube River. Monitoring has been based on the current practice which has been developed and conducted in the most of the European agricultural countries for the years. Actually, each three soil testing plots were located in the vicinity of most important Serbian cities at 11 different locations. From each soil sample's location, samples were collected from 0-20cm and 20-40 cm profiles, where the location point of circle testing plot was GPS marked for past/future monitoring. Each sampling location gave 15 soil samples at each depth, giving data about an average content of organic C, total and available N, pH values, and average of available K<sub>2</sub>O and P<sub>2</sub>O<sub>5</sub> content. Up to now, it has been conducted over the last three years. Our data showed that SOC content in Central Serbia decreased with depth, from average 1.663% in the 0–20 cm to 1.53% below 20 cm. There was a large variation (0.809–4.75%) in SOC of the topsoil and lower values were obtained with the increase of depth (0.805–3.14%). The decrease of SOC was independent of the production type on the investigated soil, and probably was the result of the climate changes with higher outer temperatures. The higher of C emission was determined at the soils which have been kept fertile by intensive cultivation during the vegetation period. This investigation gives also details about other soil agronomic parameters of importance for current plant production in the investigated regions.

Keywords: soil profile, pH, C emission.

CSNRP19

**THE IMPACT OF SOIL AND FOLIAR FERTILIZATION ON THE  
CONTENT OF MACROBIOGEN ELEMENTS IN CAULIFLOWER  
(BRASSICA OLERACEA VAR. BOTRYTIS)**

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Cauliflower is a yearlong cabbage culture that is among the finest vegetables. Regarding the other cultures cabbage, the cauliflower has expressed requirements in terms of abiotic environmental conditions and shows extremely high quality properties in breeding with improved farming practices. Plant nutrition is one of the main agro-technical measures which have a direct impact on the quality and quantity of plants. In order to gain new insights for better production of cauliflower in R. Macedonia, a scientific and research experiment was conducted in the vegetation year 2014 in the Valandovo region. The experiment was placed by random block system in three variants and three repetitions. It was carried out on alluvial soil with moderate basic pH reaction, good assistance of physiological available forms of nitrogen and low assistance of physiological available forms of phosphorus and potassium. Regarding the calcium carbonate the content of the soil was classified as medium carbonate soil. For primary soil fertilization like edafon N<sub>75</sub> P<sub>150</sub> K<sub>150</sub> was taken, and variants in the experiment were named after the use of foliar fertilizers reactions. In the experiment were included three variants: Variant No. 1 Control (untreated) Variant No. 2 Humustim and Variant No. 3 Rhizoactive. Foliar application of fertilizer was carried out with 0.4% aqueous solution of fertilizers three times during the vegetation. After the chemical analysis of the cauliflower, it was concluded that the variant no. 3 features exceptionally high nitrogen content (4.22% of the dry matter), phosphorus (0.48% of the dry matter), potassium (3.92% of the dry matter), calcium (0.24% of dry matter) and magnesium (0.33% of the dry matter) compared to other varieties.

Keywords: cauliflower, chemical composition, macrobiogen elements, fertilization.

CSNRP20

## **APPLICATION OF PERLITE AS SUBSTRATE FROM THE REPUBLIC OF MACEDONIA FOR IMPROVEMENT ON SOME PHYSICAL PROPERTIES OF SOILS**

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Perlite is a generic name for an amorphous volcanic rock that expands by a factor of 4–20 when rapidly heated to 1400–1800°F (760–980°C). Water trapped in the structure of the material vaporises and escapes, and this causes the expansion of the material to 7–16 times its original volume. The expanded material is a brilliant white, due to the reflectivity of the trapped bubbles. Perlite has many applications. Because of its low density and relatively low price many commercial applications for perlite have developed. In the construction insulation it is used in lightweight plasters, in horticulture perlite can be used as a soil amendment or alone as a medium for hydroponics or for starting cuttings. When used as an amendment it has high permeability low water retention and helps prevent soil compaction. Perlite is frequently used in potting soil mixtures and as a standalone growing medium. Perlite is clean, sterile and free of weeds and disease, odorless, light weight, and safe to handle, supplies the ideal balance between air and water in addition to the characteristic of keeping water and fertilizer to ensure the plant's needs. This light weight medium is inert, non-toxic, non-decomposable and easy to handle with enhanced water retention and aeration capacity. Perlite improves aeration and drainage. When perlite is added to heavy clay soils, surface puddles and surface crusting may be eliminated. In addition, plant roots may more easily penetrate the perlite soil media and develop more fully. More oxygen in soil results in faster growth. Perlite increases the amount of oxygen available to the plant roots because it does not retain water. As a result, air pockets form around the perlite even when the growing medium is wet. Accordingly, the purpose of this study was to examine the influence on the physical properties of substrate perlite and soil type Gleysol including: Bulk density  $\text{gr/cm}^3$ ; Particle density  $\text{g/cm}^3$ ; Total Porosity (%); Water porosity (%); Air porosity (%). Two types of substrates were used, soil type Gleysol (WRB, 2016) and perlite. Two different levels of soils (50% and 80 % by volume) were added to perlite and 100% perlite was used as a control. The results from our research show that in there is a positive correlation between the water porosity and air porosity ( $r = 0.99$ ). Also there is high negative correlation between the bulk density and air porosity ( $r = - 0.97$ ).

Keywords: perlite, soil, physical properties.

CSNRP21

**PRESENTATION OF DENDROLOGICAL COLLECTION IN THE  
BOTANICAL GARDEN OF THE PROTECTED AREA PARK  
ARCHITECTURE MONUMENT 'UNIVERSITY CITY'**

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**Abstract**

The paper presents the dendrological collection of the Botanical garden which is situated in the protected area "Park architecture monument 'University city'" of the University of Banja Luka. The Botanical garden covers an area of 5.17 ha and is open to public access. After the soil recultivation in 2008 until today, the establishment of ex situ woody plants collection has been conducted. The Botanical garden's dendrological collection comprises 38 families and 133 taxons. There are 84 tree species, of which 64 are broad-leaved, and 18 are coniferous species. Also, there are 49 shrub taxons, of which 4 taxons are coniferous, 9 evergreen and 36 deciduous. Family *Pinaceae* is the most numerous among conifers, with 15 species present in the collection, followed by the *Cupressaceae* family with 5 species present. The most represented broad-leaved families are *Rosaceae*, with genera *Sorbus* and *Prunus*, followed by the family *Sapindaceae*, with the genus *Acer*, family *Oleaceae*, with genus *Fraxinus* and family *Fagaceae*, with genus *Quercus*. Other specimens of broad-leaved trees in the collection are from genera *Tilia*, *Liquidambar*, *Rhus*, *Betula*, *Catalpa*, *Carpinus*, *Corylus*, *Diospyros*, *Elaeagnus*, *Cercis*, *Gleditsia*, *Castanea*, *Ginkgo*, *Aesculus*, *Liriodendron*, *Magnolia*, *Platanus*, *Crataegus*, *Malus*, *Pyrus*, *Populus*, *Salix*, *Ulmus* and *Zelkova*. Shrub taxons comprise genera: *Ilex*, *Ruscus*, *Cotinus*, *Yucca*, *Berberis*, *Mahonia*, *Lonicera*, *Symphoricarpos*, *Euonymus*, *Cornus*, *Weigela*, *Hamamelis*, *Hydrangea*, *Philadelphus*, *Ligustrum*, *Syringa*, *Paeonia*, *Amelanchier*, *Chaenomeles*, *Cotoneaster*, *Kerria*, *Prunus*, *Pyracantha*, *Spiraea*, *Buddleia*, *Lycium*, *Sambucus* and *Viburnum*. This collection is one of the most comprehensive in Republic of Srpska and presents a valuable research poligon for the national Gene bank and the University. Also, it is a useful resource for studying species adaptability in local urban ecological conditions.

Keywords: ex situ collection, taxon, adaptability.

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CSNRP22

## **TAXONOMIC AND BIOGEOGRAPHICAL ANALYSIS OF BRYOPHYTA IN THE COASTAL AREA OF THE RIVER UKRINA**

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Bryophyta are a blind branch in the evolution of plants, but they are a very significant group, which with its number of described species and its wide spread, makes a remarkable component of the whole biodiversity. This work shows a taxonomic and biogeographical analysis of Bryophyta in the coastal area of the river Ukrina. On the researched localities, 43 species are sampled and determined. The determination has been done with the use of a microscope, binocular magnifying glass and on the basis of the corresponding literature. The biogeographical analysis is based on the data Düll et al. (1999). Apart from the ecology, the research on Bryophyta is also notable for the areas of pharmacy and medicine because many of their species possess a capability of synthesis of antibiotics matters.

Keywords: Bryophyta, river basin, taxonomic analysis, biogeographical analysis.

