IX INTERNATIONAL SYMPOSIUM ON AGRICULTURAL SCIENCIES

24th September 2020
Banja Luka
Bosnia and Herzegovina

BOOK OF ABSTRACTS

AGRORES 2020

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AGRICULTURAL SCIENCES

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in cooperation with

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Session 2

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13:30-13:45 **O4_03**	Gordana Rokvic, Ljiljana Drinic, Nebojsa Novkovic IMPLEMENTATION OF GENDER RESPONSIVE BUDGETING IN AGRICULTURE AND RURAL DEVELOPMENT IN BOSNIA AND HERZEGOVINA AND THE SURROUNDING COUNTRIES	
13:45-14:00 **O4_04**	Nebojša Novković, Beba Mutavdžić, Žarko Ilin, Nataša Vukelić, Šumadinka Mihjlović ANALYSIS AND PREDICTION OF PRODUCTIVE AND ECONOMIC CHARACTERISTICS OF WATERMELON PRODUCTION IN VOJVODINA REGION	
14:00-14:15 **O4_05**	Ranko Sarić, Snežana Branković, Adiba Džudović THE EFFECT OF WEED CONTROL IN POPLAR PLANTATIONS	
14:15-14:30 **O4_06**	Aleksandar Miljatović, Veljko Vukoje ANALYSIS OF NET WORKING CAPITAL OF AGRICULTURAL ENTERPRISES OF VOJVODINA	
14:30-14:45 **O4_07**	Bratislav Pešić, Nikola Stolić, Nebojša Zlatković TYPE OF WASTE AS A FACTOR OF ECONOMIC DEVELOPMENT OF HOUSEHOLDS AND ENVIRONMENTAL PROTECTION IN RURAL ENVIRONMENTS	

14:45-15:00 O4_08	Marija Stojadinović, Bratislav Pešić, Nikola Stolić, Nebojša Zlatković THE SIGNIFICANCE OF AGRICULTURAL ADVISORS FOR AGRICULTURAL DEVELOPMENT IN THE TOPLICA DISTRICT
15:00-15:15 O4_09	Vesna Mrdalj, Leila Šeper, Nataša Tomić AGRICULTURAL SUPPORT POLICIES OF BOSNIA AND HERZEGOVINA AND INTERNATIONAL ECONOMIC INTEGRATIONS
15:15-15:30 O4_10	Željko Vaško, Veselin Dutina, Boris Vaško INTERMEDIATION IN INCREASE OF AGRICULTURAL LAND USE BY ICT SUPPORT
15:30-15:45 O4_11	Tihomir Novaković, Beba Mutavdžić, Dragan Milić, Dragan Tekić, Aleksandar Miljatović MEASURING OF TECHNICAL EFFICIENCY OF AGRUCULTURAL HOLDINGS IN SERBIA USING DEA METHOD
15:45-16:00 O4_12	Sanjin Ivanović, Zorica Vasiljević, Jonel Subić TREATMENT OF OTHER GAINFUL ACTIVITIES AND MARKETING COSTS ACCORDING TO VARIOUS FADN REGULATIONS
P4_01	Bojan Dimitrijević, Jelena Golijan, Slavoljub Lekić, Nada Lakić THE IMPACT OF SOME SOCIO - DEMOGRAPHIC FACTORS ON CONSUMER ATTITUDES TOWARD ORGANIC SEED IN THE REPUBLIC OF SERBIA
P4_02	Vera Rašković, Nemanja Stošić, Milan Glišić ANALYSIS OF PRODUCTION, EXPORT AND IMPORT OF TOMATOES IN SERBIA
P4_03	Ljiljana Drinić ENTREPRENEURSHIP DEVELOPMENT BY LEAN STARTUP METHODOLOGY
P4_04	Enika Gregorić, Vesna Počuča, Gordana Matović, Mirjana Ruml DROUGHT ANALYSIS FOR THE REGION OF NORTH BACKA, SERBIA
P4_05	Nemanja Jalić, Aleksandar Ostojić BOSNIA AND HERZEGOVINA'S WINE FOREIGN TRADE AND MARKET
P4_06	Mihajlo Munćan, Tamara Paunović, Jelena Đoković IMPROVING THE ECONOMIC EFFICIENCY OF FAMILY FARMS BY INTRODUCING A NEW LINE OF LIVESTOCK PRODUCTION
P4_07	Stanislav Zekić, Bojan Matkovski, Danilo Đokić WINE PRODUCTION IN SERBIA AND COMPETITIVENESS ON INTERNATIONAL MARKET

P4_08	Marija Stojadinović, Pešić Bratislav, Nikola Stolić, Nebojša Zlatković THE SIGNIFICANCE OF AGRICULTURAL CONSULTANTS FOR THE DEVELOPMENT OF AGRICULTURE IN THE TOPLICA DISTRICT
16:00-16:30	**Discussion of oral and poster presentations**

PLENARY LECTURES

Plenary

Food and digital: bits & bites

Srđan Krčo, Senka Gajinov

DunavNET, Novi Sad, Serbia

Feeding a continously increasing world population in a sustainable manner in combination with the general lack of farm work-force and the constraints imposed by the ongoing COVID-19 pandemic, are challenges faced by the global food industry. Going digital is considered one of the most promising paths to address these challenges and ensure not only production of food in sufficient quantities, but transparent production of high quality food. To that end, IoT, sensors, the cloud, artificial intelligence, and other technology terms are becoming everyday terms of modern farmers, while yield, disease prediciton, feed to food ratio, ploughing, etc. are entering vocabularies of the technology community.

Accelerating the digital transformation of agriculture and, more generally, the complete food supply chain, has been high on the agenda of the European Commission. This was further emphasized by the recently adopted Green Deal. In this presentation, the objectives and activities of the H2020 DEMETER project, a large-scale smart farming project, will be presented. With more than 20 ongoing pilots across the food sector, the project is validating technology and quantifying stakeholders' benefits.

An overview of the pilots done in DEMETER, will be followed by practical insights and experience gained from a range of deployments done in vineyards, orchards, poultry and pig farms throughout Europe. Most notably, the process of setting up a smart vineyard region on Fruska Gora, digital transformation of "Plantaze 13. Jul" as the largest vineyard in Europe as well as streamlining the feed supply process and using novel AI algorithms to improve the wellbeing of chickens will be addressed.

Plenary

Contemporary agriculture and the real green revolution – Does the renewable energy production really matter?

Prof. Ph.D. Andrei Jean Vasile

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Abstract

Contemporary agriculture has experienced numerous and very different patterns of evolution and adaptation to the new environmental demands which has been generating a real green revolution in field. Exploring the influence of renewable energy on contemporary agriculture requires an integrated approach to include the multitude of options available in the field, which have also provoked intense debates both in terms of availability, necessity and the opportunity to promote agro-fuels. Starting from the obvious assumption that biofuels regardless of the source, either from dedicated agricultural production or residues or biomass is not always a sustainable solution, successfully applicable to ensure energy independence for energy consumption that proves excessive and widespread wide-spread. Under these conditions, renewables have different degree of availability, and as such will be able to replace only to a very small extent conventional fossil fuels. The development and promotion of agro-fuels production, unlike other energy sources, has a limited character in production that inevitably involves situations of competition, at least from the perspective of cultivated lands, with food production, with the requirements of maintaining biodiversity and cultural landscapes. The main aim of the paper is to present and analyze the implications of the renewable energy production on developing the contemporary agriculture and assuring the real green revolution in this economic sector. For this purpose, a sectorial analysis is added to an existing production framework of the agro-fuels option. In addition, different approaches on renewables influences on the energy policy are considered. A case study for European Union is used to derive and design policy recommendations regarding the choice of renewable energy production in promoting real green revolution. In this context, the results will argue that the agricultural development models promoted and applied generates immediate and long-term consequences, both on the production and consumption patterns influencing the real green revolution in contemporary agriculture.

Key words: agriculture, renewables, agro-fuels, green revolution, land use, food, CAP.

Section 1: CROP SCIENCE

Poster Presentations

P1_01

Content of free polyphenols and flavonoids in organic and conventionally produced maize seed (*Zea mays*)

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Abstract

Maize is a very important source of phytochemicals (such as carotenoids, phytosterols, polyphenols, etc.) naturally occurring in plants, which have the many human health benefits and reducing the risk of chronic diseases. Numerous studies around the world indicate that organically produced foods are richer in the content of organic acids and polyphenolic compounds with antioxidant properties, compared to conventional produced foods. The aim of this work was to determine the content of the most important antioxidants - polyphenols and flavonoids in maize seed produced in organic and conventional agricultural production during 2015-2017. Content of free (not bound) phenolics and flavonoids were determined using standard spectrophotometric methods with Folin-Ciocalteu reagent and aluminium-chloride, respectively. Content of free phenolics was expressed as mg of ferulic acid equivalents (FAE) per kg of dry sample weight and free flavonoids content was expressed using mg of quercetin equivalents (QE) per kg of dry sample weight. Content of free polyphenols ranged from 1492 to 2663 mg (FAE)/kg of dry matter, with the highest value oberved in conventional maize seed (season 2016) (2663 mg (FAE)/kg of dry mass sample) and the lowest one in organically maize seed from 2017 (1492 mg (FAE)/kg of dry mass sample). Content of free flavonoids was in rang 241 - 371 mg QE/kg of dry mass sample, with the highest values recorded in organic maize seed from 2017 season (371 mg QE/kg of dry mass sample) and the lowest in organic maize seed from 2015 (241 mg QE/kg of dry mass sample). The obtained results indicated that didn`t exist statistically significant difference between the two production systems in the content of free polyphenols in maize seeds, while a higher content of free flavonoids in 2016 and 2017 were observed within organic seeds compared to conventional.

Key words: seeds, maize, polyphenols, flavonoids

P1_02

Effect of gibberellic acid treatment on the initial growth of red fescue

Vladeta Stevović[1], Miloš Marjanović[1], Dragan Đurović[1], Dalibor Tomić[1], Milomirka Madić[1], Vesna Đurović[1]

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Abstract

Red fescue seed is small and with a small amount of reserve food, which causes low germination energy, all of which affect the very establishment of the crop. The aim of the study was to analyze the influence of pre-sowing treatments with gibberellic acid on the growth of roots and shoots of young red fescue plants. Maxima 1 (Dutch cultivar) red fescue seed was used for the experiment. Control and five treatments of different concentrations of gibberellic acid have been applied: control; 1.0 mmol L-1; 1.5 mmol L^{-1}; 2.5 mmol L^{-1}; 4.0 mmol L^{-1}; 6.0 mmol L^{-1}. The seeds are set between filter paper in Petri dishes (80 mm) using 4 mL of solution. After 48 hours of treatment, the seeds were rinsed with distilled water on filter paper and placed in germination chamber for a period of ten days. Four repetitions with fifty seeds each were used. Young seedlings are planted in substrate containers that are stored in a greenhouse. Analysis was made 35 days after sprouting plants by taking 10 plants each. The following parameters were analyzed: dry mass of root and dry mass of shoot. Significantly higher root mass compared to the control treatment was observed only on treatment with a gibberellic acid concentration of 4.0 mmol L^{-1} (0.78 g per plant). Treatment with gibberellic acid at concentrations of 1.5 and 4.0 mmol L^{-1} significantly influenced the increase in the mass of the shoot of the red fescue (2.49 and 2.67 g per plant), compared to the control variant (2.11 g per plant). The results obtained indicate that pre-sowing treatments with gibberellic acid at a concentration of 1.5 and 4.0 mmol L^{-1} can significantly influence the more intense initial growth of young red fescue plants.

