X INTERNATIONAL SYMPOSIUM ON AGRICULTURAL SCIENCES

BOOK OF ABSTRACTS

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27-29, May, 2021
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Bosnia and Herzegovina

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Faculty of Agriculture
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TABLE OF CONTENTS

SYMPOSIUM PROGRAM

SYMPOSIUM PROGRAM

AGRORES 2021	**Thursday, May 27, 2021**	
Time	**Opening remarks**	Cultural Centre Trebinje
14:00 – 14:30		
	Welcome address by: - Zlatan Kovačević, Dean of Faculty of Agriculture, University of Banja Luka; - Boris Pašalić, Minister of Agriculture, Forestry and Water Management of the Republic of Srpska; - Mirko Ćurić, Mayer of the City of Trebinje; - Boban Ilić, SWG Secretary General; - Željko Vaško, President of the Organizing Committee.	
	Plenary session	Cultural Centre Trebinje
	Moderator: Željko Vaško	
14:30 – 15:00 PL_01	Aleksandra Martinovska-Stojčeska AGRICULTURAL POLICY IN THE EU APPROXIMATION CONTEXT: STATE OF AFFAIRS IN PRE-ACCESSION COUNTRIES	
15:00 – 15:30 PL_02	Ordan Čukaliev ASSESSMENT OF THE AGRI-ENVIRONMENTAL POLICY IN WESTERN BALKANS	
15:30 – 16:00 PL_03	Vlado Kovačević REVIEW OF GEOGRAPHICAL INDICATIONS SCHEMES IN SOUTH EAST EUROPE	
16:00–16:30	**Discussion**	

	Social event	Trebišnjica river
17:00 – 19:00	Boating on Trebišnjica river and wine tasting	

AGRORES 2021	**Friday, May 28, 2021**

AGRORES 2021		**SECTION 1:** **CROP SCIENCE**	*Session 1*

	Oral Presentations	Hotel „Leotar“, Hall A and Google Meet platform
	Moderator: Mihajlo Marković	
09:00-09:15 O1_01	Muftah Krayem STUDY OF THE CHEMICAL COMPOSITION OF TRITICALE TO COMPARE WITH OTHER CERIAL CROPS GENOTYPE	
09:15-09:30 O1_02	Vojin Cvijanović, Gorica Cvijanović, Nenad Đurić, Vojin Đukić, Mladen Petrović, Vesna Stepić, Zlatica Miladinov CRUDE PROTEIN CONTENT IN WHEAT GRAIN DEPENDING ON THE FEEDING METHOD	
09:30-09:45 O1_03	Marija Bajagić, Vojin Đukić, Zlatica Miladinov, Gordana Dozet, Gorica Cvijanović, Jegor Miladinov, Vojin Cvijanović EFFECTS OF FALL AND SPRING PRIMARY TILLAGE ON SOYBEAN YIELD AND 1000-GRAIN WEIGHT IN AGRO ECOLOGICAL CONDITIONS SERBIA	
09:45-10:00 O1_04	Mihajlo Voruna, Ognjen Cvijić, Zorana Đekanović, Duška Delić DETECTION OF *GAEUMANNOMYCES TRITICI* IN WHEAT	
10:00-10:15 O1_05	Mihajlo Marković, Nataša Čereković, Đurađ Hajder, Milan Šipka, Nery Zapata, Teresa A. Paço, Erminio Efisio Riezzo, Sabrija Čadro, Mladen Todorović PROMOTING SMART AGRICULTURAL WATER MANAGEMENT IN BOSNIA AND HERZEGOVINA “SMARTWATER” PROJECT	
P1_01	Marina Crnković, Đorđe Malenčić, Kristina Petrović, Jovana Šućur INFLUENCE OF THE MACROPHOMINA PHASEOLINA (TASSI) GOID. ON SOD ACTIVITY IN FOUR DIFFERENT GENOTYPES OF SOYBEAN SEEDLINGS	
P1_02	Jelena Golijan, Aleksandar Kostić, Biljana Dojčinović, Danijel Milinčić, Slavoljub Lekić DETERMINATION OF P, K AND MG CONTENT IN MAIZE SEED SUBJECTED TO THE ACCELERATING AGEING TEST	

P1_03	Ljubiša Živanović, Jelena Golijan, Dragana Živanović, Jela Ikanović, Ljubica Šarčević-Todosijević EFFECTS OF SEED INOCULATION, NPK FERTILIZATION AND NITROGEN FERTILIZATION ON YIELD COMPONENTS AND BEAN SEED YIELDS
P1_04	Ljubiša Živanović, Jelena Golijan, Jela Ikanović, Ljubiša Kolarić, Vera Popović, Ljubica Šarčević-Todosijević INFLUENCE OF CULTIVAR, SOIL CONDITIONERS AND NPK FERTILIZERS ON YIELD COMPONENTS AND BEAN GRAIN YIELD
P1_05	Aleksandar Simić, Marija Ćosić, Mirjam Vujadinović – Mandić, Snežana Babić, Đorđe Moravčević, Dragan Stanojević, Stefan Stepić SEASONAL WATER NEEDS OF MEADOWS AND PASTURES IN DIFFERENT REGIONS OF SERBIA
P1_06	Željko Dolijanović, Svetlana Roljević Nikolić, Nemanja Gršić, Snežana Oljača, Milena Simić, Zoran Jovović EFFECTS OF DIFFERENT GROWING SYSTEMS ON THE GRAIN YIELD OF WINTER WHEAT
P1_07	Dalibor Tomić, Vladeta Stevović, Dragan Đurović, Milomirka Madić, Vesna Đurović, Marjanović Miloš, Đorđe Lazarević APPLICATION OF PRE-SOWING TREATMENTS WITH GIBBERELLIC ACID IN WHITE CLOVER
P1_08	Ružica Ždero Pavlović, Bojana Blagojević, Milan Mirosavljević, Boris Popović ASSESSMENT OF DROUGHT STRESS ON BARLEY (*HORDEUM VULGARE* L.) SEEDLINGS USING BIOCHEMICAL PARAMETERS
P1_09	Lovro Sinkovič, Barbara Pipan, Aleksandra Savić, Mirjana Vasić, Vladimir Meglič GENETIC DIVERSITY OF *LATHYRUS SATIVUS* L. COLLECTION AND CHARACTERISTICS OF SEEDS GROWN IN SLOVENIA AND SERBIA
P1_10	Jovana Žunić, Dijana Mihajlović, Biljana Kelečević, Zlatan Kovačević DETERMINATION OF POTENTIALLY TOXIC ELEMENTS IN COMMON WILD PLANTS USED IN FOLK MEDICINE
P1_11	Vladimir Filipović, Sara Mikić, Vladan Ugrenović, Tatjana Marković, Vera Popović, Snežana Mrđan, Stefan Gordanić THE INFLUENCE OF BIOFUNGICIDES ON GERMINATION AND PROTECTION OF THE SEEDS *FOENICULUM VULGARE* L.
P1_12	Milan Biberdžić, Dragana Lalević, Saša Barać, Jelena Stojiljković, Milomirka Madić, Vera Rajičić INFLUENCE OF MINERAL FERTILIZERS AND ZEOLITES APPLICATION ON THE YIELD OF SOME WHEAT VARIETIES

P1_13	Blažo Lalević, Ajla Omerašević, Branislav Knežević, Amer Sunulahpašić, Monika Stojanova, Snežana Hrnčić, Saud Hamidović ESSENTIAL OIL OF FENNEL IN SUPPRESSION OF *BOTRYTIS CINEREA* PERS. FR.
P1_14	Vesna Počuča, Gordana Matović, Enika Gregorić ANALYSIS OF THE WATER REGIME OF CHERNOZEM UNDER WINTER WHEAT CROPS IN THE REGION OF ZEMUN FROM 1966/67 TO 2019/20
P1_15	Saud Hamidović, Dženita Medenjaković, Teofil Gavrić, Fejzo Bašić, Vera Karličić, Siniša Mitrić, Blazo Lalevic ANTIFUNGAL ACTIVITY OF SODIUM BICARBONATE AND GARLIC AQUEOUS EXTRACT
P1_16	Sonja Gvozdenac, Ana Marjanović Jeromela, Tijana Zeremski, Nadežda Stojanov, Jelena Ovuka, Sandra Cvejić, Dejan Prvulović BIORATIONAL CO2 FUMIGATON OF OIL-SEED RAPE: INSECTICIDAL POTENTIAL AND EFFECT ON SEED QUALITY
P1_17	Marina Dervišević, Nikola Đorđević, Isidora Knežević, Snežana Đorđević ANTAGONISTIC ACTIVITY OF BACTERIAL ISOLATES AGAINST C*ERCOSPORA BETICOLA* IN LABORATORY CONDITIONS
P1_18	Isidora Knežević, Marina Dervišević, Nikola Đorđević, Snežana Đorđević ANTIFUNGAL ACTIVITY OF *BACILLUS* SP. AGAINST *FUSARIUM GRAMINEARUM*
P1_19	Snežana Mladenović Drinić, Jelena Vukadinović, Danijela Ristić, Ana Nikolić, Jelena Srdić, Natalija Kravić, Violeta Anđelković TOCOPHEROLS VARIABILITY IN MAIZE INBRED LINES WITH DIFFERENT COLOR AND KERNEL TYPE
P1_20	Sandhya Takooree, Nooreen Mamode Ally, Hudaa Neetoo, Mala Ranghoo-Sanmukhiya, Mira Vojvodić, Aleksandra Bulajić TWO NEW FUNGAL DISEASES OF TOMATO AND POTATO ENDANGERING PRODUCTION IN MAURITIUS
P1_21	Amer Sunulahpašić, Branimir Nježić, Monika Stojanova, Dženita Medenjaković, Berina Imamović, Blazo Lalevic, Saud Hamidović INHIBITION OF *BOTRYTIS CINEREA* PERS. FR. GROWTH USING ROSEMARY AND LAVENDER ESSENTIAL OILS
P1_22	Nemanja Gršić, Željko Dolijanović, Đorđe Moravčević, Marija Ćosić, Aleksa Lipovac, Mirjam Vujadinović-Mandić SEASONAL WATER REQUIREMENTS OF MAIZE IN THE REGION OF VOJVODINA
P1_23	Markola Šaulić, Ivica Đalović, Mostafa Oveisi, Vladan Jovanović, Dragana Božić, Sava Vrbničanin WHICH METHODS ARE THE MOST RELIABLE FOR PREDICT WEED SEED BANK?

P1_24	Vojislav Trkulja, Jelena Mihić Salapura, Bojana Ćurković, Bojana Vuković, Gordana Babić, Jovana Prijić, Bogdan Nedić SURVEY ON THE PRESENCE OF *RALSTONIA SOLANACEARUM*, THE CAUSAL AGENT OF POTATO BROWN ROT IN REPUBLIC OF SRPSKA 2011-2020
10:15-11:15	**Discussion of oral and poster presentations**

AGRORES 2021		**SECTION 2:** **HORTICULTURE**	*Session 2*

	Oral Presentations	Hotel „Leotar“, Hall B and Google Meet platform
	Moderator: Miljan Cvetković	
09:00-09:15 O2_01	Miljan Cvetković, Alisa Hadžiabulić, Silva Grobelnik Mlakar COMPARATIVE ANALYSIS OF UNIVERSITY-BUSINESS COOPERATION IN AGRICULTURE IN THE WESTERN BALKANS AND EU	
09:15-09:30 O2_02	Neva Karatas, Sezai Ercisli FRUIT CHARACTERISTICS OF *PYRUS ELAEAGRIFOLIA* PALL. GENOTYPES IN EASTERN TURKEY	
09:30-09:45 O2_03	Radoš Zelenbabić, Boris Pašalić, Miljan Cvetković THE INFLUENCE OF REFLECTIVE MATERIALS ON FRUIT CHARACTERISTICS AND RED SKIN COLORATION OF “IDARED” APPLES	
09:45-10:00 O2_04	Ljubica Vavan, Ermin Suljkanović, Miljan Cvetković VEGETATIVE CHARACTERISTICS AND INITIAL FRUIT-BEARING CAPACITY OF PEAR GROWN ON DIFFERENT TRAINING SYSTEMS	
10:00-10:15 O2_05	Halil Ibrahim Sagbas, Gulce Ilhan, Sezai Ercisli SOME IMPORTANT FRUIT CHARACTERISTICS OF DIVERSE *ELAEAGNUS ANGUSTIFOLIA* L. GENOTYPES FROM CORUH VALLEY IN TURKEY	
10:15-10:30 O2_06	Gulce Ilhan, Ataturk University, Sezai Ercisli SUGAR AND ORGANIC ACIDS IN UNGRAFTED LOQUAT (*ERIOBOTRYA JAPONICA* LINDL.) GENOTYPES IN CORUH VALLEY IN TURKEY	
10:30-10:45 O2_07	Muhammed Kupe, Sezai Ercisli BIOCHEMICAL DIFFERENCES BETWEEN CULTIVATED (*VITIS VINIFERA* L. SSP. *VINIFERA*) AND WILD GRAPEVINES (*VITIS VINIFERA* L. SSP. *SYLVESTRIA* (GMELIN) HEGI)	

10:45-11:00 O2_08	Stefan Gordanić, Aleksandar Simić, Dragoja Radanović, Tatjana Marković, Snežana Mrđan, Sandra Vuković, Vladimir Filipović, Sara Mikić MORPHOLOGICAL DEFINITION POPULATIONS OF *ALLIUM URSINUM* L. FROM THE WESTERN PART OF THE REPUBLIC OF SERBIA
11:00-11:15 O2_09	Radenka Kolarov, Dejan Prvulović, Sonja Gvozdenac ANTIOXIDANT CAPACITY OF WILD-GROWING ORANGE MULLEIN (*VERBASCUM PHLOMOIDES* L.)
11:15-11:30 O2_10	Zorana Đekanović, Mišaela Vakić, Mariana Mihaljica, Duška Delić IN VITRO TRIALS OF ANTIFUNGAL EFFECT USING PYROPHYLLITE
11:30-11:45 O2_11	Mišaela Vakić, Mirko Jokić, Mariana Radulović, Siniša Mitrić, Duška Delić FORECASTING THE OCCURRENCE OF RASPBERRY GREY MOLD DISEASE (*BOTRYTIS CINEREA* PERS.) AND FUNGICIDE EFFICACY
11:45-12:00 O2_12	Petar Nikolić, Jovana Bila Dubaić FIRST FINDING OF SCULPTURED RESIN BEE (*MEGACHILE SCULPTURALIS* SMITH) IN BOSNIA AND HERZEGOVINA
12:00-12:15 O2_13	Branimir Nježić, Sandra Golubović, Petar Nikolić, Borut Bosančić TROPHIC STRUCTURES OF NEMATODES IN RELATION TO VEGETATION TYPE AND LAND USE
P2_01	Jasmina Aliman, Maja Kazazić, Emina Mehić, Maida Đapo-Lavić, Mirnesa Smajić PHYSICOCHEMICAL AND ANTIOXIDANT PROPERTIES OF THREE STRAWBERRY CULTIVARS AND WILD STRAWBERRY FROM CENTRAL BOSNIA REGION
P2_02	Svjetlana Zeljković, Tanja Ećim, Jelena Davidović Gidas, Emina Mladenović EFFECTS OF DIFFERENT SUBSTRATES ON GROWTH AND DEVELOPMENT OF GLOBE AMARANTH (*GOMPHRENA GLOBOSA* L.)
P2_03	Milena Lakićević, Milena Maksimović, Branislava Pavlović, Mia Vicković FLORISTIC ELEMENTS IN THE DANUBE PARK (NOVI SAD, SERBIA)
P2_04	Milena Lakićević, Emina Mladenović, Saša Orlović, Lazar Pavlović, Ksenija Hiel POPLAR TREES IN THE UNIVERSITY PARK IN NOVI SAD (SERBIA)
P2_05	Dragan Žnidarčič NITROGEN RATES INFLUENCE ON RADICCHIO YIELD AND YIELD COMPONENTS

P2_06	Marija Ćosić, Aleksa Lipovac, Mirjam Vujadinović Mandić, Zorica Ranković – Vasić, Ana Vuković Vimić, Zoran Pržić, Dunja Sotonica GRAPEVINE WATER REQUIREMENTS IN DIFFERENT REGIONS OF SERBIA
P2_08	Marija Simonović, Jovana Miletić, Milica Veselinović, Draga Graora DISTRIBUTION OF INVASIVE SPECIES *PHYLLOCNISTIS VITEGENELLA* CLEMENS (LEPIDOPTERA: GRACILLARIIDAE) ON GRAPEVINE IN SERBIA
P2_09	Draga Graora, Marija Simonović, Marina Dervišević, Novica Miletić PRESENCE AND HARMFULNESS OF SAN JOSE SCALE, *COMSTOCKASPIS PERNICIOSA* (COMSTOCK) ON CHERRY TREES
P2_10	Marijana Peić Tukuljac, Dejan Prvulović, Sonja Gvozdenac THE INFLUENCE OF EXTRACTION SOLVENT ON ANTIOXIDANT POTENTIAL OF ST. JOHN'S WORT (*HYPERICUM PERFORATUM* L.)
P2_11	Boban Đorđević, Dejan Đurović, Gordan Zec SENSITIVITY OF FLOWER BUDS OF SWEET CHERRY CV. CARMEN ON DIFFERENT ROOTSTOCKS DURING THE ECOLOGICAL DORMANCY
P2_12	Aleksa Lipovac, Dragan Nikolić, Dejan Đurović, Đordje Boškov, Mirjam Vujadinovć-Mandić, Ana Vuković-Vimić, Marija Ćosić IRRIGATION WATER REQUIREMENT OF FRUIT TREES IN THE CENTRAL, WEST AND SOUTH SERBIA ON A DISTRICT SCALE
P2_13	Nikolina Lisov, Ivana Plavšić, Aleksandar Petrović, Ljiljana Gojković Bukarica EFFECTS OF THERMOVINIFICATION AND CARBONIC MACERATION ON POLYPHENOLS EXTRACTION CV. CABERNET SAUVIGNON
P2_14	Đorđe Vojnović, Žarko Ilin, Boris Adamović, Gabrijela Koprivica EFFECT OF SUBSTRATE TYPE AND VOLUME OF CONTAINER POTS ON THE MORPHOLOGICAL CHARACTERISTICS OF LETTUCE (*LACTUCA SATIVA* L.) SEEDLINGS
P2_15	Gorica Vuković, Tijana Stojanović, Aleksandra Petrović, Bojan Konstantinović, Nikola Puvača, Dušan Marinković, Bojana Špirović Trifunović, Vojislava Bursić TROPANE ALKALOIDS IN MINT TEAS AT THE SERBIAN MARKET
P2_16	Bojana Blagojević, Anna Teresa Serra, Maja Milović, Ružica Ždero Pavlović, Tatjana Jurić, Nenad Magazin, Alicja Kucharska, Boris Popović *PRUNUS* FRUITS – POWERFUL FUNCTIONAL FRUITS

P2_17	Biljana D. Bošković, Miloš Pajić, Milan Dražić, Kosta Gligorević, Mitar Davidović THE INFLUENCE OF THE EXPLOITATION PERIOD OF THE ORCHARD SPRAYER ON THE TECHNICAL CORRECTNESS OF THE MEASURING REGULATORY SYSTEM
P2_18	Borut Bosančić, Ljubica Vavan, Sonja Rašeta, Marina Antić, Petar Nikolić, Branimir Nježić MORPHOLOGICAL VARIATIONS OF SEED CHARACTERISTICS IN STUDIED POPULATIONS OF YELLOW GENTIAN IN THE AREA OF KUPRES HEIGHTS
12:15-13:15	**Discussion of oral and poster presentations**

AGRORES 2021		**SECTION 3:** **ANIMAL SCIENCES**	*Session 3*

	Oral Presentations	Hotel „Leotar“, Hall A and Google Meet platform
	Moderator: Nebojša Savić	
11:30-11:45 O3_01	Mirna Gavran, Drago Bešlo, Maja Gregić, Danko Šinka, Zvonimir Steiner, Vesna Gantner PREDICTION OF AMMONIUM EMISSION FROM DAIRY CATTLE USING THE PRECISION FARMING METHODOLOGY	
11:45-12:00 O3_02	Zvonimir Steiner, Ivan Babić, Vesna Gantner, Stipo Benak, Mario Ronta, Stanko Ivanković THE COST PRICE OF THE INCREMENT OF CALVES FED DAIRY PRONOUNS THAT CONTAIN DIFFERENT LEVELS OF PROTEIN AND ENERGY	
12:00-12:15 O3_03	Mirna Gavran, Matko Adrić, Vesna Gantner THE USE OF HORSES IN THE EVENTING – A REVIEW	
12:15 -12:30 O3_04	Biljana Rogić, Sara Popadić, Bojana Rudić, Slađana Preradović, Božo Važić PEDIGREE ANALYSIS OF LIPIZZAN STALLIONS: GENERATION INTERVAL AND INBREEDING	
P3_01	Bratislav Pešić, Nikola Stolić, Nebojša Zlatković DAMAGES TO AGRICULTURAL CROPS CAUSED BY AN INCREASE IN THE NUMBER OF WILD BOARS IN THE HUNTING GROUND "KUTLAVICA"	
P3_02	Nebojša Savić, Dragan Mikavica NECESSITY OF ESTABLISHING REPRODUCTIVE CENTERS FOR FISH IN BOSNIA AND HERZEGOVINA	

P3_03	Dragan Mikavica, Nebojša Savić USE OF "SMALL" HYDROACCUMULATION FOR THE PURPOSE OF FISH PRODUCTION
P3_04	Angeleska Aleksandra, Crceva Nikolovska Radmila, Dimitrieska Stojkovik Elizabeta, Katerina Blagoevska, Risto Uzunov, Biljana Dimzoska Stojanovska MEASUREMENT OF THE 226RA, 232TH AND 40K ACTIVITIES IN CORN IN THE REPUBLIC OF NORTH MACEDONIA AND RESULTING ANNUAL RADIATION DOSE BY INGESTION
P3_05	Radmila Crceva Nikolovska, Aleksandra Angjeleska, Zehra Hajrulai Musliu, Riste Uzunov FEEDING INFLUENCE ON THE QUALITY OF SHEEP MEAT: FROM THE FARM TO THE FORK
P3_06	Bojan Golić, Vesna Kalaba, Tanja Ilić MICROBIOLOGICAL STATUS OF DRINKING WATER ON FARMS IN THE REPUBLIC OF SRPSKA (B&H) IN THE PERIOD 2018-2020 IN RELATION TO THE EXAMINED PARAMETERS
P3_07	Nebojša Zlatković, Bratislav Pešić, Nikola Stolić INFLUENCE OF MAXIMUM DAILY TEMPERATURE AND TEMPERATURE-HUMIDITY INDEX ON PIG GROWTH IN FATTENING
P3_08	Vesna Kalaba, Bojan Golić, Tanja Ilić COMPARISON OF THE ANTIBACTERIAL EFFECT OF MANUKA HONEY AND DOMESTIC ACACIA HONEY
P3_09	Nebojša Savić, Dragan Mikavica EFFECTS OF DIFFERENT LIGHT INTENSITY ON THE GROWTH OF RAINBOW TROUT (*ONCORHYNCHUS MYKISS*) FINGERLINGS
P3_10	Sergey Semyonov, Aleksandr Aristov EFFECTIVENESS OF A FEED ADDITIVE IN ORGANIC ANIMAL HUSBANDRY
12:30-13:30	**Discussion of oral and poster presentations**

AGRORES 2021	**SECTION 4:** **AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT**	*Session 4*

	Oral Presentations	Hotel „Leotar“, Hall C and Google Meet platform
	Moderator: Gordana Rokvić Knežić	

09:00-09:15 O4_01	Mihajlo Munćan, Jelena Đoković, Tamara Paunović CHANGE OF FAMILY FARM PRODUCTION TYPE IN TERMS OF INCREASING ECONOMIC BUSINESS RESULTS
09:15-09:30 O4_02	Ana Vujošević, Đorđe Moravčević, Sandra Vuković POSITION AND PERSPECTIVES OF SUSTAINABLE DEVELOPMENT OF HORTICULTURAL PRODUCTION IN THE REPUBLIC OF SERBIA
09:30-09:45 O4_03	Dragan Dokić, Mirna Gavran, Vesna Gantner A COMPARATIVE ANALYSIS OF THE COST MANAGEMENT IN CEREAL PRODUCTION IN CROATIA AND EUROPEAN UNION
09:45-10:00 O4_04	Nebojša Novković, Nataša Vukelić, Zorica Sredojević, Snežana Jovanović, Veljko Šarac ANALYSING AND PREDICTION OF CEREALS PRODUCTION CHARACTERISTICS IN VOJVODINA
10:00-10:15 O4_05	Nebojša Novković, Beba Mutavdžić, Dragana Tekić, Ljiljana Drinić, Gordana Roković ANALYSING AND PREDICTION OF CEREALS PRICES REPUBLIC OF SERBIA
10:15-10:30 O4_06	Mladen Petrović, Nikola Ljiljanić, Vojin Cvijanović, Vedran Tomić, Robert Radišić FINANCIAL ASPECTS OF POTATO PRODUCTION ON FARMS IN THE REPUBLIC OF SERBIA
10:30-10:45 O4_07	Lana Nastić, Sanjin Ivanović, Marko Jeločnik EVALUATION OF INVESTMENTS IN COW - CALF PRODUCTION IN SERBIA USING MODIFIED INTERNAL RATE OF RETURN APPROACH
10:45-11:00 O4_08	Željko Vaško VALUATION OF INVESTMENT OPPORTUNITIES: GOAT FARM VERSUS SHEEP FARM IN THE CONDITIONS OF BOSNIA AND HERZEGOVINA
11:00-11:15 O4_09	Marija Nikolić RECONSIDERATION OF COOPERATIVE PRINCIPLES – PILLAR OF DEVELOPMENT OR LIMITATION FACTOR?
11:15-11:30 O4_10	Gordana Roković Knežić, Adrijan Gunić COOPERATIVE OWNERSHIP AND COOPERATIVE PROPERTY IN AGRICULTURAL SECTOR
11:30-11:45 O4_11	Gordana Roković Knežić, Jelena Đurić, Ljiljana Drinić AGRITOURISM AS A SPECIFIC FORM OF RURAL TOURISM
11:45-12:00 O4_12	Dragan Brenjo, Novo Pržulj, Zlatan Sarić, Radoslav Grujić, Džemil Hajrić DETERMINING THE CRITERIA FOR THE LABEL "MOUNTAIN PRODUCT", IN BOSNIA AND HERZEGOVINA, ON THE EXAMPLE OF THE MOST IMPORTANT INDIGENOUS CHEESES