CSNRP23

## **SOME TAXONOMIC AND DENDROMETRIC CHARACTERISTICS OF TWO MOST PRESENTED BROAD-LEAVED AND CONIFEROUS GENUS IN THE PROTECTED AREA „UNIVERSITY CITY“ BANJA LUKA**

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### **Abstract**

Protected area for genetic resources management – Park architecture monument “University city”, which covers about 28 ha of land in urban area of the city of Banja Luka (Bosnia and Herzegovina), got its role of student campus in 2004. The paper presents taxonomic and dendrometric elements of two most presented broad-leaved genus, and two most presented coniferous genus in protected area, as well as grades of their vitality and decorative value (grades from 1- bad to 5- excellent). Besides stating scientific and common names of these species, the paper also lists values of diameter and breast height (DBH) (cm), tree height (m), trunk height (m) and crown spread (m) that were recorded in 2014. The most presented broad-leaved species in protected area belong to *Tilia* and *Acer* genus. Species *T. argentea*, *T. cordata*, *T. platyphyllos*, *A. negundo*, *A. platanoides*, *A. pseudoplatanus* where analysed. The most numerous of them are *T. argentea* with 92, and *A. negundo* with 64 trees. The most presented coniferous genus are *Pinus* and *Picea*. The most numerous of them are *Pinus strobus* with 135 trees, and *Picea pungens* with 128 trees. Taking into account the estimated age of these trees, their dimensions and environmental conditions, as well as the specific purpose of protected area, it can be concluded that trees in question have average to bad vitality and decorative values. On the other hand, existence of such important natural value in city's urban area, obliges everyone responsible to conduct adequate protection measures assigned bay the law and appropriate planning documents, in order to extend life span of protected trees in the harsh urban environment.

Keywords: revalorization, dendrofund, dendrometric, elements, evaluation.

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CSNRP24

## **AWARENESS OF AGRICULTURAL PRODUCERS ABOUT THE IMPACT OF FERTILIZERS OVERUSE ON THE ENVIRONMENT**

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Overuse of fertilizers can have harmful effects on environment. The Nitrates Directive aims to protect water quality by preventing nitrates from agricultural sources polluting ground and surface waters and by promoting the use of good farming practices. Implementation of good agricultural practices is one of the basis of The Nitrate Directive. For Republic of Serbia it is important to implement good agricultural practices in order to be present on EU trade. The paper is based on research about awareness of agricultural producers about the impact of fertilizers overuse on the environment. To analyse the awareness of the farmers on fertilizers influence on the environment 39 farms in Serbia were visited and farm owners were interviewed. Data were collected by face to face interviews. Analysis of the collected data showed that all farmers use fertilizers. It is important to notice that 79.4% of farmers use chemical fertilizers more than recommended, and 87.1% use organic fertilizers more than recommended. Furthermore, 66.6% of farmers do not know which harmful pollution effects of nitrates on soil and water are. 71.7% of farmers has not heard for The Nitrates Directive. Therefore, it can be concluded that farmers are not aware enough of fertilizers impact on the environment, and it is necessary to educate them more about that. It is also important for environmental protection to underline that farmers' activities should be harmonized with good agricultural practices.

Keywords: environment, fertilizer, awareness, agriculture.

CSNRP25

**CHARACTERISTICS OF THE FRUIT OF AUTOCHTHONOUS SWEET  
CHERRY CULTIVARS (PRUNUS AVIUM L.) OF THE  
BANJALUKA REGION**

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Banjalučka region is characterized by a very rich and varied diversity of old and autochthonous cultivars of sweet cherries, which represent a very important genetic potential for future breeding programs. Autochthonous cultivars of sweet cherries are spontaneously propagated and used in very few areas for production and consumption in the fresh state. A very small percentage of the fruits of these autochthonous cultivars are used in local markets or in some forms of processing. The main reason for this behavior is the small number of individual trees whose fruits are used for use in their own household, as well as ignorance of the basic characteristics of the fruit of these cultivars that would be the basis for a marketing approach with the aim of placing at supermarkets, which recently become the dominant places for placement of agricultural products. In order to popularize the production and sale of fruit of autochthonous sweet cherry cultivars, we made basic pomological measurements of the 5 most common varieties of autochthonous cultivars of sweet cherries in the Banjaluka region, the weight and dimensions of the fruit, weight and dimensions of the pit, dimension of the stem, dry matter content of the fruit and the firmness of the flesh of the fruit.

Keywords: *Prunus avium* L., autochthonous cultivar, fruit.

CSNRP26

**PHENOTYPING TOOLS FOR ASSESSMENT OF SOME LEAF  
MORPHOLOGICAL TRAITS IN EUROPEAN HORNBEAM  
(CARPINUS BETULUS L.)**

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Phenotyping tools are used for assessment of plant morphological traits from cellular to whole plant level. Many software tools were developed for phenotyping, of which most are freeware and widely used by researchers. This study was conducted by using image analysis of European hornbeam (*Carpinus betulus* L.) leaves from Banja Luka region. Leaves were taken from preselected mother trees in July 2017 from 3 localities (Krupa na Vrbasu, Kadinjani and Donji Podgradci), 5 trees from each locality and 30 leaves from each tree. Leaves were pressed, scanned (HP ScanJet 4030p, 600 dpi), images calibrated and measured by image analysis tool MorphoLeaf v. 1.41. Analysis in MorphoLeaf is based on semi-automatic identification of leaf geometric landmarks (such as leaf base, tip, serration points) and output measurements are leaf blade length, width, projected area, perimeter and number of teeth, petiole width, as well as the reconstructed average contour of measured leaves. For biometrical and statistical comparison of data standard descriptive measures were used in combination with factorial anova and appropriate post-hoc testing. The statistical significance of the differences was set at  $p < 0.05$ . Grouping of cultivars is analysed through Principal Components Analysis. Biometrical calculations and graphical representation of data were made with assistance of statistical software SPSS 22 (IBM). Analysis of the studied leaf traits indicated statistically highly significant difference between the studied genotypes for all leaf traits. It was observed that genotypes from Krupa na Vrbasu have smaller leaves and related traits, genotypes from Donji Podgradci have bigger leaves in combination with larger teeth number, and genotypes from Kadinjani have bigger leaves in combination with less teeth. The acquired data and results are a basis for identification of analogy between leaf morphological traits of selected mother trees and seedlings produced under different combinations of nursery conditions (substrate, water management, light intensity).

Keywords: image analysis, MorphoLeaf, leaf traits, nursery.

Acknowledgements: This research is a part of the project "Support for implementation of COST action FA 1306 in the country – First phase of introduction of modern technologies in nursery production of horticultural plants" which was financed by the Ministry of Civil Affairs of Bosnia and Herzegovina (contract no. 10-02-2-212/16-36 from August 17, 2016).

CSNRP27

## **INTEGRATED WASTE MANAGEMENT - PROTECTED AREA "UNIVERSITY CITY" MANAGING BASELINE**

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Due to its large quantity and improper disposal, waste is considered to be the greatest endangering and damaging element in protected area. As a result of societal and commercial activities within the "University city", as well as student housing, and managing and research activities, different categories of waste are generated. The system of integrated waste management in "University city" recognises 30 classified categories of waste, based primarily on activities which generate the waste, type of waste, materials and processes. Waste categorisation was carried out in accordance with Waste Catalogue which is part of Rulebook of waste categories, testing and classification ("Republic of Srpska Official Gazette", nr.: 19/15). Waste is categorized in groups determined by place and source of origin. Groups of waste are labeled by double-digit number, and six-digit number was given to each specific type of waste - sixfigure code number. Identification of waste categories, as well as information on waste, required for sixfigure code number determination for each specific waste, ensure safe handling and managing the concerned waste, and it allows each holder in waste managing process to conduct their activities without a negative impact on environment and human health safety. Reuse and waste recycling, selecting secondary raw materials from waste and exploitation of waste as an energy-generating product will lead to far more efficient environment protection within the "University city" complex, and also will enable financial benefit gain through reducing costs of waste disposal and secondary raw materials trading.

Keywords: protected area, waste management, waste categories.

Acknowledgement: This research was financially supported by the Environmental Protection and Energy Efficiency Fund of the Republic of Srpska (contract no. 04-1575-01/16, signed on December 12, 2016).