Key words: GA3, pre-sowing treatment, red fescue

P1_03

Effect of gibberellic acid treatment on the initial growth and nodulation of white clover

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Abstract

Initial growth is a critical phase, which greatly influences on the success establishment of white clover crops. The aim of the study was to analyze the influence of pre-sowing treatments with gibberellic acid on the growth of young plants and the number of nodules on the white clover root. For the experiment was used seed of white clover cultivar Rivendel (Denmark cultivar). The control and five treatments with different concentrations of gibberellic acid were applied: 0.25 mmol L^{-1}; 0.50 mmol L^{-1}; 0.75 mmol L^{-1}; 1.0 mmol L^{-1}; 1.5 mmol L^{-1}. The grains are set between filter papers in Petri dishes (80 mm) using 4 mL of solution. After 12 hours of treatment, the grains were rinsed with distilled water on filter paper and set to germination in a germination chamber for a period of ten days. Four repetitions with fifty grains each were used. Seedlings were planted in containers with substrate that were kept in a greenhouse. Analysis were made 30 days after emergence by taking 10 plants each. The following parameters were analyzed: dry mass of root, dry mass of shoot, and number of nodules per plant. Significantly higher root mass compared to the control treatment was observed only on treatment with a 1 mmol L^{-1} gibberellic acid concentration. The treatments with a 1 mmol L^{-1} and 1.5 mmol L^{-1} gibberellic acid concentration, had a significant impact on increase the mass of shoot. The number of nodules was significantly higher only at the treatment of 1.5 mmol L^{-1} (17.1 nodules per plant), compared to the control variant (7.4 nodules per plant). The results obtained indicate that pre-sowing treatments with gibberellic acid at concentrations of 1 and 1.5 mmol L^{-1} can significantly influence the more intense growth of young white clover plants.

Key words: gibberellic acid, pre-sowing treatments, white clover

P1_04

Variability of micronutrient content in sweet corn hybrids after boiling

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Abstract

Different processing methods result in changes of the nutritional profile of sweet corn, which vary by nutrient content and genotypes. The effects of boiling on carotenoids and tocopherols content of twelve sweet corn hybrids were investigated. Content of β-carotene, lutein+zeaxanthin and tocopherols (δ-T, β+γ-T, α-T) content was determined by HPLC and was expressed as the mean value of three independent measurements. Obtained data were subjected to the two factorial analysis of variance (ANOVA) by using M-STAT-C software. The boiling resulted in a significant increase in the concentration of carotenoids and tocopherols for all hybrids, except hybrid 1 for β-carotene, as well as hybrids 7 and 12 in which content of α-tocopherol decreased after boiling. Content of δ-tocopherol in sweet corn hybrids ranged from 0.29 to 1.01 μg/g, β+γ- tocopherols 7.98 – 21.09 μg/g and α-tocopherol 1.16 – 6.89 μg/g. The highest content of total tocopherols in fresh ear had hybrid 10 (26.40 μg/g.) and after boiling hybrid 1 (43.90 μg/g), the lowest content in fresh ear had hybrid 8 (10.27 μg/g.), and after boiling hybrid 7 (20.19 μg/g). Content of lutein + zeaxanthin ranged from 12.72 – 27.02 μg/g, and β-carotene 0.25 – 1.13 μg/g. The highest content of total carotenoids in fresh ear and after boiling had hybrid 12 (27.77/45.28 μg/g), the lowest concentration in fresh ear had hybrid 2 (10.27 μg/g) and after boiling hybrid 3 (24.55 μg/g). The highest increase of total carotenoids has been determined in hybrids 2 and 11. The results show that the trend of increasing of micronutrient content depends on the genotype of sweet corn. This study confirmed that boiling enriches nutrition's in sweet corn and gives it an added value in terms of functional foods. The results of this study may also be useful to breeders to improve the nutritional characteristics of genotypes of sweet corn.

Key words: sweet corn, carotenoids, tocopherols, cooking

P1_05

The significance of transversal distribution during the application of plant protection by boom sprayer

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Abstract

The capacity of nozzles changes during the exploitation, i.e. it produces deviation from normal values. The consumption has an effect on the increase of the capacity of the nozzle, or the fraying and abrasion of the cartridge itself, which has a consequence of increased flow of the substance. On the other hand, decrease of the capacity occurs as a consequence of impurities which come with water which is used as a carrier of substances. The aim of the study is to point to the significance of regular control of the nozzle capacity, since it effects on the quality of the application, all of which affect the deviation from the mean value of the transverse distribution. Measured deviations of the nozzles according to the positions had significant deviations (5- decrease 83,33%, or 13- increase of the capacity for 61,11%), and the consumption of the substance according to the surface (ha) fit perfectly. During designing and monitoring of the treatment standard, most of the producers monitor consumption (l/ha), and this paper points to frequent occurrences in practice (deviations) that can significantly affect the quality of the application, as shown by water-sensitive papers. The coverage of water-sensitive papers ranged from 5.60 to 57.40%.

Key words: nozzles, transversal distribution, boom sprayer, controlled application

P1_06

Genotype and fertilization effect on zinc content in maize (*Zea mays* L.)

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Abstract

Maize is a staple crop in many parts of the world, and is often targeted for micronutrient „biofortification". Certain levels of micronutrients such as manganese (Mn), zinc (Zn) and iron (Fe) are necessary to mediate the numerous biochemical reactions essential for growth and development of the maize plant. The microelements content in grain is a complex trait affected by a number of factors, including genotype, soil properties, environmental conditions and nutrient interactions. This two-year field study was designed to evaluate the influence of different fertilizer combinations on zinc content in maize grain. Four divergent maize hybrids NS 4023, NS 6010, NS 6030 and NS 640 were grown under three fertilizers combinations: 1: $P_{60}K_{60}$ + $N_{40autumn}$ + $N_{60spring}$ + Zn; 3: $P_{60}K_{60}$ + $N_{40autumn}$ + $N_{80spring}$ + Zn; 3: $P_{60}K_{60}$ + $N_{160spring}$ + Zn in both years of study. The plants were foliar spraying with Zn solution (0.5%, 1.0% and 1.5%) using $ZnSO_4 \times 7H_2O$ in the fourth and sixth week after sowing. The plot dimensions were 5 × 2.8 m, having intra-row spacing of 22 cm and row spacing of 70 cm. Plant tissue analyses included concentration of Zn in grain. When compared to control, foliar application Zn (1.5% $ZnSO_4 \times 7H_2O$) increased grain Zn concentrations by 17% (NS 4023) to 29% (NS 6030). The ranges of grain Zn concentration were 46.1–59.8 mg kg^{-1} respectively, across the two years. Fertilization, genotype, and genotype × fertilization interaction affect grain Zn accumulation of maize. Zn foliar application at 1.5% might be a pragmatic option to improve the grain yield and grain Zn concentration in maize. Options for improving grain yield and grain Zn concentration in maize include screening maize genotypes for higher root Zn uptake and grain translocation efficiency, the inclusion of these Zn-efficient genotypes in breeding programs, and Zn fertilization through soil, foliar and seed treatments.

Key words: genotype, fertilization, zinc content, maize.

P1_07

Identificaton of binucleate rhizoctonia spp. ag-a from strawberry and multinucleate *R. solani* ag-2-2 from sugar beet in Serbia

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Abstract

Rhizoctonia spp. comprise soil-borne fungi widely distributed in temperate climate worldwide which are annually causing significant yield loses to a range of cultivated plants. A species status of *Rhizoctonia spp*. has not yet been established and the isolates are classified based on nuclei status as multinucleate and binucleate *Rhizoctonia spp*., and further divided into 13 anastomosis groups (AG) (AG-1-13) of multinucleate Rhizoctonia and 23 AG (AG-A-W) of binucleate Rhizoctonia. In this paper we are reporting morphological and molecular features of binucleate *Rhizoctonia spp*. AG-A causing black root rot on strawberry and multinucleate R. solani AG-2-2 causing root and crown rot of sugar beet. During 2015 and 2016 at several strawberry and sugar beet producing areas, plants expressing prominent root and crown necrosis and rot have been observed with disease incidence estimated at 20-30%. At two localities, in the vicinity of Belgrade (City of Belgrade District) and Vašica locality (Srem District), symptomatic strawberry and sugar beet plants were sampled and 12 and 8 Rhizoctonia-like isolates have been recovered, respectively. As exhibiting uniform morphological features, two representative isolates originating from strawberry and sugar beet (101-16 and 270-15) were selected and identified. Pathogenicity of representative isolates was confirmed in artificial inoculations of strawberry runners or sugar beet seedlings, respectively, followed by a successful reisolation. The isolates were identified based on hyphal branching pattern, nuclear status (binucleate isolate from strawberry and multinucleate from sugar beet) and conventional AG pairing with known tester isolates. The identification was confirmed by sequencing of ITS region of rDNA of isolates 101-16 and 270-15 (GenBank MH517393 and MK123309, from strawberry and sugar

beet, respectively). Identification of multinucleate R. solani AG-2-2 was also confirmed using sensitive and specific real-time PCR protocol.

Key words: Rhizoctonia spp, Identification, strawberry, sugar beet

P1_08

A Comparison of Methods for Assessment of Soil Weed Seed–Bank in the Long-Term Crop Rotation

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Abstract

The aim of the research was to determine which methodological procedure is more appropriate for assessing how the crop rotation affects the composition and size of weed seed bank. A long–standing stationary experiment "Plodoredi" at the Institute of Field and Vegetable Crops in Novi Sad was used for the research. According to the "Square grill" method, the land was sampled with two plots of wheat for 50 years in a monoculture and 3 year crop rotation (winter wheat-corn-soybean). It was sampled in autumn 2014, spring and autumn 2015, and two metrological procedures were used to assess the soil weed seed bank: physical extraction of seed and seedling emergence method. According to the first method, 500 ml of the soil sample was washed with a jet of water through a sieve of a different diameter (2 mm, 200 μm, 500 μm and 800 μm), and separate seeds were determined using the determination keys. The seedling emergence method was carried out under controlled conditions of greenhouses for a period of 12 weeks, and the number of seedling was monitored. Method of physical extraction estimated that the number ranged from 53250 seeds m-2 in autumn 2014 to up to 43725 seeds m-2 after spring sampling. On plots where the rotation of three crops is applied after all three sampling, the number of weed seeds in relation to the monoculture (15600/18075/16875 seeds m-2) is estimated to be three times smaller. This method indicated that in the monocultures total in the soil was represented 15 weed species, while in the 3–year crop rotation 17. According to the seedling emergence method and counting the seedling, it was found that on the monoculture in the following period it is ready to germinate 6 weed species, or 11 in 3–year crop rotation.

Key words: weed seed bank, crop rotation.