12:00-12:15 O4_13	Vlado Kovačević REVIEW OF WAREHOUSE RECEIPT AS AN INSTRUMENT FOR AGRICULTURAL FINANCING IN SERBIA
12:15-12:30 O4_14	Edis Beširović, Johannes Holzner, Dragan Brković ANALYSIS OF THE AGRICULTURAL INVESTMENT MARKET IN WESTERN BALKAN COUNTRIES
P4_01	Ankica Kondić-Špika, Ana Marjanović Jeromela, Dragana Miladinović, Tijana Zeremski, Jegor Miladinović THE INSTITUTE OF FIELD AND VEGETABLE CROPS AS A GOOD EXAMPLE FOR TRANSFER OF KNOWLEDGE AND NEW TECHNOLOGIES INTO AGRICULTURAL PRACTICE IN SERBIA
P4_02	Miroslav Nedeljković FORECASTING OF PLUM PRODUCTION TREND IN REPUBLIC OF SRPSKA
P4_03	Aleksandar Ostojić, Nebojša Savić, Nemanja Jalić, Vera Kanlić SUPPLY AND DEMAND OF FISH IN BOSNIA AND HERZEGOVINA AND REPUBLIC OF SRPSKA
P4_04	Tamara Stojanović, Gordana Rokvić Knežić FINANCIAL ANALYSIS OF AGRICULTURAL COOPERATIVES IN THE REPUBLIC OF SRPSKA
P4_05	Ljiljana Drinić, Gordana Rokvić Knežić, Nataša Đenadija MOTIVATIONAL FACTORS OF FEMALE ENTREPRENUERS
P4_06	Dragan Milić, Tihomir Novaković, Grahovac Mila, Dragana Budakov, Jovana Grahovac, Vanja Vlajkov ANALYSIS OF PESTICIDE IMPORTS IN THE REPUBLIC OF SERBIA
12:15-13:15	**Discussion of oral and poster presentations**

		PANEL: **ICT IN AGRICULTURE**	*Session 5*

	Oral Discussion	Hotel „Leotar“, Hall A
16:00–18:00	***Moderator: Miljan Cvetković*** *University of Banja Luka, Faculty of Agriculture, Banja Luka, BiH*	
	INFORMATIVE COMMUNICATION TECHNOLOGIES AND AGRICULTURE - HOW MUCH DO WE KNOW, AND HOW MUCH DO WE ACTUALLY APPLY IN REGULAR PRODUCTION? Panelists: **Prof. Dr. Vesna Maraš, Dean** *University of Donja Gorica, Faculty of Food Technology, Food Safety and Ecology, Podgorica, Montenegro* **Prof. Dr. Radovan Stojanović** *University of Montenegro, Podgorica, Montenegro,* *Founder and President of the Montenegrin Association for New Technologies (MANT)* **Mirko Jokić, BSc Agric.** *Ministry of Agriculture, Forestry and Water Management of the Republic of Srpska, Department for the Provision of Agricultural Extension Services, BiH* **Milan Šipka, MA** *University of Banja Luka, Faculty of Agriculture, Banja Luka, BiH* The panel session is supported by the Erasmus+ project VIRAL	

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PLENARY LECTURES

Keynote speakers

Dr. Aleksandra Martinovska Stojcheska is professor and Head of the Department of Agricultural Policy at the Institute of Agricultural Economics, Faculty of Agricultural Sciences and Food, Ss. Cyril and Methodius University in Skopje (North Macedonia). She teaches farm cost management and budgeting, business analysis, farm accounting and valuations in agriculture. Her research interests are in the area of economic and technical performance in agriculture, efficiency and productivity analysis, cost of production, cost-benefit analysis, and lately also farmer behavior in decision-making and strategic choices, stakeholder and value-chain analysis, economic aspects of climate change, as well as agricultural and rural development policy. She participated in various national and international projects. Her national and international scientific collaboration includes participation in expert discussion groups, organization of multi-actor events, peer-reviewing of scientific publications, communication and dissemination of research results in publications. She is member of the National IPARD Monitoring Committee, National Liaison to the European Association of Agricultural Economics, and Key Expert in the National Convention for the EU-MK.

Dr. Ordan Chukaliev is professor in Irrigation of Agricultural Crops, Ss. Cyril and Methodius University in Skopje, Faculty of Agricultural Sciences and Food (North Macedonia). Also, he is holding the position of the Vice Rector for International cooperation, Ss. Cyril and Methodius University in Skopje. He has more than 25 years of experience in teaching of irrigation of agricultural crops for undergraduate, graduate and doctoral students. Moreover, he has about 35 years of experience as researcher in the field of agriculture, particularly the effect of the environmental factors on crop yield, environmentally friendly agriculture, irrigation, water saving, increasing of water and fertilizer use efficiency in agriculture, climate change, development of innovations, smart agriculture, biomass and bioenergy. During the last 25 years he has participated in more than 50 international projects as project leader, national team leader, participant, international expert and consultant. Moreover, he has been worked as senior researcher - GH-40 at MARS Unit of the Joint Research Center of European commission in the period 2012-2014. He has prepared number of international and national reports related to climate change, agriculture and environment, as well as feasibility studies for construction of the irrigation schemes. He has been invited to present results of his activities on number of conferences, symposia and workshops at national and international level.

Dr. Vlado I. Kovacevic is Research Associate at the Institute for Agricultural Economics Belgrade (Serbia). He completed his BSc, MSc and PhD at the Faculty of Agriculture in Zemun, University of Belgrade. Completed numerous courses and training in the field of agricultural economy in the USA, Europe and Japan. Fellow of the Ministry of Science and Technology of the Republic of Serbia from 1997 to 2001. From 2002 to 2003 he worked as a broker in the financial market. From 2003 to 2006 worked in the Ministry of Agriculture, Forestry and Water Management - advisor in the sector for international cooperation. In 2006-2008 worked at TD Waterhouse Edmonton, Canada. From 2008-2016 worked in the Ministry of Agriculture, Trade, Forestry and Water Management as an advisor to the Minister. Since 2016 he has been working a research associate at the Institute for Agricultural Economics Belgrade. He has been engaged in a number of external IEP research projects.

PL_01

Agricultural policy in the EU approximation context: State of affairs in pre-accession countries

Aleksandra Martinovska-Stojčeska

University Ss. Cyril and Methodius,
Faculty of Agricultural Sciences and Food – Skopje, North Macedonia

Corresponding author: Aleksandra Martinovska-Stojčeska
amartinovska@fznh.ukim.edu.mk

Abstract

The European Union (EU) perspective is a key strategic priority for the EU pre-accession countries. The economic and social importance of agriculture marks this sector as one of the most complex and sensitive in the enlargement context. The sector faces significant structural challenges and lags in productivity behind other sectors, remaining below the EU average across the pre-accession countries. The recent agricultural policy developments in the Western Balkan (WB) countries and Turkey are assessed using unified statistical databases and the Agricultural Policy Measures Classification (APMC) tool as a harmonized and consistent approach in tracking agricultural and rural development policy progress. The pre-accession countries adhere to the EU Common Agricultural Policy model in their agricultural and rural development policy strategical planning, though the domestic perspectives are reflected in the national policies. In the period 2017 to 2019, total budgetary transfers increase in the WB countries and decrease in Turkey. In average for the period 2017 to 2019, the annual agricultural support ranges from about 25 to 40 mill. EUR in Montenegro and Albania, followed by Kosovo* and Bosnia and Herzegovina with 70 to 80 mill. EUR, North Macedonia close to 150 mill. EUR, Serbia with around 300 mill. EUR and Turkey with about 2500 to 3500 mill. EUR per annum. The agricultural support is dominated by market and direct support measures in most countries, where direct payments linked to specific crops and livestock or granted per output prevail. Measures for increasing competitiveness are mainly represented with on-farm investments. The structural and rural development support vis-à-vis the market and direct support is represented at a different scale across the countries: Albania (85%), Montenegro (57%) and Kosovo* (50%), North Macedonia (15%), Turkey (12%), and Bosnia and Herzegovina (6%). Environmental and social aspects are still marginally supported. Functional administrative and control systems need to be further developed as an important prerequisite for capacity needed to implement agricultural and rural development actions.

Key words: agricultural policy, Western Balkans; EU approximation.

PL_02

Assessment of the agri-environmental policy in Western Balkans

Ordan Chukaliev

Ss. Cyril and Methodius University in Skopje,
Faculty of Agricultural Sciences and Food - Skopje, Republic of North Macedonia

Corresponding author: Ordan Chukaliev, cukaliev@gmail.com

Abstract

The Agri-environmental policy (AEP) in the Western Balkan was assessed through the national AEP reports prepared by the selected national experts, using the common methodology. The reports included state of the agriculture, environment and the environmental policy, state of the agri-environment, institutional and legal settings for implementation of agri-environmental policy and measures, agri-environmental policy and agri-environmental measures in place, and state of the agri-environmental indicators. In the second step the national reports were analyzed, and aggregated into the regional Report, that summarizes the regional issues and does not always address specific conditions for each country. The participating countries are in different stages of their EU accession process, therefore the AEP development is different. The countries are faced with different environmental challenges. Moreover, the monitoring required for data driven policy development and decision making exists in all countries, but should be further improved. Agri-environmental indicators, if existing, are in initial stage of development and need further improvement. Overall, the analysis suggests that the countries already established good institutional setup for implementing agri-environmental policies and measures, particularly in frame of the Instrument for Pre-accession Assistance for Rural Development (IPARD). However, environmental policy and protection of the environment is located at the ministries responsible for environment. The countries reported that ministries responsible for environment are taking part in agri-environmental policy as well. Four of the participating countries reported that their institutional setup is fully aligned with standards of the European Union (EU), while other two are facing challenges related with some constitutional (Bosnia and Herzegovina) provisions and legal instruments in force (Kosovo*). The biggest challenge in whole region is the capacity building of the existing institutions. Even though the institutions are established, the performance level can be higher. This will be even more important with new Common Agricultural Policy (CAP) that promotes environment care,

climate change mitigation, and preserving landscapes and biodiversity as part of the 9 specific objectives.

Key words: Agro-environmental policy, Agri-environmetal measures, Agri-environmental indicators, Western Balkans

PL_03

Review of Geographical Indications schemes in South East Europe

Vlado Kovačević[1], Sonja Sibinovska[2], Veli Hoti[3]

[1]*Institute of Agricultural Economics, Belgrade, Serbia*
[2]*Cyril and Methodius University Skopje, Faculty of Agricultural Sciences and Food, Skopje, North Macedonia*
[3]*Maastricht University, Pristina, Kosovo**

Corresponding author: Vlado Kovačević, vlado_k@iep.bg.ac.rs

Abstract

The aim of this paper is to analyse the situation in the field of foodstuff geographical indications (GI) in South and Eastern Europe (SEE), the state of play related to the harmonization of the geographical indication with the EU acquis and to draw recommendations for future development of the geographical indication in South and Eastern Europe. Despite the large number of traditional products, suitable agroecological condition for production, this potential is not used so far. For small farms which is dominating in SEE, path for improved competitiveness is not in the production of high-yield production of average quality products, but rather in the added value products such as a GIs. The methodology used in this paper is mainly descriptive statistical and comparative analyse. According to the results of this paper, the main reasons for the underdevelopment of GIs in SEE are: in the unharmonized legal framework of most countries/territory with the EU, poorly developed system of producer organizations, lack of flexible registration environment for small processing capacities, lack of systemic GI support measures etc. The analysis showed that all countries/territory have established a legal framework related to GIs, but with the exception of Montenegro, these laws are not fully harmonized with the EU. The analysis showed that due to the poor visibility of these products, producers and consumers do not benefit much from previous GIs registered products. There is no single product from SEE registered in the EU. Recommendations for further development of GIs in SEE include: full harmonization of legislation with the EU, introduction and support for the development of producer's organizations, introduction of flexible conditions for registration of small processing capacities, system support for GI producers and processors, support for registration of national GIs at EU level.

Key words: Geographical indication, Protected Designation of Origin, Protected Geographical Indication, Traditional Specialties Guaranteed

Section 1: CROP SCIENCE

Poster Presentations

P1_01

Influence of the *Macrophomina phaseolina* (Tassi) Goid. on SOD activity in four different genotypes of soybean seedlings

Marina Crnković[1], Đorđe Malenčić[1], Kristina Petrović[2], Jovana Šućur[1]

[1] *Faculty of Agriculture, University of Novi Sad, Serbia*
[2] *Institute of Field and Vegetable Crops, Serbia*

Corresponding author: Marina Crnković, m.crnkovic.95@gmail.com

Abstract

Macrophomina phaseolina (Tassi) Goid. is a very common pest in Serbia, which affects root and lower stem in many plants, causing charcoal rot. Among other plants, soybean is also often affected by this pathogen and, like others, on the attack responds with oxidative burst. The aim of this work was to compare the sensitivity of four different genotypes of soybean (*Glycine max* (L.) Merr.): FAVORIT, ATLAS, SAVA and RUBIN on this pathogen. The activity of antioxidant enzyme superoxide-dismutase (SOD; EC 1.15.1.1.) was compared between four soybean genotypes, after the attack of the fungus *M. phaseolina*. Soybean seeds were inoculated using the method of artificial inoculation on filter paper. After seven days, seedlings were collected for biochemical assays. It was measured 1 g of plant material fresh weight and homogenized with 10 ml 0.1 M K2HPO4, pH 7.0. After centrifugation, the supernatant was used for enzyme activity measurements. The SOD activity was measured spectrophotometrically, by monitoring the inhibition of nitroblue tetrazolium (NBT) reduction at 560 nm, according to method by Mandal et al (2008). The results expressed as U g-1 fresh weight, showed the highest activity of SOD in FAVORIT genotype compared to control, and the lowest activity in SAVA. ATLAS and RUBIN showed no statistically significant differences in SOD activity between inoculated seeds and control. In a conclusion, the most sensitive soybean genotype to fungus *M. phaseolina* was SAVA and the most resistant was FAVORIT.

Key words: Macrophomina phaseolina, oxidative stress, soybean, superoxide-dismutase (SOD)

P1_02

Determination of P, K and Mg content in maize seed subjected to the accelerating ageing test

Jelena M. Golijan[1], Aleksandar Ž. Kostić[1], Biljana P. Dojčinović[2], Danijel D. Milinčić[1], Slavoljub S. Lekić[1]

[1]University of Belgrade, Faculty of Agriculture, Belgrade, Serbia
[2] University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Belgrade, Serbia

Corresponding author: Jelena M. Golijan, golijan.j@agrif.bg.ac.rs

Abstract

The seed accelerating ageing test is one of the most important tests that determine the seed germination as well longevity of the seed during storage period. The aim of this study was to examine the content of selected macroelements (P, K and Mg) in organic and conventional maize seed (variety Rumenka), and to establish the distribution of these elements in seedlings by the application of the seed accelerating ageing test (maize seed were exposed to the temperature of 41°C and air humidity 100% for 72 h). After the treatment, seed germination was established by the standard method. The content of P, Mg and K was determined by using Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES) and expressed as μg/g of dry weight. The most abundant element in the seed was P, followed by K, and Mg. Seedlings from organic maize seed subjected to the seed accelerating ageing test showed a lower P content compared to the control group, both in the root (3878.7 μg/g) and in the above-ground part (6067.36 μg/g), while P content decreased in the root of the conventional seed seedlings (4804.23 μg/g), and increased (8033.75 μg/g) in the above-ground part compared to the control. After the treatment of the accelerating ageing test, the K content decreased both in the root (conventional-10556.34 μg/g; organic- 7726.99 μg/g) and in the above-ground part (conventional-15722.99 μg/g; organic-12213.14 μg/g) of the seedlings. The accelerated aging test provoked decrease in the Mg content both in the root (2197.53 μg/g) and the above-ground part (1574.62 μg/g) of organic seedlings compared to the control. The same trend was observed in seedlings from conventional seed. From the given results, it can be concluded that the accelerated ageing test leads to different distribution of P, K and Mg in the root and above-ground part of maize seedlings.

Key words: seed, accelerated ageing test, phosphorus, potassium, magnesium, ICP-OES

P1_03

Effects of seed inoculation, NPK fertilization and nitrogen fertilization on yield components and bean seed yields

Ljubiša Živanović[1], Jelena Golijan[1], Dragana Živanović[2], Jela Ikanović[1], Ljubica Šarčević-Todosijević[3]

[1]Faculty of Agriculture, University of Belgrade, Belgrade, Serbia
[2]Municipal Council of Paraćin, Paraćin, Serbia
[3] High Medical - Sanitary School of Professional Studies "Visan", Belgrade, Serbia

Corresponding author: Jelena M. Golijan, golijan.j@agrif.bg.ac.rs

Abstract

The study examined the effects of seed inoculation, NPK fertilization, and nitrogen fertilization on yield components and bean seed yields of Galeb cultivar. Microexperiments in the field were performed during 2019 in the agroecological conditions of central Šumadija (locality Rača Kragujevačka), on brown forest soil type (Eutric Cambisol).

The research included a two-factor factorial design of the following variants: a) fertilization: 1) Control (unfertilized), 2) NPK 6:24:12 (400 kg ha^{-1} a.m.), 3) AN 34% N (200 kg ha^{-1} a.m.), 4) NPK 6:24:12 (400 kg ha^{-1} a.m.) + AN 34% N (200 kg ha^{-1} a.m.), b) seed inoculation: 1) without inoculation and 2) with inoculation.

The applied agro-technique was a standard one, i.e. identical to the regular beans production. The research showed that increased nutrition, regarding the yield's components, increased the number of pods per plant from od 26.5% (variant AN) to 52.9% (applied variant NPK+AN), along with the number of seeds per plant increasing from 11.0% (AN) to 28.0% (NPK+AN), as well as the mass of the seed per plant from 31.0% (AN) to 75.9% (NPK+AN).

During the fertilization process, bean seed inoculation caused the number of pods per plant to decrease by 2.2%, the number of seeds per plant decreased by 1.6% while the plant seed's mass reduced by 4.7%. Additional fertilization in the form of nitrogen fertilization only (AN) increased the bean seed yields by 9.3%, while NPK fertilization at the beginning increased it by 31.3%. Also, the number of seeds in NPK+AN variant was increased by 22.9%.

As for the variant without fertilization, seed inoculation enabled a higher yield by 70 kg ha^{-1} compared to the treatment without inoculation. The highest bean seed yield (1.96 t ha^{-1}) was obtained with the combination of NPK fertilizer at the start and seed inoculation caused by nodule bacteria.

Key words: bean, seed inoculation, fertilization, yield, yield components

P1_04

Influence of cultivar, soil conditioners and NPK fertilizers on yield components and bean grain yield

Ljubiša Živanović[1], Jelena Golijan[1], Jela Ikanović[2], Ljubiša Kolarić[1], Vera Popović[3], Ljubica Šarčević-Todosijević[4]

[1] University of Belgrade, Faculty of Agriculture, Serbia
[2] University of Belgrade, Institute of Chemistry, Technology and Metallurgy, Serbia
[3] Institute of Field and Vegetable Crops, Serbia
[4] High Medical-sanitary School of Proffesional studies "Visan", Serbia

Corresponding author: Jelena Golijan, golijan.j@agrif.bg.ac.rs

Abstract

The primary goal of bean production is to obtain high and stable yields, in which an important role. For that reason, in this manuscript we investigated the impact of cultivar, soil conditioners and NPK fertilizer on yield components and grain yield of bean (*Phaseolus vulgaris* L.). Field microexperiments were conducted during the 2020 in the agroecological conditions of the central Šumadija (locality Rača Kragujevačka), on brown forest soil type (Eutric Cambisol), according to the Split plot design in four repetitions. In this research, a three-factorial experiment was based in the following variants: Variety (A1 - Galeb, A2 - Sremac), "pH Plus" soil conditioners (B1 - without "pH Plus", B2 - with "pH Plus" 500 kg ha^{-1}) and NPK fertilization (C1 - control - without fertilizer application, C2 - $N_{30}P_{20}K_{30}$ kg ha^{-1} a.m., C3 – $N_{60}P_{40}K_{60}$ kg ha^{-1} a.m.).

Standard agrotechnological measures were applied, as for the regular production of bean. The results showed that the application of NPK increased the number of pods per plant from 36.3% (on the treatment $N_{30}P_{20}K_{30}$ kg ha^{-1} a.m.) to 46.1% (on the treatment $N_{60}P_{40}K_{60}$ kg ha^{-1} a.m.) in comparison to the control, number of grains per plant from 17.5% to 27.2%, as well as the mass of grains per plant from 20.0% to 48.3%. The application of "pH Plus" soil conditioners increased the number of pods per plant by 9.7%, number of grains per plant by 9.9% and the weight of grains per plant by 4.2%. All yield components were higher in Galeb cultivar compared to Sremac cultivar. The highest grain yield (1297 kg ha^{-1}) was achieved in the combination of the cultivar Galeb, application of the "pH Plus" soil conditioner (500 kg ha^{-1}) and in the treatment of NPK fertilizers 60:40:60 kg ha^{-1} of active matter.

Key words: beans, fertilization, yield components, grain yield

P1_05

Seasonal water needs of meadows and pastures in different regions of Serbia

Aleksandar Simić[1], Marija Ćosić[1], Mirjam Vujadinović – Mandić[1], Snežana Babić[2], Đorđe Moravčević[1], Dragan Stanojević[1], Stefan Stepić[1]

[1] *Faculty of Agriculture, University of Belgrade, Serbia*
[2] *Institute for Forage Crops, Serbia*

Corresponding author: Aleksandar Simić, alsimic@agrif.bg.ac.rs

Abstract

Global warming, as a consequence of climate change, has reduced the inhibitory effect of low temperatures on grass growth in meadows and pastures, while in the same time evapotranspiration has increased in relation to precipitation. Therefore, water deficit became a limiting factor for plant growth. Consequently, analysis of water deficit on meadows and pastures in different regions of Serbia was performed in this research. The meadows and pastures or grasslands in Serbia occupy about 27.6% of used agricultural land. For the analysis meteorological data from the previous 20 years (2000 - 2019) were used. Data were taken from 17 meteorological stations located in administrative districts belonging to the regions included in this research. Referent evapotranspiration is estimated using the Hargreaves method, effective precipitation is estimated as 90% of daily precipitation and crop evapotranspiration is calculated as a product of the reference evapotranspiration and the crop coefficient. Grassland water deficit is calculated as the difference between crop evapotranspiration and effective precipitation. The amount of water used for the process of evapotranspiration during the vegetation period on average was 421.5 mm (from 332.8 in Zlatibor to 444.7 mm in Zaječar district). The highest need for water occurs in July, due to maximum utilization, and then the water deficit is on average 66.6 mm (from 7.7 mm in Zlatibor to 87.2 mm in Pčinja district). The average seasonal water deficit is 140 mm (from 77.7 mm in the area of Zlatibor district to 205 mm in the area of Pčinja district). As water availability is a key factor for grassland productivity, the goal of this research was to examine water needs of meadows and pastures in agricultural areas where these surfaces are represented in a significant percentage. Productivity and the quality of fodder obtained from meadows and pastures is related to climate change, as well as with increase of temperatures and decrease and/or unfavorable distribution of precipitation during the summer period.

Key words: water deficit, climate change, meadows and pastures

P1_06

Effects of different growing systems on the grain yield of winter wheat

Željko Dolijanović[1], Svetlana Roljević Nikolić[2], Nemanja Gršić[1], Snežana Oljača[1], Milena Simić[3], Zoran Jovović[4]

[1] *University of Belgrade, Faculty of Agriculture, Serbia*
[2] *Instute of Economics in Agricuture, Serbia*
[3] *Maize Research Institute, Serbia*
[4] *Biotechnical Faculty, Montenegro*

Corresponding author: Željko Dolijanović, dolijan@agrif.bg.ac.rs

Abstract

The examination of the effects of different growing systems on the grain yield of winter wheat was conducted at the research and study field "Radmilovac" of Faculty of Agriculture (44º45' N, 20º35' E Serbia, 130 m above mean see level). Investigations was conducted in 2016/17 and 2017/18 year on the luvic chernozem soil type, in completely randomized blocks with three repetitions. Conventional growing system (CGS) was aimed to achieve high grain yields and included ploughing using a mouldboard plough at 25 cm and pre-sowing tillage using a disc harrow and a harrow, basic fertilization in autumn with 600 kg ha^{-1} NPK (15:15:15) and top dressing in spring with high N dose (120 kg ha^{-1} N). In intergrated growing system (IGS), based on low inputs, tillage was performed using a chisel plough at 25 cm with ≥30% of maize crop residues retaining on the soil surface and the pre-sowing tillage using a disc harrow and a harrow, basic fertilization in autumn with 600 kg ha^{-1} NPK (15:15:15) and top dressing in spring with 60 kg ha^{-1} N. In both growing systems grew two common winter wheat cultivars (*Triticum aestivum* ssp. *vulgare*) Ilina and Zvezdana. Statistical analysis confirmed that year, growing system and genotype have a significantly greater impact on wheat productivity than their interactions. More favorable meteorological conditions in the first year led to obtaining statistically significantly higher grain yields in both growing systems (7,840 and 6,450 kg ha^{-1}). A higher yield per unit area (7,470 kg ha^{-1}) was found in the conventional compared to the integrated growing system (6,150 kg ha^{-1}). In both growing systems, the Ilina variety had higher yields compared to the Zvezdana variety. An integrated cultivation system on heavier soils has less positive effects than on soils with more favorable characteristics, especially in the short term.