CSNRP28

## ECOLOGICAL ANALYSIS OF WEED FLORA IN VINEYARDS OF BOSNIA AND HERZEGOVINA

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Weed flora of vineyards in Bosnia and Herzegovina is represented with 133 species of vascular plants (Kovačević et al., 2014). Plant life-forms are determined by using updated and upgraded Ellenberg and Mueller-Dambois classification (Ellenberg et Mueller-Dambois, 1967) based on Raunkiaer principles (Raunkiaer, 1934) presented in Flora Srbije (Sarić, ed., 1992). This classification has enabled more specific division biological spectrum of weed flora. Biological spectrum analysis has defined 5 life forms. Taking into account quantitative and qualitative presence of specific life forms it is determined that weed flora has a therophyte-hemicryptophyte-geophyte character. It is determined a domination of therophyte (61 species or 45.86%), of which 47 species are tree-form (T scap) types and together with succulent tree-form (T scap-succ) types make for 78.69% of total therophytes. At phenolic dynamics it is determined a domination of summer (a) types with 41 species or 67.21% of total therophytes, while looking at height category tall plants dominate with a total of 32 species of which 14 species belong to cross Mes-Meg group in 10 to 100 centimeters height range. Hemicryptophyte are second with 53 species or 39.85%. 37 species or 69.81% of hemicryptophyte are tree-form (H scap) type. There is a dominance of summer (a) species with 47 representatives or 88.68% of total number of hemicryptophytes. In height categories there is a domination of relatively tall plants from Mes-Meg group with a total of 16 species. Geophytes are present with 13 species or 9.77% of which most numerous are rhizomatous (G rhiz) forms with 6 representatives or 46.15%. Phanerophytes (P) and Scandentophytes (S) are both present with three species each (2.26%). Domination of therophytes confirms anthropogenic conditionality and variability of habitat, hinting ruderal character. Significant presence of hemicryptophyte is in accordance with macroclimate conditions of Bosnia and Herzegovina, and hints that a significant number of vineyards is characterized with a low level of agro-technical measures.

Keywords: weeds, life forms, vineyards.

CSNRP29

## **THE SIGNIFICANCE OF TRANSVERSAL DISTRIBUTION DURING THE APPLICATION OF PLANT PROTECTION BY BOOM SPRAYER**

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In this study we give the emphasis on nozzles whose state has a big influence on the quality of transversal distribution of the application of plant protection, and thus on the quality of pesticide application as well. The capacity of nozzles changes during the exploitation, i.e. it produces deviation from normal values. The consumption has an effect on the increase of the capacity of the nozzle, or the fraying and abrasion of the cartridge itself, which has a consequence of increased flow of the substance. On the other hand, decrease of the capacity occurs as a consequence of impurities which come with water which is used as a carrier of substances. Decreased capacity is a consequence of congested nozzle, and in certain situations the capacity might be down to a zero. All of the above has a significant influence on the securing of the desired standard of the treatment, which actually is the ultimate indicator of optimally chosen parameters. The aim of the study is to point to the significance of regular control of the nozzle capacity, since quality application and good transversal distribution of plant protection depends on their state. The control of the transversal distribution in some European countries is not implemented. However, various studies show that it represents the most important way to gain an efficient application of the pesticides. The results found during this study prove that it makes sense to talk about all of this. Measured deviations of the nozzles according to the positions had significant deviations (5- decrease 83.33%, or 13- increase of the capacity for 61.11%), and the consumption of the substance according to the surface (ha) fit perfectly. During the designing and monitoring of the treatment standards most of the producers concentrate on the consumption (l/ha), and that exact doing points to frequent occurrences in practice (deviations) which can have a significant influence on the quality of the application.

Keywords: nozzles, transversal distribution, boom sprayer, controlled application.

## **Section: ANIMAL SCIENCE**

### **Oral presentations**

ASO1

**THE CHALLENGES OF ACCESSION TO EUROPEAN UNION**Vesna Gantner<sup>1</sup>, Božo Važić<sup>2</sup>, Maja Gregić<sup>1</sup>*<sup>1</sup>University of J.J. Strossmayer in Osijek, Faculty of Agriculture, Osijek, Croatia**<sup>2</sup>University of Banja Luka, Faculty of Agriculture, Banja Luka, Republic of Srpska, B&H*

Republic of Croatia submitted on 21 February 2003 a request for membership in the European Union (EU), which started a multi-year process of preparation and negotiations on accession to the EU. After considering the request for membership and additional information provided, the European Union on 18 June 2004 granted Croatia candidate status, which Croatia has acquired the right to use funds from the EU pre-accession assistance. A number of decisions that define the structure for negotiations on Croatian accession to the European Union were adopted in the coming period, participants in the negotiations were nominated, and the principles and strategic guidelines for negotiations were defined. The Ministry of Agriculture, Fisheries and Rural Development was defined as responsible for Chapter 11 (Agriculture and Rural Development), Chapter 12 (Food Safety, Veterinary and Phytosanitary Control) and Chapter 13 (Fisheries). Then, the Working Group for preparation of negotiations on Chapter 11 was established. This group participated in the screening and assessment of compliance of Croatian legislation with the EU acquis as well as in drafting the proposals for negotiating positions. This group also had a role as a forum for informing the professional public about the most important aspects of Croatia's preparations for future EU membership. Key negotiating requests of Croatia concerned the determination of amount of financial envelope for direct payments, terms of application and financing of the direct payments and the determination of production quotas for milk and sugar. Important requests were related to the determination of reference periods, and the conditions for the implementation of rural development measures. The overall process of accession negotiations was completed at the meeting of the Intergovernmental Conference on Croatian accession to the European Union on June 30, 2011. The financial envelope for direct payments determined on the basis of statistical data on realized agricultural production and resource utilization in the defined reference period was set to 373 million euros per year. Also, since 2014, Croatia could use the EU budget for Rural Development (EAFRD) in the amount of 333 million euros per year (additionally includes national budget funds). Finally, The EU provides the legal framework and financial ability, but will and how that is used, depends on the Member State.

Keywords: European Union, accession, negotiations, direct payments, rural development.

ASO2

## **THE INFLUENCE OF SOME STARTER CULTURES ON THE COLOR AND LIPID OXIDATION IN INDUSTRIALLY PRODUCED MACEDONIAN TRADITIONAL SAUSAGE**

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Sausages belong to the widest range of meat products available in a wide variety of species and with various commercial names. The aim of this paper is to monitor the influence of two starter cultures on the color and lipid oxidation of industrially produced Macedonian traditional sausage. The research covered three variants: Variant 1: Control variant (conventionally produced Macedonian traditional sausages using nitrite salt and powdered acerola); Variant 2: Macedonian traditional sausages where the basic formulation was enriched by the addition of starter culture CS-300 (*Staphylococcus carnosus* ssp. *utilis* + *Staphylococcus carnosus*) in combination with Swiss chard powder (as a substitute for nitrite salt) and powdered acerola; Variant 3: Macedonian traditional sausages where the basic formulation was enriched by the addition of starter cultures CS-300 (*Staphylococcus carnosus* ssp. *utilis* + *Staphylococcus carnosus*) and BLC-78 (*Pediococcus acidilactici* + *Staphylococcus carnosus*) in combination with Swiss chard powder (as a substitute for nitrite salt) and powdered acerola. The lightness of the color ( $L^*$ ) continuously decreases in the control variant, resulting in a loss of color in the specified time interval. This phenomenon is not observed in the samples of variant 2 and variant 3. On the 4th day of production, variant 2 and variant 3 have statistically significant differences ( $p < 0.05$ ) for redness value, compared to the control variant. From the aspect of retaining the values for redness ( $a^*$ ) and the yellowness ( $b^*$ ), a better effect showed a starter culture that was added to variant 2. Thus, the samples of this variant showed better values for total color change ( $\Delta E$ ) and color saturation ( $C$ ). The lowest TBA value was determined in the variant 2, and the highest TBA value was determined in the variant 3. Starter cultures have a positive influence on the color and lipid oxidation in the industrially produced Macedonian traditional sausage. According to the obtained results, with the use of the starter culture CS-300 good quality of the sausages is achieved. At the same time a safe product is obtained where the use of nitrite salt is completely eliminated.

Keywords: macedonian traditional sausage, starter cultures.

ASO3

**DETERMINATION OF THE EFFECT OF DAILY PRODUCTION LEVEL OF PRIMIPAROUS HOLSTEIN COWS ON RESPONSE TO HEAT STRESS CONDITIONS (THI THRESHOLD) IN EASTERN CROATIA**

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The goal of this paper was to determine the effect of daily production level of primiparous Holstein cows kept on dairy cattle farms in Eastern Croatia on response to heat stress conditions (THI threshold). With that purpose, individual test-day records with data on ambient temperature and relative humidity in the barns were analysed. Data were collected in regular milk recording from 2006-2012. The THI threshold values for daily milk yield were determined by least square analyses of variance for each given THI value (from 68 to 72) using the PROC MIXED (SAS). Low producing cows experienced significant drop at THI=68, while in high producing primiparous Holsteins first significant drop in daily milk yield was observed when THI=69. Also, the amount of daily production drop depended on cow's production level (0.155-0.256 kg/day in high producing; 0.319-0.460 kg/day in low producing). It could be concluded that the response of primiparous Holstein cows kept in Eastern Croatia to heat stress conditions depends on daily production level.

Keywords: primiparous Holsteins, heat stress conditions, temperature-humidity index, daily production level, Eastern Croatia.