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P1_09

Seed germination of common cocklebur (*Xanthium orientale* subsp. *italicum* (Moretti) Greuter)

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Abstract

An understanding of seed germination is one of the significant factors for predicting the weed spreading, invasiveness and developing effective strategies in weed management. In Bosnia and Herzegovina *Xanthium orientale* subsp. *italicum* is a widespread weed species on arable land (field crop, vegetable, orchards, vineyard) as well as in non-arable habitats. Seed germination depends on a several environmental factors (humidity, temperature, light, soil pH), but one of the most important factor which effect on seed germination is temperature. For testing of temperature effects on germination, seeds from 18 populations were collected. Seed germination were conducted in an incubator, on six different temperature (15, 20, 25, 30, 35 i 40°C) in the dark. Humidity was constant for all researched populations. As the substrate sterile sand was used. The number of germinated seeds was recorded every second day, during 20 days period and germination rate were calculated. The temperature and time has statistically significant effect on seed germination for all researched populations. The lowest germination occurred at 15°C, and the highest germination at 35°C. Total seed germination for the species *X. orientale* subsp. *oriental*, depending on the populations, was 55.0-95.0%.

Key words: germination; temperature; *Xanthium orientale* subsp. *italicum*

P1_10

Determination of the fumonisins content in different small grains

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Abstract

Fungi of the *Fusarium* genus belonging to the Liseola section can synthesise fumonisins of greater or smaller concentrations. Maize is a primary host of these species. In recent years their presence has been also observed in small grains. The aim of this study was to observe the concentrations of fumonisins synthesised by small grains after artificial inoculation. Twelve isolates of the following species were selected from the collection of fungal cultures of the Maize Research Institute, Zemun Polje for artificial inoculation: Fusarium verticillioides (6), Fusarium subglutinans (3) and Fusarium proliferatum (3). The concentrations of synthesised fumonisins were analysed in four small grains: wheat (Aurelia), barely (Nektar), triticale (Zenit) and durum (Cosmostar). The artificial inoculation was performed with the hand sprayer when more than a half of tested plants were in the full-blossom stage. Inoculation of plants was done in four replications. The amount of inoculum (spore concentration was 1x10-6 per 1 ml) was 20 ml per a group of 20 spikes. The isolate of *Fusarium graminearum* species was used for spike inoculation in the positive control, while sterile distilled water was used in the negative control. Inoculated spikes were covered with wet PVC bags that were removed after 48h. After harvest, fumonisins were analysed by the ELISA test (Tecna, Italy). According to obtained results not a single isolate of the observed species synthesised fumonisins in the barley crop. In the remaining crops, isolates of F. subglutinans species synthesised fumonisins in low concentrations (0.793-24.949 ppm), while the corresponding values of isolates of *F. proliferatum* species were high and ranged from 35.886 to 60.000 ppm. Isolates of *F. verticillioides* species had low values in wheat (2.162-7.925 ppm), while these values in durum were high (29.610-47.174 ppm). The mean values of synthesised fumonisins in the triticale crop were low (1.357-32.587 ppm).

Key words: cereals, *Fusarium*, fumonisins

P1_11

Resistance of small grains to toxigenic fungi of the *Fusarium* genus of the Liseola section

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Abstract

Resistance of durum (Cosmostar), triticale (Zenit), wheat (Aurelia) and barley (Nektar) to toxigenic fungi of the *Fusarium* genus of the Liseola section was observed in the present study. Fifteen isolates of fungi of the *Fusarium* genus of the Liseola section (*Fusarium verticillioides*, *Fusarium proliferatum* and *Fusarium subglutinans*) were selected from the collection of fungal cultures of the Maize Research Institute, Zemun Polje for studies. Spikes were inoculated according to the modified method of Mesterházy et al. (1999) in the early morning hours when more than 50% of the plants in the plot were in the full-blossom stage. Groups, each of 20 spikes, were inoculated per replication. The prepared inoculum amounted to 20 ml per replication. The spore concentration for the inoculum was 1x10-6 spores per 1 ml. In a negative control, spikes were inoculated with the same amount of sterile distilled water, while in the positive control, spikes were inoculated with the suspension of *Fusarium graminearum* spores. The inoculum was applied with the hand sprayer. After inoculation, spikes were covered with wet PVC bags to provide favourable conditions of moisture for the fungal development. Bags were removed after 48 h. After 3-week inoculation, the degree of infection was established on the 1-7 scale according to Blandino et al. (2012). The highest average rating was recorded in wheat (4.98), and the lowest in barely (2.85). These ratings in the remaining two plant species amounted to 3.61 (wheat) and 3.28 (triticale). The disease severity index (DSI) was the highest in durum (77.91%), then in wheat (65.42%), triticale (53.47%), while it was the lowest in barley (46.78%). Based on the gained results it may be concluded that the highest resistance to *Fusarium* species of the Liseola section was expressed by barely, while the lowest degree of tolerance was recorded in wheat.

Key words: cereals, *Fusarium*, resistance

P1_12

Effect of the choline on the production of pharmacologically attractive secondary metabolites in wheat sprouts

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Abstract

Wheat is one of the oldest, most important and most consumed grain in the world. Recently, consuming of wheat sprouts have become popular because it can bring more health benefits than consuming wheat grain. During the sprouting of wheat seeds, many valuable processes are activated that accumulate various bioactive compounds, such as vitamins, amino acids and phenolic acids. The aim of this study was to assess the effect of two different concentrations of choline chloride (5 mM and 10 mM) on wheat growth parameters and the production of pharmacologically attractive secondary metabolites in wheat sprouts. This was accomplished by determining the phenolic acids by HPLC PDA method. Choline chloride treated seedlings showed higher shoot length than control as well as increased fresh weights. Also in 5 mM choline chloride treated seedlings higher content of chlorophyll and carotenoids were observed. The results showed that 5 mM choline chloride enhanced the biomass accumulation and phenolic acid accumulation in wheat sprouts. HPLC analysis revealed that ferulic acid was the most aboundant phenolic acid in wheat sprouts.

Key words: choline chloride, wheat sprouts, polyphenols

P1_13

Grain yield and 1,000-grain weight of triticale varieties depending on the fertilization

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Abstract

As a new small grain crop created by breeding, triticale is receiving increasing attention of producers at both domestic and global levels, given its combination of major positive properties of wheat and rye. Unlike other small grains, the area under triticale in the Republic of Serbia is small, but has been steadily increasing over the years. Field trials were set up during 2017/18 and 2018/19 in the Požega area (Western Serbia) to analyze the impact of mineral nutrition on the grain yield of triticale. Two varieties of triticale (KG-20 and Odyssey) and four fertilizer treatments (I - non-fertilized, II - 300 kg ha^{-1} KAN (27% N), III - 300 kg ha^{-1} NPK (15:15:15 NPK) and IV- 300 kg ha^{-1} NPK + 2400 kg ha^{-1} "Njival Ca" (98.5% $CaCO_3$, 1% $MgCO_3$) were used in the experiment. The trial was established in a randomised block design with three replications and a plot size of 5 x 2 m (10 m^2). The Požega region is characterised by a temperate continental climate with precipitation unevenly distributed across months. Starting from the fact that precipitation and temperature are very important for the development of cereals, the first year of research can be characterized as more favorable in terms of meteorological conditions for the cultivation of triticale in this area. The application of mineral fertilizers resulted in a significant increase in grain yield and 1,000 grains weight in both varieties. Significantly higher grain yields on average for both varieties and years were obtained III (Kg-20: 5 585 kg ha^{-1} and Odyssey: 5370 kg ha^{-1}) and IV fertilization variants (Kg-20: 5 615 kg ha^{-1} and Odyssey: 5 687 kg ha^{-1}). On average, the Kg-20 variety had a higher yield, and a mass of 1000 grains relative to the Odyssey varietyThe presence of first- and second-order interactions (variety / fertilization / year) indicates different responses of the varieties to changing agroecological conditions, especially the quantities of nutrients used, as well as to the changing climatic factors.

Key words: Triticale, mineral nutrition, grain yield, 1,000-grain weight

P1_14

Yield potential and fruit quality of club apple cultivars in climatic conditions of eastern Serbia

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Abstract

The production of branded apple cultivars of high market value, requires to meet the requirements of the Club in terms of both agro-ecological conditions and the possibility of applying the latest cultivation technology. The most significant commercial apple orchard with club cultivars in Serbia is within Delta Agrar company in the vicinity of Zajecar. Orchards were established in 2016. with high density of nursery tree per ha (Eveline - 3906, Pink Lady - 3125, Modi and Lafayette – 5208). Training system is highly slender spindle. In order to determine the significance of the crown distance from the trunk on the quality and quantity of fruits, 30 trees per cultivar were examined during the 2019. Each tree was divided into 12 segments. Significant differences were identified among the cultivars in yield potential (number of generative buds before and after pruning, number of fruits after chemical thinning, number of fruits harvested) as well as fruit quality (fruit diameter, fruit weight, color coverage and intensity of fruit color by segments). Lafayette and Eveline formed a higher number of generative buds per tree, while the biggest number of fruits per tree after the thinning was recorded at Eveline (91.9) and Pink Lady (99.4) cultivars. Pink Lady and Eveline were the cultivars with most harvested fruits per tree, comparing the Lafayette (72.06) cultivar. Eveline had the largest fruit diameter (74.78 mm), the highest fruit weight (184.89 g) and the high percentage of additional color coverage (79.23%). The smallest diameter (65.92 mm) of fruit eith, well covered color (77.49%) recorded with Modi cultivar. Pink Lady had the lowest percentage of additional color coverage (73.44%), with an intensity, according to the colorimeter, ≥ I 5.61. Most fruits are located in the lower part of the crown of Eveline, Lafayette and Pink Lady cultivars and in the middle part of the crown of Modi cultivar. High yield and extra fruit quality of all tested cultivars are achieved. Eastern Serbia is suitable for growing club cultivars of apples.

Key words: Keywords: club cultivars, yield potential, fruit quality

P1_15

ZP Admiral- facultative triticale variety

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Abstract

The present study displays the most important agronomic and technological traits of the first Serbian facultative triticale variety, ZP Admiral, developed at the Maize Research Institute, Zemun Polje. Grain yield of the ZP Admiral in the two-year trails of the Serbian Committee for the Release of Varieties as a spring type amounted to 6185 kg ha-1, and as a winter type 8398 kg ha-1. ZP Admiral is an early triticale variety, three days earlier than standard check, with excellent resistance to lodging. The variety is characterized with leaf and spike waxiness, while the surface of stem neck is hairy. The protein content of ZP Admiral as a winter crop amounted 12,9% comparing to 12.7% of standard variety Odisej, and had a slightly lower protein content 12% than in a spring sowing. Quality parameter ash content, a measure of the total amount of minerals, of the spring ZP Admiral was higher than in winter sowing 2.4% and 1.9%, respectively. Volume weight was 81.5 kg hl-1 and 78.2 kg hl-1 in spring and winter sowing respectively, and 1000 kernel weight 36g and 38.7g, respectively. Because of its adaptability, yield stability and good level of drought tolerance new facultative variety ZP Admiral has good potential for production in different agro-ecological environments.

Key words: triticale, facultative type, variety, breeding

P1_16

Genetic diversity of maize inbred lines assessed by SSR markers

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Abstract

Morphological traits are the earliest used markers in germplasm characterization, but their application may be difficult due to the presence of recessive homozygous alleles and their low frequency. Nowadays Simple Sequence Repeat (SSR) markers are widely used for estimation of genetic diversity within different species, due to their reproducibility, informativeness co-dominant and multi-allelic nature. They are also most effective for evaluation and selection of plant material, as well as assessment of genetic variability and relatedness of maize inbred lines. The aim of our work was to evaluate genetic diversity of maize inbred lines by SSR markers and compare results with their pedigre information. Seventeen polymorphic SSR markers were used to characterized 23 maize inbred lines that belong to diferent breeding programs. A total number of detected alleles was 78 and varied between two to nine, with an average of 4.6 alleles per marker. Based on presence or absence of alleles in each sample coefficient of similarity was calculated by Jaccard in NTSYSpc2 program package, version 2.1. The highest value (0.88) of genetic similarity was calculated between L21 and L22, while the lowest value (0.18) was found between inbred lines L3/L16 and L15/L20. Genetic similarity matrix was used to construct dendrogram by UPGMA (Unweighted Pair Group Method with Arithmetic Mean) method. Dendrogram analysis grouped maize inbred lines in one large cluster with 21 analyzed genotypes and one smaller cluster with two lines, mostly in accordance with their origin. Genetic heterogeneity between inbred lines detected by selected set of SSR markers, makes them a good choice for genetic diversity analysis and planning maize breeding programs.