Key words: growing system, winter wheat, grain yield, fertilizing

P1_07

Pre-sowing treatments with gibberellic acid in white clover

Dalibor Tomić[1], Vladeta Stević[1], Dragan Đurović[1], Milomirka Madić[1], Vesna Đurović[1], Marjanović Miloš[1], Đorđe Lazarević[2], Mirjana Petrović[2], Jasmina Knežević[3]

[1] University of Kragujevac, Faculty of Agronomy, Čačak, Serbia
[2] Institute for Forage Crops, Kruševac, Serbia
[3] University of Priština, Faculty of Agriculture, Lešak, Serbia

Corresponding author: Dalibor Tomić, dalibort@kg.ac.rs

Abstract

The aim of this study was to analyze the effect of pre-sowing treatments with different concentrations of gibberellic acid solution, as a growth stimulator, on root and stem growth, seedling weight and nodulation of young white clover plants. The experiment was performed in 2019 in the laboratory for seed seed control at the Faculty of Agriculture in Čačak. Seed of rivendel cultivar were used. Six treatments with gibberellic acid were applied (control, 0.25; 0.5; 0.75; 1.0 and 1.5 mmol L^{-1} gibberellic acid). Root length, stem length and seedling weight were evaluated. Seedlings from the parallel experiment were planted in containers with substrate and cultivate in the greenhouse.Plants were analyzed 45 days after treatment. The obtained results indicate that pre-sowing treatments with gibberellic acid at a concentration of 1 and 1.5 mmol L^{-1} can significantly affect more intensive growth of plants of white clover.

Key words: white clover, gibberellic acid, nodulation, plant growth, seed

P1_08

Assessment of drought stress on barley (*Hordeum vulgare* L.) seedlings using biochemical parameters

Ruzica Zdero Pavlovic[1], Bojana Blagojevic[1], Milan Mirosavljevic[2], Boris Popovic[1]

[1] *University of Novi Sad, Faculty of Agriculture, Serbia*
[2] *Institute of Field and Vegetable Crops, Serbia*

Corresponding author: Ruzica Zdero Pavlovic, ruzica.zdero@polj.uns.ac.rs

Abstract

On a global scale, drought stress causes a significant threat to plant production. If barley plants experience drought stress at the seedling stage it may reduce plant fitness and affects the grain yield at the final stage of growth. In this study was investigated the relationship between drought and oxidative stress tolerance in barley. Twenty days after germination, two two-row winter barley cultivars NONIUS and NS 565 were exposed to 5 days long drought. The activity of antioxidant enzymes, superoxide dismutase (SOD), catalase (CAT) and guaiacol peroxidise (POD) were determined. Lipid peroxidation and relative electrolyte leakage were investigated as parameters of oxidative stress. When NONIUS seedlings were exposed to drought stress, the antioxidant system could not effectively remove reactive oxygen species, leading to increased lipid peroxidation (an increase from 44.3 to 74.0 nmol/g FW) and damage of membrane (an increase from 8.9 to 23.9%). Drought stress also decreased relative water content (RWC) more in cultivar NONIUS than in cultivar NS 565, and increased proline content, soluble protein, and electrolyte leakage in both cultivar. Proline is effective in increasing the cell turgor and the activity of antioxidant enzymes. When plants were in drought conditions, proline accumulates in both cultivars more than in control. It was observed that cultivar NONIUS was exposed to a higher level of oxidative stress then barley cultivar NS 565. In NONIUS seedlings, the activity of SOD, enzyme involved in scavenging of superoxide anion radical, was increased only in root samples while in leaf samples stayed at the control level. In leaf samples of cultivar NONIUS special emphasis is on increased GPX activity under drought (increased from 3.1 to 6.2 μmol/mg protein). According to the results obtained in this study, cultivar NS 565 is a more appropriate choice for production in environments where spring drought is expected.

Key words: antioxidant enzymes, barley, drought stress, proline

P1_09

Genetic diversity of *Lathyrus sativus* L. collection and characteristics of seeds grown in Slovenia and Serbia

Lovro Sinkovič[1], Barbara Pipan[1], Aleksandra Savić[2], Mirjana Vasić[2], Vladimir Meglič[3]

[1] *Crop Science Department, Agricultural Institute of Slovenia, Slovenia*
[2] *Institute of Field and Vegetable Crops, Serbia*
[3] *Crop Science Department, Agricultural Institute of Slovenia, Slovenia*

Corresponding author: Lovro Sinkovič, lovro.sinkovic@kis.si

Abstract

Grass pea (*Lathyrus sativus* L.) is a less common and nearly forgotten crop in many countries, including Slovenia and Serbia. In the present study, genetic analysis and seed characteristics of the collection of 22 grass pea accessions from several Southeast European plant gene banks were examined. The collection was produced in an open-field experiment at two countries/locations, i.e. Slovenia/Ljubljana – Jablje and Serbia/Novi Sad – Rimski Šančevi, during the 2019 growing season. For analysis of genetic diversity, specific high polymorphic SSR markers were applied. Initial screening at 12 species-specific SSR loci using binary data revealed a great genetic diversity among the grass pea accessions within a collection and three genetic groups were formed. Differences in seed size were measured using descriptors for seed length, width and thickness, and 100-seed weight. Furthermore, several seed colour characters using IBPGR descriptors were visually assessed. The average seed length, width and thickness of the seeds in the collection were 9.0 mm, 8.3 mm and 5.4 mm, respectively, while 100-seed weight ranged considerably from 11.7 g to 38.9 g. The highest differences between growing location were seen for 100-seed weight where the coefficient of variability reached 23.5%. The examined grass pea accessions had less monochromatic (one colour) and more colourful seeds, with two or three colours. Based on the seed coat colour accessions were classified into several groups, the most numerous were yellow-white and yellow-green seeds. The data obtained will be the basis for describing *Lathyrus sativus* genetic resources in databases. Besides, will serve as useful information for plant breeders in breeding of new varieties and for further studies of the morpho-agronomic traits of grass pea. Further genetic studies such as next-generation sequencing are suggested.

Key words: accession; descriptor; genetic diversity; grass pea; seed size; SSR marker

P1_10

Determination of potentially toxic elements in common wild plants used in folk medicine

Jovana Žunić[1], Dijana Mihajlović[1], Biljana Kelečević[1], Zlatan Kovačević[1]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Jovana Žunić, joocic@gmail.com

Abstract

The aim of this study was to determine the concentrations of Cd, Cu, Ni, Pb and Zn in herbaceous plants (dandelion- *Taraxacum officinale*, broad-leaved plantain- *Plantago major* and ribwort plantain- *Plantago lanceolata*) self-collected from the natural environment in three different locations in the north of the Republic of Srpska. Selected species represent the most common wild plants used in folk medicine as medicinal and edible herbs. Due unlimitedness accessibility caused by spontaneously flora growing in grasslands, measurement of potentially toxic elements in plants can be significant in view of toxicological, phytotherapeutic and environmental aspect. Plant material were air-dried, digested and analyzed by flame atomic absorption spectrometer. The results have shown that Zn had the highest concentration, varied from 26.29 to 56.25 mg/kg, followed by Ni (14.12 to 49.33 mg/kg), while the contents of Cd, Pb and Cu were noticeably lower and ranged from 0.18 to 15.71 mg/kg. Among the studied plant species, *Taraxacum officinale* showed significant greater accumulation ability for all determined elements (at least two times higher than *Plantago* sp.), except for Pb concentration, which was approximately the same in all analyzed species. Determined metal contents in all tested plants were found within the permissible limits proposed by World Health Organization (WHO).

Key words: traditional medicine, heavy metals, grassland, potential health risk

P1_11

The influence of biofungicides on germination and protection of the seeds *Foeniculum vulgare* L.

Vladimir Filipović[1], Sara Mikić[1], Vladan Ugrenović[2], Tatjana Marković[1], Vera Popović[3], Snežana Mrđan[1], Stefan Gordanić[1]

[1] *Institute for Medicinal Plants Research „Dr Josif Pančić“, Serbia*
[2] *Institute of Soil Science, Serbia*
[3] *Institute of Field and Vegetable Crops, Serbia*

Corresponding author: Sara Mikić, smikic@mocbilja.rs

Abstract

There is no List of permitted plant protection products that can be used in medicinal and aromatic plant production. The effects of two biofungicides, from the List of permitted plant protection products used in organic production, on the seed quality and health of medicinal plant *Foeniculum vulgare* L. cv. 'Vojvođanski' were examined. The aim was to find products of plant permitted in organic production with beneficial effect on fennel seeds. Seed germination testing was done according to the Rule book on seed quality control, while the seed health was examined by the filter paper method. The treatment of the seed was done with solutions of biofungicides 'Extrasol F' and 'Polyversum'. The solutions of 'Extrasol F' were applied in concentrations of 0.20 ml/kg and 0.40 ml/kg, while the solutions of 'Polyversum' were applied in concentrations of 0.50 g/kg and 1 g/kg. Distilled water solely was used in the control. Seed examinations were done after 14 days. The results showed that biofungicides in the recommended concentrations of 0.20 ml/kg and 0.50 g/kg, had an effect of 73.3% and 64.7%, respectively, on germination, while in the concentrations of 0.40 ml/kg and 1 g/kg, the seed germination was lower by 5.7% and 1.7% than the control. Based on the symptoms of necrosis, dark mycelia and abundant sporulation observed on the seed surface, the fungus identified was *Alternaria* sp. The percentage of infected seeds was reduced (28% and 25.7%) after the treatment with lower concentration. The higher concentrations didn’t reduce the percentage of infected seeds. Since these solutions of the biofungicides affect the seed germination, and they prevent infection, further research should be focused on achieving greater efficacy in protection of fennel seeds.

Key words: fennel seed, seed health, biofungicides, *Alternaria* sp.

P1_12

Influence of mineral fertilizers and zeolites application on the yield of some wheat varieties

Milan Biberdzic[1], Dragana Lalevic[1], Sasa Barac[1], Jelena Stojiljkovic[2], Milomirka Madic[3], Vera Rajicic[4]

[1] *University of Pristina in Kosovska Mitrovica, Faculty of Agriculture, Serbia*
[2] *Department of Agriculture Expertize and Consulting, Leskovac, Serbia*
[3] *University of Kragujevac, Faculty of Agronomy, Cacak, Serbia*
[4] *University of Nis, Faculty of Agriculture, Krusevac, Serbia*

Corresponding author: Milan Biberdzic, milan.biberdzic@pr.ac.rs

Abstract

Zeolite is well known for the improvement of the structure of the soil due to the fact that it reduces its acidity, which is of high importance for agricultural production that takes place on soils with low pH values. It has shown exceptional results in improving soil characteristics, thus increasing the yield and quality of cultivated plants. The aim of our study was to determine the yield and some qualitative properties of numerous wheat varieties, depending on the mineral fertilizers and zeolites application. The experiments were performed in 2018/19 and 2019/20, in the area of Southern Serbia (Bojnik). The research involved 4 wheat varieties and 4 variants of fertilization, including mineral fertilizers and zeolite. The research results demonstrated that there were no major differences in the 1000 grains weight, regardless of the variety of wheat or variant of fertilization. The hectoliter grain weight of the wheat variant which was treated with the combination of mineral fertilizers and a higher dose of zeolite was considerably higher than the control variant weight. All fertilization variants had a significantly higher grain yield compared to the control variant. The variant on which the combination of mineral fertilizers and a higher dose of zeolite were applied achieved a significantly higher grain yield compared to the variant with mineral fertilizers. The application of zeolite in combination with mineral fertilizers increased the wheat yield as compared to those that were treated with mineral fertilizers alone, by an average of 370 kg ha-1. In addition to the selection of varieties (Pobeda and Nikol), the application of a combination of mineral fertilizers and zeolites proved to be effective for growing wheat on acidic soils in southern Serbia.

Key words: wheat, NPK fertilizers, zeolite, yield

P1_13

Essential oil of fennel in suppression of *Botrytis cinerea* Pers. Fr.

Blazo Lalevic[1], Ajla Omerašević[2], Branislav Knežević[3], Amer Sunulahpašić[4], Monika Stojanova[5], Snežana Hrnčić[6], Saud Hamidović[2]

[1] University of Belgrade, Faculty of Agriculture, Serbia
[2] University of Sarajevo, Faculty of Agricultural and Food Sciences, Bosnia and Herzegovina
[3] University of Priština in Kosovska Mitrovica, Faculty of Agriculture, Serbia
[4] Ministry of Agriculture, Water management and Forestry, Bosnia and Herzegovina
[5] University Ss. Cyril and Methodius, Faculty of Agricultural Sciences and Food, North Macedonia
[6] University of Montenegro, Biotechnical faculty, Montenegro

Corresponding author: Blazo Lalevic, blazol@agrif.bg.ac.rs

Abstract

Phytopathogenic fungi have been known to cause disease a long time ago. They cause about 75% of plant diseases. Phytopathogenic fungi are eukaryotic organisms whose body is mostly conical in shape. Therefore, they can penetrate the body in three ways: through the natural openings of the plant, through the resulting mechanical tissue injuries, as well as by direct penetration through uninjured tissue. *Botrytis cinerea* is one of the pathogens causing significant losses in more than 200 crops worldwide. The objective of this paper was to determined the effect of the fennel essential oil against the growth of B. *cinerea* by measurement of inhibition zones. Mycelia of *B. cinerea* were placed on PDA (potato dextrose agar). Four sterile discs (8 mm) were impregnated with 5, 10, and 15 µl of fennel essential oil. In control, distilled water was used for the impregnation of discs. All experiments were performed in triplicate. Incubation was done at 25ºC for 6 days in the dark. The obtained results showed that increasing the essential oil volume had a strong influence on inhibition zone diameter. Using 5, 10 and 15 µl of fennel essential oil, inhibition zone diameter was 2.5, 5.0, and 5.5 mm, respectively. In the control variant, the inhibition zone was not detected. This research confirms the potential for the application of fennel essential oil in the suppression of *B. cinerea* growth.

Key words: fennel, essential oil, *Botrytis cinerea*

P1_14

Analysis of the water regime of chernozem under winter wheat crops in the region of Zemun from 1966/67 to 2019/20

Vesna Počuča[1], Gordana Matović[1], Enika Gregorić[1]

[1]*University of Belgrade, Faculty of Agriculture, Belgrade, Serbia*

Corresponding author: Gordana Matović, gmatovic@agrif.bg.ac.rs

Abstract

The research covered the period from 1966/67-2019/20 to analyze the water regime of chernozem soil in the area of Zemun under winter wheat crops. The aim was to determine whether the water regime of the rhizosphere layer of soil under winter wheat has improved or deteriorated over the last fifty-four years. The analysis was performed using the FAO CROPWAT 8.0 crop model. Daily minimum and maximum air temperatures as well as the amount of precipitation measured at meteorological station Surcin were used. Reference evapotranspiration (ETo) was calculated by the modified Hargreaves method. Simulations of winter weat potential evapotranspiration (ETc), irrigation requirements and yield reduction were investigated. Analyzes showed that the average ETc was about 350 mm, and winter wheat irrigation requirements were 173 mm. Going from the first (1966/67-1985/86) to the third (2006/07-2019/20) period of the research, an increase in ETc of 7% and irrigation requirements of 10% was registered. A reduction in winter wheat yield was also observed. During the first period (1966/67-1985/86) the yield reduction was 6%, and during the second (1986/87-2005/06) and the third (2006/07-2019/20) period was 10% in relation to genetic crop potential. Winter wheat had the highest water requirements (ETc) during April and May (95mm and 99mm) with a tendency to increase from the first to the third period. The highest irrigation requirements were also in April and May (57mm and 54mm) without regularity in distribution comparing the three examined periods.

The general conclusion is that the water regime of chernozem under winter wheat crops in the area of Zemun had slightly changed in the last 54 years. Simulations show that crop water requirements, irrigation requirements and yield reduction are slightly increasing.

Key words: Winter wheat, CROPWAT, ETc, irrigation requirements, yield reduction

P1_15

Antifungal activity of sodium bicarbonate and garlic aqueous extract

Saud Hamidović[1], Dženita Medenjaković[1], Teofil Gavrić[1], Fejzo Bašić[1], Vera Karličić[2], Siniša Mitrić[3], Blazo Lalevic[2]

[1] *University of Sarajevo, Faculty of Agricultural and Food Sciences, B&H*
[2] *University of Belgrade, Faculty of Agriculture, Serbia*
[3] *University of Banja Luka, Faculty of Agriculture, B&H*

Corresponding author: Blazo Lalevic, blazol@agrif.bg.ac.rs

Abstract

Current trends in phytomedicine are ordering the use of ecologically accepted methods for plant protection. That can be implemented by reducing the usage of the standard chemical resources (pesticides) and by applying for preventive protection through the newest methods of biological measures. Moreover, preventive use of preparations allowed in organic production, together with the timely use of other agrotechnical measures, can successfully prevent the growth of the phytopathogenic species of fungi. The objective of this work was the examination of the antifungal effect of sodium bicarbonate and garlic aqueous extract. Mycelia of two phytopathogenic fungi (*Fusarium oxysporum* Schltdl. and *Plasmopara viticola* (Berk. & M.A. Curtis) Berl. & De Toni) were placed on PDA (potato dextrose agar). The sterile discs were impregnated with 10 µl of self-made preparations from sodium bicarbonate (0.5%, w/v) and garlic aqueous extract (0.4%, w/v). All experiments were performed in triplicate. The measurement of inhibition zones was performed after 6 days of incubation (22 and 30ºC). In the control variant, distilled water was used for the impregnation of discs. The results showed that all preparations affected the growth of phytopathogenic fungi. By the application of both preparations, fungal growth was inhibited. By incubation at both temperatures, a higher inhibition rate of *F. oxysporum* growth using garlic extract compared to sodium bicarbonate was observed. The lowest inhibition rate of *F. oxysporum* using distilled water was noticed. By incubation at 22ºC, a more expressed inhibition rate of *P. viticola* using garlic extract compared to sodium bicarbonate was observed. In contrast, sodium bicarbonate was the more efficient agent on the inhibition rate of *P. viticola* at 30ºC compared with garlic extract. This research indicates that garlic extract and sodium bicarbonate may have a potential for application against *F. oxysporum* and *P. viticola*.

Key words: Fusarium oxysporum, Plasmopara viticola, sodium bicarbonate, garlic

P1_16

Biorational CO2 fumigaton of oil-seed rape: insecticidal potential and effect on seed quality

Sonja Gvozdenac[1], Ana Marjanović Jeromela[1], Tijana Zeremski[1], Nadežda Stojanov[1], Jelena Ovuka[1], Sandra Cvejić[1], Dejan Prvulović[2]

[1] Institute of Field and Vegetable Crops, Novi Sad, Serbia
[2] University of Novi Sad, Faculty of Agriculture, Serbia

Corresponding author: Ana Marjanović Jeromela, ana.jeromela@ifvcns.ns.ac.rs

Abstract

Fumigation with carbon dioxide (CO2) is very effective biorational alternative to toxic chemical fumigants. It is widely used for a variety of commodities, and the efficacy against insect pests is well documented. However, the information on its effect on the quality of seeds, oilseeds in particular, is scarce. This information is important because oilseeds are more difficult to store and preserve, compared to cereal grains or legumes, and are more susceptible to quality deterioration due to high content of oil and fatty acids. This work aimed to assess the efficacy of CO2 fumigation of oilseed-rape in controlling *Plodia interpunctella*, in relation to seed vitality and quality. CO_2 was applied to oil-seed rape artificially infested with *P. interpunctella* larvae, at different levels (62, 92 and 96%) in gas-tight bags. The mortality of larvae was observed after four different exposure periods (1, 2 and 24 h, and 7 days) which represented different subtreatments. After seven days, seed vitality (germination energy and germination) and seed quality (content and composition of oil and fatty acids) were assessed. The lowest concentration (62%) was effective in suppression of *P. interpunctella* larvae only after 7 days of exposure, when the total mortality was recorded (100%). Two highest CO_2 concentrations caused relatively high mortality two hours after the exposure (78, 83%, respectively), although 22% of larvae recovered rapidly after the bags were opened. At these concentrations, total mortality (100%) without larval recovery was achieved in both subtreatments, after, 24 h and 7 days of exposure. The fumigation with CO_2, irrespective of concentrations, showed no adverse effect on germination energy, seed germination, or the content and composition of oil and fatty acids in seeds. However, the possible varietal differences must be considered, thus preliminary fumigation of seed samples is recommended prior to large scale fumigation.

Key words: Carbon dioxide, controlled atmosphere, canola, *Plodia interpunctella*, germination

P1_17

Antagonistic activity of bacterial isolates against C*ercospora beticola* in laboratory conditions

Marina Dervišević[1], Nikola Đorđević[1], Isidora Knežević[1], Snežana Đorđević[1]

[1]*Biounik d.o.o., Research and Development Center, Belgrade, Republic of Serbia*

Corresponding author: MarinaDervišević, marina.dervisevic@agrounik.rs

Abstract

Cercospora beticola Sacc. is the most economically significant sugar beet disease. In years suitable for developing the disease, the yield of the root and the total sugar content can be reduced by up to 50%. The application of chemical fungicides is a standard measure in the control of *C. beticola*. Still, the emergence of resistance have led to a decrease in available commercial agents'effectiveness. This study aimed to examine the efficacy of antagonistic bacterial isolates to control this pathogen under laboratory conditions. The antagonistic activity of four autochthonous bacterial isolates (*Bacillus amyloliquefaciens* (Priest *et al*.) Borriss *et al*. B002, *Bacillus subtilis* (Ehrenberg) Cohn Z3, *Lactobacillus plantarum* (Orla-Jensen) Bergey *et al*. L2 and *Pediococcus pentosaceus* Mees L5B) against three isolates of *C. beticola* (K1-2, K1-3, T2L2) was examined by dual cultivation method. In a bioassay, sugar beet leaves first were sprayed with a suspension of bacteria (2.8 x 10^{10} CFU/ml) after 24 hours of suspension of spores *C. beticola*. In the control, the leaves were sprayed only with the suspension of spores *C. beticola*. In each variant, there were six sugar beet leaves. After seven days, results were assessed by the Horsfall and Barratt (1945) scale. In the dual cultivation method, the highest percentage of inhibition (21.9 to 24%) was observed in the treatment with *B. subtilis* Z3 against all three isolates of *C. beticola*; *B. amyloliquefaciens* B002 and *L. plantarum* L2 showed a slightly lower percentage of inhibition, while *P. pentosaceus* L5B did not show any antagonistic activity against *C. beticola* isolates. In bioassay, isolates of *B. subtilis* Z3, *B. amyloliquefaciens* B002 and *L. plantarum* L2 had excellent preventive action against *C. beticola*. Their efficiency ranged from 87.48 to 99.17% compared to the control. These results indicate that the tested bacterial strains have good potential to control *C. beticola*, which can be an excellent alternative to chemical fungicides.

Key words: sugar beet, *Cercospora beticola*, biocontrol, antagonistic bacteria

P1_18

Antifungal activity of *Bacillus* sp. against *Fusarium graminearum*

Isidora Knežević[1], Marina Dervišević[1], Nikola Đorđević[1], Snežana Đorđević[1]

[1] *Biounik d.o.o., Research and Development Center, Belgrade, Republic of Serbia*

Corresponding author: Isidora Knežević, isidora.knezevic1996@gmail.com

Abstract

Fusarium graminearum Schwabe is one of the most important pathogens of wheat. The presence of this pathogen leads to loss of yield. The most common measure to control *F. graminearum* is the use of chemical compounds. Considering the constant application of compounds of the same mechanism of action, resistance to these compounds often occurs. The use of antagonistic bacteria has good potential in controlling this pathogen. In this research, the antifungal activity of antagonistic bacteria of the genus *Bacillus* on an isolate of *F. graminearum* under laboratory conditions was investigated. The inhibitory effect of 10 strains of bacteria was examined in the method of dual cultivation. Mycelia were transferred to a fresh PDA medium, and a suspension of bacteria was applied at 3 cm from the mycelial disc. After seven days of incubation at 25℃, the inhibitory activity of specific bacterial strains against *F. graminearum* was observed. The highest percentage of inhibition was recorded in four strains of *Bacillus mojavensis* Roberts *et al*. (99/18 R-6, 31/18 RS 7-1, 31/18 RS-4 and 31/18 RS-8), in two strains of *Bacillus velezensis* Ruiz-García *et al*. (31/18 RK 1-1 and RK 3-2) and one strain of *Bacillus amyloliquefaciens* (Priest *et al*.) Borriss *et al*. 31/18 RK 1-2. The percentage of inhibition in these strains was between 30 and 40%. In two strains of *Bacillus licheniformis* (Weigmann) Chester 31/18 RS-9 and 31/18 RS-10, a percentage of inhibition of 11% and 17%, respectively, was recorded. In contrast, *Bacillus licheniformis* RS 92/17 6B did not show any inhibitory activity, according to *F. graminearum*. As this research indicates a good potential of *Bacillus* species in controlling *F. graminearum*, further research should examine their effectiveness in field conditions because the use of these bacteria would provide wheat protection without the possible risk of resistance.