ASO4

**QUALITY OF CORN SILAGE, GRASS SILAGE, HAY AND  
CONCENTRATE ON THE FARMS OF DAIRY COWS IN THE  
MUNICIPALITY KALESIJA AND ZIVINICE**

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Milk production in farms from the North-eastern region of Bosnia and Herzegovina is very different and varies in the interval from 10 to 25 liters of milk per day per dairy cattle. The basic cause of such differences in the production of milk is the quality of feed. Profitable milk production can be achieved only by the properly balanced meal from the available feed on the farm. Optimal meal cannot be achieved if we are not available to analyse the quality of feed on the farm. Feed analysis on the farm provide milk manufacturers with a simple solution of preparation of meals based on table or actual value feed. There is a great advantage to have an actual feed analysis, because the table values do not always have to disagree with the actual values of quality feed. In November of 2017 we made the analysis of basic quality feed on 36 farms in the production system which have 10 or more dairy cattle, of which 17 farms in the municipality Kalesija and 19 farms in the municipality Zivinice. We analyzed different feed: corn silage, grass silage, hay and concentrate. Quality analysis on contents of protein, cellulose, moisture, ash and pH silage was performed. Based on the analysis, which was firstly done in this area, directly from farmers, we give recommendations on the drafting of a meal for dairy cattle. Feed analysis is performed in the Agricultural Institute Una-Sana Canton of Bihać. Based on the analysis it can be concluded that the quality of feed in larger farms meet the quality parameters.

Keywords: corn silage, grass silage, hay, concentrate, protein, cellulose, ash, moisture, pH.

ASO5

**THE EFFECT OF DIFFERENT TREATMENTS OF UDDER SANITATION  
ON THE REDUCTION OF THE NUMBER OF BACTERIA  
ON TEATS AND IN MILK**

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The aim of study was to determine the effectiveness of various procedures of udder sanitation, observed through the number of microorganisms in raw milk. Study included total of randomly chosen 42 dairy cows, divided in 6 groups with 7 headages in each group. Swabs were taken from the teats of the cows of the first group, as a control group, without implementing any measures of sanitation. In other groups of cows different ways of disinfection (before and after milking, and their combinations) were used. Besides swabs, samples of milk were also taken after milking. For disinfection, *Deosan Teatfoam*, preparation on the basis of chlorhexidine was used. Swabs were examined microbiologically, and milk samples were examined on total number of bacteria and number of somatic cells. Measured characteristics were presented by average values with standard error and processed by appropriate statistical methods. By analysis of the number of bacteria on teats after treatments applied, statistically highly significant difference between treatments ( $p < 0.01$ ) was noticed. By analysis of the number of bacteria in milk, highly significant difference between treatments ( $p < 0.01$ ) was also noticed. Treatment 4, where washing and drying of udders was carried out before milking, and final disinfection of udder after milking, is marked as the best, as best in the reduction of number of bacteria on teats and number of bacteria in milk. Treatment 4 shows additionally the tendency of decrease of number of bacteria in the last milking periods.

Keywords: udder, sanitation, milk, number of bacteria.

## **Section: ANIMAL SCIENCE**

### **Poster presentations**

ASPI

## **ENERGY NUTRITION OF WHEAT FOR NON RUMINANT ANIMAL**

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Grain quality in wheat is assessed on a number of indicators that characterize the physical, chemical and technological properties of the grain. The value of these indicators for each variety is genetically determined and is shaped according to the specific soil and climatic conditions of the area and the agro-technical factors. In recent years a wide variety of varieties of ordinary winter wheat has been offered. The main objective of this study is to analyze the effect of foliar fertilizer treatment on common wheat on the nutritional value of the grain. The experience was taken in the field of study of the Faculty of Agriculture, Trakya University, Stara Zagora, Bulgaria, during the period 2016-2017. The chemical analysis of the wheat grain was performed using the classic Weende method. Based on the results, energy and protein nutrition of wheat for non-ruminant pigs and poultry was calculated. The levels of crude protein in common wheat varieties have been established. The results for the digestible protein content (DP) showed that the applied crop treatment products did not affect DEE, DNFE, ME<sub>pg</sub> levels for both wheat varieties. The values of digestible and exchangeable energy vary within narrow limits, indicating that crop and crop products do not affect the energy nutrition of wheat for pigs and poultry.

Key words: common wheat, fertilization, energy efficiency.

## **IMPORTANCE OF INTRACELLULAR AND EXTRACELLULAR PROTEIN HSP70 IN PERIPARTAL PERIOD IN DAIRY COWS**

Miloš Petrović<sup>1</sup>, Radojica Đoković<sup>1</sup>, Milun D. Petrović<sup>1</sup>, Vladimir Kurćubić<sup>1</sup>, Marko Cincović<sup>2</sup>, Branislava Belić<sup>2</sup>, Zoran Ž. Ilić<sup>3</sup>, Neđeljko Karabasil<sup>4</sup>

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Numerous pathophysiological mechanisms (inflammation, insulin resistance and metabolic adaptation) develop during metabolic stress in periparturient period in dairy cows. Heat shock proteins have a significant impact in regulating these processes. Heat shock proteins (Hsp) are chaperon for the proper formation of the polypeptide chain and are responsible for its translocation in the cell. According to the molecular mass we distinguish several types: 10 kDa (Hsp10), 20-30 kDa (Hsp27, HspB1), 40 kDa (Hsp40), 60 kDa (Hsp60), 70 kDa (Hsp70, Hsp71, Hsp72, Grp78, Hsx70) kDa (Hsp90, Grp94) and 100 kDa (Hsp104, Hsp110), but the guidelines for the nomenclature of the human heat shock protein are also based on the systematic gene symbols assigned by the Hugo Gene Nomenclature Committee (HGNC). The best known HSPs are: stress induced form HSP70 / HSP72 (HSPA1A), constitutive forms HSP70 / HSP73 / HSS73 (HSPA8), an endoplasmic reticulum form, Grp78 / BiP (HSPA5) and a form localized mainly in mitochondria HSP75 / mtHSP70 / mortalin / TRAP-1 (HSPA9). Their expression can be induced: physiological (growth factors and hormones), pathophysiological (infections, inflammation, ischemia, oxidative injuries and toxins), environmental conditions (heat stress and heavy metals). In cattle, four types of HSP70 genes were identified, and iRNA for this protein was found in the tissue of different cells types and in the blood plasma. Intracellular Hsp70 helps to re-establish the native conformation of denaturated proteins under the influence of various stressors, preventing their aggregation and keeping the cells from apoptosis and exhibiting an antiinflammatory effect. Extracellular Hsp70 has the role of cytokine, immunostimulatory role (helps synthesize proinflammatory cytokines) and improves antitumour control. Hsp70 comes into circulation in two ways. One mechanism is passive, concentration of Hsp in the blood grows as a result of cell necrosis or their stress burden. The second mechanism is active and implies active secretion of Hsp into the bloodstream by different cells. Hsp 70 plays a major role in the pathophysiological mechanisms dominant in cows in early lactation. Therefore further research on the significance of this heat shock protein in metabolic adaptation and cow health in the periparturient period has to be carried out.

Key words: Heat shock proteins Hsp70, dairy cows, periparturient period.

ASP3

**THE EFFECT OF ENVIRONMENTAL COOLING RATE AND  
TEMPERATURE-HUMIDITY INDEX ON THE MILK YIELD OF  
HOLSTEIN CATTLE ON SPECIFIC FARM**

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This work is targeted on the effect of environmental cooling rate and temperature-humidity index on the milk yield of holstein cattle on specific farm. In modern agriculture, the significance of high temperature rises. High temperature will be challenging especially in the dairy cattle breeding. The experiment for this paper took place on University farm in Žabčice (South Moravia) in summer 2017. This experiment lasted over one month. The cows from the most productive section were chosen. These cows are suspected to be affected by a heat stress more than low-producing ones. The Environmental cooling rate (ECR) was measured by Hill's thermometer and later calculated according to formula. Temperature-humidity index (THI) was calculated from the temperature and humidity data obtained by data logger placed in the stable. Milk yield data were obtained directly from the milk parlor. The results show, that the ECR is in a weak positive relationship ( $r= 0.07$ ) with the milk yield. In contrast to that, THI showed the mild negative relationship to the milk yield ( $r= -0.14$ ). This supports our previous statements that a higher temperature negatively affects the milk yield. These findings can be used for farmers to optimise their production and to uphold their competitiveness in upcoming climate.

Key words: heat stress, cattle, yield, holstein.

ASP4

## **MEASUREMENTS OF MICROCLIMATE PARAMETERS ON THE ROBOTIC DAIRY FARM IN CROATIA**

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Microclimate in a barn presents one of the major effect on cows' health and welfare. The heat stress negatively influences on the milk production of dairy cows. Extreme values of air temperature and humidity in the barns have negative effect on cows kept in those barns. The objective of the study was to measure basic microclimate parameters on a robotic dairy farm located in Croatia. Research period referred to summer season, from 01 June – 31 August 2013. Measurements were carried out for the following parameters: temperature (T), humidity (H) and temperature-humidity index (THI). The results showed that the values of T and THI were higher than optimal values recommended by the scientific literature. The values of T ranged from 13 to 38 °C, for H were from 29 to 90%, and the values of the THI were from 56 to 85. Furthermore, distribution of THI were very unfavourable for the cows the most of the times ( $\text{THI} \geq 70$ ), more precisely, over 50% of the time the animals were exposed to the heat stress. Although measurements were performed on a modern dairy farm equipped with additional cooling (fans) that was not sufficient to create an optimal microclimate environment for dairy cows. Because of that, additional measures need to be undertaken during summer months in order to reduce the temperature-humidity index, all with the purpose to increase comfort of dairy cows and to prevent decrease in milk production.