Key words: maize inbred lines, genetic similarity, SSR markers, *Zea mays* L.

P1_17

Potential of Kladovo agricultural soil for irrigation from the aspect of infiltration characteristics

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Abstract

Growing crops in a traditional (rainfed) farming way under climate change conditions, results in low and variable yields. Only about 3% of arable soil of Serbia is irrigated. This makes agricultural production potentially the most vulnerable branch of the economy under newly emerged conditions. Increasing surface areas under irrigation systems along with good irrigation practices is a good way to achieve stable and high yields. The aim of this research is to evaluate the potential of using agricultural soils of Kladovo region (Eastern Serbia) for irrigation, based on research on infiltration and water-physical properties of different soil types. The study covered an area of 1700 ha, on which 12 soil profiles were opened .The soil type characteristic and their water-physical properties have been determined. Field infiltration rates were obtained with the double ring infiltrometer. Based on the obtained cumulative infiltration curves, parameters for the infiltration estimation by the method of Kostiakov-Lewis were obtained. This method is closely related to the textural class of the soil. Three soil types were determined; Arenosols (silty loam), Fluvisols (silty and sandy loam texture) and Pseudogleys (loamy texture). Within first hour of testing, infiltration ranged from 210.6 to 1085.8 mm h-1, 80.5 to 155.75 mm h-1, 84.9 to 101.7mm h-1 for Arenosols, Fluvisols and Pseudogleys respectively. From the water-physical and infiltration point of view, it can be concluded that Arenosols are suitable for pressurised irrigation systems, while for the Fluvisols and Pseudogleys it is essential to apply ameliorative measures in order to improve infiltration rate and soil water capacity. Soil suitability for irrigation can't be estimated solely by using soil texture classes (Kostiakov-Lewis method), but field infiltration measurements must also be taken into account, which, regardless of the soil type and its textural class, depend greatly on the land use.

Key words: Infiltration; Irrigation; Soil texture; Land use

P1_18

Effect of salicylic acid on the production of pharmacologically attractive secondary metabolites in wheat sprouts

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Abstract

Wheat is one of the most important cereals in the world. Recently, young wheat seedlings (sprouts) are increasingly being used as natural health supplements in form of fresh juice or powder, as they possess a higher nutritional value than adult plants. During germination and sprouting, wheat accumulates various bioactive compounds (such as vitamins, amino acids and phenolic acids) responsible for anticancer, antimicrobial and antioxidant activity. The aim of this study was to evaluate the influence of salicylic acid on wheat seeds on the germination parameters (growth parameters), pigment content and polyphenols. The results show that seeds treated with SA have higher shoot lengths than the control (9.56 cm and 8.39 cm, respectively). Fresh weights of seedlings were increased due to SA treatment as compared to control (50.3 mg/seedlings and 46.5 mg/seedings). SA treated seedlings had higher content of chlorophylls and carotenoids. HPLC analysis of wheat reveled that ferulic acid was the major compound, followed by p-coumaric and p-hidroxy benzoic acids. The increase in the phenolic acid content found in SA treated wheat sprouts suggests an improved bioavailability and a higher antioxidant potential. In conclusion, the results showed that SA has potential to enhance the biomass accumulation and polyphenols in wheat sprouts.

Key words: salicylic acid, wheat sprouts, polyphenols.

P1_19

Quality of Silage from Whole Maize Plant Prepared on Dairy Cattle Farms

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Abstract

The goal of this research was to determine the quality of silage from the whole maize plant prepared on dairy cattle farms in lowland and mountain areas of Republic of Srpska. Examination of the quality of maize fodder was conducted for three years, from 2011 to 2013. The samples of silage were taken from the locations Prijedor, Derventa and Mrkonjic Grad. This research included nine farms. Farm silage samples were taken from horizontal silos and silo stacks during the winter period. Organoleptic properties, odor, color and presence of mold on samples were determined directly on the farm. One kilogram samples were taken for chemical analysis and packed in nylon bags. The following parameters were determined: moisture content, pH value, crude proteins, crude cellulose, crude fat and ash. The following parameters were obtained by calculation: BEM, metabolic energy and NEL. A significant variation in pH value and dry matter content was observed in the tested maize silage samples. The pH values varied from 3.3 (Mrkonjic Grad) to 4.3 (Derventa) and dry matter content ranged from 249.1 g kg-1 DM (Mrkonjic Grad) to 452.0 g kg-1 DM (Derventa). A significant variation in the content of crude cellulose was also observed, ranging from 195.7 to 304.6 g kg-1 DM. The silage from farm 2 (Prijedor, 2012) had the best quality, with 100.2 g kg-1 DM of crude proteins and 6.24 MJ kg-1 DM of energy value NEL.

Key words: silage, maize, farm, pH, proteins, cellulose, NEL

P1_20

The yield of some wheat varieties sown at the optimum time and in late sowing

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Abstract

Wheat sowing at the optimum time is very important, especially from the aspect of vegetation length, timely wading and rooting of plants, plant development, nutrient utilization rate, and ultimately total wheat yield. It is often the case that due to unfavorable climatic factors, such as drought or heavy rainfall, a delay in the removal of pre-crop and similar occasions. sowing is not carried out at the optimum time. In this case, the plants are underdeveloped, some of them collapse during the winter and in the spring some stages of development are shortened, which altogether results in diminished yields. The paper shows the yield and some components of grain quality of several varieties of wheat sown in the optimal period (October) and in the late-term (early December). The experiments were carried out in 2016/17 and 2017/18, in the area of Southern Serbia (Leskovac) with 5 wheat varieties (Obsesija, Avenue, Sosthene, Farineli and Darija), under the same agro-ecological conditions on alluvium soil. Sowing in 2016/17 was done on October 30, and in 2017/18 on December 8. The results of the experiment show that the average yield of sowed wheat in the optimal period was 6.776 kg ha-1 and those sown in the delayed period 5.091 kg ha-1. The largest yield reductions were observed for the Avenue and Farineli varieties (2,490 and 1,960 kg ha-1). Also, the mass of 1000 grains and hectolitre mass were lower in delayed sowing. These data indicate the importance of an optimum deadline for sowing wheat, which is often not respected in production.

Key words: Keywords: wheat, optimal term, delayed sowing, yield

P1_21

The effect of fall sown different cover crops on popcorn weediness

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Abstract

The use of cover crops can be considered as an effective method, especially in sustainable and organic agriculture through weed control and reducing herbicide use, improving soil and increasing main crop yield. An experiment was conducted using randomized complete block design with four replications in 2015–2016 growing seasons, at the Experimental Field of Maize Research Institute in Zemun Polje. Cover crops (fall–winter species) were considered as the main factor (common vetch, field pea, winter oats, fodder kale), mixtures common vetch and field pea with winter oats, dead organic mulch and traditional variant, without coverage on biomass. Green biomass of the cover crops was incorporated in the soil, and treatments with favorable establishment and above-average biomass yields tended to suppress weeds by showing lower weed dry matter and weed numbers. The most common species of weeds in popcorn at the investigated locality were *Sorghum halepense* L. Pers., *Datura stramonium* L., *Chenopodium album* L., *Amaranthus hybridum* L., *Solanum nigrum* L., *Amaranthus retroflexus* L., *Amaranthus albus* L., *Convolvulus arvensis* L., and *Hibiscus trionum* L. Significantly higher weed infestation was observed in the second year of the investigation and the reasons were unfavorable weather conditions, especially high air temperature and unequal distribution of precipitation. The highest weed control efficacy within the cover crop species was established in 2016 by mixtures of legume crops and winter oats. The results showed very significant difference between treatments, especially in terms of fresh biomass of weeds, thus the lowest weed biomass was related to mixed legume species (common vetch and field pea) and winter oats (260 and 250,78 g), while on the control variants (dead organic mulch and traditional variant) 562.15 and 540, 46 g was measured. The number of weed species and number of plants per species was also the highest in the control variants.

Key words: weeds, popcorn, cover crops, coverage of soil

P1_22

RESPONSE OF ITALIAN RYEGRASS SEED CROP TO NITROGEN FERTILIZATION AND TRINEXAPAC-ETHYL APPLICATION

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Abstract

Italian ryegrass (Lolium multiflorum Lam) is prone to lodging as consequence of high precipitation levels during growth period, and/or high nitrogen fertilizers application rates in spring. The aims of the studies were to determine the possible changes of Italian ryegrass growth in the first production year using different nitrogen spring application rates and growth regulator doses. Field trials were conducted during two consecutive years under no irrigation conditions. Tetraploid Italian ryegrass cv. K-29 was seeded each autumn with seedling rate of 20 kg ha^{-1} and fertilizer addition (NPK 8:16:24) 250kg ha^{-1}. Three rates of nitrogen (0, 50 and 100 kg ha^{-1}) were applied at early spring, and somewhat later three doses (0, 0.5 and 1 L ha^{-1}) of growth regulator trinexapac-ethyl. Trials were set as complete randomized block design with four replications and plot size of 10 m^2. Prior to the seed harvest, biometrical traits such as number of generative tillers, internodes' length, stem length, spike length and the number of spikelets per spike were measured on 10 randomly sampled tillers from each plot.

Due to different precipitation levels (relatively low in the first and relatively high in the second year of examination) there was significantly different effect of trinexapac-ethyl on Italian ryegrass. All morphological parameters measured except 5th internodes' length and spikelet number were statistically significantly different from control in the first year while the only difference was evident for the 4th internodes' length in the second year. As for nitrogen application there were significantly differences in 5^{th} and 6^{th} internodes' length as well as in tiller and spike length in the first year but only in regard to tiller length in the second year. The opposite effect of those treatments could be useful for optimizing Italian ryegrass seed production in Serbian environmental conditions.

Key words: Italian ryegrass, trinexapac-ethyl, nitrogen fertilization, lodging

Section 1: CROP SCIENCE

Oral Presentations

01_01

Maize genetic resources in Serbia – management and utilization in breeding

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Abstract

Maize Research Institute „Zemun Polje“ (MRIZP) gene bank preserves ex-situ an active collection (5806 accessions), thus ranking among the five largest European national maize gene bank collections. Local (i.e. western Balkan) maize landraces (2217 accessions) are considered to be the most significant genotypes, since they represent the original biological material created by the process of natural selection and adapted to local growth conditions, thus offering the great opportunities for different breeding purposes and contributing to yield increase. Currently, they are not directly used in breeding, but rather for development of synthetic populations or core collections for the traits of interest, allowing the integration of the most valuable traits (adaptability, variability, divergence and heterotic potential). In the last 15 years, in MRIZP gene bank was conducted identification of superior genotypes regarding specific traits (cytoplasmatic male sterility) and abiotic stress tolerance (herbicides tolerance). In response to more frequent unpredictable and extreme climatic events, as well as to growing demand for healthy food and feed, in MRIZP gene bank were established drought tolerant and improved quality core collections through implementation of long-term pre-breeding programmes, as the most promising way of linking genetic resources and commercial breeding programmes. Moreover, exchange of maize inbred lines from MRIZP gene bank and Agricultural Institute Osijek working collections, genotyping and phenotyping of inbreds, and statistical analysis of molecular and agronomic data, is conducted through ongoing Project “Harmonization of methods for phenotyping, genotyping and management of genetic resources in maize”. Joint analysis of genetic diversity originated from the Western Balkan Corn Belt, along with comparative analysis with the same standards (available genome sequencing data of public lines), will enable the determination of heterotic pattern, removal of possible duplicate and redundant accessions from the collections, contributing to a more efficient management of large inbred lines collections.