Key words: Fusarium graminearum; *Bacillus*; dual cultivation

P1_19

Tocopherols variability in maize inbred lines with different color and kernel type

Snežana Mladenović Drinić[1], Jelena Vukadinović[1], Danijela Ristić[1], Ana Nikolić[1], Jelena Srdić[1], Natalija Kravić[1], Violeta Anđelković[1]

[1] *Maize Research Institute, Serbia*

Corresponding author: Snežana Mladenović Drinić, drinicsnezana2@gmail.com

Abstract

Tocopherols in human plays an important role in the treatment or prevention of a number of diseases as well as in plants in development and protection cell membranes from oxidation. Maize kernels are rich in total tocopherol consisting of α-, β-, γ- and δ- isoforms. Tocopherols content in 15 maize inbred lines from GenBank and working collection of MRI, with different kernel type and color (orange, yellow, white, sweetcorn and popcorn), grow in 2019 at experimental field of Maize Research Institute in three replication were determined by HPLC-DAD and analyzed by PCA. The variation for the tocopherols is presented in maize inbred lines with different kernel type (standard, sweetcorn, popcorn) and kernel color (white, yellow, orange). Sweet corn inbred lines have the highest mean value of ß+γ-tocoherols (65.11 μg/g DW) and δ tocopherols (1.65 μg/g DW). The highest α-tocopherol content has inbred lines with standard kernel type followed by sweet corn inbred lines and popcorn (12.35, 9.01 and 4.67μg/g DW respectively). The first two principal components explain 67.09 % (for PC1) and 22.32 % (for PC2) of the overall data variance, respectively. According to the PC score, based on the tocopherols content white and sweet maize were separated from the tested samples. The most efficient parameter for distinguishing white maize was α-tocopherol content, while for sweet maize were δ-tocopherol and β+γ-tocopherol content. Obtained PCA data show that different kernel maize colors and type indicate unique phytochemicals content. Demonstrated variations of tocopherols suggest a genetic potential for breeding tocopherols improved maize.

Key words: tocopherols, maize, HPLC, PCA

P1_20

Two new fungal diseases of tomato and potato endangering production in Mauritius

Sandhya Takooree[1], Nooreen Mamode Ally[1], Hudaa Neetoo[1], Mala Ranghoo-Sanmukhiya[1], Mira Vojvodić[2], Aleksandra Bulajić[2]

[1] *Department of Agricultural and Food Science, University of Mauritius, Mauritius*
[2] *University of Belgrade, Faculty of Agriculture, Serbia*

Corresponding author: Aleksandra Bulajić, bulajic_aleksandra@yahoo.com

Abstract

Tomato (*Solanum lycopersicum*) and potato (*Solanum tuberosum*) represent two of the most frequently produced and consumed vegetables in Mauritius with annual production of over 18,000 and 14,000 tonnes, respectively. The high humidity and temperature prevailing in Mauritius represent a favorable environment for many pathogens. In this paper we are reporting on the detection and identification of *Corynespora cassiicola* (Berk. & M.A. Curtis) C.T. Wei causing target spot of tomato and *Rhizoctonia solani* J.G. Kühn AG-3 causing black scurf of potato. In August 2019, in a greenhouse at the locality of Camp Thorel, tomato plants with numerous circular, target-like, dark brown lesions on the leaves, were collected as well as seed potato tubers with numerous irregular shaped black scurf lesions collected at the locality of Saint Pierre. Isolation and preliminary identification on PDA, revealed the presence of isolates of *Corynespora* sp. and *Rhizoctonia* sp., respectively. The isolates originating from tomato and potato (408G-19/M and 448G-19/M) were selected and characterized. Pathogenicity was confirmed after artificial inoculations of healthy tomato plants or potato tubers, followed by a successful re-isolation after symptom development. *Corynespora* sp. isolates formed fast-growing gray-brown, velvety colonies and numerous, pale brown, cylindrical, straight or slightly curved conidia with two to 14 pseudosepta which were singly borne or in short chains. *Rhizoctonia* sp. formed fast-growing, white colonies with multinuclear hyphae exhibiting typical branching pattern, and pairing with known *R. solani* AG-3 tester isolates. The identification was confirmed by sequencing ITS region of rDNA of isolates 408G-19/M and 448G-18/M from mycelium from tomato and potato, respectively (GenBank Accession Numbers MN860167 and MT523021). The nucleotide sequences of the representative isolates from tomato and potato shared 98 to 100% identity with *C. cassiicola* and *R. solani* AG-3 isolates, respectively, confirming the conventional identification. Considering the high initial disease incidence observed in both crops, a significant impact on production and control practices is expected.

Key words: Corynespora cassiicola, target spot, *Rhizoctonia solani* AG-3, black scurf

P1_21

Inhibition of *Botrytis cinerea* Pers. Fr. growth using rosemary and lavender essential oils

Amer Sunulahpašić[1], Branimir Nježić[2], Monika Stojanova[3], Dženita Medenjaković[4], Berina Imamović[4], Blazo Lalevic[5], Saud Hamidović[4]

[1] *Ministry of agriculture, water management and forestry, Bosnia and Herzegovina*
[2] *University of Banja Luka, Faculty of agriculture, Bosnia and Herzegovina*
[3] *University Ss. Cyril and Methodius, Faculty of agricultural sciences and food, North Macedonia*
[4] *University of Sarajevo, Faculty of agricultural and food sciences, B&H*
[5] *University of Belgrade, Faculty of agriculture, Serbia*

Corresponding author: Blazo Lalevic, blazol@agrif.bg.ac.rs

Abstract

In the past several decades, the fungal incidence has been increased dramatically worldwide. In agricultural and food production, pathogenic fungi have disastrous effects, causing significant yield losses. Therefore, alternative technologies were developed for improving the agricultural production and plant protection techniques. Various etheric oils' potential for suppression of phytopathogenic fungi is well described; some researches have pointed out the possibility of using rosemary and lavender essential oils for the suppression of fungal growth. *Botrytis cinerea Pers. Fr.* is one of the economically most important pathogens causing significant losses in plant production. Thus, the objective of this work was to determine inhibition effects of rosemary and lavender essential oil on *Botrytis cinerea Pers. Fr.* Mycelia were cultivated on potato dextrose agar. Sterile discs were impregnated with 5, 10, and 15 µl of essential oils, and as control treatment distilled water was used for the impregnation of sterile discs. All experiments were performed in triplicate. Discs were incubated in the darkness for 6 days at 25ºC, after that period measurement of the inhibition zones was performed. The results showed the absence of an inhibition zone in the control treatment, whilst essential oils had an inhibition effect on fungus growth. Lavender oil expressed more pronounced inhibition effect compared to rosemary oil. Increased essential oil volume resulted in stimulation of the inhibitory effect of both oils. In summary, rosemary and lavender essential oil could serve as potential antifungal agents in plant production.

Key words: Antifungal activity, phytopathogen, mycelium growth, plant essential oils

P1_22

Seasonal water requirements of maize in the region of Vojvodina

Nemanja Gršić[1], Željko Dolijanović[1], Đorđe Moravčević[1], Marija Ćosić[1], Aleksa Lipovac[1], Mirjam Vujadinović-Mandić[1]

[1] *Faculty of Agriculture, University of Belgrade, Serbia*

Corresponding author: Nemanja Gršić, nemanja.grsic@agrif.bg.ac.rs

Abstract

Global climate changes, which are characterized by an increase in temperature, reduction of precipitation, especially during the summer months, significantly affect the overall production of spring sowing crops. Maize is the predominant crop in Serbia. It is grown in about 1 million hectares with average yield about 7,9 t/ha. Precisely for that reason, in this paper, the analysis of water deficit on the maize fields in the region of Vojvodina was performed. The total used agricultural land of the surveyed area is about 1,574,365.71 ha, while the maize grown area occupies about 551,028 ha (35%). A series of meteorological data from the previous 20 years (2000 - 2019) from 7 meteorological stations of the Administrative Districts from the regions covered by the survey were used for the analysis. Evapotranspiration, crop evapotranspiration (maize), effective rainfall and water deficit were calculated using FAO-56 methodology. The amount of water consumed during the evapotranspiration process in the vegetation period averaging about 625.07 mm (from 597.4 mm in the North Bačka District to 646.8 mm in the West Bačka District). Maize has the greatest water requirement during the tasseling and silking phases, in July, when the largest water deficit is observed, which averages 152.51 mm (from 143.6 mm in the South Banat District to 159.2 mm in the Srem District). The seasonal water deficit averages 347.24 mm (from 310.8 mm in the area of South Bačka District to 369 mm in the area of West Bačka District). As the availability of water is a key factor for high and stable maize yields, this research aimed to examine the water requirements in the area where the maize represents more than half of the total production.

Key words: Water deficit, climate change, maize

P1_23

Which methods are the most reliable for predict weed seed bank?

Markola Saulic[1], Ivica Djalovic[2], Mostafa Oveisi[3], Vladan Jovanovic[4], Dragana Božić[1], Sava Vrbničanin[1]

[1] University of Belgrade, Faculty of Agriculture, Belgrade–Zemun, Serbia,
[2] Institute of Field and Vegetable Crops, National Institute of the Republic of Serbia, Serbia
[3] Department of Agronomy and Plant Breeding, Faculty of Agricultural Science & Engineering, University of Tehran, Iran
[4] Institute of Pesticides and Environmental Protection, Serbia

Corresponding author: Ivica Djalovic, maizescience@yahoo.com

Abstract

The primary aim of the study was to estimate the weed seed bank in different management systems. Research on this topic is modestly and there are great variability in the results with similarly set experimental conditions, because of using different methods. Therefore, it was decided to use square method and to compare two methods for estimating weed seed bank: physical extraction of seed and seedling emergence method. The research was performed at the stationary long-term experiment "Plodoredi" of the Institute of Field and Vegetables Crops in Novi Sad. During three years and 6 assessment and 2-year crop rotation (winter wheat-maize) with standard application of mineral fertilizer 100 kg ha^{-1} N was monitored. During the first year (2014), method physical extraction of seed gave an insight that 20.100 seeds per m^{-2}, which belong to 18 weed species, persist in the entire examined soil layer (0-40 cm). Using the seedling emergence method, it was estimated only 4.625 seeds per m^{-2}, which originate from 5 weed species. During the last assessment (2017), the physical extraction, although more complicated, indicated that there were 27.075 seeds per m^{-2} in the examined layer, i.e. 20 weed species. Also, rhizomes *Convolvulus arvensis* and *Sorghum halepense* were observed. The second method for determine weed seed bank gave a different picture of potential weeding, and only 6 weed species and 3.000 seeds per m^{-2} were recorded. This indicates that the entire weed seed bank isn't active, i.e. that some seeds are not able to germinate, others are dormant, but they present a potential danger. The estimated number of seeds per m^{-2} by physical extraction as more efficient method was used in further research for the create a „Artificial Neural Network'' model for predicting the dynamics of weed emergence.

Key words: weed seed bank, physical extraction of seed method, seedling emergence method, „Artificial Neural Network" model

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P1_24

Survey on the presence of *Ralstonia solanacearum*, the causal agent of potato brown rot in Republic of Srpska 2011-2020

Trkulja Vojislav[1], Mihić Salapura Jelena[1], Ćurković Bojana[1], Vuković Bojana[1], Babić Gordana[1], Prijić Jovana[1], Bogdan Nedić[1]

[1]*PI Agricultural institut of Republic of Srpska, Banja Luka, Bosnia and Herzegovina*

Corresponding author: vtrkulja@blic.net

Abstract

In Republic of Srpska and Bosnia and Herzegovina potato presents important domestic export potential. However, phytopathogenic quarantine bacteria *Ralstonia solanacearum* (Smith) Yabuuchi *et al*. – cause of potato brown rot pose a significant threat to the successful potato production. Considering the above mentioned, monitoring has been carried out since 2011 in order to prevent the introduction and determine the possible presence in B&H. From 2011-2020, PI Agricultural Institute of RS, Banja Luka analyzed samples of seed and mercantile potatoes (*Solanum tuberosum* L.) produced in the territory of Republic of Srpska, as well as samples of imported seed and mercantile potatoes.The samples were analyzed in accordance with EU directive (98/57/EC) and laboratorie protocols stated in Official Gazette of Republika Srpska 81/17. The results of laboratory analyzes of imported potatoes during 2011, 2012, 2014, and 2020 showed the presence of quarantine phytopathogenic bacteria *Ralstonia solanacearum.* Positive results were obtained in three samples of young mercantile potatoes from Egypt (2011), two samples of mercantile potatoes from Serbia (2012), one sample of mercantile potatoes from Serbia (2014) as well in nine samples of mercantile potatoes, also from Serbia (2020). Thus, implementation of this monitoring is very important in order to protect domestic potato production and timely detect infected consignments and/or potato crops, as well as successful implementation of the phytosanitary measures prescribed by law, which is the basis for successful domestic production of potatoes, and for maintaining the obtained license for the export of domestic potatoes to the European Union market.

Key words: Ralstonia solanacearum, quarantine bacteria, potato brown rot, survey in Republic of Srpska

Section 1: CROP SCIENCE

Oral Presentations

01_01

Study of the chemical composition of triticale to compare with other cerial crops genotype

Muftah krayem[1]

[1] *Department of biology, Faculty of Education, Misurata, Libya*

Corresponding author: Muftah krayem, krayemmuftah@gmail.com

Abstract

The objective of this research was to determination the chemical composition of grains triticale and other cereal crops grown in south of Libya (arid regions) during the season 2013-2014, the seeds collected from the experiment designed in a randomized completely block design RCBD with 4 replicates. Significant differences at 5% were determined by excel statistical analysis. Triticale var. (begal), bread wheat var. (bohot 208), durum wheat var. (bohot 107) and barley var. Acsad 176 were cultivated under the same condition. The result showed that the triticale represented high percentage of protein content equal to 15.89%, More over bread wheat, durum wheat and barley exhibited percentage equal to15.41%, 13.35% and 14.55% respectively. on the other hand, Crude fiber percentages were approximately similar for triticale and durum wheat but lower than that bread wheat and barley. Also, Lipid content of triticale was less than that of both genotype of wheat and barley. Carbohydrates showed high percentage for durum wheat equal to 80.50% whereas triticale, bread and barley indicated Significant percentages equal to 77.73%, 77.03%, 74.45% respectively. Mineral content showed high percentage for wheat 43% and lower percentage for triticale 18.4%.

Key words: Triticale, bread wheat, Durum wheat, Barley, Chemical Composition

01_02

Crude protein content in wheat grain depending on the feeding method

Vojin Cvijanovic[1], Gorica Cvijanovic[2], Nenad Djuric[3], Vojin Djukic[4], Mladen Petrovic[1], Vesna Stepic[3], Zlatica Miladinov[4]

[1] *Institute for Science Application in Agriculture, Serbia*
[2] *Institute of Information Technologies University Kragujevac, Serbia*
[3] *Megatrend University Belgrade, Faculty of Biofarming Backa Topola, Serbia*
[4] *Institute of Field and Vegetable Crops, Serbia*

Corresponding author: Vojin Cvijanovic, cvija91@yahoo.com

Abstract

The aim of this study was to determine the protein content of wheat grain in a sustainable production method. The research was conducted at the Scientific Institute PKB Agroekonomik Padinska Skela (2017-2019) with four varieties of wheat (Ratarica, Pobeda, Nogal and Apache) in densities of 400 and 500 grains/m2. The basic fertilization was with 400 kg NPK/ha. Feeding was performed: T1 with 150 kgN/ha; T2 150 kgN/ha+1 foliar treatment with multiple inoculum T3 100 kgN/ha+2 foliar treatments and T4 50 kgN/ha+3 foliar treatments. The multiple preparation (EM Aktiv 6 l/ha) is a large group of effective microorganisms. The average protein content was 13.95% and was statistically significantly dependent on the variety and treatment and their interaction $p < 0.01$. Ratarica and Pobeda varieties had the highest protein content. T3 treatment had the greatest impact on protein content in all three years of research, which was environmentally and economically justified.

Key words: wheat genotype, supplementation, microbiological preparation, mineral nitrogen, proteins

01_03

Effects of fall and spring primary tillage on soybean yield and 1000-grain weight in agro ecological conditions Serbia

Marija Bajagić[1], Vojin Đukić[2], Zlatica Miladinov[2], Gordana Dozet[3], Gorica Cvijanović[4], Jegor Miladinović[2], Vojin Cvijanović[5]

[1]*University Bijeljina, Facultiy of Agriculture, Bijeljina, Republic of Srpska, BiH*
[2]*Institute of Field and Vegetable Crops, Novi Sad, Serbia*
[3]*Megatrend University, Faculty of Biofarming, Bačka Topola, Serbia*
[4]*Institute of Information Technologies, University Kragujevac, Serbia*
[5]*Institute for Science Application in Agriculture, Serbia*

Corresponding author: Marija Bajagić, bajagicmarija@yahoo.com

Abstract

The effect of fall and spring primary tillage on soybean yield and 1000-grain weight was examined in a three-year study (2013-2015). The trial included cultivars with different maturity periods, developed at the Institute of Field and Vegetable Crops Novi Sad: Valjevka and Galina 0 maturity group, Sava and NS Maximus I maturity group, Rubin and Venera II maturity group. Trial subplots were prepared using different periods of primary tillage, which was conducted in fall (01–05 November) and spring (25–31 March) in Bačka Topola. The highest yields and 1000-grain weight were obtained after fall primary tillage in all the three study years. Yield decreases of 2.72 % to 38.91 % and 1000-grain weight decrease of 1.33 %-11.93 % were recorded after spring primary tillage. The data were processed in the program *STATISTICA 10*, and the significance of the differences between the mean values of treatment was tested with the Tuckey's multiple range test.

*Key words***:** soybean yield, 1000-grain weight, primary tillage

Acknowledgments: The paper is part of the research of project no. 451-03-9/2021-14/200378, 451-03-9/2021-14/200032, and TR 31092 funded by the Ministry of Science and Environmental Protection of the Republic of Serbia.

01_04

Detection of G*aeumannomyces tritici* in wheat

Mihajlo Voruna[1], Ognjen Cvijic[1], Zorana Đekanović[1], Duška Delić[1]

[1] *University of Banjaluka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Duška Delić, duska.delic@agro.unibl.org

Abstract

Take-all, caused by the fungus *Gaeumannomyces tritici* (J. Walker) Hern.-Restr. & Crous (syn. *G. graminis* var. *tritici* J. Walker), is the most important root disease of wheat worldwide. During June 2020, in wheat field in Odžak locality, Bosnia and Herzegovina, patches of wheat plants showing severe take-all infection including white heads and stunted growth were recorded. Degenerate roots and blackened culm bases were noticed in additional. Small pieces of infected tissue were placed on one-quarter-strength potato dextrose agar (PDA) amended with rifampicin and streptomycin for 5 days at 27 °C. DNA was extracted from developed mycelia on the culture media following protocol recommended from DNeasy Plant mini kit (Qiagen, Germany). Primers NS5 and NS6 were used to amplify part of the small subunit of nuclear rDNA (18S rDNA). One week later, dark mycelia and deeply lobed hyphopodia were observed growing from roots on the PDA. Alternation of color from orange to purple was observed as well in the culture media. The PCR assay with primers NS5 and NS6 amplified fragment of 627 bp specific for s *G. tritici*. The nucleotide sequence of the isolate was assigned the GenBank Accession No. MW701352. A BLAST search showed that the sequence had >99% similarity to *G. graminis* var. *graminis* (Accession No. DQ116719). To confirm pathogenicity, inoculum was prepared by incubating wheat seeds on autoclaved vermiculite sand with the isolate for 4 weeks at 25°C in a greenhouse.Four weeks after inoculation rotted cortex of roots was observed. Koch's postulates were fulfilled by reisolating the fungus from the symptomatic plants and the culture was confirmed as *G. tritici* by its sequence and the morphological characters. To the best of our knowledge, this is the first report of take-all root rot caused by *G. graminis* var. *tritici* on wheat in Bosnia and Herzegovina.

Key words: Triticum estivum, take all symptoms, hyphopodia, PDA, PCR, pathogenicity

01_05

Promoting SMART agricultural WATER management in Bosnia and Herzegovina - "SMARTWATER" project

Mihajlo Marković[1], Nataša Čereković[1], Đurađ Hajder[1], Milan Šipka[1], Nery Zapata[2], Teresa A. Paço[3], Erminio Efisio Riezzo[4], Sabrija Čadro[5], Mladen Todorović[6]

[1]University of Banja Luka, Faculty of Agriculture, Republic of Srpska, BiH;
[2]Estación Experimental de Aula Dei - CSIC, Spain;
[3]Centro de Investigação em Agronomia, Alimentos, Ambiente e Paisagem (LEAF), Instituto Superior de Agronomia, Universidade de Lisboa, Lisboa, Portugal;
[4]Sysman Progetti & Servizi Srl, Italy;
[5]University of Sarajevo, Faculty of Agriculture and Food Science, Bosnia and Herzegovina; [6]Mediterranean Agronomic Institute of Bari (CIHEAM), Italy

Corresponding author: Mihajlo Marković, mihajlo.markovic@agro.unibl.org

Abstract

Promoting SMART agricultural WATER management in Bosnia and Herzegovina — "SMARTWATER" is a HORIZON 2020 project granted by European Commission and coordinated by the University of Banja Luka. The main objective is to reinforce networking, research and science and technology cooperation capacities of the University of Banja Luka (UNI-BL), the University of Sarajevo (UNSA) and other connected BiH institutions, in the field of sustainable agricultural water management and to increase their competency and fund rising skills for a successful participation in the European Union (EU) Research Programs. In this context, the project promoted the twinning with the EU institutions including Mediterranean Agronomic Institute of Bari (CIHEAM-IAMB), Consejo Superior de Investigaciones Científicas (CSIC), Instituto Superior de Agronomia (ISA), SYSMAN PROGETTI & SERVIZI SRL (SYS). SMARTWATER project will develop a large set of joint activities promoting networking, joint experimental fields, research cooperation and the exchange of knowledge and experts. The focus will be on the application of smart technologies (cloud-based and remote sensing) in agricultural water management, the optimization of the water–energy–food nexus, climate change impacts and adaptation measures. Moreover, the project will provide technical assistance and expertise to improve the research and innovation capacities of BiH institutions and to delineate adequate research strategies and policies for the future. Hence, the project will boost the S&T capacity through a series of capacity building actions focusing mainly on the early-stage researchers. These include

advanced training courses, participation in a joint MSc program, summer schools and hands-on workshops on R&I funding. A modern scientific strategy for stepping up and stimulating scientific excellence and innovation capacity will be outlined following a multi-stakeholder participatory approach.

Key words: Water, Management, Smart, Technologies, BiH

Section 2: HORTICULTURE

Poster Presentations

P2_01

Physicochemical and antioxidant properties of three strawberry cultivars and wild strawberry from central Bosnia region

Jasmina Aliman[1], Maja Kazazic[2], Emina Mehic[2], Maida Djapo-Lavic[2], Mirnesa Smajic[1]

[1] Agro Mediterranean Faculty, Dzemal Bijedic University of Mostar, Bosnia and Herzegovina
[2] Faculty of Education, Dzemal Bijedic University of Mostar, Bosnia and Herzegovina

Corresponding author: Maja Kazazic, maja.kazazic@unmo.ba

Abstract

Strawberries contain important amount of bioactive compounds, mostly polyphenols. Aim of this study was to evaluate physical properties and determine amount of polyphenols, anthocyanins and antioxidant activity in 3 different strawberry cultivars (Clery, Marmolada and Arosa) and compare it to the wild strawberry (*Fragaria vesca* L.) from the same area. Total phenolic content was determined by the Folin-Ciocalteu method. Antioxidant activity was determined using ABTS radical scavenging capacity assay and ferric reducing antioxidant potential (FRAP) assay. pH-differential method was used for determination of total anthocyanin content of all samples. There are significant differences in the content of all investigated bioactive compounds among selected strawberry cultivars. The highest phenolic content and antioxidant activity was found in wild strawberry (*Fragaria vesca* L.). Cultivar Clery had slightly higher content of total anthocyanins than wild strawberry fruits. Thus, it can be concluded that wild strawberry is a good source of polyphenols, anthocyanins, and antioxidants.

Key words: anthocyanins, antioxidant activity, polyphenols, strawberry

P2_02

Effects of different substrates on growth and development of Globe amaranth (*Gomphrena globosa* L.)

Svjetlana Zeljković[1], Tanja Ećim[2], Jelena Davidović Gidas[1], Emina Mladenović[3]

[1] Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina
[2] City administration of Prijedor, Department of Traffic, Municipal Affairs, Environment and Legal Properties and Housing Affairs, Bosnia and Herzegovina
[3] Faculty of Agriculture, University of Novi Sad, Serbia

Corresponding author: Svjetlana Zeljković, svjetlana.zeljkovic@agro.unibl.org

Abstract

Commercial substrates have the greatest application in the production of ornamental flowers. Depending on the species being produced, there is an adequate substrate for each production. Thanks to a wide range of commercial substrates, they can be completely adapted to the type of plants, and provide everything they need in the most sensitive stage of life, as well as in later stages. The research is based of the possibilities and effectiveness of different substrates on growth and development of roots and above ground parts of the Globe amaranth (*Gomphrena globosa* L.), in the seedling phase and in the adult plant phase. The research was conducted in the Nursery "Gornja Puharska" Prijedor, during 2019. The substrates used in the experiment are a mixture of garden soil, Baltic and peat of Grahovo, Hawitta baltisches UBI 20 Tonsubstrat 2, and Klasmann-Deilmann - TS3 Medium basic substrate. Measurements of morphological parameters of growth and development of plants (plant height, number of leaves and flowers and flower diameter) were performed, as well as determination of fresh and dry weight of roots and above-ground parts and the number of seeds. Efficiency of use Klasmann-Deilmann - TS3 Medium basic substrate is reflected in an increase in the average value of vegetative morphological parameters (plant height and number of leaves) of seedlings and adult plants of the Globe amaranth. Furthermore, this substrate had a positive effect on both fresh and dry mass of adult plants, as well as the number of obtained seeds, compared to the other two substrates. Efficiency of use substrate which is a mixture of garden soil, Baltic and peat of Grahovo, is reflected in an increase in the average values of generative morphological parameters (number of flowers and flower diameter) of the Globe amaranth - *Gomphrena globosa* L., compared to applied commercial substrate.