Key words: microclimate parameters, dairy farm, comfort of cows, summer months.

## **BIODIVERSITY PROGRAM OF BUSHA CATTLE IN THE R. OF MACEDONIA**

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Busha cattle is indigenous breed in many Balkan countries. It has been bred for centuries. It belongs to a group of primitive shorthorn cattle (*Bos brachyceros europaeus*). These cattle used to be dominant and most important breed in almost all Balkan countries until 50s and 60s of the XX century but today in lowland areas with intensive farming they are already replaced with more productive and specialized cattle breeds. In Macedonia this breed has officially been classified as triple purpose breed (for meat, milk and work) but considering its low productive capabilities it is more similar to some primitive working breeds. This breed is a part of the National Biodiversity Program for conservation of the indigenous breeds of animals in the R. of Macedonia. Because of the economic, cultural and scientific reasons it is very important to protect biological diversity of autochthonous breeds like busha cattle. The aim of the research was to carry out the breeding program for Busha cattle, by realization of the inventarization, phenotypic characterization and establish gene bank as well as to carry out the selection program for this breed. A phenotypic characterization was done on the adult Busha cattle, for the basic productive and morphological traits in adult Busha cattle. Also was established a gene bank for different strains of adult busha cattle in the R. of Macedonia. During the last few years, there are certain negative trends in population size of busha cattle, according to the decreasing of rural population in hill-mountain regions and small interest of young people to rear indigenous breeds like Busha cattle.

Key words: cattle, Busha, biodiversity program, gene bank, phenotypic traits.

ASP6

## **MARE'S MILK WITHIN THE EUROPEAN UNION**

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The aim of this study was to show the benefits of mare's milk comparing to other types of milk and its integration within the European Union. Mare's milk for thousands of years was used prophylactically and therapeutically in medicine. Also, mare's milk has many positive effects on the human body, but is completely neglected in the diet of the European population. Mare's milk has unique composition comparing to other types of milk. In total, more than 40 nutrients and valuable substances are identified in milk of mares. Mare's milk helps the intestine in its work, stimulates the formation of intestinal flora and thus the absorption of calcium. Also, the content of vitamin D is 17 times higher than in cow's milk. It also contains a high proportion of vitamin C, which leads to the strengthening of our immune system and stimulates the production of antibodies. Consumption of mare's milk strengthens the cardiovascular system and is an excellent natural medicine. The positive effects of the consumption of mare's milk have been reported in allergies, during chemotherapy or after surgery, in case of problems with the skin, and spring and autumn ailments. Mare's milk is neglected in human nutrition partially due to unknowing of the its characteristics, the demanding production technology and also due to justified high market price. Farms in Western Europe at the beginning of the century recognized the potential of mare's milk and directed their farms to this kind of production. Today they offer various products to the market (food and cosmetic) and also tourism services on their farms. Sustainable business was noted on the farms targeted on production of mare's milk. These farms breed exclusively or partially cold-blooded horse breeds that are not suitable for equestrian sports.

Key words: mare's milk, European Union, Republic of Croatia.

ASP7

**BODY WEIGHT AND MASS OF EGGS SEXUALLY MATURE FEMALES  
OF RAINBOW TROUT (ONCORHYNCHUS MYKISS) IN THE FARM  
"UGARSKI BRZACI" KNEŽEVO**

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Controlled spawning rainbow trout (*Oncorhynchus mykiss*), was carried out on January 28, 2018 in salmonid fish farm "Ugarski brzaci" Kneževo. During spawning, from broodstock, 15 sexually mature females were selected as representative samples of the population of spawned females. The age of the female in the spawning was 4+. The total length of the body of the individual varied from 40 to 66 cm, and the mass of the extruded egg varied from 160 to 880 g. The total weight of all analyzed individuals was 33.62 kg, and the total weight of the extracted eggs was 5.14 kg. Relative value of the mass of the extruded egg in relation to the total body weight of the female was 15.29%. The controlled spawn of rainbow trout in the farm "Ugarski brzaci" - "Kneževo" is described in detail.

Key words: "Ugarski brzaci", Kneževo, rainbow trout, weight of body and egg.

ASP8

## AQUACULTURE IN BOSNIA AND HERZEGOVINA

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Aquaculture is an activity that at world level has an annual growth rate of about 6% (FAO), which indicates the importance and potential of this sector in the world and in our country. Bosnia and Herzegovina (B&H) has great water potential, and is dominantly characterized by freshwater aquaculture and a small part of mariculture. From warm-water fish species in freshwater B&H predominantly grown carp (*Cyprinus carpio*) with a smaller share related species, a species of predominantly grown rainbow coldwater trout (*Oncorhynchus mykiss*). In mariculture B&H are represented seabass (*Dicentrarchus labrax*), seabream (*Sparus aurata*), shellfish mediterranean mussels (*Mytilus galloprovincialis*) and european oysters (*Ostrea edulis*). The trout production takes place in classical concrete structures and cage systems intensively, mariculture is based on the intensive cultivation of fish in cages and shells in floating parks, and warm water fish species are taken in classical earthen pools by a semi-intensive system. In the period 2010-2016 there is a trend of decreasing production areas in exploitation of carp ponds and cages, while in trout farms there is a trend of increase until 2014 and a decline until 2016. The production area of cage farms for production of sea fish is about 8000 m<sup>2</sup>. Although there is a downward trend in production areas, trout production has been on the rise since 2010 (2900.9 t) by 2016 (3394.9 t). The largest decrease in production is in carp, from 1355.8 t in 2010 to 789.4 t was in 2016. Production of marine fish is about 170 t, and shellfish about 70 t (2010, 2011 and 2012). According to the quantities produced, the trout is dominating with 74.39%, followed by carp with 17.3%, and other fish 8.32% and on the basis of previous data on sea fish, about 4% and shells are about 2%. The participation of aquaculture of the Republic of Srpska in the total aquaculture of B&H in 2012 was 67.7%. B&H has a great water potential that provides the opportunity to increase production in aquaculture by building new production facilities or by increasing production in existing fish farms using new systems and techniques, especially when it comes to growing trout.

Key words: Bosnia and Herzegovina, aquaculture, status, opportunities.

## THE IMPACT OF THE ENVIRONMENT ON THE CONSERVATION OF ANIMAL GENETIC RESOURCES

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It is generally known that the environment represents everything that surrounds us, that is, everything that directly or indirectly involves a life and production activity. It can be said that the environment is a space on Earth where survival of living beings is possible, whereby a smaller or larger area in the environment, ruled by similar conditions for life, constitutes a living habitat (biotope). Given that the habitat allows for the necessary conditions for the life of a particular plant and animal community, it is assumed that natural and cultivated life communities have a significant impact on the conservation of animal genetic resources. Many authors state that the animal domestication also marked the beginning of animal selection for food production, the production of skin and fiber, for work and other needs in agriculture. During the centuries-old controlled breeding of domestic animals, combined with natural selection, a great diversity of domestic animals was created at the world level. Based on prevailing opinion in the world, conservation of animal genetic resources is very important for economic, scientific, cultural and historical reasons. However, the common interest of all is the preservation of the genome of certain animal populations, so that interests in the future can be realized in the future for all the just mentioned reasons. Since some places offer different life opportunities and differ in their appearance, as well as under the conditions that govern them, it can be considered that the environment has a certain impact on the conservation of animal genetic resources. Among other things, it should be emphasized that the environment is different for each living being, because each organism inhabits a certain living space, within which action and other organisms are involved, which possesses certain physical and chemical characteristics that affect the available resources.

Key words: animal resources, biotope, environment.

**Section: AGRICULTURAL ECONOMICS  
AND RURAL DEVELOPMENT**

**Oral Presentations**

AERDO1

## **FOOD SECURITY IN TRANSITION: SUCCESSES, FAILURES, AND NEW CHALLENGES FOR SOUTHEASTERN EUROPE**

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The paper provides an overview of the food security and poverty dynamics in the Europe and Central Asian region since the early 1990s and contrasts it with the overall global situation. Particular attention is given to the results for the Balkan region of Southeastern Europe. We draw from a recent FAO report on Food Security in Europe and Central Asia and focus on four sub-regions that constitute the geographic focus of this paper – Central Asia, Eastern Europe, Central Europe and Southeastern Europe. Four pillars of food security – availability, access, utilization and stability – are used for the assessment of the food security situation in the region. An array of economic and policy factors that have been shaping food security in the region are also explored. Overall, in the analyzed period the countries of our focus have shown significant progress with regards to alleviating food insecurity and extreme poverty. It is only Tajikistan and Uzbekistan that have not reached the 2001 Millennium Development Goal hunger target or World Food Summit target by 2015. However, considering the multidimensionality of food security that goes beyond prevalence of undernourished captured in the international hunger targets, there are a number of problems and risk factors that all countries we look at face to some extent. These factors either negatively affect the current state of food security, or could contribute to its deterioration in the longer run if they are not addressed. In particular, malnutrition and food utilization issues remain a problem in Southeastern Europe as well as in most of the ECA region.