Key words: core collections, gene bank, pre-breeding, *Zea mays* L.

01_02

Common wild oat (*Avena fatua* L.) spikelet and seed morphology variation in Bosnia and Herzegovina

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Abstract

Intraspecific variation in spikelet and seed morphology was assessed for eleven populations of wild oat. Spikelet lengths varied between 1.13 and 1.81 cm, with highly significant differences being recorded between most analyzed populations. Lemma color varied between ocher, light-brown, brown and black, with the majority of analyzed populations (63.64%) having predominately (≥50%) brown lemma color. Percent of lemma hairiness was also assessed and yielded some highly significant differences between the populations. Length of the awn varied between 2.34 and 4.74 cm, with differences in mean values of awn length per population being statistically significant between several analyzed populations. The angle between the awn and the dorsal surface of lemma was also studied and varied between 85.76 and 140.71. Analysis of grain length has shown highly significant differences only between the populations from Bačevci (BIH02) and Aleksandrovac (BIH03), when compared with other nine analyzed wild oat populations, while contrary to this, grain mass was shown to be a highly significant factor when comparing wild oat populations. Consequently, it can be theorized that the wide range of variation documented for certain seed morphology traits results from a high local differentiation potential of wild oat populations.

Key words: genus *Avena*, wild oat, *Avena fatua*, morphological parameters, morphological variability

01_03

Evaluation of grain yield and its components of some experimental, registered and commercial ZP maize (*Zea mays* L.) hybrids

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Abstract

The grain yield and its components of eighteen experimental, one registered and two commercial maize hybrids were examined in six different environments. The main objectives were to identify the best performing experimental and registered hybrids and to select appropriate hybrids for approving and commercialization. Based on the results, many decisions are made. Experimental hybrid Exp.15 is submitted for testing to the Variety Commission of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia. This hybrid, as a high-yielding and a stable one, could enrich the assortment of registered medium-late maize hybrids in Serbia. First year of its testing for the purpose of being registered is going to be 2020. Further, registered hybrid ZP 685 is suggested for commercialization as one of the best performing in present study. In addition, the goal of this study was also identification of the superior inbred lines for use in future breeding programs. Inbred lines L1 (BSSS) and L4 (Independent heterotic group) are chosen for crossing with an aim to create a new origin population - source for deriving new recombinant inbred lines. Cross L1 x L4 will be a part of maize breeding program at Maize Research Institute "Zemun Polje" in 2020. Lines L1 and L4 are also suggested for crossing with all others Lancaster lines from MRIZP (which are not parental components of tested hybrids) for deriving new experimental F1 hybrids. As well, Lancaster lines L5, L6 and L7 should be crossed between themselves for creating new origin populations for deriving new recombinant Lancaster inbred lines. Hybrid Sister 1 had very high and stable grain yield and as such it is the most cost effective for seed production.

Key words: maize, experimental hybrids, grain yield, yield components, variety registration

01_04

Variation in duration of pre-anthesis phases of development in barley (*Hordeum vulgare* L.)

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Abstract

Phenology of small cereals as a complex trait, which provides matching plant development with growing conditions, is important factor that influence plant adaptation to particular environment and finally yield. Scales of growth based on plant phenology and scales of development based on apical morphology are very precise, but relationships between them are not always clear. Some morphogenetic features of cereals growth can be predicted on the basis of leaf appearance. That means shoot apex development is coordinated with leaf appearance and total number of formed leaves. The objective of this research was to study relationships among apical development and plant phenology and the variability in phenological development of diverse winter barley cultivars under field conditions. The twelve barley cultivars differed in origin, pedigree and agronomic traits were used in this study over six growing seasons at the Novi Sad location (45°20'N, 15°51'E, altitude 86 m) and under rainfed conditions. Phyllochron approach was used as method to determination of beginning/finishing stages of development apex and the duration of the phases was converted to cumulated growing degree days (GDD). Spikelet initiation started at 2.5 Haun stage and finished at 7.1 Haun stage. Preanthesis phases (single ridge-SR, double ridge-DR, spikelet development-SD, heading-H, anthesis-A) and grain filling period (GFP) were under significant effect of genetic (G), environmental (E) and interaction factors (GxE). Of the total variation of DR phase 55.7% participated to GxY, 22.1% to E and 12.3% to G. Spikelet development were mainly under G and E control, 42% and 44%, respectively. Heritability was 0.57 and 0.95 for DR and SD, respectively. Across cultivars and environments from the total growing period 138 GDD belonged to sowing-first leaf period, 161 to SR, 326 to DR, 541 to SD, 254 to flag leaf-H, 142 to H-A and 732 to GF. Although the variability was found in the duration of the pre-anthesis phases and GF, especially in spikelet and flower development, among most of the phases a positive genotypic correlation was found.

Key words: Barley *(Hordeum vulgare L.),* spike development

Section 2: HORTICULTURE SCIENCE

Poster Presentations

P2_01

Bioecological analysis of city block greenery in Novi Sad (Serbia)

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Abstract

The aim of this paper is analysis of existing greenery and making plant inventory list for the area of the city block of Liman I in Novi Sad. In the studied area flora is mainly consisted of native deciduous trees which are common for the southeast Europe and a small percentage of introduced species. Coniferous trees are less present, and most of them belong to the mountain and humid climate belt, so that they demonstrate lower adaptability to the existing environmental conditions. The most numerous species are field elm (*Ulmus minor* Mill.) and small-leaved linden (*Tilia cordata* Mill.). The species that have shown the best adaptability to urban condition and usually urban stress are *Tilia cordata* Mill. and *Tilia tomentosa* Mnch. This kind of analysis are important for creation of the realistic inventory database which can be used for the rational green management and planning.

Key words: Key words: urban greenery, plant inventory list, city block

P2_02

Phytochemical analysis and antioxidant potential of pomegranate (*Punica granatum*) juice

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Abstract

A maritime and continental specimen of pomegranate fruits have been collected at the two different locations: a) Adriatic seaside (near Bar, Montenegro), and b) near Novi Sad (Serbia), respectively. Since they were growing under different agroecological conditions, the aim of this study was to determine the content of total polyphenols, tannins, flavonoids, anthocyanins, proanthocyanidins and carotenoids in the juice of the ripe fruit of five pomegranate cultivars. In addition, antioxidant activities of fruit juices were evaluated using two free radical neutralisation tests - DPPH and ABTS+. Results showed that continental specimen contained higher levels of total polyphenols, flavonoids and proanthocyanidins, but the content of anthocyanidins (0,38 mg malvidin-3-glucoside g-1 fr. w.) and carotenoids (30,32 mg g-1 fr. w.), both in cv. Slatki barski, was significantly higher in the specimen from Montenegro. Still, it seems that due to higher levels of biologically active natural antioxidants such as flavonoids and proanthocyanidins, continental pomegranate juice showed significantly higher activity in neutralization of the DPPH-free radicals (up to 80,61 mg trolox g-1 fr. w.) compared to maritime specimen (17,44-55,19 mg g-1). ABTS+ test showed the same results, where the juice of the continental cv. NS Aca reached 98,69 mg trolox g-1 fr. w. Phytochemical analysis of the contents of selected natural products justifies the assumption that continental pomegranate fruits may also be considered as useful and biologically active natural antioxidants as well as the source of functional food, since the content of these phytochemicals corresponds, and even exceeds the content found in fruits of pomegranate growing on the Adriatic coast. The raising conscience of multiple value of pomegranate is needed because this species, beside its nutritive properties, also possess medicinal, decorative and commercial value.

Key words: pomegranate, polyphenols, antioxidants

P2_03

Diversity of Slovenian *Vitis* spp. genotypes

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Abstract

Viticulture in the Mediterranean basin is an old agricultural activity, dating to antiquity, and intimately associated with the history and culture of the grapevine cultivation regions. Project MedVitis proposes an integrated effort by four Mediterranean partners from Greece, Slovenia, and Morocco, aiming to protect the diversity of grapevine germplasm across the three countries, in order to better manage issues of grapevine identification, genetic erosion, climate change and *Vitis* pathogenicity. In Slovenia, some old grapevine varieties are preserved in national collections; but there are still many old varieties which are typical for specific agro-climatic areas and some have become important for the production of regional vines. The identification of local, unknown varieties is often difficult by morphological descriptors alone, because there are many synonyms/homonyms of particular local varieties. A set of 36 *Vitis* genotypes have been identified and selected for further phenotypic (ampelometric) characterization and genetic studies. This set consists of rare, unknown, resistant and standard grapevine cultivars from all three wine-growing regions in Slovenia, i.e. Podravje, Posavje and Primorska. Ampelographic characterization consist of 85 OIV descriptors related to young shoot, shoot, woody shoot, young leaf, mature leaf, flower, bunch and berry. During the growth period several samplings were performed and photo documented on each individual vine. Leaf samples from the selected Slovenian genotypes were collected for subsequent genotyping procedures. A set of different microsatellite markers have been utilized, including the SSR markers recommended as grapevine-specific molecular descriptors by the OIV. Diversity parameters, genetic structure and linkages of analyzed genotypes were assessed and evaluated through different algorithms implemented into selected bioinformatics programs and software packages. Ampelographic description and molecular characterization of selected genotypes will enable the identification, characterization and preservation of valuable autochthonous *Vitis* germplasm. Collected data will be used to upgrade and improve the national collection inventories and databases.

Key words: ampelometry, OIV descriptors, grapevine, SSR markers

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P2_04

MedVitis - Protecting the diversity of Mediterranean Vitis in a changing environment

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Abstract

Viticulture and wine production are important sectors of agriculture in Mediterranean countries. Diverse geographical terrains and regional climates within each country have favoured wide *Vitis* diversity and led to local varieties that are well adapted to specific agro-climatic conditions supporting sustainable agricultural systems of low inputs. Introduction of foreign commercial varieties over the years have resulted in genetic erosion and loss of genetic diversity, necessitating collaborative actions aiming to preserve the diversity of *Vitis* genetic resources in this area. Environmental changes triggered by the global climate change as well as the threat of diseases predict negative impacts for Mediterranean viticulture. Project MedVitis is an integrated effort by Slovenian, Greek and Moroccan partners, aiming to protect Mediterranean grapevine biodiversity and enrich national grapevine collections. MedVitis entails phenotypic and molecular assessment of commonly used as well as rare grapevine varieties in order to enable proper variety identification, resolve issues of ambiguous identity (synonyms, homonyms) impacting the authenticity of final products, and allow for the updating of existing, or development of new national grapevine databases. Furthermore, exploring rare grapevine germplasm may provide novel information about varieties with tolerance to environmental changes. Exchange of knowledge and expertise among partners with respect to phenotypic and genetic characterization of grapevine varieties and information about potential resilience of different varieties to adverse climatic conditions would provide valuable tools for promoting sustainable viticulture in each country. Overall, the project aims to protect the diversity of grapevine germplasm

across Greece, Slovenia and Morocco, and set the ground for addressing more efficiently issues of grapevine identification, genetic erosion, climate change and *Vitis* pathogenicity in the Mediterranean basin. MedVitis is expected to contribute to the conservation of Mediterranean grapevine genetic resources, promote sustainable viticulture, and enhance rural development affecting the economy and growth of local communities in the Mediterranean region.