Key words: substrate, *Gomphrena globosa* L., morphological parameters

P2_03

Floristic elements in the Danube park (Novi Sad, Serbia)

Milena Lakićević[1], Milena Maksimović[1], Branislava Pavlović[1], Mia Vicković[1]

[1] *Univeristy of Novi Sad, Faculty of Agriculture, Serbia*

Corresponding author: Milena Lakićević, milenal@polj.uns.ac.rs

Abstract

The paper presents the analysis of the floristic elements in the Danube park in Novi Sad, Serbia. The Danube park was established in 1895 and proclaimed a natural monument in 1998. This park occupies 3.9 hectares and has a total of 85 species of trees and shrubs existing in the park. From a biodiversity perspective, species richness and evenness, the park is one of the most valuable green areas in Novi Sad. The paper presents a brief history of the park establishment, but the research focus is on its plant material, and therefore the following analyses have been conducted: determination of all individuals of trees and shrubs present in the park, calculation of the family spectrum, and analysis of alpha biodiversity indices: Simpson, Shannon, Margalef and Fisher index. The three most dominant plant families are Berberidaceae, Oleaceae, and Caprifoliaceae with the share equal to 16%, 16%, and 15%, respectfully. The values of all calculated indices confirm that the park is valuable from a biodiversity perspective, i.e., the value of the Shannon index is equal to 3.574, while the value of the Simpson index is 0.958. The calculation of biodiversity indices is performed in the R program, using the package "vegan". The conducted research confirms the importance of the Danube park for floristic biodiversity preservation in the urban zones of Novi Sad.

Key words: flora, urban parks, biodiversity, biodiversity indices

P2_04

Poplar trees in the University park in Novi Sad (Serbia)

Milena Lakićević[1], Emina Mladenović[1], Saša Orlović[1], Lazar Pavlović[1], Ksenija Hiel[1]

[1] *University of Novi Sad, Faculty of Agriculture, Serbia*

Corresponding author: Milena Lakićević, milenal@polj.uns.ac.rs

Abstract

The University park in Novi Sad occupies 5.9 hectares and is situated in the campus area, close to the Danube riverbank. According to the analysis conducted in 2020, there are 13 woody species registered in the park represented by 295 specimens. All existing woody plants belong to the Angiospermeae division, and the three most dominant species are: Euroamerican poplar (*Populus* x *euramericana* (Dode) Guinier), common hackberry (*Celtis occidentalis* L.) and European hornbeam (*Carpinus betulus* L.). The paper focuses on the analysis of poplar trees, namely representatives of *Populus* x *euramericana* (Dode) Guinier and *Populus alba* L. Euroamerican poplar is the most dominant species in the park, with the share of 52% in overall tree species composition, while white poplar counts 8 tree specimens, and has a share of 2.7% in overall species composition. The analysis included the investigation of the main morphometric characteristic: height, DBH and crown width, followed by the determination of entomological and phytopathological damages, and the assessment of vitality and aesthetic value of each poplar tree. For the processing of numerical data we have used the programming language R (version 3.5.3) and its interface - RStudio (version 1.2.1335) and calculated the following statistical parameters (minimum, first quartile, median, mean, third quartile and maximum) for all morphometric characteristics. The general conclusion is that the specimens of Euroamerican poplar are well developed mature trees, affected by diverse types of damages, while the specimens of white poplar are mainly intact from the severe damages of any kind.

Key words: Populus x *euramericana, Populus alba*, R program, morphometric characteristics

P2_05

Nitrogen rates influence on radicchio yield and yield components

Dragan Žnidarčič[1]

[1] *Biotehnical Centre Naklo, Slovenia*

Corresponding author: Dragan Žnidarčič, dragan.znidarcic@bc-naklo.si

Abstract

Field experiments were laid out in two consecutive seasons between 2019 and 2020 on the laboratory field of Biotechnical centre in Naklo near Kranj, Slovenia (an altitude: 420 m; φ = 46° 16′ 18″; λ = 14° 18′ 56″). It was conducted with the objective of finding the effect of nitrogen application levels (0 - control, 50, 100, 150 and 200 kg/ha) and 6 cultivars ('Monivip', 'Castel Franco', 'Anivip', 'Foresto', 'Palla rossa' and 'Verona') on yield and yield components of headed chicory. Trial was arranged in spilt plot factorial scheme (main plot – N levels; subplots – cultivars) on randomized complete block design base with four replications for all the seasons. The N fertilizers were applied as KAN (27% calcium amonium nitrate) in two split doses (at transplanting and 40 days after transplanting). The experimental variables measured were fresh weight (g/plant) and yield attributes (dry matter, crop height, leaf number and head firmness).

There was no interaction effect of cultivar and nitrogen application levels of tested parameters. Highest fresh weight (360.2 g/crop) achived when the cultivars received 150 kg N/ha. In contrast, percentage of dry matter content and firmmness of radicchio heads decreased as increased soil N supply. Crops that received 150 kg N/ha recived heighst height (34.5 cm). N levels were not significantly effect on the leaf number of the mature heads.

Key words: radicchio, *Cichorium intybus*, cultivars, nitrogen, yield, yield components

P2_06

Grapevine water requirements in different regions of Serbia

Marija Ćosić[1], Aleksa Lipovac[1], Mirjam Vujadinović Mandić[1], Zorica Ranković – Vasić[1], Ana Vuković Vimić[1], Zoran Pržić[1], Dunja Sotonica[1]

[1] *Faculty of Agriculture, University of Belgrade, Serbia*

Corresponding author: Marija Ćosić, c.marija@agrif.bg.ac.rs

Abstract

Grapevine seasonal water requirements and hydromodule of a drip irrigation system were evaluated for fourteen administrative districts of Belgrade Region, Regions of Eastern, Southern and Central Serbia and Šumadija. Meteorological observations were analyzed at fourteen meteorological stations of the Republic Hydrometeorological Service of Serbia for the last 20 years (2000-2019). The observations were used to calculate referent evapotranspiration, effective precipitation and grapevine evapotranspiration. Water deficit during the vegetation (March-September) were estimated as a difference between the sum of the grapevine evapotranspiration and effective precipitation. The largest water deficit occurs in July, which is the month of peak water consumption. The average seasonal water deficit for the grapevine is about 138 mm, hydromodule of a drip irrigation system in the month of the greatest water needs (July) is in average 0.45 $l \cdot s^{-1} \cdot ha^{-1}$. Increased frequency of dry periods during the summer months and the reduction and irregular distribution of precipitation during the vegetation period are consequences of the ongoing climate change. Therefore, irrigation became a necessary measure of climate change adaptation in agricultural plant production. In viticulture, the maximum income is not always related to the maximum yields, but rather to finding and maintaining the balance between the quality and quantity of yields. Irrigation improves water use efficiency, morphological and physiological plants characteristics and grapes quality. However, these improvements are not always achieved by the full irrigation regime, but more often by applying the regime of deficit irrigation. Aim of this research is to support producers, based on the grapevine water requirements and available soil and water resources, to select appropriate cultivation system, agro- and ampelo-technical measures that will provide high level yield and grape quality.

Key words: grapevine, water deficit, climate change, irrigation, hydromodule

P2_08

Distribution of invasive species *Phyllocnistis vitegenella* Clemens (Lepidoptera: Gracillariidae) on grapevine in Serbia

Marija Simonović[1], Jovana Miletić[1], Milica Veselinović[1], Draga Graora[1]

[1] *University of Belgrade - Faculty of Agriculture, Serbia*

Corresponding author: Marija Simonović, marija.simonovic@agrif.bg.ac.rs

Abstract

Leafminers represent one of the most important groups among invasive phytophagous insects, while some leaf-mining species are significant pests in agriculture, forestry and urban areas, as well. One of them is american grapevine leafminer, *Phyllocnistis vitegenella* Clemens (Lepidoptera: Gracillariidae), which has been introduced from North America to Italy (1994). Since then, this species spread to many European countries. In Serbia, american grape leafminer was recorded for the first time in vineyard in Neštin area, in September 2019. As this invasive species adapts well to the new environmental conditions it has the potential to become an important grapevine pest. Therefore, the aim of this study was to determine distribution of *P. vitegenella* on grapevine (*Vitis vinifera* L.) in Serbia. The research was conducted during 2020 in total of 31 localities in Serbia (9 vineyards and 22 private yards). After visual inspection of grapevine, leaves with mines that contains larvae or pupae were sampled and transported to the laboratory where these preimaginal stages were reared in Petri dishes to adult eclosion in order to species identification. During research, presence of *P. vitegenella* was recorded in 25 localities (5 vineyards and 20 private yards). The results of this research indicate that *P. vitegenella* spread to many areas of our country in just one year after being recorded for the first time in northern part of Serbia. The presence of this species on grapevine not only in private yards, but also in vineyards, indicates its successful acclimatization, which will be the subject of further research.

Key words: Phyllocnistis vitegenella, grapevine, distribution, invasive species

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P2_09

Presence and harmfulness of San Jose scale, *Comstockaspis perniciosa* (Comstock) on cherry trees

Draga Graora[1], Marija Simonović[1], Marina Dervišević[2], Novica Miletić[1]

[1]*University in Belgrade -Faculty of Agriculture, Belgrade, Republic of Serbia*
[2]*Biounik d.o.o., Research and Development Center, Belgrade, Republic of Serbia*

Corresponding author: Draga Graora, dgraora@agrif.bg.ac.rs

Abstract

San Jose scale, *Comstockaspis perniciosa* (Comstock) is polyphagous species which inhabits many fruit trees, most commonly apple, pear and cherry. It is a quarantine pest in many countries. However, in Serbia it has recently lost this status. Presence of San Jose scale on fruits intended for export is not allowed. Presence and harmfulness of *C. perniciosa* were evaluated on cherry (*Prunus avium* L.) during 2020/21 in Radmilovac locality. The orchard was in the seventh year of age and the dominant variety was Burlat. In order to reduce scale population, late winter treatment with mineral oil (Nitropol, 1.5%) was done on 25.02.2021 in phenophase swelling buds. Infested twigs were sampled troughout the season. After sampling, the abundance of scales, as well as their vitality, were monitored in laboratory using binocular. San Jose scale develops three generation per year and overwinters as first instar larvae on woody parts of the cherry. In the observed locality, all above-ground parts of the plant were heavily infested. Feeding of such a high number of individuals caused redness, yellowing and drying of the leaves as well as drying of thin twigs. The symptoms on trunk and branches were manifested in the form of wounds from which amber-colored resin is excreted. It darkens over time and the bark of the tree cracks and dries. Damaged plants are physiologically weakened, do not have sufficient nutrients for the formation of fertile buds, they are more susceptible to the attacks of other pests and diseases, as well as to frosts. Since scale is easily transmitted by plant material, strict phytosanitary control and use of healthy plant material are the best preventive measures for controlling this pest. Late winter treatment of cherry trees is necessary measure for controling this pest. During this research, the use of mineral oil-based preparation has achieved good results, thus reducing populations of *C. perniciosa* to a minimum.

Key words: San Jose scale, harmfulness, cherry, pest control

Acknowledgments: This research was funded by grants 451-03-9/2021-14/200116 of Ministry of education, Science and Technological Development, Republic of Serbia.

P2_10

The influence of extraction solvents on the antioxidant potential of St. John's wort (*Hypericum perforatum* L.)

Marijana Peić Tukuljac[1], Dejan Prvulović[1], Sonja Gvozdenac[2]

[1]*University of Novi Sad, Faculty of Agriculture, Novi Sad, Serbia*
[2] *Institute of Field and Vegetable Crops Novi Sad, Novi Sad, Serbia*

Corresponding author: Marijana Peić Tukuljac, peictukuljacmarijana@yahoo.com

Abstract

Hypericum perforatum L. (St. John's wort) is medicinal plant with high antioxidant, anti-inflammatory, antiviral, antimicrobial and antitumoral activities, used in treatments of many diseases. In this paper content of polyphenols compounds (total phenols, tannins and flavonoids) and antioxidant potential of methanol, ethanol, acetone and aqueous extracts of Hyperici herba were evaluated. The highest concentration of total phenols and total tannins were found in acetone extracts. The highest total flavonoids amount was detected in alcohol extracts. Acetone extracts showed the strongest antioxidant capacity. The results suggested that polyphenols are one of the main compounds responsible for antioxidant activity of *Hipericum perforatum* L. extracts. Due to its chemical composition *Hipericum perforatum* L. is valuable raw material for pharmaceutical and cosmetical industry.

Key words: St. John's wort, antioxidant capacity, polyphenols

P2_11

Sensitivity of flower buds of sweet cherry cv. Carmen on different rootstocks during the ecological dormancy

Boban Đorđević[1], Dejan Đurović[1], Gordan Zec[1]

[1]*Faculty of Agriculture, University of Belgrade*

Corresponding author: Boban Đorđević, b.djordjevic@agrif.bg.ac.rs

Abstract

The study examined the influence of five vegetative rootstocks on the sensitivity of flower buds of sweet cherry cultivar Carmen to frost during the period of ecological dormancy. The study was carried out at commercial orchard located in OFD Radmilovac, Belgrade, in the five growing years (2020). Cultivar Carmen was grafted on following rootstock: Colt, Gisela 5, Gisela 6, Maxma 14 and Oblačinska cherry. Winter frosts occurred during the ecological dormancy on March 14th and 15th. The intensity of frost was – 7 °C. The percentage of damage and non-damage flowers per fruiting branches was determined by couting (50 flowers buds per tree were taken from every part of canopy and fruiting branches. The highest damage of flowers buds had trees grafted on Oblačinska cherry, average 77% of flower buds, while the lowest had trees grafted on Maxma 14, average 24% of total flower buds. Significantly higher sensitivity of flower buds had short fruiting branch compared to long fruiting branch. The highest productivity had trees grafted on Gisela 6 and Maxma 14.

Key words: rootstock, sweet cherry, ecological dormacy, flower bud

P2_12

Irrigation water requirement of fruit trees in the Central, West and South Serbia on a district scale

Aleksa Lipovac[1], Dragan Nikolić[1], Dejan Djurović[1], Djordje Boškov[1], Mirjam Vujadinovć-Mandić[1], Ana Vuković-Vimić[1], Marija Ćosić[1]

[1] *Faculty of Agriculture, University of Belgrade, Serbia*

Corresponding author: Aleksa Lipovac, alipovac@agrif.bg.ac.rs

Abstract

A common problem of all fruit producers is establishing the optimal irrigation schedule (irrigation interval and amount of water) which would provide a high-quality yield with efficient use of water, preservation of soils and the environment. In this study, Seasonal Irrigation Water Requirement (SIWR) was calculated from the difference between the crop evapotranspiration (ETc) and effective rainfall (Pe) for the fruit crops in the 13 districts of Central (CS), West (WS), and South Serbia (SS). Analysed fruit production averaging around 9.8% of total arable land area. Depending on the crop water requirements and grass cover (GC) fruits were separated into seven groups: apples, pears, plums, walnuts and hazels without GC (I) and with GC (II); apricots, peaches, nectarines without GC (III) and with GC (IV); sweet cherries, sour cherries without GC (V) and with GC (VI) and raspberries, blackberries, blueberries (VII). Reference evapotranspiration (ETo), Pe, ETc, and SIWR were calculated based on FAO-56 methodolgy using daily meteorological data (mean, maximum and minimum temperature ,extra-terrestrial radiation and rainfall) for the period 2000-2019 obtained from 13 meteorological stations. The average SIWR amounts to 349, 541, 153, 272, 123, 220, and 207 mm for all the seven groups; I, II, III, IV, V, VI, and VII, respectively. Spatially SIWR values ranged from 232.8, 366.5, 428.2 mm for WS, CS, and SS districts respectively. Depending on whether the orchard is grass-covered or not ETo changes significantly. Crop evapotranspiration is 26% higher in the GC orchards compared to the orchards without GC. Great differences in SIWR going from Western to Eastern parts of Serbia indicate that for good irrigation practices and efficient irrigation system design, it is necessary to adopt SIWR calculated on a district scale or even farm scale. Obtained results indicate that besides SIWR, selecting the proper agronomy practices and growing systems has a significant impact on obtaining high-quality yields while saving water and preserve soils.

Key words: Irrigation Water Requirements, fruit plantations, evapotranspiration, grass-cover

P2_13

Effects of thermovinification and carbonic maceration on polyphenols extraction cv. Cabernet sauvignon

Nikolina Lisov[1], Ivana Plavšić[1], Aleksandar Petrovic[1], Ljiljana Gojkovic Bukarica[2]

[1] Faculty of Agriculture, Serbia
[2] Faculty of Medicine, Serbia

Corresponding author: Aleksandar Petrovic, zesta@verat.net

Abstract

In this study, the impact of winemaking technique: classical vinification with different maceration time (7 (CC7) and 14 (CT14) days); thermovinification (60°C (T60) and 80°C (T80) and carbonic maceration (CM) on the total phenolic content and phenolic acids in wines was studied. Total phenolic content in wine samples was determined by the Folin–Ciocalteu's (FC) method using gallic acid as a standard and phenolic acids in wines were performed by UPLC H-Class System. It was conducted that the application of thermovinification (T60°C, 2800mg GAE/l; T80°C, 3130 mg GAE/l) leds to higher total phenolic content then in wines CT14 (1395 mg GAE/l). On the other hand, total phenolic content of CM wines were a lower than those in the wines made by CC7, which lasted 7 days. All phenolic acids have had higher content in samples CT14, except caffeic acid which was the highest for T60 sample (7,5819 mg/l).

Key words: thermovinification, carbonic maceration, total phenolic content and phenolic acids

P2_14

Effect of substrate type and volume of container pots on the morphological characteristics of lettuce (*Lactuca sativa* L.) seedlings

Đorđe Vojnović[1], Žarko Ilin[1], Boris Adamović[1], Gabrijela Koprivica[1]

[1] *University of Novi Sad, Faculty of Agriculture, Serbia*

Corresponding author: Đorđe Vojnović, djordje.vojnovic@polj.edu.rs

Abstract

Improvement in lettuce (*Lactuca sativa* L.) seedling production is a true challenge because young lettuce reacts differently depending on the substrate. Hence, this study's objective was to examine the effects of substrates type and volume containers pots on the morphological characteristics of seedlings lettuce, grown under greenhouse conditions. The experiment was conducted in August and September 2020 in a greenhouse located in Čelarevo, Serbia. The trial comprised of a factorial combination of three substrates type (S1: 50% white peat + 50% black peat; S2: 100% white peat and S3: 100% black peat) and three levels of volumes containers pots (V1: 25 cm^3; V2: 37 cm^3 and V3: 60 cm^3) with three replications. This study showed that the tallest plants were in the treatment S2V3 (13.21 cm), opposed to the treatment S3V3 where the shortest plants height was recorded (7.73 cm). The highest number of leaves was obtained at the S2V3 (9.26) and the lowest was found at the S3V1 (7.00), i.e. it significantly increased by 24.41%. The longest root was found at the S1V3 (4.96 cm) and the shortest at S2V1 (2.94 cm). The average weight of leaves in the experiment ranged from 1.23 g to 7.36 g, while the average weight of root ranged from 0.55 g to 1.35 g. In general, this study represents the base for developing agronomic strategies for lettuce seedlings production under greenhouse conditions.

Key words: Lactuca sativa L., leaf lettuce, seedling, greenhouse

P2_15

Tropane alkaloids in mint teas at the Serbian market

Gorica Vuković[1], Tijana Stojanović[2], Aleksandra Petrović[2], Bojan Konstantinović[2], Nikola Puvača[3], Dušan Marinković[2], Bojana Špirović Trifunović[1], Vojislava Bursić[2]

[1] *University of Belgrade, Faculty of Agriculture, Serbia*
[2] *University of Novi Sad, Faculty of Agriculture, Serbia*
[3] *University Business Academy in Novi Sad, Faculty of Economics and Engineering Management in Novi Sad, Department of Engineering Management in Biotechnology, Serbia*

Corresponding author: Vojislava Bursić, bursicv@polj.uns.ac.rs

Abstract

The interest in tropane alkaloids as food contaminants has been increasing. Tropane alkaloids are plant toxins that mainly occur in *Atrop*a, *Datura* and *Hyoscyamus* sp belonging to the Solanaceae family. The sensitive and selective LC-MS/MS method was applied for the analysis of atropine and scopolamine in mint tea samples from the Serbian market. Tea, which has beneficial properties thanks to the phenolic compounds, can be accidentally contaminated by many weed seeds, which contained the tropane alkaloids, during harvest. Only the tropane alkaloids present in the tea bags before the tea making were analysed. Atropine and scopolamine were detected in 30% of the analysed samples in the concentration above the limit of quantification.

Key words: atropine, scopolamine, mint tea

P2_16

Prunus fruits – powerful functional fruits

Bojana Blagojević[1], Anna Teresa Serra[2], Maja Milović[3], Ružica Ždero Pavlović[3], Tatjana Jurić[3], Nenad Magazin[3], Alicja Kucharska[4], Boris Popović[1]

[1] Faculty of Agriculture, University of Novi Sad, Serbia
[2] Instituto de Tecnologia Química e Biológica António Xavier, Universidade Nova de Lisboa (ITQB NOVA), and iBET, Instituto de Biologia Experimental e Tecnológica, Portugal
[3] Faculty of Agriculture, University of Novi Sad, Serbia
[4] Department of Fruit, Vegetable and Plant Nutraceutical Technology, Faculty of Food Science, Wroclaw University of Environmental and Life Sciences, Poland

Corresponding author: Bojana Blagojević, bojana.blagojevic@polj.uns.ac.rs

Abstract

Prunus L. is a genus of commercially most exploited stone fruits, like plums, cherries, peaches, apricots. Many wild growing and decorative species also belong to this genus. The aim of the study was to examine different *Prunus* species from Vojvodina (north Serbia) in order to assess their biological potential and to evaluate the correlations between polyphenol constituents and tested bioactivities. There were investigated plum and some autochthonous plum species (*P. domestica* L. and *P. insititia* L.), white and red cherry plums (*P. cerasifera* Ehrh.), purple-leaf cherry plum (*P. pissardi* Carrière), sweet cherry (*P. avium* L.), sour cherry (*P. cerasus* L.), apricot (*P. armeniaca* L.), peach (*P. persica* (L.) Batsch), mahaleb cherry (*P. mahaleb* L.), blackthorn (*P. spinosa* L.), and steppe cherry (European dwarf cherry, *P. fruticosa* Pall.). Phenolic profile was determined by UPLC-Q-TOF-MS/MS method and bioactivities were tested in vitro. There were assessed antioxidant capacity, inhibition of carbohydrate hydrolyzing enzymes α-amylase and α-glucosidase, and antiproliferative activity on human colon cancer cells HT29. Blackthorn, steppe cherry, and mahaleb cherry were highlighted with the highest phenolic content and the most powerful bioactivities among the tested fruits. The strongest antioxidant capacity was in accordance with the highest phenolic content. Boosting antioxidant response of the organism is important, because mitigating oxidative stress is the underlying mechanism for many health benefits, including management of chronic diseases. Inhibition of intestinal α-amylase and α-glucosidase activities reduces the release of glucose molecules, leading to its lower uptake. This is one of the strategies of type 2 diabetes management. Despite moderate inhibition of α-amylase, almost all examined fruits exhibited the α-glucosidase inhibition activity better than commercially used inhibitor acarbose.

Antiproliferative activity assessment on HT29 cells showed very good potential of *Prunus* fruits for combined therapies with anticancer drugs for more effective results.

Key words: Prunus, polyphenols, bioactive potential, functional food

P2_17

The influence of the exploitation period of the orchard sprayer on the technical correctness of the measuring regulatory system

Biljana D. Bošković[1], Miloš Pajić[1], Milan Dražić[1],
Kosta Gligorević[1], Mitar Davidović[1]

[1]*University of Belgrade, Faculty of Agriculture, Zemun – Belgrade, Serbia*

Corresponding author: Biljana D. Bošković, biljana.boskovic@agrif.bg.ac.rs

Abstract

The effective implementation of chemical protection in fruit and grapevine production is possible with use of technically correct orchard sprayer. The paper presents the results obtained during the control testing of 41 different models of orchard sprayers, with different period of exploitation in agricultural holdings across Serbia that are used in intensive fruit and viticultural production. During the control testing, a large number of parameters were monitored, using standardized methods and test procedures. What is specifically analyzed in this paper is the technical correctness of the manometer as a corrective device of the *Measuring regulatory system* of the orchard sprayer. Checking the correctness of the manometer ensures the appropriate working pressure of the liquid in the designed range, which significantly improves the quality of chemical protection and extends the life of the nozzle. Out of the total number of investigated orchard sprayers, 31% are in exploitation for less than three years, while the largest number of orchard sprayers ie. 44% is in exploitation for seven years or more. The technical correctness of the manometer group 1 is at a high level (C_{ta}= 0.80) compared to other groups of tested orchard sprayers. Group 2 and group 3 have an identical coefficient of technical accuracy of the manometer (C_{ta} = 0.66 - 0.68). Low coefficient of technical accuracy of the orchard sprayers manometer (C_{ta} = 0.38) occurs in group 4, which shows the direct dependence of the technical correctness of the manometer on the period of exploitation of the orchard sprayer.