Keywords: food security, Europe and Central Asia, Southeastern Europe, malnutrition.

AERDO2

**SLOW FOOD ARC OF TASTE AND PRESIDIO PROJECTS AS MODEL  
OF SUSTAINABLE AGRICULTURE, SUCCESS STORIES AND  
PROBLEMS FACED BY SLOW FOOD TREBINJE,  
HERCEGOVINA FOOD COMMUNITY**

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For last 30 years Slow Food movement is working on preservation of food biodiversity. It is doing it through two main projects: Arc of Taste and Presidio project. "Arc of Taste" is a world catalogue of endangered traditional foods while "Presidio" product&project establishes a group of producers and helps them to preserve and valorize arc of taste product. Today there are 4698 "Arc of Taste" products from the whole world and 530 "Presidio". In Italy and Switzerland "Presidio" is a registered brand. From Bosnia and Hercegovina 17 products are presently in Slow Food "Arc of Taste" catalogue among which two are "Presidio": cheese in sack and "Požegač" plum sweet (slatko). On the list are also "Bjelčić" corn from Potkozarje, Popovo polje "Stodanac" corn, Gacko cattle, Hercegovina honey, hercegovinian dried figs, cream "kajmak" from the sheepskin sack, "Poljak" bean, "Pramenka" sheep, "Prijedorska zelenika" apple, "Roga" green bean, Livno cheese, Vlasic cheese, Trebinje tomato "Jabucar", and huchen. Thanks to constant work of 3 Slow Food Communities, Slow Food Trebinje, Hercegovina, Slow Food Potkozarje and Podgrmec and Slow Food Ustikolina, the number of identified and local forgotten varieties is increasing what raises hopes about the future of sustainable agriculture in Bosnia and Hercegovina but poses us in front of several problems too. In this paper, the arc of taste products identified in Hercegovina will be presented, expose positive experience related to the valorization of some of these products as well as problems faced.

Keywords: traditional food, biodiversity, "Presidio", "Arc of Taste".

AERDO3

## **ANALYSIS OF DEMOGRAPHIC CHANGES IN RURAL AREAS OF THE REPUBLIC OF SRPSKA**

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The rural areas of Republika of Srpska occupy about 95% of the territory of the Republic of Srpska and about 83% of its population. At the same time, it should be noted that smaller towns, along with the adjacent villages, are classified into rural areas. The paper analyzes the results of the 2013 Population Census and the 1991 Census, comparing the basic demographic indicators that refer to: the total population per observed municipalities, then the number of inhabitants in the rural areas of the listed municipalities, the total number of households and the number of households in rural areas, as well as the number of household members. Comparison was also done for the municipalities in plain regions in relation to the municipalities of the hilly-mountain regions of the Republic of Srpska. The results of the analysis show that there has been a decrease in the total number of inhabitants in the observed municipalities, which on average amounts to 18.95% for the flatland municipalities and 40.34% for the municipalities of the mountainous region. There was also a decrease in the number of inhabitants in the rural areas of these municipalities, which on average amount to 23.69% for the plains and 50.03% for the municipalities of the mountainous region. The number of household members in rural areas decreased by 26.66%. The downward trend was also determined by the analysis of both the total number of households and the number of households in rural areas. In addition, the negative trend is also reflected in the increase in the number of households with one or two members and a decrease in the number of households with four, that is, with five or more members of the household. Unlike these data, data from the Register of Agricultural Holdings show the trend of growth of registered family farms and the growth of the number of members of these farms. However, at the same time we have a decrease in the average number of members per household. If the reduction in the number of agricultural population is accompanied by the same population density of rural areas, then we could say that this is a positive phenomenon which is a prerequisite for intensifying agricultural production and concentration of capital and resources on a smaller number of larger farms.

Keywords: population census, rural areas, households.

AERDO4

## **PROCESSES OF CONCENTRATION IN AGRIBUSINESS ON EXAMPLE OF THE POLISH MILK MARKET**

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Nowadays, in the world we can observe progressive processes of concentration of production and capital in agribusiness. On the one hand, it can be considered as something positive, because it is connected with the improvement of economic efficiency and the necessity to fight with stronger and stronger competitors. On the other hand, it can be a threat to real sustainable development of agriculture and agribusiness, because it leads to raising capital in the hands of an ever smaller number of entities, and in the long-term to monopolize the market more and more. This study presents changes on the Polish milk market with a particular demonstration of concentration processes in the sector. The results were based on secondary data that came from public statistics databases in Poland. The analysis of the data showed that in the years 2007-2016 the number of dairies decreased from 232 to 175. Employment in these plants dropped from 37.23 thousand people up to 32.36 thousand people. At the same time, the value of sales increased from approximately PLN 21,800 million to PLN 27,637 million, and the production volume increased (eg production of processed milk in 2008 was about 2413 thousand of tones, and in 2016 it was 3350 thousand of tones). The obtained results confirm that the Polish milk market is characterized by a increasing level of concentration.

Keywords: milk market, concentration processes, agribusines.

## COMPARATIVE ANALYSIS OF PEPPER PRODUCTION CHARACTERISTICS IN SERBIA, MACEDONIA AND THE REPUBLIC OF SRPSKA

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The parameters of pepper production in Serbia, Macedonia and the Republic of Srpska were analysed in the period 2005-16. Sown areas, yields and total production were analysed. Quantitative analysis was performed by using the descriptive statistics method, and the tendencies of changes were calculated by average annual rate of change in the analysed period. In Serbia, there were 13,042 hectares of pepper in average, ranging from 11,714 to 16,997 hectares (variation coefficient 11,4%). The average area under pepper was 8,465 hectares in Macedonia (variation interval 8,170-8,766 hectares and variation coefficient 2%). The smallest area under pepper was 2,146 hectares in the Republic of Srpska, and it ranged from 1,813 to 2,464 hectares per year, with a variation coefficient of 10.3%. Serbia shows a trend of increasing areas at a rate of 2.45% per annum, Macedonia practically stagnates (0.64%) and the Republic of Srpska is falling at a rate of -2.14% a year. The average pepper yield was 9.1 tons per hectare in Serbia, ranging from 7.4 to 13.4 t/ha, with a variation coefficient of 18.8%). In Macedonia, the average yield was 18.6 t/ha (variation interval of 15.5 to 22 t / ha and variation coefficient 10.1%). In the Republic of Srpska the average pepper yield was somewhat higher than in Serbia and it was 11.9 t/ha (variation interval 9.4-20.2 t/ha and variation coefficient 23.6%). In the observed period, there is a growth tendency in yields: 4.92% in Serbia, 2.61% in Macedonia and 7.2% in the Republic of Srpska per year. The average annual pepper production in Serbia was 120,289 tons (interval 88,614-227,645, tons, or i.e. variation coefficient of 32.3%). The highest average production was in Macedonia with 158,041 tons (variation interval of 127,926 - 189,555 tons and variation coefficient of 11,8%). The average pepper production was 25,338 tons in the Republic of Srpska, (variation interval of 17,909-37,884 tons and variation coefficient of 18,8%). Pepper production shows a tendency of growth: in Serbia, 7.48%, Macedonia 3.27%, and 4.89% in the Republic of Srpska.

Keywords: pepper, comparative analysis, Serbia, Macedonia, Republic of Srpska.

AERDO6

## **THE IMPORTANCE OF AGRICULTURAL PRODUCTS IN DEFINING THE CONSUMER PRICE INDEX**

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The aim of price statistics is to monitor price changes over the time on the one hand, but also to compare the prices of specific areas at the same time on the other hand. All these data are used by different economic entities such as the Central bank, various state and economic institutions and population at all. Interest in price statistics for population relates to the movement of consumer prices as the main indicator of inflation. The most appropriate price index that tracks the growth in the price of products spent on personal consumption is the Consumer Price Index. The Consumer Price Index (CPI) measures changes in the general level of goods and services prices over the time, which households buy (consume or pay) in order to meet their needs. It is one of the most important economic and social indicators calculated by National Statistical Services around the world for various purposes. The Consumer Price Index covers the prices of goods and services that households consume in order to meet their own needs which can be classified into specific groups according to the COICOP-HIPC classification. The most important role in defining the Consumer Price Index have the prices of food, which are mostly based on agricultural products. According to mention above, the subject of research is the structure of the consumer price index ie the distribution of product weights participating in the index of consumer prices. The focus is on the participation of weights of agricultural products that are used in raw condition. The aim of this research is to show the weight structure for the period 2013-2016., which is characterized by a shift to the calculation of consumer prices that corresponds to the Harmonized Consumer Price Index (HCPI), an index used in the countries of the European Union. The results of the survey will show the share of the weight values for each individual agricultural product. In this way, it will point to products whose price changes can cause significant changes in the formation of the consumer price index which consequently have a significant impact on the calculation of inflation.