Key words: biodiversity, characterisation, genetic erosion, g*rapevine* germplasm

Acknowledgement: The project "Protecting the diversity of Mediterranean *Vitis* in a changing environment (MedVitis)" is funded through the ARIMNet2 (2017) Joint Call by the following funding agencies: Hellenic Agricultural Organization-Demeter (Greece), Ministry of agriculture, forestry and food (Slovenia), Ministere de l'Enseignement Superieur de la Recherche Scientifique et de la Formation des Cadres (Morocco). ARIMNet2 (ERA-NET) has received funding from the EU 7th Framework Programme for research, technological development and demonstration under grant agreement no. 618127.

P2_05

Lathyrus diversity: available resources with relevance to crop improvement – progress reviews and relationship with AEGIS (EUGrainLeg)

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Abstract

The ECPGR (European Cooperative Programme for Plant Genetic Resources) Grain legumes working group cover a range of species, which have enormous benefits for environment, food security and as well as the breeding material. However, despite its huge potential lots of species, including *Lathyrus* sp., are not well represented in European collection and enough exploited for different purposes. As starting point of EUGrainLeg project the activities act in two directions: i) AEGIS progress and improved data on European grain legumes plant genetic resources, and ii) improvement of group strategy work – in view of subgroup establishment based on species interest, in order to facilitate experience and knowledge exchange. The task of establishing the European grain legume collection needs updates and improvements, taking in account the large number of species managed inside the group. The significant diversity of *Lathyrus* sp. exist, but there are difficulties/gaps in order to identify accessions as AEGIS accessions, recording to registered data. EUGrainLeg project aiming following: 1) inventory and collecting of *Lathyrus* genetic material from each of national collection participating countries; 2) establishment of a *Lathyrus* working collection, exchange material and knowledge; 3) investigations towards the establishment of a high quality *Lathyrus* according to the principles of AEGIS; and 4) evaluation and characterization of established *Lathyrus sativus* core collection in different environmental conditions upon a

common set of traits (phenological, growth habit, pod and seed traits, seed productivity, etc.). EUGrainLeg project tasks will ensure collection, characterization and introduction of *Lathyrus* accessions in the European collections; provide phenotypic data that will result in improved quality and increased quantity of data and will be made available after the project via EURISCO database; propose *Lathyrus* accessions to AEGIS; and provide visibility and accessibility of *Lathyrus* plant genetic material for potential users.

Key words: grain legume germplasm, ECPGR, EURISCO

Acknowledgement: The project "*Lathyrus* diversity: available resources with relevance to crop improvement – progress reviews and relationship with AEGIS (EUGrainLeg)" is funded through the Sixth Call of the ECPGR Activity Grant Scheme (2018).

P2_06

Morpho-agronomic characteristation of *Lathyrus sativus* L. genetic resources from Slovenia and Bosnia and Herzegovina

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Abstract

Grass pea (*Lathyrus sativus* L.) is traditionally used as grain for human consumption and its foliage as a fodder crop. The local wild and agricultural floras in Slovenia and Bosnia and Herzegovina (BiH)/Republika Srpska are relatively rich in *Lathyrus* spp. Morpho-agronomic characterization for eight grass pea accessions obtained from Slovenian and Republika Srpska plant gene banks were implemented in this research. The same set of grass pea accessions was cultivated in each country, i.e. Slovenia – Jablje and BiH – Banja Luka, in the open field trial during the growing season 2019. Different quantitative and qualitative IPGRI (International Plant Genetic Resources Institute) descriptors for *Lathyrus* spp. related to inflorescences, plants, pods and seeds were measured and/or visually estimated. Plant growth habit of all tested *Lathyrus sativus* L. accessions was semi-erect and/or erect, number of primary branches ranged from 1 to 6, and leaflet shape was same for all (lanceolate). The accessions grew from 16 to 40 cm high and needed between 31 and 47 days to reach 50 % flowering and 75 to 89 days to maturity. Flowers showed only two colours, i.e. white and white blue. Pod-bearing position ranged between 8 and 17 cm. Average pod length and width were 3.6 cm and 1.7 cm, respectively, whereas number of seeds per pod varied from 1 to 4. Out of eight accessions only one showed broad-linear pod shape, while others had beaded pod shape. The most represented seed shapes were square, rhomboid and oblate or flattened with high colour variability (yellow-white, yellow-green, brown, and green mottled). 100-seed weight ranged from 20.1 to 33.4 g. The results of the present study will add the value through enrichment of the *Lathyrus* spp. collection in both countries, improvement of the existing data and documentation, and further studies of the morpho-agronomic traits of the grass pea.

Key words: accession; characterization; IPGRI descriptors; grass pea

Acknowledgement: This research was financially supported by the Sixth Call of the ECPGR Activity Grant Scheme (2018) project "*Lathyrus* diversity: available resources with relevance to crop improvement – progress reviews and relationship with AEGIS (EUGrainLeg)" and the Ministry for Scientific and Technological Development, Higher Education and Information Society of Republic of Srpska and the Slovenian Research Agency, i.e. Bilateral project between Slovenia and Bosnia and Herzegovina (ARRS-BI-BA/19-20-009).

P2_07

Morphological characterization of tomato accessions (*Lycopersicon esculentum* Mill.) from Gene Bank of Republic of Srpska

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Abstrakt

Through the Program for conservation of plant genetic resources in Republic of Srpska, tomato accessions were inventoried, collected and deposited in Gene Bank of Republic of Srpska. In order to describe these accessions morphological and fruit characterization was done, while future steps will be biochemical, sensory and molecular characterization. 21 accessions were characterized: GB00545, GB00548, GB00874, GB00875, GB01092, GB01106, GB01107, GB01108, GB01109, GB01110, GB01122, GB01123, GB01124, GB01125, GB01126, GB01128, GB01129, GB01132, GB01238, GB01239 and GB01240. These accessions were described according to IPGRI morphological descriptors (The International Plant Genetic Resources Institute, 1996) for tomato (*Lycopersicon* spp.). During the season of 2019, 10 plants (produced in greenhouse from seedlings) per accession were monitored for 62 characteristics, out of which 25 were morphological characteristics and 37 fruit characteristics. Analysing morphological characteristics the results show major variations in vine length between different accessions, ranging from 66 cm (GB01123) to 148 cm (GB01125). When considering leaf type, accessions GB00874 and GB01125 have potato leaf type, while other accessions have standard leaf type. Most of the accessions have 4 or 5 leaves under 1st inflorescence, while 3 or 6 leaves have two accessions and 2 or 7 leaves has one accession. Moreover, inflorescence type was generally multiparous in 11 accessions, generally uniparous in 6 accessions and both in 4 accessions. Petal length ranged from 7.75 mm (GB00545) to 12.22 mm (GB01129) and sepal length ranged from 8.44 mm (GB01109) to 11.85 mm (GB01129). All observed accessions have yellow corolla color. Finally, concerning 1000-seed weight in all monitored accessions, it was ranging from 2.57 g in accession GB01129 to 4.03 g in accession GB00875.

Key words: tomato accessions, morphological characterization, IPGRI

P2_08

Soil suitability within the borders of the municipality of Bužim for the apples (*Malus domestica*) cultivating

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Abstract

The consequences of improper land management are long-term, incomprehensible for agricultural production, and reflected through the loss of land, reduced yields, soil erosion, etc. In order to determine the optimal role or suitability of the land for apple cultivation within the Bužim municipality, a survey was conducted according to the FAO method of AEZ (FAO, 1976), and based on the obtained results, an assessment of the suitability of the land for apple cultivation was carried out. After research and sublimation of all the results it was confirmed that a significant land portion of the total 13,026.27 ha agricultural land within the Municipality of Bužim are suitable for fruit production marked from S1 to N suitability class. Thus, the areas with the best graded class S1 cover only 1.23% or 159.52 ha, the S2 class occupies 5.51% (717.24 ha), the S3 class occupies 2.29% (298.24 ha). And the largest areas are marked as the unfavorable N-class with 36.68% (4,772.60 ha). It is evident that preexisting conditions for apple production within the municipality do exist. With the implementation of the necessary measures of soil / land regulation, education of agricultural producers, and mindfulness of constraint factors hindering intensive production such as: terrain slope, depth, rockiness and soil response; a progress in production can be made.

Key words: soil suitability, apple, cultivation

P2_09

Polyphenolic compounds and antioxidant capacity of fruits of sweet pepper

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Abstract

Sweet pepper (*Capsicum annuum*, L.) is one of the most grown vegetable in the world because of its nutritional contribution, therapeutic and pharmaceutical value. Its significance in nutrition is due to high content of natural bioactive compounds such as phenols, flavonoids, carotenoids, capsaicinoids as well as vitamin A, E and C. The goal of this study was to determine content of total polyphenols, flavonoids and potential antioxidant activity of different sweet pepper cultivars. The plant material for this trial was methanol extracts of three different types of sweet pepper fruit: bell pepper, kapia type and tomato-pepper type (one cultivar of each fruit type). The fruits were collected at technological maturity. Determination of total phenolic content (TP) was estimated using Folin-Ciocalteu method. The total flavonoids content (TF) was carried out using a procedure based on the flavonoid characteristics to build metal-complexes with aluminium chloride ($AlCl_3$). Antioxidant capacity of methanol extracts was measured by 2,2'-azinobis-(3-ethylbenzothiazoline-6-sulphonic acid (ABTS) assay and ferric reducing antioxidant power (FRAP). The type of sweet pepper with the highest content of TP was tomato-pepper. Bell pepper showed higher content of TF in comparison with tomato-pepper and kapia type fruits. Concentration of phenolic compounds in bell pepper fruits was higher than content in pepper with elongated fruits but lower than values in tomato-pepper. According to both of antioxidant assays, tested tomato-pepper type exhibited higher antioxidant activity than the other two pepper cultivars analysed in this paper probably due to the highest level of TP. This result suggests that phenolic compounds can make a significant contribution to antioxidant capacity of sweet pepper fruit.

Key words: Capsicum annuum, antioxidants, phenols, bioactive compounds

Acknowledgements: This study was supported by the Ministry of Education, Science and Technological Development of Republic of Serbia.

P2_10

Effect of irrigation on fruit quality and yield of 'Red Cap'apple cultivar depending on crop load

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Abstract

Effect of irrigation on fruit quality and yield of Red Cap apple variety depending on crop load were studied. The aim of the paper is to determine how many apple fruits can be left on trees in third vegetation, growth under different irrigation treatments (without irrigation, normal irrigation - control and increased irrigation - double irrigation rate). For the Red Cap variety in the third year after planting, in order to achieve good fruit quality and satisfactory yield, it is necessary to leave a maximum of 25 fruits per tree, or 3.5 fruits per $cm^2$of trunk cross-sectional area (TCSA). Different irrigation treatments have influence on the fruit size, the proportion of first class fruits, as well as the degree of ripeness of the fruits. Increased irrigation during the months of July and August affects these parameters, but to a lesser extent than the crop load. The largest irrigation effect on the increase of fruit size had trees from crop load III, who had 5,5 fruits per $cm^2$of TCSA. Increased irrigation during July and August had no statistically significant effect on tested parameterson trees that had less than 4,5 fruits per cm^2 of TCSA and trees that had more than 6,5 fruits per cm^2 of TCSA.