Key words: coefficient of technical accuracy, control testing, chemical protection, period of exploitation of the orchard sprayer

P2_18

Morphological variations of seed characteristics in studied populations of Yellow gentian in the area of Kupres Heights

Borut Bosancic[1,2], Ljubica Vavan[1,2], Sonja Raseta[1,2], Marina Antic[1,2], Petar Nikolic[1,2], Branimir Njezic[1]

[1]*Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina*
[2]*Genetic Resources Institute, University of Banja Luka, Bosnia and Herzegovina*

Corresponding author: Borut Bosancic, borut.bosancic@agro.unibl.org

Abstract

Yellow gentian (*Gentiana lutea* L.) is a perennial herbaceous plant cultivated and foraged for pharmacological purposes related primarily to its root. It has limited ecological range to its indigenous high mountainous areas of South Europe and is also endangered by intensive harvesting in nature. The aim of this research is to study variations and possible differences in morphological traits of seeds collected from different populations which could prove to have further impact on seed development and production of plantlets. Thousands of seeds were collected from individual plants originating from each of the four studied populations in the area of Kupres Heights. Number of traits was measured on samples from each studied population, i.e. seed length with wings, seed width with wings, length of the seed without wings, width of the seed without wings and seed mass. The results of the analysis indicated that the populations were significantly different for most of the measured morphological characteristics. The most favourable situation was in the Ponori population, except for the seed width without wings. The largest seed width without wings was recorded in the population of Poljana. The least favourable situation was with seed characteristics related to the Ljubuša population. Studied populations of Yellow gentian differed in quality of produced seed. All populations are thriving and environmental factors did not vary to large extent so there was no reason to assume such difference prior to the study. As the results indicated that populations differed significantly for most measured characteristics that further raises the issues of whether these differences affect seed germination and seedling quality. There is also an issue which of the characteristics will most effect the germination and quality of produced plantlets. The study indicated that it is pivotal to take into consideration population structure prior to seed collection for further cultivation.

Key words: genetic resources, medicinal plants, foraging, endangered species, morphological variability

Section 2: HORTICULTURE

Oral Presentations

02_01

Comparative analysis of University-business cooperation in agriculture in the Western Balkans and EU

Miljan Cvetković[1], Alisa Hadžiabulić[2], Silva Grobelnik Mlakar[3]

[1]*University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*
[2]*Džemal Bijedić, University of Mostar, Bosnia and Herzegovina*
[3]*University of Maribor, Slovenia*

Corresponding author: Miljan Cvetković, miljan.cvetkovic@agro.unibl.org

Abstract

University-business cooperation has a long history, but it is not developed as it was initially planned to be done. There are significantly a lot of examples of recognition of the values and the opportunities that lay in entrepreneurship and the role of education in stimulation of such activities. There are numerous benefits of university-business cooperation in this field which should result with sustainability and new development opportunities. The aim of this paper is to present a comprehensive and up-to-date understanding of the situation of university-business cooperation in agriculture and the use of ICT in agriculture in the Western Balkans and the EU, as well as to develop policy recommendations on how to better organize and improve this cooperation. The research methodology is based on the use of questionnaires. On-line surveys were created with in late spring 2020 and conducted among certain target groups in participating countries. Knowledge transfer is mainly addressed to farmers and advisors and to lesser extent to other stakeholders in the sector. Business sector do not have enough knowledge of what to expect from graduates and higher education institutions. On the other hand, universities have a similarly low level of knowledge concerning business needs. The results are comprehensive and provided better overview about the real knowledge on ICT and readiness to use it. As the digital transformation takes place, the agricultural environment is constantly evolving and can eventually be transformed into digital and smart agriculture. Understanding the major changes, we will be able to identify gaps, risk and opportunities and how they are driving new business models, adopting technologies and finally changing the economic, social and environmental elements in the digital age. One of the main recommendations would be the usage of the positive experience and good practice of European universities in university-business cooperation at universities in the Western Balkans. As a main conclusion, we must emphasize that in most areas there is a well-developed digital infrastructure, which is a prerequisite for digital agriculture. So, the first step has been made and it is up to the parties involved to take advantage of the opportunities provided.

Key words: University-business cooperation, ICT in agriculture

Acknowledgment: The research is part of report WP 1.1. titled "Comparative analysis report on university business cooperation in agriculture and use of ICT in agriculture" realized trough Er asmus+ project VIRAL. The research is done in collaboration with the institutions: Wageningen University, University in Tuzla, Innovation center Banja Luka, Agro-voće, Foundation for innovation and technology development, \"Plantaže 13 juli, Montenegrin association for new technologies, University of agronomic sciences and veterinary medicine of Bucureşti, University Bijeljina, Western Balkans institute, University Donja Gorica, Jaffa Komerc.

02_02

Fruit characteristics of *Pyrus elaeagrifolia* Pall. genotypes in Eastern Turkey

Neva Karatas[1], Sezai Ercisli[1]

[1] *Ataturk University, Erzurum*

Corresponding author: Sezai Ercisli, sercisli@gmail.com

Abstract

More recently, there were increased interest to lesser-known fruits, which found in nature as free of pests and diseases. One of this specie is the oleaster-leafed pear (*Pyrus elaeagrifolia*) and its fruit is highly valued for both processing and human health benefits. In this study, a comparative study on phenological (ripening dates), morphological (fruit weight, fruit length/width ratio, fruit pedicel length, fruit flesh texture, fruit firmness and the number of seeds per fruit) and biochemical (soluble solid content, titratable acidity, total phenolic content, vitamin C and antioxidant activity) characteristics of twenty-six oleaster-leafed pear (*Pyrus elaeagrifolia*) genotypes were determined. Ripening dates, fruit weight, fruit length/width ratio, fruit pedicel length and fruit firmness were in range of 18 October to 07 November; 6.19 g to 21.04 g; 0.75 to 1.03; 7.11 mm to 18.56 mm and 3.84 to 8.22 kg/cm^2, respectively. Soluble Solid Content (SSC), titratable acidity, vitamin C and total phenolic content were found between 11.90-20.35%; 0.42-1.24%; 4.7-7.3 mg/100 g and 57-108 mg gallic acid equivalent per 100 g fresh fruit base, respectively. Oleaster-leafed pear fruit contains edible and non-edible portions, and this study provided the one of the first detailed report on the diversity of a wide range of phenological, morphological and biochemical data in edible parts of the fruit.

Key words: Pyrus elaeagrifolia, diversity, morphology, biochemical content

02_03

The influence of reflective materials on fruit characteristics and red skin coloration of "Idared" apples

Radoš Zelenbabić[1], Boris Pašalić[2], Miljan Cvetković[2]

[1] *Agriculture Payments Agency Ministry of Agriculture Forestry and Water Management, Bosnia and Herzegovina*
[2] *University of Banja Luka Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Miljan Cvetković, miljan.cvetkovic@agro.unibl.org

Abstract

Agro- and pomotechnical measures can significantly increase the level of utilization of available light in apple production. This is especially important when growing apples in vigor combinations of varieties / rootstocks. The aim of this paper is to examine the impact of the use of different reflective materials in regular apple production. The research was performed during a two - year period in a production plantation on the territory of Gradiška. During 2018 and 2019, the possibilities and effects of the application of reflective materials on the basic characteristics of fruits of the Idared variety grafted on the MM106 rootstock were examined. "Mylar" reflective foil and plastic nylon painted white were placed in a row space 60 cm wide on both sides of the row, 4 to 5 weeks before harvest. After placing the reflective materials, the growth of fruits was monitored. In the phase of physiological maturity, fruits were harvested and analyzed in laboratory conditions. Reflective materials had an impact on certain characteristics of the fruit and especially the manifestation of the basic and additional coloration of the fruit.

Key words: apple, fruit quality, coloration

02_04

Vegetative characteristics and initial fruit-bearing capacity of pear grown on different training systems

Ljubica Vavan[1], Ermin Suljkanović[1], Miljan Cvetković[1]

[1] *University of Banja Luka, Bosnia and Herzegovina*

Corresponding author: Ljubica Vavan, ljubicavavan96@gmail.com

Abstract

Pear is the third most important fruit species in Republika Srpska, right after plums and apples. The cost-effectiveness of production is largely determined by the use of pear seedlings (Pyrus communis L.) as the most important rootstock, as well as by the characteristics of cultivated varieties. The introduction of cultivation forms that can absorb the initial lushness of a pear grown on a seedling can be of great importance. The aim of this study is to examine the vegetative characteristics and initial yield potential of pears grown in the cultivation forms "Bi-baum" and "UFO" (Upright Fruiting Offshoot). As a control, the pear is grown in the form of a slender spindle. The research was conducted during spring of 2021 with varieties ‘Williams’, ‘Clapp’s favorite’ and ‘Buttira Precoce Morettini’. In the second year of age, basic vegetative parameters and initial fertility (number and structure of fruiting branches and fruiting buds on the trees) were analyzed. Preliminary research indicates that the largest cross section of the trunk was found in the variety ‘Williams’ (39.01 mm) in the UFO system and the largest length of all branches (regardless of age) had the variety ‘Buttira Precoce Morettini’ (6670 cm) in the "Bi-baum" system. The largest number of fertile buds (172.4) was found in the variety ‘Williams’ grown on the spindle system. The research is of special importance in terms of finding the optimal cultivation form for growing pears on a non-generative basis in the agro-ecological conditions of northwestern Bosnia.

Key words: pear, variety, fruiting branches, buds

02_05

Some important fruit characteristics of diverse *Elaeagnus angustifolia* L. genotypes from Coruh valley in Turkey

Halil Ibrahim Sagbas[1], Gulce Ilhan[1], Sezai Ercisli[1]

[1]*Ataturk University, Agricultural Faculty, Department of Horticulture, Erzurum, Turkey*

Corresponding author: Sezai Ercisli, sercisli@gmail.com

Abstract

Russian olive (*Elaeagnus angustifolia*) fruit are used for traditional food and dietary supplements in Eastern Europe, Balkans, Anatolia and near Asia. The specie morphologically included numerous diverse genotypes and also contain large amounts of phytochemicals that may benefit human health. Information on the effect of genotype on some important fruit traits is needed in order to formula better breeding strategies for Russian olive. The main fruit characteristics of Russian olive genotypes were evaluated from 10 native grown plants at Coruh valley in Turkey. Results showed that genotype influenced fruit weight, shape index, peel and flesh color, total phenolic content and antioxidant activity. The fruit weight ranged from 0.96 g (EA6 genotype) to 2.09 g (EA9) genotype. The majority of genotypes had cream flesh color but white cream color was also evident. Total phenolic content varied from 433 mg GAE/100 g FW (EA1) to 604 mg GAE/100 g FW (EA7). Genotypes EA9 and EA3 had significantly higher fruit weight and genotypes EA7 and EA2 had the highest antioxidant capacity, and they may be good selections for producing health Russian olive products.

Key words: Russian olive, composition, analysis

02_06

Sugar and organic acids in ungrafted loquat (*Eriobotrya japonica* Lindl.) genotypes in Coruh valley in Turkey

Gulce Ilhan[1], Sezai Ercisli[1]

[1] *Ataturk University, Erzurum, Turkey*

Corresponding author: Sezai Ercisli, sercisli@gmail.com

Abstract

Located northeastern part of Turkey, Coruh valley is accepted one of the 34 plant biodiversity hotspots in the world. The valley is very rich in terms of indigenous fruit species. Present study describes specific sugar and organic acid content in fruits of seven un-grafted loquat genotypes. Specific sugars and organic acid contents of heritage loquat genotypes were studied at harvest. The standard cultivars cv. Sayda was included in the study. HPLC results indicated the presence of four specific sugars such as glucose, fructose, sucrose and maltose and five organic acids such as malic, tartaric, oxalic, citric and succinic acid in loquat fruits. Glucose was the major sugars and malic acid was the predominant organic acid for all genotypes and cv. Sayda. At harvest, the fruit juice content of glucose, fructose, sucrose and maltose ranged from 5.80 to 7.22 mg/100 g, 3.90 to 5.74 mg/100 g, 1.11 to 1.62 and 0.14 to 0.77 mg/100 g, respectively. The malic acid content varied from 407 to 611 mg/100 g, tartaric acid from 104 to 142 mg/100 g, oxalic acid from 22 to 35 mg/100 g, succinic acid from 10 to 24 mg/100 g and citric acid from 7 to 12 mg/100 g, respectively. The distribution pattern of individual sugars and organic acids can be used in the development of commercial, industry and contract industry loquat cultivars that would target specific consumer requirements and consumer health.

Key words: Content, loquat, organic acids, sugars

02_07

Biochemical differences between cultivated (*Vitis vinifera* L. ssp. *vinifera*) and wild grapevines (*Vitis vinifera* L. ssp. *sylvestria* (Gmelin) Hegi)

Muhammed Kupe[1], Sezai Ercisli[1]

[1] *Ataturk University, Erzurum, Turkey*

Corresponding author: Sezai Ercisli, sercisli@gmail.com

Abstract

In the present study, berry biochemical composition of 7 wild grapevine and 2 standard grape cultivars grown in Coruh valley in Turkey were examined. Results showed significant differences exist among all genotypes across a number of biochemical properties. The wild grapevine genotypes generally showed smaller berry size, variable berry color and biochemical content. Total phenolic, total anthocyanin and total tannin content were found quite variable among wild and cultivated grapevines ranged from 137 to 441 mg GAE/100 g; 29 to 107 mg/100 g and 33 to 71 mg/100 g, respectively. Radical scavenging capacity of wild genotypes were between 56-81% while it was 61% for cv. Cavus and 76% cv. Manda gozu. Wild genotypes C5 showed some advantages such higher total phenolic content, total tannin and radical scavenging capacity. Biochemical analysis revealed that wild grapevine genotypes present a potential sources for qualitative traits in grapevine breeding programs.

Key words: Grape, wild, biochemistry, differences

02_08

Morphological definition populations of *Allium ursinum* L. from the western part of the Republic of Serbia

Stefan Gordanić[1], Aleksandar Simić[2], Dragoja Radanović[1], Tatjana Marković[1], Snežana Mrđan[1], Sandra Vuković[2], Vladimir Filipović[1], Sara Mikić[1], Đorđe Moravčević[2]

[1] *Institute for the Study of Medicinal Herbs "Dr Josif Pančić", Belgrade, Republic of Serbia*
[2] *Faculty of Agriculture, University of Belgrade, Belgrade, Republic of Serbia*

Corresponding author: Stefan Gordanić, sgordanic@mocbilja.rs

Abstract

In Western Serbia, at an altitude of 80 to 1211 m, thirteen populations of wild garlic (*Allium ursinum* L.) were discovered at different localities in eight different soil types. Plant material was sampled from each of the thirteen localities by the method of random sampling. Morphological parameters were measured on the sampled plant material: length of aboveground and underground part of the plant, bulb thickness, weight, length, leaf width, length and thickness of the flower stalk, with the aim of assessing the locality that has the most productive morphological parameters. The populations of *Allium ursinum* growing on the mountains Povlen and Rudnik have the most productive morphological parameters. It can be said that wild garlic in these two localities is the most adequate plant material for harvesting fresh plant material, which will be used for other research in agronomy.

Key words: bulbs, morphometric data, populations, wild garlic

02_09

Antioxidant capacity of wild-growing orange mullein (*Verbascum phlomoides* L.)

Radenka Kolarov[1], Dejan Prvulović[1], Sonja Gvozdenac[2]

[1] *Faculty of Agriculture, University of Novi Sad, Serbia*
[2] *Institute of Field and Vegetable Crops, Serbia*

Corresponding author: Radenka Kolarov, kolar.rada@gmail.com

Abstract

Orange mullein is a biennial plant belonging to the figwort (Scrophulariaceae) family. The flowers are arranged in spikes located on the top of the stem, vivid yellow. It is a drought and cold-tolerant plant requiring much sunlight that grows on on pastures, roadsides, in dry weed associations. The subject of the study were leaves and flowers of the plant extracted in four different solvents, distilled water, 70% acetone, 70% methanol and 70% ethanol. Total phenolics are more present in the leaves and reaches a value of up to 15.70 mg of gallic acid per g of dry weight of plant material, while flavonoids are more dominant in flowers and reach a value of 5.82 mg of quercetin per g of dry weight of plant material. It is the flavonoids that are mainly responsible for the high antioxidant activity establishing a correlation with all the tests performed, including FRAP, ABTS, DPPH, total antioxidant activity, total reduction capacity and NBT reduction test.

Key words: orange mullein, polyphenols, antioxidant capacity, Kopaonik

02_10

In vitro trials of antifungal effect using pyrophyllite

Zorana Đekanović[1], Mišaela Vakić[1], Mariana Mihaljica[1], Duška Delić[1]

[1] *Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina*

Corresponding author: Duška Delić, duska.delic@agrounibl.org

Abstract

During autumn 2019 fungal pathogens from genus *Phoma*, *Sclerotinia* and *Fusarium* were used as a model pathogens to examined antifungal influence of pyrophyllite. Pyrophyllite is a phyllosilicate mineral composed of aluminium silicate hydroxide: $Al_2Si_4O_{10}(OH)_2$. For the study mechanically and gel modified fractions of pyrophyllite from Parsovići-Konjic mine, Bosnia and Herzegovina, BiH were used. Fungal isolates of *Phoma glomerata* (Corda) Wollenw. & Hochapfel caused blossom of grapevine inflorescence, *Fusarium* sp., from wilted potato and pepper and *Sclerotinia sclerotionum* (Lib.) de Bary from potato with stem rot were plated on potato dextrose agar (PDA) medium in which three different amounts of gel modified pyrophyllite fractions of < 100 μm and +0-2 mm and mechanically modified fractions of < 100 μm, < 45 μm and + 0-2 mm were added. For control pure PDA without added pyrophyllite has been used. Antifungal activity of pyrophyllite was assess measuring Petri dishes diameter of the colony areas. The growth of fungal colonies on plates with addition of pyrophyllite was compared with the colonies growth on PDA plates without addition. Inhibitory effects were observed against all the tested isolates of fungi. The strongest inhibition have been determined for *P. glomerata* and *Fusarium* sp., with mechanically modified fractions of < 45 μm and + 0-2 mm, while minimum have been recorded for *S. sclerotionum*. *In vitro* results of this work reveal antifungal effects pyrophyllite against three fungal isolates causal agents of different plant diseases. This pilot bioassay provides promising results for future *in vivo* trials of pyrophyllite against fungal pathogens in different crop.

Key words: Biocontrol, natural compounds, plant defense stimulants

02_11

Forecasting the occurrence of raspberry grey mold disease (*Botrytis cinerea* Pers.) and fungicide efficacy

Mišaela Vakić[1], Mirko Jokić[2], Mariana Mihaljica[1], Siniša Mitrić[1], Duška Delić[1]

[1] Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina
[2] Ministry of Agriculture, Forestry and Water Menagment, Bosnia and Herzegovina

Corresponding author: Mišaela Vakić, misaela.vakic@agro.unibl.org

Abstract

One of the main pathogens of raspberry is the phytopathogenic fungus *Botrytis cinerea* Pers.- the causative agent of gray mold. A reliable prediction of its occurrence is crucial for the application of fungicides, since it would allow to reduce the number of fungicide treatments to a minimum. In practice, several models have been developed to forecast the occurrence of *Botrytis cinerea* Pers., most of them were concerned about predicting the occurrence in grapevine and strawberries. Therefore, this paper will introduce a forecast model for the occurrence of the disease in raspberries. The proposed forecast model is based on model of Broome et al. (1995) and has been developed within the CARPO reporting and forecasting system introduced by the Ministry of Agriculture, Forestry and Water Management Republic of Srpska. With the proposed model the occurrence of the disease in raspberries was predicted in 2018 and 2019. Further, the efficacy of fungicides has also been tested. The experiment was carried out in a raspberry plantation near Prijedor, in a block system with four repetitions. The Luna sensation fungicide (Fluopiram 250 g / l + Trifloxystrobin 250 g / l, SC) and Signum (Boscalid 267 g / kg + Pyraclostrobin 67 g / kg, WG) were used. This was all compared to the control that was not treated. 100 fruits were taken from each repetition on two occasions. Efficiency was determined immediately after harvest, as well as after keeping fruits in a humid chamber for 5 days at 24° C and in cold room for 7 days at 4°C. In 2018 the Control Disease Index ranged from 28 to 85 and the fungicide efficacy was 28.5% to 59.3%, depending on the treatment.In 2019 disease index ranged from 38 to 70, and fungicide efficacy was 61,4 do 88,6%.

Key words: raspberry, gray mold, predicting model, fungicide efficacy

02_12

First finding of sculptured resin bee (*Megachile sculpturalis* Smith) in Bosnia and Herzegovina

Petar Nikolić[1], Jovana Bila Dubaić[2]

[1] *University of Banja Luka, Faculty of Agriculture, Republika Srpska*
[2] *Faculty of Biology, Serbia*

Corresponding author: Petar Nikolić, petar.nikolic@agro.unibl.org

Abstract

In the summer of 2020, first specimen of sculptured resin bee (*Megachile sculpturalis* Smith) was found at the University city of Banja Luka. The female was nesting in wooden tunnel with 10 mm in diametar. Location of the nest was near the old trees of Sophora japonica, plant species usually visited by this bee species. After first observation another findings were recorded in different parts of the city of Banja Luka what implicate that *M. sculpturalis* has beeen introduced several years ago. *M. sculpturalis* originates from Asia while in the last 12 years it has rapidly spread throught Europe. It is active in the period from Jun to August while it overwinters as larva in the nest. Main plant hosts of *M. sculpturalis* are *Sophora japonica*, *Pycnanthemum* sp., *Lythrum salicaria*, *Koelreuteria paniculata* and others. It is one of the biggest bees in the world, while it doesn't show any sings of aggresion. Samples were taken for genetic analisys for determination of path of introducion. Potential impact on domestic bees and wild bee fauna in area of introduction will be explored.

Key words: Megachile sculpturalis, Bosnia and Herzegovina, alien species, wild bee

02_13

Trophic structures of nematodes in relation to vegetation type and land use

Branimir Nježić[1], Sandra Golubović[1], Petar Nikolić[1], Borut Bosančić[1]

[1] *Faculty of Agriculture, University of Banja Luka, B&h*

Corresponding author: Branimir Njezic, branimir.njezic@agro.unibl.org

Abstract

Soil nematode community as a heterotrophic, assemblages different feeding types that evolutionary adapted to intake specific type of food. Since autotrophs are the main source of carbon in the soil they influence directly or indirectly nematode community composition. The aim of this study was to determine the relationship between nematode community composition and vegetation type at the Botanical garden at University of Banja Luka. Soil samples were taken from grassland, vegetable garden, arboretum, and experimental orchard. Ostenbrink elutriator was used to extract mobile stages of nematodes, that were subject to further morphological identification to the feeding type level. The nematodes were the most abundant in samples from grassland averaging 2845 nematodes per 200 ml of soil, while the lowest number of nematodes was found in vegetable garden 874 and experimental orchard 629. Plant-feeding nematodes encompass almost one-third of the nematode population, being the most dominant in grassland and arboretum. Five genera of plant-feeding nematodes were identified: *Meloidogyne, Pratylenchus, Helycotilenchus, Tylechorinchus* and *Xihinema*. *Meloidogyne*, the most damaging nematode genus was the most numerous in grassland. A high level of disturbance, represented by an increased proportion of bacteriovor nematodes and decreased number of omnivore and predatory nematodes was found in the vegetable garden. The lowest level of soil disturbance was observed in grassland, characterized by the highest number of nematodes and a higher proportion of omnivore nematodes. These results reveal that at a small scale, vegetation type and land management can significantly influence nematode community and indicate biological process related to soil health.

Key words: soil health, nematode community, soil management

SECTION: ANIMAL SCIENCES

Poster Presentations

P3_01

Damages to agricultural crops caused by an increase in the number of wild boars in the hunting ground "Kutlavica"

Bratislav Pešić, Nikola Stolić, Nebojša Zlatković

Academy of Southern Serbia, Leskovac, Serbia

Corresponding author: Bratislav Pešić, batta.pesic@gmail.com

Abstract

The problem of damage to agricultural crops from wildlife is evident every year, and, in many cases it is the subject of litigation between farmers and hunting ground users to compensate for the damage caused and in most cases both sides are dissatisfied with the epilogue. Damage to fields with cereals most often occurs on cornfields, during the milk phase of grain maturity, and the fields where early hybrids are grown, which are the first to mature, are most affected. Damage is caused by breaking (felling) the tree and consuming the corn class. The aim of the research was to determine in what way and to what extent wild boars, bred in the hunting ground, cause damage to agricultural crops. Research on the amount of damage done was performed during the hunting seasons 2015/2016, 2016/2017, 2017/2018, 2018/2019 and 2019/2020 in the hunting ground LU "Kutlavica" in Manojlovac. A nalysis demands for damages to agricultural crops, take the data on the damage caused to the corn, potato fields and fruit trees in the plots of physical persons from five locations within the hunting ground " Kutlavica ": KO Donja Kupinovica, KO Gornja Kupinovica, KO Jersenovo, KO Orašac, KO Jelasnica. During the data analysis, the correlation coefficient and standard deviation were determined, the statistical significance between the number of requests caused by those claims and the number of heads of wild boar, as well as a statistically significant correlation between these two variables at the level of $P < 0,05$. Maintaining the optimal number of games, planned sowing of cereals, raising the level of protection of agricultural crops, winter feeding and the use of new IT technologies in the hunting ground, are key solutions in preventing the damage caused by wild boars.