Keywords: The Consumer Price Index, agricultural products.

AERDO7

## **ORGANIC FARMING IN POLAND**

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Organic farming is a branch of agriculture dealing in the production of organic food produced with care to eliminate the use of artificial fertilizers and pesticides. Ecological methods of food production is protecting the health of society and the environment and constitute a sustainable system in ecological, economic and social terms. Organic farming in Poland is an - growing branch of the economy. The description was developed on the basis of secondary sources of information. The results were mainly based on data from the Eurostat database and from specialist literature. The descriptive method (including the statistical description) and the graphic method were used to compile the results. The number of organic farms increased from 2.2 thousand up to 22.2 thousand. In 2014, Poland ranked sixth in terms of the number of producers and processors in the European Union. The largest share in the structure of ecological land is taken up by crops for fodder production. The area of ecological farms in Poland in 2004 amounted to 83 thousand. In 2015, it amounted to 581 thousand ha. The presented research indicates the dynamic development of organic farming in Poland in recent years.

Keywords: organic farming, ecology, market analysis, ecological production, Poland, statistics.

AERDO8

## **SUPPORT SYSTEMS FOR REGIONAL AND TRADITIONAL PRODUCTS IN POLAND**

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Regional and traditional products are an interesting niche on the food market. They are characterized by uniqueness, high quality and connection with a specific region or tradition of manufacturing. These features make such products sought by an increasing number of consumers. On the other hand, they need support and good promotion from various public and social institutions, because thanks to this the market of regional and traditional products can grow better and give benefits to producers and buyers. The study presents the main support and promotion systems for regional and traditional products in Poland. The aim of the research is to characterize these systems and to define the conditions that must be met in order for the selected product to be considered regional or traditional. The source data came from the institutions creating these systems, including from the Ministry of Agriculture and Rural Development. In Poland, three systems for supporting regional and traditional products are the most popular. These are: Traditional Products List (LTP), "Quality & Tradition" system and the EU system of protection of such products. These systems have nationwide coverage, and there are still many local initiatives outside of them.

Keywords: regional product, traditional product, food.

AERDO9

## **OPINIONS OF POLISH CONSUMERS ABOUT THE INNOVATIVE COFFEE DRINK**

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Coffee is one of the most popular beverages in Poland - over 80% of adult Poles declare regular coffee drinking, a large part of them reach for it at least once a day (according to CBOS data, even 60%), and as many as 16% drink a few coffees every day. According to various estimates, on average, we drink over 500 portions of coffee annually. Over the last 10 years, coffee consumption in Poland has increased by as much as 80 percent. Voivodships: Lubuskie and Kujawsko-Pomorskie, as well as Pomorskie and Dolnośląskie are the voivodships with the highest coffee consumption rate. However, voivodships that recorded consumption below the national average are Podlaskie, Mazowieckie, Świętokrzyskie and Podkarpackie. Since 2007, a dynamic increase in coffee imports to Poland has been observed (an increase of over 56% in 2007-2012). In 2012, over 3.5 million bags of coffee weighing 60 kg each were brought to Poland. Consumption of imported coffee accounted for approx. 60% of imports, the remaining 40% was re-export. The dynamic development of the coffee market means that attempts are made to introduce new products that expand the existing offer. One of the latest innovative coffee products is the Cold Brew Coffee drink produced by the Etno Cafe Company, which is a cold macerated coffee ready to be consumed directly from the bottle. It is a more convenient and healthier alternative to sweet energy drinks. Student Scientific Society of Market Analysis during the summer camp in Kudowa Zdrój in 2017 carried out consumer research among potential buyers of this product. The study involved 61.6% of women and 38.4% of men aged 14 to 84 years. Most of the respondents (over 56%) said they had a positive attitude towards coffee, and a little over 4% negative. Over 90% of study participants have never consumed this coffee product before. During the survey, the reviewers expressed their opinions on, among other things, the topic: color, aroma, taste, sweetness, acidity, price and willingness to buy.

Keywords: opinions, innovation, research, consumption, export, import, product, Etno, Cold Brew Coffee, market.

AERDO10

## **COMPARATIVE ANALYSIS OF PRESSED APPLE JUICES BASED ON THE OPINIONS OF POLISH CONSUMERS**

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Poland is one of the world biggest producers of apples, as well as juices and concentrate form this fruits. Over 4 million tons of apples are produced in Poland and this is the first place in Europe and the third place in the world – after China and the U.S. Apple exports amounted to over 1 million tons. In 2016, 78 countries were recipients of polish apples. In Poland, more and more people reach for pressed juices, for the sake of taste and raising awareness of healthy eating. The total consumption of pressed juices increased by 147% between 2014 and 2015. Apple is the second, after orange, most popular flavour of juices in Poland. The data sources are primary and come from surveys that have been made by Student Scientific Society of Market Analysis form WUELS during the scientific camp in August 2017. A sensory analysis had been selected as a research method. A research questionnaire had been prepared for the needs of the study and consumers rated three types of pressed apple juices. Selected pressed juices are widely available in large Polish retail chains. Juice No. 1 is " Świeżo tłoczony Sok Jabłkowy 100%" sold in the "TESCO" shops, juice No. 2 is "Vital fresh" sold in the "Biedronka" shops, and juice No. 3 is "Klimkiewicz" sold in the "POLOmarket" shops. 45 respondents in age from 13 to 70 participated in this study. Women accounted for 60% of respondents , while men represented 40%. Two aspects were compared: taste and sweetness and the next part was a holistic assessment. According to the respondents, the ideal sweetness is characterized by two juices: No. 1 and No. 3 (60% each). The tastiest of the juices was juice No. 1 - 51% of respondents rated it as good. In conclusion, juice No. 1 was considered the best. In the questionnaire there were more questions about buying and drinking pressed juices and whether tasting of juices meant that they would buy it in the future.

Keywords: pressed juice, apple, consumer analysis.



**Section: AGRICULTURAL ECONOMICS  
AND RURAL DEVELOPMENT**

**Poster Presentations**

AERDP1

## **FINANCIAL POSITION ANALYSIS OF LIVESTOCK PRODUCTION COMPANIES IN THE REPUBLIC OF SRPSKA**

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The subject of our research was the financial position analysis of the livestock production companies in the Republic of Srpska. Depending on the status of short-term and long-term financial balance (liquidity), indebtedness, solvency, maintenance of real equity value and reproduction capability this position can be described as good, acceptable and bad. Our research focuses on the most important indicators of financial position which can be calculated from the available financial statements. The analysis cover financial data of approximately 85 livestock production companies (that is 26% of total number of registered agricultural companies) for the six year period (2010-2015). We have applied several scientific-research methods such as: historical data series analysis, data classification, compilation and comparison, structural analysis, descriptive statistics, calculation of financial position indicators and method of inference. The results of financial position analysis show that the financial position of livestock production companies in the Republic of Srpska, in general, is not acceptable. This means that the livestock industry as a whole does not meet the requirements of short-term financial balance, i.e. liquidity (current ratio and quick ratio are below the criteria and the industry average), working capital (negative in average), level of indebtedness (high and above the industry average), interest coverage (negative in average) and solvency level (below the criteria and industry average). Approximately 40% of livestock production companies has a financial position better than the industrial average. However, the unacceptable financial position of the whole agricultural industry and the fact that financial indicators of the majority of livestock production companies are below the industry average indicate that the livestock industry has serious financial problems and needs systemic measures in order to become more efficient and therefore more profitable and financially sustainable.

Key words: livestock production, liquidity, indebtedness, solvency.

AERDP2

## **COMPARATIVE ANALYSIS OF TRADITIONAL FARMING AND IPM IN RAMPUR, CHITWAN**

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According to the Food and Agriculture Organization (FAO) of the United Nations\*, IPM means considering all available pest control techniques and other measures that discourage the development of pest populations, while minimizing risks to human health and the environment. It is a holistic approach to sustainable agriculture and focuses on managing insects, weeds and diseases through a combination of cultural, biological and chemical measures that are cost effective, environmentally sound and socially acceptable. Extent of crop yield reduction in cowpea depends on the duration of pest attack as well as their density/intensity. While the major problem faced in cowpea in the area was a combination of bacterial and viral wilt, the pest that caused a major nuisance was the aphids. Hence, monitoring of the crop health for timely detection is the most crucial factor governing the economics of crop production, success of IPM strategies, adoption and effectiveness of plant protection tools. A set of physical, cultural and biological methods were used in the cultivation of cowpea and the results were compared with typical farmer cultivation. IPM practices reduced the yield loss significantly in this research conducted inside the university premises with a much higher B/C ratio.

Key words: IPM, B/C ratio.