Key words: apple, irrigation, crop load, yield, fruit quality

P2_11

Wild bee fauna associated with intensive apple production

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Abstract

Village Turjak in the Gradiška municipality represent well known fruit growing area in the Republic of Srpska and Bosnia and Herzegovina. Among represented fruit species in the Turjak village most popular are apple, pear, cherry and peach. Due to long tradition of fruit production and uniform agriculture landscapes with a lot of chemical usage the aim of this research was to investigate species diversity of wild bees present in three intensive apple orchards during flowering period. Distance between orchards was minimum two kilometers, while all orchards consisted of same apple varieties: Idared, Golden delicious, Pink and Gala. Sampling of bees was conducted in April of 2019 with two method applied. First method was net catching directly from the flower witch was done two times daily, before and after noon in duration of one and a half hour. Second method of catching implied water traps in three colors (white, blue and yellow). The total number of wild bee species in apple orchards were 36 representing 7 different genera. Number of species was 13, 16 and 26 per orchard representing 4, 5 and 6 genera. The most numerous was Andrena with 15 species, while *Lossioglossum* counted 10 species and *Bombus* was present with six species. Except these, following genera were found: *Xilocopa*, *Halictus*, *Osmia* and *Colletes*. Diversity of bees shows big differences between pollination communities among orchards. Additional measures should be taken to provide better conditions for wild bee reproduction and growing, all with a goal to a achieve optimal pollination service.

Key words: wild bee fauna, apple, pollination

P2_12

Migratory behaviour of *Parthenolecanium corni* Bouché (*Hemiptera: Coccidae*) developmental stages on grapevine

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Abstract

Parthenolecanium corni Bouché (Hemiptera: Coccidae) is an important grapevine pest in many vine-production regions in Europe. The aim of this research was to determine migratory behavior of mobile developmental stages as well as preferred parts of grapevine for larvae and adults settlement. The research was conducted from September 2018 to December 2019 in Neštin area (Serbia). Samples were collected according to Hoffmann (2002). Grapevine phenological growth stages were determined by BBCH scale identification key according to Lorenz et al. (1994). During this research, we have recorded that different P. corni developmental stages change their position on the grapevine throughout the year. It has one generation per year and overwinters as second instar larva under the bark of the trunk. At the end of bud swelling (BBCH-3), overwintering larvae moved from trunk to cordon. First females were formed when inflorescences were swelling with flowers closely pressed together (BBCH-55) and 90% of female population was located on the cordon while only 10% of them was on the trunk of grapevine. On first third of the cordon, nearest to the trunk, 65% of females were settled, 26% on the second and only 1,46% on the last third. Oviposition took place when inflorescences were fully developed with separated flowers (BBCH-57). First instar larvae appeared when young fruits began to swell (BBCH-71) and they migrated to the leaves. About 43% of first instar larvae population was settled on the leaves nearest to the trunk and cordon. During the summer they were feeding on the leaves and in September (BBCH-91) they moulted into second instar larvae. At the beginning of leaf-fall (BBCH-93), second instar larvae started migration to the trunk, under the bark, to overwinter. Data about P. corni migration behavior on grapevine may be used for proper monitoring and determination of appropriate control measures.

Key words: Coccidae, grapevine, migratory behaviour

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P2_13

Predators of soft scale insects (*Hemiptera: Coccidae*) in vineyards in Serbia

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Abstract

Biological control is a rising trend in plant protection. Many natural enemies, predators and parasitoids, are used as effective non-insecticide method to control different pests, including soft scale insects (*Coccidae*), on grapevine. There are four scale insects from Coccidae family registered on grapevine in Serbia. Among them, *Parthenolecanium corni* Bouché and *Pulvinaria vitis* (L.) are considered economically important. These species may cause physiological weakening of grapevine, premature defoliation, reduction in yield and fruit quality and even deterioration of whole plants. As data on predator species of soft scale insects in vineyards in Serbia are scarce, as well as the fact that there is increasing interest in using natural enemies to control pests in viticulture, the aim of this study was to determine predator species of *P. corni* and *P. vitis* on grapevine in Serbia. The research was conducted during 2018-2019, on grapevine (*Vitis vinifera* L.) in Jagodina, Neštin and Radmilovac where large scale colonies were registered. Predatory larvae were collected from scale colonies in ten days intervals troughout the vegetation period and were individually reared under laboratory conditions, in order to prevent cannibalism. Identification was done according to Bienkowski (2018) identification key. *P. corni* was registered in Neštin, while *P. vitis* was registered in Jagodina and Radmilovac. Total of seven predator species were found associated with both scale insects. In *P. corni* colonies, four species were registered: *Anthribus nebulosus* (Forster) (Anthribidae), *Coccinella septempunctata* L. (Coccinellidae), *Chrysoperla carnea* Steph. (Chrysopidae) and *Sympherobius elegans* Steph. (Hemerobiidae). Four species of coccinellids were found in *P. vitis* colonies: *C. septempunctata* L., *Exochomus quadripustulatus* (L.), *Harmonia axyridis* (Pallas) and *Hippodamia variegata* (Goeze) (Coccinellidae). The most abundant predator of both scale insect colonies was *C. septempunctata*. Records of all species, except *E. quadripustulatis,* are first data about predators of *P. corni* and *P. vitis* on grapevine in Serbia.

Key words: Coccidae, grapevine, predator, Coccinellidae

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P2_14

Effect of pyrophyllite application on quality of lettuce

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Abstract

The use of different granulations of natural minerals in agricultural production is helping to preserve and improve soil quality, whose degradation, on a global scale, is a growing problem. In this study, the influence of the use of pyrophyllite in the production of lettuce (*Lactuca sativa* L.; cv. Zeralda F1) in a greenhouse without heating system was examined in accordance with organic production principles. Pyrophyllite originated from the locality Perović-Konjic, Bosnia and Herzegovina. Pyrophyllite was used in two granulations: 5 mm and 100 μm. Treatments were divided into control treatment (treatment without additional pyrophyllite and fertilizer), treatment with 20% or 40% added fertilizer and treatments with different ratios of pyrophyllite and fertilizer, as well as treatments with 20% and 40% pyrophyllite in the total volume of the substrate. The ratios of fertilizer and pyrophyllite in the treatments in which both pyrophyllite and fertilizer were tested were 30 : 70, 50 : 50 and 70 : 30. Tested parameters in this research were relative water content of the leaf (RWC), fresh leaf mass (FW), leaf mass in full turgid weight (TW), weight of the dry leaf (DW) and average weight of salad (kg). Larger granular pyrophyllite (5 mm) in most of the tested parameters gave better results. The highest weight of lettuce was recorded in plants in substate with 40% added pyrophyllite at granulation of 5 mm (0.42 kg). Also, the highest average weight of dry leaves had plants in substate with 20% added fertilizer in the total weight, in the composition of which the ratio of pyrophyllite: fertilizer was 50 : 50, where 5 mm pyrophyllite was used, and this weight was 0.32 g. The results of this study suggest that pyrophyllite treatment could be an effective technique for improving soil quality and crop production.

Key words: pyrophyllite, lettuce, fertilizer, organic principles

P2_15

Pomological characteristics and bioactive compounds of Cornelian cherry (*Cornus mas* L.) cultivars in the only collection pool in Serbia

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Abstract

Cornelian cherry is a domesticated plant suitable for organic production that can be used as both food and medicine. Due to the great importance of Cornelian cherry fruits as a functional food and a wide interest in the cultivation, an intensive breeding program was initiated at the Faculty of Agriculture in Novi Sad, which identified the best selections according to their biological characteristics and introduced them into intensive cultivation. The collection pool is extremely important for further research to improve cultivation technology as well as to make recommendations for the commercial fruit production. The only cornelian cherry collection pool in this area was established in 2011 at the field of Faculty of Agriculture with our 20 selections and 17 introduced cultivars. The aim of this study was to evaluate pomological characteristics of 17 cultivars, grown in the same conditions in 2018. Most cultivars bloom in the second half of February while some of them bloom in early March. The fruits ripen from early August to late September. Significant differences have been noted between cultivars in morphometric characteristics (fruit weight and flesh to stone ratio were 2.27 to 4.83 g and 70.22% to 84.32%, respectively) and bioactive compounds of the mesocarp [content of total dry matter (TSC), anthocyanins, phenols, flavonoids, and antioxidative activity (IC50) were recorded as follows: 18.99% to 29.60%, 31.62 mg/100 g to 152.28 mg/100 g, 513.26 mg/100 g to 1686.60 mg/100 g, 85.06 mg/100 g to 238.38 mg/100 g, and 0.20 mg/ml to 0.76 mg/ml, respectively]. The introduced investigated cultivars can be recommended in continental conditions for cultivation in the organic production concept of healthy fruit in combination with local selections.

Key words: cornelian cherry, cultivar, organic production, pomological traits, functional food

P2_16

The impacts of microbial fertilizer application on the health condition and quality of the tomato fruit

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Abstract

The research aims to obtain the results of the impact of an application of microbial fertilizers in combination with mineral fertilizers on the health and chemical composition of tomatoes. The study was conducted in 2013 and 2014 on the basic experimental plots in two variants (1. inorganic fertilizer and chemical crop protection + microbial fertilizer Slavol, 2. inorganic fertilizer and chemical crop protection-control). In the year 2013, there was no significant presence of diseases and pests, except for the occurrence of *Tetranychus urticae.* In early June 2014, the symptoms of *Phytophthora infestans* appeared only in the control variant. In both years of the study, the average total soluble solids, total acidity, and content of N, Mg, K, Cu were higher in the variant with applied microbial fertilizer. Content of nitrates, lycopene, P, Fe and Zn varied depending on the year and treatment. The application of microbial fertilizer has contributed to better health, and the contents of some tomato fruit quality parameters were increased.

Key words: tomato, Slavol, diseases, pests, quality

P2_17

In vitro propagation of orchid

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Abstract

In vitro culture is a branch of plant biotechnology, which is a set of techniques for vegetative propagation of plants in a defined nutrient medium and under controlled environmental conditions. The advantage of *in vitro* propagation is that the propagation can start with very small amount of plant material representing the initial explants, which is very important in the protection of endangered and rare species. As well, this technique is suitable also for plants that have a problem propagating by seeds. There are a lot of commercial orchids that are artificially grown for their beautiful flowers. The orchid produces a huge number of seeds but the seeds can not germinate easily in nature due to the absence of endosperm in the seeds. Because of that, orchid has been propagated vegetatively, which is very slow process. *In vitro* culture techniques are now adopted for rapid propagation of commercially important orchid species. This investigation was undertaken to establish an efficient regeneration protocol for micropropagation of *Phalaenopsis*. Nodal segments were used as experimental materials which were surface sterilized and the nodals were excised. The isolated nodal segments were cultured in MS medium (Murashige and Skoog, 1962) supplemented with 0.5 mg/l of cytokinin (BAP) and 0.1mg/l of auxin (IBA). Explants were cultured in the growth room under 21°C ± 2°C temperature with a photoperiod of 16 hours of day and 8 hours of night. After two months of culture regenerated shoots were 75% and they were transferred to fresh Lindemann orchid medium. The medium contains macronutrients and micronutrients as described by Lindemann et al. in 1970. In basal of young plantlets appears new buds and starting developing air roots. The well developed *Phalaenopsis* plantlets were successfully adapted in the potting mixture containing coconut husk and peat moss under natural condition.