Key words: wild boar, damages, maize, claim, compensation

P3_02

Necessity of establishing reproductive centers for fish in Bosnia and Herzegovina

Dragan Mikavica[1], Nebojša Savić[1]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Savić Nebojša, nebojsa.savic@agro.unibl.org

Abstract

The basis of production of consumer fish are the initial reproductive centers in which sexually mature individuals breed and in which pre-consumer individuals are raised. Basically, these individuals are distributed to areas where fish are produced in a non-classical way or are distributed to areas of individual farming. Bosnia and Herzegovina has a relatively large number of full-scale fishponds, but this is not enough to meet all the needs for pre-consumption fish. A large number of fish producers have a problem with the procurement of pre-consumer fish because the vast majority of pre-consumer fish are kept by full-system fish farms for their own needs. A sufficient number of reproductive centers for fish in which smaller fish would breed and raise would be satisfactory. In this way, the existing production capacities of both salmonid and cyprinid fish in full-system fish farms would be increased. It is especially important to form salmonid reproductive centers in which trout fish species (*Salmo trutta* m. *fario, Oncorhynchus mykiss, Hucho hucho, Salvelinus alpinus, Salvelinus fontinalis, Thymallus thymallus*) would reproduce and breeding. In addition, it is necessary to form cyprinid reproductive centers for warm-water fish species (*Cyprinus carpio, Hypophthalmichthys molitrix, Hypophthalmichthys nobilis, Ctenopharyngodon idella, Silurus glanis, Tinca tinca, Sander lucioperca, Amiurus nebulosus*). Reproductive centers also play an important role in restocking degraded watercourses in which populations of these fish species live in natural conditions.

Key words: reproductive centers, fish, Bosnia and Herzegovina

P3_03

Use of "small" hydroaccumulation for the purpose of fish production

Dragan Mikavica[1], Nebojša Savić[1]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Savić Nebojša, nebojsa.savic@agro.unibl.org

Abstract

Water occupies a significant part of the territorial area of Bosnia and Herzegovina. Recently, smaller watercourses have been used to form hydro-accumulation lakes, ie hydropower plants that are used only for energy purposes. Almost all rivers on which hydropower plants have been formed are suitable for fish production in terms of water quality. Before fish production, it is necessary to examine the quality and flow of water and in connection with that to determine the breeding species of fish, the individual size of the individuals and the total weight of the fish that are farmed. These are mainly salmonid areas suitable for trout farming. The most efficient way of breeding is the fattening of pre-consumption units of rainbow trout in cages. This type of farming would significantly supplement the quantitative indicators of trout farming in classic, full-system fish farms. This would be significant in terms of achieving financial effects because fish from the cage, at the end of the breeding cycle could be used as food of animal origin, but could also be sold in the region and beyond. The installation of cages in accumulation lakes, their construction as well as the complete production technology is prescribed by an adequate scientific institution in the field of fisheries. This fish would be produced according to all legal regulations, and in accordance with environmental and meat quality standards prescribed by the EU. This is a guarantee that the fish will be distributed freely. During the production, the quality of water in the downstream area will be controlled, and measures will be taken to preserve the quality of that water.

Key words: "small" hydroaccumulation, fish production

P3_04

Measurement of the 226Ra, 232Th and 40K activities in corn in the Republic of North Macedonia and resulting annual radiation dose by ingestion

Angeleska Aleksandra[1], Crceva Nikolovska Radmila[1], Dimitrieska Stojkovik Elizabeta[2], Katerina Blagoevska[1], Risto Uzunov[1], Biljana Dimzoska Stojanovska[1]

[1] Faculty of Veterinary Medicine, Food Institute, University "Ss. Cyril and Methodius", Skopje, Republic of North Macedonia
[2] Food Institute, Faculty of Veterinary Medicine Skopje, Republic of North Macedonia

Corresponding author: Angeleska Aleksandra, mizasandra@fvm.ukim.edu.mk

Abstract

Considering the fact that there has been a significant population growth and this increases the need of food, various agricultural activities are increasingly being used, including the use of phosphate fertilizers that can directly affect agricultural crops. Therefore, it is necessary to know the level of present radionuclides, especially in corn, which is very often used for the needs of people and animals. The purpose of this study was focused on comparing the activity concentrations of 226Ra, 232Th, 40K in corn samples, and the calculated results were the basis for the assessment of the external hazard index (Hex), the internal hazard index (Hin), the radium equivalent activity (Raeq), and the annual gonadal dose equivalent (Dgon). The gamma spectrometry technique was used for measurement of the samples, i.e. an instrument - gamma spectrometer (Canbera Packard) with a high purity germanium detector. The obtained spectra from the measurement were analyzed by using the GENIE 2000 program. Based on the performed examinations, the activity concentrations in corn ranged from 0.42 to 0.77 Bq kg - 1 for 226Ra, from 0.06 to 0.87 Bq kg - 1 for 232Th, and from 117.54 to 322.11 Bq kg - 1 for 40K. The mean value of the radiation hazard index, the Heks value is lower than the maximum allowed value which is <1 for Heks. The value of the radium equivalent activity Raeq ranges from 9.01 to 23.16 and is below the maximum recommended limit, i.e. 370 Bq kg-1. The annual gonadal dose equivalent has an average value of 75.62. The research in this study shows that all samples of corn have no biological hazard i.e. it was found that the natural levels of radioactivity are not within the high-risk range and are below the international standards.

Key words: gamma-ray spectrometry, natural radioactivity, corn

P3_05

Feeding influence on the quality of sheep meat: from the farm to the fork

Radmila Crceva Nikolovska[1], Aleksandra Angjeleska[1], Zehra Hajrulai Musliu[1], Riste Uzunov[1]

[1] *Food Institute, Faculty of Veterinary Medicine Skopje, Republic of North Macedonia*

Corresponding author: Radmila Crceva Nikolovska, crceva@gmail.com

Abstract

Abstract: In this paper we will review research in the field of animal nutrition, and define the nutrients that sheep has. Using this information, we will be able to formulate meals that will meet their requirements. These meals should be productive and effective. Sheep meat quality parameters are important at different levels, from consumers, producers and industry. Nevertheless, all participants in the meat production chain must ensure quality and improve competitiveness. The quality of meat is affected by type of feed. Sheep meat is increasingly used in the diet, which has increased the focus of analysis of various factors that affect quality, with special reference to sensory analysis. The analysis of the 32 composition of food (concentrate), which we used during the research, we made in the laboratories of the Faculty of Veterinary Medicine, with accredited (ISO) methods. Concentrate we analyzed chemically for crude protein, crude fiber, crude fat, mineral constituents and dry matters. The organic constituents (crude protein, crude fibre) can vary as much as 15 percent, the mineral constituents as much as 30 percent. The goal of feed analysis is to predict the productive response of animals when they are fed rations of a given composition. Inclusion of concentrates in the diet improved the meats sensory quality and was related to the lowering of undesirable odor and flavor intensity. Sheep fed only on concentrates produced meat that had the highest fat flavor intensity and the best overall acceptability.

Key words: sheep, meals, feed, meat

P3_06

Microbiological status of drinking water on farms in the Republic of Srpska (B&H) in the period 2018-2020 in relation to the examined parameters

Bojan Golić[1], Vesna Kalaba[1], Tanja Ilić[1]

[1] *Public Institution Veterinary Institute of the Republic of Srpska „Dr Vaso Butozan" Banja Luka, Bosnia and Herzegovina*

Corresponding author: Bojan Golić, bojan.golic@virs-vb.com

Abstract

Water is essential for life, and a satisfactory (adequate, safe and accessible) supply must be available to all. No source of water that is intended for human consumption can be assumed to be free from pollution. Zero-probability level of microbiological contamination of drinking water does not exist. The microbiological quality of water is commonly defined as a maximum acceptable number or concentration of bacteria that do not constitute a health hazard. The experiment used drinking water samples originating from domestic animal farms from the territory of Republika Srpska (B&H) sampled in the period 2018-2020. A total of 645 samples were examined.
The aim of this study is to determine the microbiological status of drinking water on farms of domestic animals in the Republic of Srpska (B&H) in relation to the examined parameters, in order to see the real risks to animal health and give recommendations for improvement. For microbiological testing of sterilized milk were used methods BAS EN ISO 6222, BAS EN ISO 7899-2 and BAS EN ISO 9308-1/A1. The analysis revealed a significantly higher number of unsatisfactory samples of well water in relation to the water supply system. The obtained results indicate significant fecal contamination of water, especially with intestinal enterococci and coliforms, and less with *E. coli*. The microbiological status of water on farms in the Republic of Srpska (B&H) in the period 2018-2020 is significantly improved compared to previous years, but still unsatisfactory given the large number of unsatisfactory samples. However, given the fact that over a third of farms are supplied with water originating from wells, there is a high risk to the microbiological status of the water, given that well water is not under constant monitoring.

Key words: drinking water, animal, farms, microbiology

P3_07

Influence of maximum daily temperature and temperature-humidity index on pig growth in fattening

Nebojša Zlatković[1], Bratislav Pešić[1], Nikola Stolić[1]

[1]*Academy of Southern Serbia Department of Agricultural and Food Studies Prokuplje, Serbia*

Corresponding author: Bratislav Pešić, batta.pesic@gmail.com

Abstract

The aim of the study was to determine how the average growth and conversion of food changes during the year, i.e. how the appetite and final weight of pigs are affected by the maximum daily temperature, and what is the influence of the temperature-humidity index (THI). The testing period consists of comparing two rounds of fattening: summer and winter. Three litters entered the test, where they are the same sows aged 3 years. All the sows are of the same breed "YU LANDRAS" and the breeding material was used from the same boar breed "GREAT YORKSHIRE". Boar was used in both cycles in all sows. The summer period of fattening began at the end of May 2018, and the winter period of fattening began at the end of November 2018. The piglets entered the shelter three days apart with an average body weight of 25 kg and came out of fattening at the end of September with an average body weight of 105 kg. Piglets entered the fattening farm three days apart with an average body weight of 25 kg. and came out of fattening at the end of March 2019 with an average body weight of 105 kg. The results of the research show that the growth of piglets was the largest, 789.83 gr. in the period when the temperature in the building was between 16^{o}-26^{o}C. Also, the same studies showed a correlation between temperature and food consumption, because piglets consumed less food (2.08 kg) in the period of high temperatures than in the conditions of ideal temperature (2.21 kg). It was THI that had a favourable effect on piglet growth during the period of optimal temperature.

Key words: piglets, growth, food, THI, temperature

P3_08

Comparison of the antibacterial effect of manuka honey and domestic acacia honey

Vesna Kalaba[1], Bojan Golić[2], Tanja Ilić[3]

[1]*Public institution of Veterinary institute of Republic of Srpska "Dr Vaso Butozan" Banja Luka, Bosnia and Herzegovina*

Corresponding author: Vesna Kalaba, vesna.kalaba@virs-vb.com

Abstract

The global problem of bacterial resistance to antibacterial drugs is the reason for the search for new antibacterial drugs. Honey has good antibacterial properties and therefore much is expected of honey that has an antibacterial effect especially on bacteria that are resistant to the weight of the drugs used. Several components present in honey are responsible for the antibacterial activity of honey, in concentrations that differ in different types of honey. The aim of this paper is to compare the antibacterial properties of domestic acacia honey with manuka honey (*Leptospermum scoparium*), which has a standardized level of antibacterial activity. For testing the antimicrobial activity of manuka honey and acacia honey it was used clinically isolates bacteria *Streptococcus* group D, *Escherichia coli, Staphylococcus aureus, Salmonella enterica* and *Salmonella typhymurium* from collection of Public Institute Veterinary Institute Republic of Srpska "Dr Vaso Butozan" , Banja Luka and reference *Staphylococcus aureus* WDCM 00034. Bacterial cultures were prepared by incubating at 37°C in nutrient broth for 18 hours. The agar diffusion method was used. Disks with a diameter of 9 mm were placed on Petri dishes on Müeller-Hinton agar, previously seeded with 100µl of bacterial suspension with a concentration of 10^5 CFU/ml. The results showed that both analysed honey samples have good antibacterial activity against the tested pathogens with inhibition zones from 25.33 mm to 37.33 mm for manuka honey, and 28.00 mm to 37.00 mm for acacia honey. Bactericidal activity was more pronounced in manuka honey and bacteriostatic in acacia honey.

Key words: manuka honey, acacia honey, antibacterial activity

P3_09

Effects of different light intensity on the growth of rainbow trout (*Oncorhynchus mykiss*) fingerlings

Savić Nebojša[1], Mikavica Dragan[1]

[1]*University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Nebojša Savić, nebojsa.savic@agro.unibl.org

Abstract

The experiment of determining effect of different light intensity on the growth of rainbow trout (*Oncorhynchus mykiss*) fingerlings it was realized in the aquaculture laboratory at the Faculty of Agriculture in Banja Luka, for a period of 30 days. Experiment was set up in 3 groups (G_1, G_2, and G_3) with three repetitions. A total of 450 rainbow trout fingerlings (150 individuals/group), with an average individual body weight of 1.60-1.69 g, were inhabited. The light intensity (lx) during the experiment averaged 2.92 lx in G_1, 17.32 lx in G_2, and 196.22 lx in G_3, during 24 hours. Light intensity (lx) was measured once per day above the water surface using the Light Meter PCE-MLM1 device. Length and individual fingerlings mass was determined by measuring the individuals at the start and at the end of the experiment (random sample 30 fingerlings/group). The goal of the experiment was to determine the effects of different light intensity ($G_{1(2.92\ lx)}$, $G_{2(17.32\ lx)}$, $G_{3(196.22\ lx)}$) on growth of the rainbow trout (*Oncorhynchus mykiss*) fingerling. In order to determine the effects of different light intensities based on the obtained results, the specific growth rate (SGR) was analyzed, thermal unit growth coefficient (TGC), condition factor (CF), feed conversion ratio (FCR), relative body weight gain (BWG) and survival rate (%) rainbow trout fingerlings. The largest biomass gain (%), SGR, TGC, survival (%) and the lowest FCR were found in group $G_{1(2,92\ lx)}$, but the differences found in the examined growth characteristics were not statistically significant ($p>0.05$).

Key words: light intensity, growth, rainbow trout, fingerlings

P3_10

Effectiveness of a feed additive in organic animal husbandry

Sergey Semyonov[1], Aleksandr Aristov[1]

[1] *Voronezh State Agrarian University named after Emperor Peter the Great, Russian Federation*

Corresponding author: Sergey Semyonov, ramon_ss@mail.ru

Abstract

Sorption and probiotic feed additive composition was formulated following an international experience and trends in organic livestock breeding, and its efficiency under conditions of organic milk production was evaluated. This research focused on the dynamics of organic milk quality and safety parameters in the context of the sorption and probiotic feed additive created by the authors. The experimental part of the work was carried out on the Ayrshire livestock herd utilizing facilities of LLC Savinskaya Niva in the Kaluga area, Russia. The animals were divided into experimental (n=20) and control (n=20) groups using the paired analogy principle. Sorption additives and probiotics were introduced in the base diet of lactating cows. Nutrition was given three times daily at equal intervals. Ten cows from the 2nd lactation were divided into one test group receiving the basic diet (BD) and two control groups: BD + sorption and probiotic feeding additive. As part of the scientific research, the efficacy of the sorption and probiotic feed additive has been studied in conditions of organic milk production at LLC Savinskaya Niva in the Kaluga region. During the study period, mass fraction of fat in milk of experimental animals increased by 0.1 abs.%, the mass fraction of protein – by 0.21 abs.%, and mass fraction of lactose – also by 0.1 abs.% compared to the control values. The mean fat globules size in the experimental group was 3.5% higher, and their number was 7.8% higher than the control counts. In the experimental group, the proportion of casein increased by 10.5%. The rennet casein class increased to 1.7 ± 0.02 and heat resistance to 1.5 ± 0.02. Milk density was 1027.6 ± 0.30 kg/m3 and acidity was 16.9 ± 0.23 T.

Key words: milk quality, organic, sorption and probiotic feed additive

SECTION: ANIMAL SCIENCES

Oral Presentations

03_01

Prediction of ammonium emission from dairy cattle using the precision farming methodology

Mirna Gavran[1], Drago Bešlo[1], Maja Gregić[1], Danko Šinka[2], Zvonimir Steiner[1], Vesna Gantner[1]

[1]Faculty of Agrobiotechnical Sciences Osijek, University of Josip Juraj Strossmayer in Osijek, Osijek, Croatia
[2] Belje Plus Ltd, Industrijska zona 1, Mece, Darda, Croatia

Corresponding author: Mirna Gavran, mgavran@fazos.hr

Abstract

Precision dairy farming is one of the key themes which affects dairy farming in the world. The name precision dairy farming indicates the use of technologies for measuring physiological, behavioral, and production indicators on particular animals. There are several principal aims of precision dairy farming, such as maximizing animal performance, early detecting diseases in individual cows, early detecting herd level health and production problems, as well as minimizing the use of medication through preventive health measures. Some of the examples of precision dairy farming technologies are milk yield recording systems, milk component monitors, milk conductivity indicators, activity monitors, lying and rumination behaviour monitors, and heat detection monitors. For control and breeding of dairy herds, milk production features noted throughout the milk recording show meaningful information. With milk recording, farmers can control the situation by tracking their prime and worst animals. As a result, farmers can do selection, for instance: which cows don't give sufficient amount of milk and can be appropriate for slaughter or which cows are more suitable for breeding substitute. Besides, assessment of the impact of dairy farms on environmental pollution is possible using milk recording data. The object of this paper was to define the variability of milk urea, milk urea nitrogen, and ammonium emission from dairy Simmental and Holstein cows regarding months of milk recording through the precision farming methodology.

Key words: precision farming, ammonium emission, dairy cattle, milk recording

03_02

The cost price of the increment of calves fed dairy pronouns that contain different levels of protein and energy

Zvonimir Steiner[1], Ivan Babić[2], Vesna Gantner[1], Stipo Benak[2], Mario Ronta[1], Stanko Ivanković[3]

[1]Faculty of Agrobiotechnical Sciences Osijek, University of Josip Juraj Strossmayer in Osijek, Osijek, Croatia
[2] Belje Plus Ltd, Industrijska zona 1, Mece, Darda, Croatia
[3]Faculty of Agriculture and Food Technology in Mostar, Bosnia and Herzegovina

Corresponding author: Zvonimir Steiner- zsteiner@fazos.hr

Abstract

Milk substitutes are characterized by high biological value of proteins, good solubility in water, pleasant taste and satisfactory microbiological quality. The composition and quality of the milk replacer affect the growth, health and overall production indicators of the calves that consume them. The study was performed on 239 calves, of which 119 (49.8%) were fed Micromilk milk substitute (experimental group) and 120 (50.2%) fed Kalvostart energy milk substitute for the first 21 days, followed by Kalvolac (control group). the study alone lasted 59 days. There was a significantly higher increase from day 30 to 59 in calves in the experimental, as well as the total amount of milk replacer drunk. The cost price of a kilogram of gain calculated on the basis of milk consumption is higher in the experimental group (HRK 8.18 / kg) than in the control group (HRK 7.29 / kg).

Key words: milk replacer, calves, daily gain, cost price

03_03

The use of horses in the eventing – a review

Mirna Gavran[1], Matko Adrić[1], Vesna Gantner[1]

[1]*Faculty of Agrobiotechnical Sciences Osijek, University of Josip Juraj Strossmayer in Osijek, Osijek, Croatia*

Corresponding author: Mirna Gavran (mgavran@fazos.hr)

Abstract

Eventing is considered to be the most demanding and attractive discipline of equestrian sport, and it originates from the army. Eventing is also called military, horse trials, combined training, three day eventing and equestrian triathlon, where men and women compete equally. The core of this sport is endurance, strength and speed. In the beginning, Sweden was the leading country of eventing, and in the last few years, Australia and Britain have the best results. The horse breed has not been determined, but the best results are achieved by the English Thoroughbred, Holstein and Hanoverian horse. In the Republic of Croatia, Eventing is not as popular and expanded as show jumping and dressage riding, the first competition was held in 2007 in Maksimir, followed by a break and the last competition was recorded in 2018. The aim of this review is to describe the mentioned discipline of equestrian sport and to define the breeds of horses most suitable for that discipline.

Key words: eventing, history, breeds, welfare

03_04

Pedigree analysis of Lipizzan stallions: generation interval and inbreeding

Biljana Rogic[1], Sara Popadic[2], Bojana Rudic[3], Sladjana Preradovic[1], Bozo Vazic[1]

[1] University of Banja Luka, Faculty of Agriculture, Banja Luka, Republic of Srpska, BiH,
[2] University of Maribor, Faculty of Agriculture and Life Sciences, Slovenia
[3] Republic Administration for Inspection Activities, Republic of Srpska, BiH

Corresponding author: Biljana Rogic, biljana.rogic@agro.unibl.org

Abstract

Pedigree analysis is an important tool for the assessment of population structure and inbreeding levels, which are important for closed populations under high selection pressure, such is the stud Vučijak. The aim of this research is to analyze the level of inbreeding of six Lipizzan stallion lines, as well as the length of the generation interval, in order to assess the selection intensity. Information on five generation pedigrees of 44 Lipizzan stallions was used to calculated the coefficient of inbreeding (F). Further, the total generation intervals was calculated (TGI) according pedigree data for 304 stallions. Of the total number of stallions, 149 were subsequently introduced into reproduction and for these animals also was calculated generations interval (GI). The F ranged from 0.012 (Favory) to 0.034 (Maestoso). The total generation interval ranged from 9.21 (Pluto) to 13.39 (Neapolitano). The lowest GI was for the Siglavy (9.32) and the longest for the Neapolitano stallion lines (12.50). The analysis of variance showed that there are significant differences between six stallion lines. The results can be used for managing mating program on the stud, and also for implementation of conservation strategy of the Lipizzan horses.

Key words: inbreeding, generation interval, stallion lines, population structure

Acknowledgments: This work was supported by the Ministry of Scientific-Technological Development, Higher Education and Information Society of the Republic Srpska (Grant No 19.032/961-89/19).

Section 4: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

Poster Presentations

P4_01

The Institute of Field and Vegetable Crops as a good example for transfer of knowledge and new technologies into agricultural practice in Serbia

Ankica Kondić-Špika[1], Ana Marjanović Jeromela[1], Dragana Miladinović[1], Tijana Zeremski[1], Jegor Miladinović[1]

[1] *Institute of Field and Vegetable Crops, Institute of National Importance for the Republic of Serbia, Serbia*

Corresponding author: Ankica Kondić-Špika, ankica.spika@nsseme.com

Abstract

The Institute of Field and Vegetable Crops from Novi Sad (IFVCNS) has more than 80 years long tradition in transferring knowledge and research results into agricultural practice. Primarily, it is achieved by selling seeds of more than 1800 cultivars and hybrids of different plant species in Serbia and abroad, exporting to 33 countries of the world. Also, the IFVCNS has been active in the dissemination of its research findings through scientific publications, such as research papers, books, monographs, technical papers, study books, and practicum handbooks. The Institute research production encompasses more than 10.000 results, published in numerous national and international journals and provides increased visibility of the Institute. The Conference of Agronomists and Farmers of Serbia is a form of dissemination of research results and collaboration between field and vegetable crop experts and agricultural producers. Held as an annual event since 1967, it has been providing permanent innovation and improvement of agricultural knowledge to producers, agricultural stations and services, as well as research and educational institutions. Over 35.000 people participated in 55 seminars held to this day. The promotion of the results is also done by participating in events such as the Science Festival, European Researchers' Night and lectures aimed at educating agricultural producers, field days, forums, guest appearances on TV and radio shows, inclusion in forums and posts on social networks. The teaching staff of secondary schools is also educated and informed about the applied research results, about the characteristics and advantages of newly created varieties and hybrids and the importance of introducing new or insufficiently cultivated species in production. It also benefits the popularization of scientific results and activities through the organization of workshops, round tables, panel discussions, short advertising videos etc. All these channels and instruments could be recommended as possible solutions for improvement of knowledge transfer.

Key words: IFVCNS, research results, technology transfer, dissemination, agricultural practice

P4_02

Forecasting of plum production trend in Republic of Srpska

Miroslav Nedeljković[1]

[1]*University "Bijeljina", Faculty of Agriculture, BiH*

Corresponding author: Miroslav Nedeljkovic, miroslavnedeljkovic2015@gmail.com

Abstract

In this paper, a quantitative research method was used in order to forecast the trend of plum production parameters movement in Republic of Srpska for the period from 2020 to 2024. For this purpose, a quadratic trend model, as the most appropriate for the analyzed twenty-year data series (2000-2019), was used. The results of the research show that in the five-year forecast period not only the growth of fruit-bearing plum trees can be expected, but also a continuing decline of production and yield. Such results can serve as a way of considering the adoption of some of the strategic decisions in this production.