AERDP3

**THE CASE STUDIES OF A TYPICAL SAWMILLING BUSINESS IN  
GWAGWALADA AREA COUNCIL OF THE FEDERAL CAPITAL  
TERRITORY, ABUJA, NIGERIA**

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The sawmilling is situated along Kuje road Gwagwalada in the area council of the Federal Capital Territory the accelerated industrialization of the sawmill make for the populace living to demand for wood products. And the study was carried out from March to May 2014. Questionnaires were administered to sawmill workers, potentials buyers, furniture's makers, building sellers at the sawmill in Gwagwalada area council of the Federal Capital Territory to ascertain the different and various consumption, production and marketing and the business activities going on in the sawmilling for economy gain and commercial purpose. The findings are that there are expanding market for wood products, increasing in the demand for the different log for wood processing, productivity in wood business, there are urgent needs for the development of science and technology for processing of wood and the disposal of the waste wood, that is the saw dust. Most of the processing of the wood is base on automatic and the needs of chemical technological process in the saw mills is needed, buying and selling's of building materials is also noted , Furniture marketing system and selling of food stuff and beverages with commercial activities taken place, social division of labor. Suggestion was made for the installation of modern equipment, with mechanized for mass wood production.

Key words: Sawmilling, expanding, market, Gwagwalada.

AERDP4

## **GLOBAL ORGANIC FOOD MARKET**

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Organic agricultural production enables the production of controlled, certified, safe, and high-quality food, and at the same time it provides high economic and ecological profit and preserves a healthy environment. Consumer interests in products of organic origin have been steadily growing for twenty years. The aim of this paper is to give an overview of the situation in the global organic food market, as well as to point out the most important motives for consumers to decide on the consumption of organically produced foods. All countries around the world record a trend of continual organic food and beverage market growth. In some countries this growth is expressed with double-digit number. United States is the largest organic food market, with a total of 35.8 trillion euros. Fruits, vegetables, bread, cereals, drinks, milk and meat have the biggest share in the organic food market in all countries of the world. Fresh fruits take the first position in international trade. Although the production and sale of organic food is concentrated in highly developed countries, less developed countries are becoming important producers and exporters of organic products.

Key words: products, motives, producers, market.

AERDP5

## **INFLUENCE OF EXTRA FUEL EXCISE TAX ON THE COST OF PRODUCTION IN AGRICULTURE**

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The aim of the research was to determine the impact of fuel price increase in B&H due to increasing extra fuel excise tax for road construction (0.15 KM/liter + VAT) on the costs of production of selected agricultural products (maize, potatoes, milk and apple). The calculations have done on the basis of expert assessment coming from earlier calculations based on average conditions of production. Difference in the costs was assessed using calculation method based on variable costs combined with the method of differential calculation (determination of differences in the costs). The initial assumption was that there will not be changes in quantity of used raw materials and services and their purchase prices under the influence of other factors, beside considering tax. The results show that due to the increasing extra fuel excise tax the cost of maize production will increased by 26.1 KM/ha, potatoes by 79.3 KM/ha, apples by 195.6 KM/ha, and milk by 12.4 KM per milking cow. In relation to the total costs, increased in cost of production of maize is for 1.98%, potatoes for 1.48%, apples for 1.86% and milk for 0.55%, because of the increasing fuel excise tax. The conclusion is that the increasing fuel excise tax will increase the cost of production in agriculture, but not significantly (0.5-2%), unless it will not be speculations of suppliers to take advantage of this situation for unfairly higher increases prices of their goods or services.

Key words: agricultural production, costs of production.

AERDP6

## **ASSESSMENT OF THE LONG-TERM FINANCIAL POSITION OF AGRICULTURAL ENTERPRISES**

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The imperative of any enterprise regardless of the activity it is engaged in is that in addition to the profit that is the main goal of the business it provides long-term stability and a good financial position. However, a large number of enterprises do not monitor evaluate the present situation and do not plan the future situation, resulting in negative business or bankruptcy. The analysis of net working capital and the model "Z-score" can greatly contribute to an adequate assessment of the long-term financial position of the enterprise. Net working capital is a part of own and borrowed capital intended for the financing of working assets. Positive net working capital means that a long-term financial equilibrium has been achieved and that the enterprise has a good financial position and in reverse in case of a negative net working capital. On the other hand, the "Z-score" model belongs to a group of modern models and is mainly used to assess the credit rating but also to predict the likelihood of enterprise bankruptcy. According to this model, companies are classified into those that are unstable and threatened by bankruptcy, which operate in the gray zone and where there are prospects for an unfavorable financial situation and finally, those that are stable and not threatened by bankruptcy and operating in a safe zone. The aim of this research was to evaluate the long-term financial position of the agricultural enterprise using the analysis of net working capital and the model "Z-score". The results of the research have shown that these instruments if applied in combination provide a good and useful way for assessment of the long-term financial position of an agricultural enterprise and can serve the company's management when making business decisions. For the research purposes, official data from the financial reports of the agricultural enterprises operating in the territory of Vojvodina were used.

Key words: financial position, net working capital, "Z-score" model.

AERDP7

**COMPARATIVE ADVANTAGES AND INTRA-INDUSTRY TRADE FOR  
MILK AND DAIRY PRODUCTS BETWEEN BOSNIA AND  
HERZEGOVINA AND SERBIA**

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The paper analyzes the foreign exchange of dairy products between Bosnia and Herzegovina and Serbia. In the foreign trade of dairy products Serbia is the most important Bosnian trade partner. The aim of this paper is to identify the comparative advantages of Bosnian dairy sector, and the level of specialization in intra-industry trade. Indicators used in the analysis are the following: RCA ("Revealed Comparative Advantages") as an index of comparative advantages; GLi ("Grubel-Lloyd index"), which shows the level of specialization in trade; and RUV Index ("Relative Unit Value") for the analysis of horizontal and vertical specialization in intra-industry trade. For the sake of this analysis, data on foreign trade between Bosnia and Serbia for a time period between 2007 and 2016 is used. RCA and GL index were calculated at the level of product group 04 (milk and dairy products) while the RUV index is calculated at the level of 4-digits according to the harmonized system of classification of products. Based on the calculated GLi, one may conclude that the trade of dairy products between Bosnia and Serbia is intra-industry, which means that export and import have equal values. The calculated value of RCA index in the total trade of dairy products confirms that Bosnia in that product group trade with Serbia has comparative advantages in some product groups, but also Serbia has comparative advantages with respect to other product groups. RUV indicator shows that in the trade of dairy products between the two countries of interest, the prevalent feature is the vertical specialization in intra-industry trade.

**Key words:** milk sector, Bosnia and Herzegovina, Serbia, comparative advantages, intra-industry trade.

AERDP8

## **THE ROLE OF ECONOMIC PROMOTION IN BUYING WINE**

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Producers are looking for a variety of ways to find their place at the market therefore they invest certain funds for a particular function in every business, which is a marketing function. In the communication system, promotion has a significant place as a form of informing consumers or customers in order to influence consumers in purchasing products. The aim of the paper is to determine consumer opinion about the ways of promoting wine and its significance in the buying process as well as the media as their provider to consumers. A survey was conducted in the area of Banja Luka on a sample of 202 respondents. Surveying was done online using Google Forms. In the sample was 85 male and 117 female respondents. Of the 202 respondents, 76.7% was between 18-25 years old or 12.4%, 25 respondents between 26-35 years old, and only 4 respondents over 55 years. Thus, 41.1% of the respondents agreed with the statement that most advertisements for wine was noticed on the streets. An explanation of this should be found in the age of the respondents, due to relatively younger population moves around a lot and probably spends less time watching television and more often notice advertisements on billboards and transport vehicles. Through the research it became known that the greatest influence on respondents from all of observed advertising methods of the economic promotion, when it comes to wine as a product, has advertisements on the street, followed by television while the least is the internet. Interestingly, the most trusted is the so-called mouth-to-mouth propaganda as a secondary form of promotion.

Key words: survey, marketing, promotion, consumer, wine.

AERDP9

**APPLICATION OF THE MULTI-CRITERIA DECISION-MAKING  
METHODS FOR SUPPLIER SELECTION IN AN  
AGRICULTURAL ENTERPRISE**

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In today's turbulent market conditions, the selection of suppliers in an agricultural enterprise constitutes a primary function, and the entire supply chain with the necessary raw materials and intermediate goods plays an important role in the day-to-day functioning of the economic entity in this field. Experts in this field, usually represented by procurement managers in an enterprise, must provide the planned quantities and types of goods requested at favorable terms of payment and at requested delivery time, of an appropriate quality in more or less complex business conditions. Criteria placed before decision-makers at these moments are usually numerous and in conflict with each other. In order to successfully solve the problem of choosing a supplier, the decision maker uses the methods of multi-criteria analysis, and the corresponding software support. These widespread methods and decision-making techniques today owe their development to technological and technical development, as well as to the complex situations that are most often encountered when choosing alternatives and planning (local and regional). The subject of research in this paper is the selection of mineral fertilizer suppliers in the agricultural enterprise using the AHP methodology, which is today one of the most commonly applied methods of multi-criteria analysis. The aim of the research is to rank the suppliers on the basis of the set criteria, and the supplier with the highest rating will be selected for the supplier of mineral fertilizer for the observed enterprise.

Key words: multi-criteria decision making, AHP method.