Key words: forecasting, trend, plum, Republic of Srpska

P4_03

Supply and demand of fish in Bosnia and Herzegovina and Republic of Srpska

Aleksandar Ostojić[1], Nebojša Savić[1], Nemanja Jalić[1], Vera Kanlić[2]

[1] University of Banja Luka, Faculty of Agriculture, Republic of Srpska, Bosnia and Herzegovina
[2]Government of Republic of Srpska, Ministry of agriculture, forestry and water management, Republic of Srpska, Bosnia and Herzegovina

Corresponding author: Nemanja Jalić, nemanja.jalic@agro.unibl.org

Abstract

The aim of this paper was to analyze the the fish market of Bosnia and Hercegovina (B&H) and Republic of Srpska (RS) by observing the supply and demand. In addition, the paper shows the level of self - sufficiency of fish in the domestic market. The data source of fish production was the data of official statistics (B&H Agency for Statistics and RS Statistical Office), while the data of the Indirect Taxation Authority of B&H was used for the foreign trade. The desk research was conducted for the period 2014-2019. The following data processing methods were applied in the paper: descriptive statistics, data trend and balance method. In relation to the world scale, Bosnia and Herzegovina has a modest production and consumption. Until 2017., fish production grew at an average rate of 18.8%, and in the last three years production was declining at a rate of -2.1%. The share of fish production in the RS in relation to B&H is from 44.5% to 67.3%. During the observed period, Bosnia and Herzegovina had a constant trade deficit in the exchange of fish, from -8.8 million to -4.7 million BAM. The maximum imports coverage by exports for these five tariff codes was recorded in 2019. at the level of 80%. Republic of Srpska has a somewhat more favorable situation; there are periods of surplus and deficit: the negative value of the balance was determined in 2014. and 2018., while in other years it had a positive balance. In the structure of RS and B&H fish exports prevails the tariff code 0302 (fresh or chilled fish ...), and in imports tarrif code 0303 (frozen fish ...). In terms of self-sufficiency, Bosnia and Herzegovina meets 54% of its own needs for fish and Republic of Srpska 93% of its needs.

Key words: Key words: freshwater and sea fish, production, trend, foreign exchange

P4_04

Financial analysis of agricultural cooperatives in the Republic of Srpska

Tamara Stojanović[1], Gordana Rokvić Knežić[1]

[1]*University in Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Tamara Stojanović, tamara.stojanovic@agro.unibl.org

Abstract

The subject of the research is the financial analysis of cooperatives' registered as agricultural businesses in the Republic of Srpska from 2014-2018. The analysis is based on the publically available financial statements and includes absolute and relative indicators of financial position and performance. According to their number, cooperatives make almost 1/3 of total agricultural businesses in the Republic of Srpska. Average revenues of all cooperatives represent 12.3% of total revenues of the whole agricultural sector. Their assets make almost 10% of total agricultural sector's assets, while cooperatives' equity represents 18.5% of total equity of the whole sector. Considering the relative financial indicators, only profitability ratios were weaker than ratios of other agricultural companies. However, this should not be significantly alarming as cooperatives' business motives differ from the motives of profit-oriented companies. Since other ratios (liquidity and solvency ratios) were similar or better than those of other companies were, we can conclude that the financial position of agricultural cooperatives in general is not worse than the position of other agribusinesses. Nevertheless, to be more attractive for individual farmers, cooperatives need to increase their performance.

Key words: agricultural cooperatives, financial analysis, performance, indicators

P4_05

Motivational factors of female entreprenuers

Ljiljana Drinić, Gordana Roković Knežić[1], Nataša Đenadija[1]

[1] *University in Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Ljiljana Drinić, ljiljana.drinic@agro.unibl.org

Abstract

Motivational factors for female entrepreneurship are most often existential motives, such as low wages, unemployment, income for living outside poverty, and stress at work. In addition to motivational factors and barriers, the paper also analyzes the factors that drive women's entrepreneurship, as follows: development of self-confidence, work life balance, financial support, social and economic drivers, education, information and mentoring support, social capital and networking and promotion. The aim of the research was to present an exemplary case study of a female entrepreneur, from the Banja Luka region, in order to show the motivational factors of female entrepreneurs that start businesses; from her experience she demonstrates the development path from idea to entrepreneurial endeavor. The research methods of analysis and synthesis were used in the paper in combination with the methodological tools of abstraction, classification, deduction and concretization. An individual test method was used. The questions were grouped into two groups. The first group of questions consists of questions about demographic and psychographic variables. The second group of questions is related to the analysis of the company with the use of SWOT analysis which served to identify internal factors (strengths and weaknesses) and external factors (opportunities and threats) for further development of the company. The entrepreneur from the case study emphasizes that every female entrepreneur should have - stability, desire for progress, endurance and a vision for the future, followed by the desire to encourage their own development and self-improvement, and stability and talent.

Key words: female entrepreneurship, motivational factors, case study

P4_06

Analysis of pesticide imports in the Republic of Serbia

Dragan Milić[1], Tihomir Novaković[1], Grahovac Mila[1], Dragana Budakov[1], Jovana Grahovac[2], Vanja Vlajkov[2]

[1] *Faculty of Agriculture, University of Novi Sad, Republic of Serbia*
[2] *Faculty of Technology, University of Novi Sad, Republic of Serbia*

Corresponding author: Tihomir Novakovic, tihomir.novakovic@polj.uns.ac.rs

Abstract

Most of plant protection products (PPP) and active substances (AS) that can currently be found on the market of the Republic of Serbia, come from imports. The aim of the research is the analysis of pesticide imports in the Republic of Serbia for the period between 2000-2020, which is based on imported quantities of PPP and AS (in tons) by basic groups. Additionally, the aim of the paper is to reach conclusions on future trends of pesticide imports in Serbia, in accordance with the obtained results. Official Plant Protection Directorate data was used as the main source of information. The data was analyzed using the basic statistical tools of descriptive statistics (average values, coefficient of variation, annual rate of change). The average PPP imports for the period between the years of 2000-2020, amounted to 5.694,3 tons, with a high coefficient of variation of 55,5% and an average annual rate of change of 12,7%. Contrarily, the average annual import of AS for the same period totaled 2.712,9 tons, with a coefficient of variation of 19,7% and a rate of change of only 1,1%. The largest average share of PPP and AS belongs to herbicides (57,0% and 78,9%, respectively). The dominant percentage of imported herbicides can be justified by the overwhelming number of arable crops, while positive growth trend is expected and correspond to the global growth trends of PPP usage. The constant growth trend of AS imports stems from the fact that the domestic production of plant protection products has been reduced to a minimum and that the domestic market is mostly supplied from imported products. Overall, the growth trend of AS imports is at a low level and is not statistically significant, so the same level of import can be expected in the future.

Key words: pesticide, import, Republic of Serbia

Section 4: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

Oral Presentations

04_01

Change of family farm production type in terms of increasing economic business results

Mihajlo Munćan[1], Jelena Đoković[1], Tamara Paunović[1]

[1] *University of Belgrade, Faculty of Agriculture, Serbia*

Corresponding author: Mihajlo Munćan, mmuncan@agrif.bg.ac.rs

Abstract

Agricultural producers are in a constant dilemma of how to respond to modern economy challenges without compromising their businesses and consequently their own existence. Also, unstable market and economic conditions are the main cause of why farmers hesitate to make any large investments. Considering the aim of this research, family farm model was used to optimize sowing structure and test the possibilities of introducing new lines of production, to diversify production and provide better economic results, without investing in new fixed assets.

The results obtained in this work show that the change of production type (introducing vegetable production) would ensure a increasing of gross margin for almost 200%. In addition, the change of production type would also lead to an increased engagement of permanently employed workers by more than 3.5 times and mechanization for about 20%.

Key words: production type, family farms, economic results

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04_02

Position and perspectives of sustainable development of horticultural production in the Republic of Serbia

Ana Vujošević[1], Đorđe Moravčević[1], Sandra Vuković[1]

[1]*Faculty of Agriculture, University of Belgrade, Zemun, Belgrade, Serbia*

Corresponding autor: Ana Vujošević, ana@agrif.bg.ac.rs

Abstract

The deep economic crisis in which Serbia finds itself today is a consequence of the insufficient adaptability of the Serbian economy to the changes that have occurred in the world economy, as well as the insufficient and inadequately used resources it owns. In the long run, economic recovery will not be possible without a thorough restructuring and inclusion in new economic flows. As such, agriculture stands out as the support of the national economy, which can be a key factor in economic prosperity. The production of horticultural plants has a very important place in modern agricultural production and trade and is one of the most intensive agricultural activities. It can be organized on smaller areas, enables the engagement of a larger number of people, which has the effect of reducing unemployment, and in addition to harmonizing with European and world standards, it can be a key factor in economic prosperity. Therefore, in the future, we must look at horticultural production in Serbia from the aspect of a *perspective life occupation*.

Key words: agriculture, horticulture, perspectives, Serbia, sustainable

04_03

A comparative analysis of the cost management in cereal production in Croatia and European Union

Dragan Dokić[1], Mirna Gavran[2], Vesna Gantner[2]

[1]Erdut Municipality, Croatia
[2]Faculty of Agrobiotechnical Sciences Osijek, University of Josip Juraj Strossmayer in Osijek, Croatia

Corresponding author: Mirna Gavran, mirna.gavran@fazos.hr

Abstract

Given that nowadays the term "agriculture" is no longer considered only a food production activity, the contribution to the wider interests of the community in terms of preserving production, encouraging employment, increasing income and encouraging exports should be considered. Farmers are in serious temptation because of rising costs. Therefore, cost management policy must also be included in the implementation of the concept of sustainable production. The objective of this paper was to show the movement of costs in cereal production in Croatia and European Union using the reactivity coefficient and the economy coefficient, and based on these indicators to compare the competitiveness of this production in Croatia and European Union. Based on conducted evaluation it could be concluded that the production of all cereals, with exception of corn, was competitive, while the production of rapeseed in EU was highly competitive. In Croatia, the production of all cereals except corn and barley was evaluated as competitive, while the lowest competitiveness index was determined for the production of barley. Concerning the importance of agricultural production in all states, improvement of the economic efficiency and increase of the competitiveness of production and processing of agricultural and food products should be economic policy objectives.

Key words: agricultural policy, cereal production, costs, reactivity coefficient, economy coefficient

04_04

Analysing and prediction of cereals production characteristics in Vojvodina

Nebojša Novković[1], Nataša Vukelić[1], Zorica Sredojević[2], Snežana Jovanović[3], Veljko Šarac[1]

[1]*Faculty of Agriculture, Novi Sad, Serbia*
[2]*Faculty of Agriculture, Zemun, Serbia*
[3]*Institute for Corn, Zemun Polje, Serbia*

Corresponding author: Nebojsa Novkovic, nesann@polj.uns.ac.rs

Abstract

In this paper important kind of cereal crops in Vojvodina were analyzed (wheat, corn, barley, oats, rye and triticale). The production parameters include the cultivated area, annual production and yield of these cereals in the period 2005-2019. Method of descriptive statistic is used for analysis. Based on result of analysis, using extrapolation method, production parameters were predicted for the period 2020-2024. Prediction is important for macro and micro planning of cereal production.
Corn and wheat are two the most important kind of cereal crops in Vojvodina. They are also important for Serbian agriculture, too. Area under the cereal crops has tendency of decreasing, but because of positive tendency of yield, annual production show slow increasing tendency. Yields of all kind of cereal crops in Vojvodina are higher than in Serbia. Production and economics stability of cereal crops in Vojvodina were present in analyzed period, and they have a tendency to be stable in a future.

Key words: prediction, cereals, production, Vojvodina region

04_05

Analysing and prediction of cereals prices Republic of Serbia

Nebojša Novković[1], Beba Mutavdžić[1], Dragana Tekić[1], Ljiljana Drinić[2], Gordana Rokvić[2]

[1]Faculty of Agriculture, Novi Sad, Serbia
[2] Faculty of Agriculture Banja Luka, Bosnia and Herzegovina

Corresponding author:Nebojsa Novkovic, nesann@polj.uns.ac.rs

Abstract

In this paper important kind of cereal crops in Vojvodina were analyzed (wheat, corn, barley, oats, and rye). Method of descriptive statistic is used for analysis. The absolutely and relative price (price parity) of cereals were analyzed in the period 2005-2019. Based on result of analysis, using extrapolation method, price parameters were predicted for the next five year, 2020-24. Corn and wheat are two the most important kind of cereal crops. Price prediction is necessary for planning sowing structure in next period. Very stable parities of prices of certain types of cereals with the price of wheat are noticeable. Only corn has a positive tendency to improve the price parity against wheat by 0.26% per year. Average parity of corn price according to wheat price in the observed period was 0.91. This means that 1 kilogram of corn was worth 0.91 kilograms of wheat. It is to be expected that the stability of prices and their parities will be maintained in the following period as well.

Key words: prediction, cereals, prices, Vojvodina region

04_06

Financial aspects of potato production on farms in the Republic of Serbia

Mladen Petrović[1], Nikola Ljiljanić[1], Vojin Cvijanović[1], Vedran Tomić[1], Robert Radišić[1]

[1]*Institute for Scienece Application in Agriculture, Republic of Serbia*

Corresponding author: Mladen Petrović, mpetrovic@ipn.bg.ac.rs

Abstract

Vegetable production in the Republic of Serbia is performed on about 130,000 hectares that is about 3.5% of total plant production. The most common vegetable in Serbia is potato, which is grown on about 30,000 hectares. The goal of the paper is to show the financial aspects of potato production on farms in Republic of Serbia in the 2015-2019 period by utilization of calculation based on variable costs. The data for analysis have been collected on 323 farms (survey done on selected farms conducted by the Institute for Science Application in Agriculture - IPN). By utilization of sensitivity analysis it has been also shown in the paper the impact of prices and yields on amount of gross margin in potato production. The obtained results indicate a constant increase of the gross margin amount in the potato production in the analyzed period, as well as that changes in prices and yields have a significant impact on the gross margin in potato production.

Key words: gross margin, potato, farms, Serbia

04_07

Evaluation of investments in cow - calf production in Serbia using Modified Internal Rate of Return approach

Lana Nastić[1], Sanjin Ivanović[2], Marko Jeločnik[1]

[1]*Institute of Agricultural Economics, Serbia*
[2]*University of Belgrade, Faculty of Agriculture, Serbia*

Corresponding author: Sanjin Ivanović, sanjinivanovic@agrif.bg.ac.rs

Abstract

Serbian agriculture is characterized by a rather small value of livestock production comparing to the value of plant production. Therefore, there is a necessity to develop livestock production, especially certain types of livestock breeding which are not present enough in Serbian conditions. Cow-calf production is still extremely rare in Serbian agricultural practice, although it has many advantages comparing to the usual cattle production systems. Cow – calf system primarily uses pastures (as available natural resources) rather than feed produced on arable land. This is why such production system is related to the low level of production costs and less vulnerable to variations in corn prices. At the same time, cow – calf system requires less financial means comparing to the usual cattle production system such as milk production or traditional bull fattening approach. Therefore, the goal of this research is to analyze possibilities for the development of cow – calf production in Serbia, as well as the economic efficiency of investments in this production type. To analyze economic efficiency of investments in cow – calf production, authors used Net Present Value (NPV) and Internal Rate of Return (IRR) as the usual approach in investment analysis. Besides, Modified Internal Rate of Return (MIRR) is applied, as an approach which has some advantages over traditional IRR. It is determined that investments in the analyzed type of livestock production have low level of economic efficiency, while the application of MIRR method indicated lower rate of return comparing to IRR. It can be concluded that (although Serbia has good natural conditions) cow – calf production has low profitability and its development requires state support. MIRR method should be used to evaluate such investments because it provides more conservative results than traditional evaluation methods, allowing managers to make well informed investment decisions.

Key words: cow – calf production, investments, Modified Internal Rate of Return

04_08

Valuation of investment opportunities: goat farm versus sheep farm in the conditions of Bosnia and Herzegovina

Željko Vaško[1]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Željko Vaško, zeljko.vasko@agro.unibl.org

Abstract

Bosnia and Herzegovina (BiH) has 48% of the area under grasslands that can be predominately used for livestock breeding, primarily sheep and goat, which number has stagnated in recent years. The aim of the research is the economics of sheep and goat breeding, and the aim was to determine the economic efficiency of investing in the establishment of a farm with 200 goats or sheep, which would be the optimal capacity of a family farm. The economic justification of investment is determined by applying methods of investment calculations: discounted payback period (t), net present value (NPV) and internal rate of return (IRR). The obtained values for sheep and goat farm were compared to each other. The starting assumptions are a stationary breeding system (without the use of a nomadic livestock migration), the same size of production capacity (200 goats Alpine breed and 200 sheep local breed Pramenka) based on 10 ha of own land and lease of additional 10-15 ha of land and borrowing for about 60% of investment. The figures for investment calculations were collected by a combination of literature reviews, interviewing goat and sheep breeders and gathering market information. The results of the analysis, with a discount rate d=3.6%, confirmed that it is more profitable to invest in a goat farm (t=11.86; NPV=443,081; IRR=14.14%) than in a sheep farm (t=19.55; NPV=3,020; IRR =3.81%). The conclusion is that the difference comes from the fact that the goat farm provided income from sale of milk and kids, and the sheep farm only from the sale of lambs (because the domestic breed Pramenka is poorly milk productive). It is recommended to invest in BiH in the goat farms, and in the case of investing in sheep farms to procure sheep of breeds with good genetic potential and for milk production.

Key words: investment opportunities, economic efficiency, goats, sheep

04_09

Reconsideration of cooperative principles – pillar of development or limitation factor?

Marija Nikolić[1]

[1]*Faculty of Agriculture, University of Belgrade, Republic of Serbia*

Corresponding author: Marija Nikolić, mnikolic@agrif.bg.ac.rs

Abstract

Cooperative principles are the milestone for identifying cooperative organizations around the world. Throughout history, cooperative principles have changed and adapted to the various forms of cooperatives that have existed. Finally, in 1995 the so-called basic seven cooperative principles were established. The paper presents a theoretical analysis of the problem of application of cooperative principles, with special emphasis on the situation in the Republic of Serbia. The aim of this paper is to examine whether it is possible and justified to insist on the firm application of the principles in regular daily business of cooperatives, what limits their application, as well as what are the potential solutions to overcome these difficulties. The research indicates that the necessity of existence of cooperative principles is indisputable, but that there are significantly conflicting views on how they should be applied in practice. The conclusion is that it is necessary to insist on the very idea that underlies the cooperatives, that is, that the principles should be viewed as a whole. Certain exceptions from the cooperative principles in everyday business are tolerant if not inevitable, but it is necessary to insist on their unwavering application in the long run.

Key words: cooperative principles, application, business, evolution

04_10

Cooperative ownership and cooperative property in agricultural sector

Gordana Rokvic Knezic[1], Adrijan Gunic[2]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*
[2] *Agriculture Paying Agency, Bosnia and Herzegovina*

Corresponding author: Gordana Rokvic Knezic, gordana.rokvic@agro.unibl.org

Abstract

The main aim of this paper is t present the concepts of cooperative property and cooperative ownership as well as to review the law on agriculture cooperatives in Bosnia and Herzegovina and the countries in the region. The paper uses the case study method of four active agricultural cooperatives in the Republic of Srpska. Based on the literature and the conducted research, we conclude that the unresolved issue of cooperative property and cooperative ownership is a limiting factor in the development of agricultural cooperatives. In Republika Srpska, the so called "old" cooperatives that is, those cooperatives that existed during the former SFRY, have an unresolved issue of property. Some old cooperatives have successfully adopted their organization to the new legal framework, which has further facilitated their business activities, while some still lead litigation, which creates high costs and makes it difficult to conduct business activities. Unlike "old" cooperatives, newly established cooperatives do not have problems with property, because when founding a cooperative, the property and ownership of the cooperative are clearly defined. The research results clearly confirm the hypothesis of this paper, ie. that the unresolved issue of cooperative property and cooperative ownership are a limiting factor in the development of cooperatives.

Key words: cooperative property, cooperative ownership, agricultural cooperatives, law

04_11

Agritourism as a specific form of rural tourism

Gordana Rokvic Knezic[1], Jelena Djuric[1], Ljiljana Drinic[1]

[1] *University of Banja Luka, Faculty of Agriculture, Bosnia and Herzegovina*

Corresponding author: Gordana Rokvic Knezic, gordana.rokvic@agro.unibl.org

Abstract

The research aim of this study is to identify the potential of the development of rural and agritourism in the municipality of Prnjavor. The research sought to obtain the data on the current state of rural tourism, but also on the potentials and resources for the development of rural tourism. The basic methods used during the research ware survey, tourist potential mapping, mapping of tourist actors and statistical methods. The results of the research showed that the municipality of Prnjavor has the potential to engage in rural tourism, ie agritourism. The awareness of the population is not developed when it comes to rural tourism and the opportunities it provides, so more than half of the respondents stated that they do not plan to start agritourism or some other form of rural tourism.

Key words: territorial capital, rural development, rural tourism, valorization

04_12

Determining the criteria for the label "Mountain Product", in Bosnia and Herzegovina, on the example of the most important indigenous cheeses

Dragan Brenjo[1], Novo Pržulj[2], Zlatan Sarić[3], Radoslav Grujić[4], Džemil Hajrić[5]

[1] Food Safety Agency B&H, B&H
[2] Faculty of Agriculture, University of Banja Luka, RS, B&H
[3] Faculty of Agriculture and Food Science, University of Sarajevo, B&H
[4] School of Applied Medical Sciences Prijedor, RS, B&H
[5] Food Safety Agency of B&H, B&H

Corresponding author: Dragan Brenjo, brenjo@fsa.gov.ba

Abstract

In order to provide producers in hilly and mountainous areas with an effective means of placing their products on the market more successfully and reducing the real risk of confusion among consumers regarding the hilly and mountainous origin of products on the market, the European Union has adopted provisions to define quality for hilly - mountain products at Union level. The definition of a hilly-mountainous area should be based on the general classification criteria used to identify the hilly-mountainous area. For third country products, mountain areas include areas that third countries have officially designated as mountainous or that meet the same criteria as those in the EU. Bosnia and Herzegovina, as well as some other countries in its vicinity, has not yet normatively prescribed criteria for the possibility of protecting the optional quality label "Mountain Product". Taking into account the experience of countries with similar geographical characteristics, the best model of the label "Mountain Product" for Bosnia and Herzegovina is to meet the following conditions: average altitude of at least 700 m, or average altitude of at least 400 m and an average slope of at least 15% the possibility of using machinery or requiring very expensive special equipment, a combination of the two factors, in such a way that the difficulties they cause individually are less than their combination, but the combination of these factors causes equal difficulties.

Key words: Mountain product, criteria, autochthonous cheeses

04_13

Review of Warehouse Receipt as an instrument for agricultural financing in Serbia

Vlado Kovačević[1]

[1]*Institute of Agricultural Economics, Belgrade, Serbia*

Corresponding author: Vlado Kovačević, vlado_k@iep.bg.ac.rs

Abstract

Aim of this paper is to evaluate warehouse receipts as instrument for financing. The warehouse receipt is confirming the ownership of a specific agricultural commodity in stated quality in a specific public warehouse for a specific storage charge. Public warehouse system is widespread worldwide and international experience are showing that system including three components are most effective: (1) licensing procedure for public warehouses by government institution; (2) establishment of the inspection service in charge of public warehouses and (3) Indemnity fund with aim to indemnify warehouse owner under out of court procedure if public warehouse cannot deliver the commodity. When all three public warehouse components are in place, system enhance their value as collateral, commodity under warehouse receipts is easily to trade. Simply said lender are willing to lend against warehouse receipts or traders are willing to take ownership on warehouse receipts because risk of non-delivery is lower due to warehouse receipts' indemnity fund guarantees, licensing procedure and special inspection. Methodology applied in this paper including: desk research, comparative analyse and descriptive statistic. Serbian system established in 2009, consists on all three components. In the first period up to 2014 results are excellent landing amount based on warehouse receipts amounted around 50 million euros, with around 20% lower interest rate compared to similar loans and shorter procedure for loan approval. In 2015. two fraud were occurred in public warehouses. This situation deteriorates trust in Public warehouse system in Serbia. Results of this study is showing that one of the Public warehouse components is newer establish – inspection service in the charge of the public warehouses. Serbia is rear country in the Eastern Europe with failed system of Public warehouses and the lesson learned is that complete system of the Public warehouse should be established in the practice.

Key words: Warehouse receipts, Public Warehouses, Indemnity Fund, Financing in agriculture

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04_14

Analysis of the agricultural investment market in Western Balkan countries

Edis Beširović[1], Johannes Holzner[1], Dragan Brković[1]

[1] *Weihenstephan – Triesdorf University of Applied Sciences, Germany*

Corresponding author: Dragan Brković, dragan.brkovic@hswt.de

Abstract

This paper aims to analyze agricultural investment markets in Albania, Bosnia and Herzegovina, Croatia, Kosovo, Montenegro, North Macedonia and Serbia. In order to explore possibilities for investment in agriculture and analyze the business and economic markets of the Western Balkan countries different quantitative methods are used. Countries are compared on different parameters including gross domestic product, inflation, unemployment rate, foreign trade and agricultural production volume. On the basis of the macroeconomic indicators, it can be concluded that that the GDP of the Western Balkans is among the lowest in the Europe. On the other hand, economic growth in the most countries was around 4%, until year 2020 and COVID-19 pandemic. The stable economic growth in this period led to a decrease in the unemployment rate, but it stayed high and accounted for 30% in Kosovo, 18% in North Macedonia, while the lowest was in Croatia accounting to 6.9%. Due to the large number of European international companies operating in the Western Balkans, results presented confirm that around 60% of foreign trade is realized with countries of European Union. The results show long tradition and excellent climate conditions for different types of agricultural production, which is reflected in the possibility for achieving high yields of different crops in WB countries. This confirms the possibilities for the development of agricultural production and investments in the production and processing of agricultural products. As WB countries are in a phase of reform and are working to meet the requirements for EU membership, interest of foreign companies is growing in the agricultural investment markets. Due to the lack of jobs and large number of young people moving abroad, the governments of these countries offer favorable tax conditions and different measures, programs and other support in order to create jobs and attract foreign investors.

Key words: Agriculture, investment market, Western Balkan, foreign investors

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