Key words: orchid, *Phalaenopsis*, *in vitro* propagation, nodal segment, growth medium

P2_18

Efficacy of flubendiamide and emamectin benzoate in the control of cotton bollworm (*Helicoverpa armigera* Hübner) on sweet pepper

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Abstract

The cotton bollworm (*Helicoverpa armigera* Hübner) is the polyphagous pest that can cause significant losses in the pepper production (up to 35%). Larvae cause damage by puncturing in pepper fruits and feeding on their internal contents. Damaged fruits are susceptible to rot agents attack and they are not suitable for use. During 2018, in the field trial, we tested the efficacy of flubendiamide (product name: Flubendiamid 200 g/l SC) and emamectin benzoate (product name: Affirm 095 SG) in the control of cotton bollworm on sweet pepper. Flubendiamid 200 g/l SC was tested at application rate of 0.25 l/ha and 0.35 l/ha, while Affirm 095 SG was applied at 1.5 kg/ha. The experiment was performed in a sweet pepper crop at locality Kisiljevo (municipality of Veliko Gradište, Serbia). The trial was conducted according to the completely random block system in four replicates using standard EPPO method for testing the insecticide efficacy in the control of *Helicoverpa armigera* on vegetables and ornamental plants (PP 1/295 (1)). Three days after treatment (3DAT), the average damage of pepper fruit in untreated plot was 17.5%, and 8 DAT was 22%. Flubendiamid 200 g/l SC showed good efficacy at both application rates and both evaluation periods. Three days after treatment the efficacy ranged from 94.29% to 97.14%. At 8 DAT evaluation, efficacy was 95.45% and 98.86%, respectively. The treatment with Affirm 095 SG had a slightly lower efficacy (3 DAT: 90.0%), while the efficacy were even lower (84.09%), at 8 DAT evaluation. According to this results, new diamide insecticide flubendiamide showed very good efficacy and can be successfully used in *H. armigera* control on sweet pepper.

Key words: H. armigera, sweet pepper, insecticide, efficacy

P2_19

Fertility and fruit characteristics of the hazel cultivars grown in different agro-ecological conditions in Bosnia and Herzegovina

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Abstract

The main aim of this paper was to determine the fruit bearing and fruit characteritics of the hazel cultivars grown in three largest localities in Bosnia and Herzegovina, all different from one another in some aspects of agro-ecological conditions. During 2019, five to nine year old orchards were analyzed in the area of Srbac, Livno and Banja Luka. The orchards are established with the open vase and multi-bush training system. The following cultivars were represented: "Romische Zellernuss", "Tonda Gentile Romana", "Tonda Gentile delle Langhe", "Hallesche Riesennuss" and two different genotype from population of "Istrian Long". Measurment was done on five trees per cultivar randomly selected at each location. The following parameters were monitored: average number of cluster per tree, average number of fruits per cluster, total yield per tree and area unit, total mass of the fruit and kernel; length, width 1 and width 2 of the fruit and kernel; kernel percentage and occurense of blank nuts. The results obtained show that there are significant differences in fruit bearing between different cultivars at one location, and between the same cultivars at different locations. Minor differences were also observed in fruit characteristics between the same cultivars at different locations.

Key words: training form, yield, fruit qualty

02_20

Bionomy of *Parthenolecanium persicae* (Fabricius) (Hemiptera: Coccidae) on grapevine in Serbia

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Abstract

Parthenolecanium persicae (Fabricius) (Hemiptera: Coccidae) is a paleartic species found on over 70 host plants, with the highest damage being recorded on grapevine and plums. In Serbia, this one is more abundant on extensive orchards or physiologically weakened plants. Bionomy of *P. persicae* was studied from 2015 to 2019 in three localities: Aleksandrovac, Belgrade and Neštin. Sampling of plant material was performed throughout the year, in interval of 7 to 10 days during vegetation, or, once in month during plant dormancy. From each infested plant, five one- or two- years old twigs 20 cm long were taken. Sampled plant material with scale insect colonies was brought to the laboratory, where it was examined for scale insects presence and then deposited in glass cylinders for the rearing of scales insects and natural enemies. The determination of the eclosed parasitoids was performed by eng. Aleksandar Stojanović. *P. persicae* developed one generation per year and overwintered as second instar larva on grapevine shoot and trunk. Females emerged during April and early May, and oviposition was recorded in mid-May. Each female layed on average 2001 ± 3,4 white eggs. First instar larvae appeared during June. In the summer, they feed mainly on young shoots, leaves and leaf petioles. In late August and early September, second instar larvae were formed, which continue to feed until October when they migrated to shoots or hidden places on the trunks where they overwintered. Numerous colonies of *P. persicae* was recorded in the Belgrade locality, which resulting in discoloration, drying and premature leaf fall. In the vineyards of Aleksandrovac and Neštin, scale insects was present on individual plants, with no visible symptoms of damage. During our research, on the *P. persicae* we found 7 species of natural enemies. Of the parasitoids (Hymenoptera: Chalcidoidea), 6 species were eclosed: *Coccophagus lycimnia* (Walker), *Eunotus obscurus* Masi, *Marietta picta* (Andre) (Aphelinidae), *Metaphycus dispar* (Mercet), *Metaphycus insidiosus* (Mercet), *Metaphycus maculipennis* (Timberlake),

(Encyrtidae), and from predators, the species *Exochomus quadripustulatus* L. (Coleoptera: Coccinellidae).

Key words: Bionomy, *Parthenolecanium persicae*, grapevine, Serbia

P2_21

Perceptions and attitudes on ornamental characteristics and the use of mediterranean evergreen trees and shrubs

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Abstract

Trees and shrubs are used in landscaping in the following ways: as individual plants (solitaire plants), in groups, ground cover plants (shrubs), for rock gardens and for making hedges, to name a few. Ecological, morphological and biological characteristics of trees and shrubs need to be considered during the design process of different landscape areas. Evergreen species of trees and shrubs are very commonly used in the Mediterranean. The following species of evergreen trees and shrubs are grown in the Mediterranean: *Acca sellowiana* Berg., *Aucuba japonica* Thunb. *Buxus sempervirens* L. *Callistemon citrinus* (Curt.), *Citrus limon* (L.) Burm. Fil., *Eriobotrya japonica* (Thunb.) Lindl., *Euonimus japonicus* L. f., *Fortunella japonica* (Thunb.) Swingle, *Ligustrum ovalifolium* Hassk., *Photinia serratifolia* (Desf.) Kalkman, *Magnolia grandifolia* L. *Nerium oleander* L., *Pittosporum tobira* (Thunb.) Aiton f. and *Prunus laurocerasus* L, whose morphological and growth characteristics have been presented in this paper. A survey research conducted in the areas covered by the cities or on the islands both in Zadar County and Šibenik-Knin County has been used in this paper as the primary data source. The specific objective of the survey research was to explore the perceptions and attitudes of the respondents on ornamental characteristics and the use of Mediterranean evergreen trees and shrubs. The survey research was conducted in the second half of 2019 on a sample of 50 respondents. The research findings showed as follows: the respondents assessed ornamental characteristics of the selected species with very good grades, attractiveness of the use of trees and shrubs in public landscapes, as well as in public gardens and parks, was assessed with the average grade good. Maintenance method was assessed by the respondents as mostly easy, while the impact on human psyche and health was assessed with the average grade very good.

Key words: evergreen trees and shrubs, ornamental characteristics, use, perceptions, Mediterranean.

P2_22

Morphological and production-technological characteristics newly created grapevine variety Vožd

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Abstract

By the method of planned hybridization up to now, 32 new grapevine varieties (10 wine and 22 table) have been created and recognized at the Faculty of Agriculture, University of Belgrade. Newer wine varieties include the Vožd variety, which was recognized in 2017. It is intended for the production of red wines and was obtained from the crossing combination of the Začinak × Prokupac. This paper presents the most important morphological and production-technological characteristics of this variety, which were compared with the standard Merlot and Pinot Noir varieties over a three-year testing period (2017-2019). The investigated varieties varied significantly in terms of individual morphological characteristics and represented unique genotypes. Grape yield per vine, grape and berry weight of the Vožd variety were significantly higher than in the standard varieties. Structural indicators of the berry indicate that the Vožd variety had a smaller content of the skin in the berry (3%) compared to the varieties Merlot (6%) and Pinot Noir (8%). The sugar content in the must of Vožd variety (20.3%) was lower than the standard varieties (Merlot - 22.5%; Pinot Noir - 22.9%). The produced wines of the tested Vožd variety and standard varieties were drinkable, harmonious, with specific varietal characteristics and differences in individual parameters. Total phenolic content of the newly created Vožd variety was 800 mg GAE/l while it was 975 mg GAE/l for Merlot and 1025 mg GAE/l for Pinot Noir. Anti-DPPH radical activity of the tested wines was positively correlated with the total phenolic content. With the application of appropriate agro and ampelotechnical measures, the Vožd variety can be recommended for cultivation in production vineyards.

Keywords: *Vitis vinifera*, hybridization, Vožd, yield components, wine quality

P2_23

Phenological models for predicting the budburst and flowering date of grapevine

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Abstract

The study aimed to develop temperature-based models to predict the budburst and flowering dates in grapevine. Models were developed using phenological data for 20 wine cultivars grown in the region of Sremski Karlovci (Serbia) and temperature observations over the period 1986–2007. The input variable for the budburst model was the mean daily temperature averaged over the period from 1 March to the event onset, while the input variable for the flowering model was the maximum daily temperature averaged over the period from 15 April to the event onset. The models proved to be capable of predicting the onset of budburst and flowering in grapevine with high accuracy. On average for 20 cultivars studied, the mean absolute differences between the observed and predicted budburst and flowering dates were 4 and 3 days, respectively.

Key words: Vitis vinifera L., Budburst, Flowering, Phenological model, Sremski Karlovci

P2_24

Indicators fertility and quality of grapes of the Moldova grapevine cultivated according to the principles of organic production

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Abstract

In most developed winegrowing countries in the world there is a growing demand for grape products without pesticide residues and other harmful substances, which encourages the development of specific forms of production such as organic. The success of organic grape production depends, among other things, on the proper selection of the varieties and the appropriate varietal agrotechnics. In Macedonia, organic grape production is in the beginning. This paper presents basic indicators of fertility and quality of Moldova grapes grown according to the principles of organic production. The investigations were carried out in a vine plantation on the estate of "Lozarstvo" in Lozovo, which belonging to the Povardarie region. In addition to the appropriate agro and ampelotechnical measures, the authorized products from the organic production list were applied in the vineyard. In the period 2018-2019. The yields (kg/ha), weight of the cluster (g), the number of berries in the cluster, the wight of the berry (g), the sugar content (%) and the total acids in the broad (g/l) were determined. The highest average yield was determined in 201-9. and amounted to 8050 kg/ha. The highest weight of grapes and berries was also determined in 2019. (485,50 g; 6,5 g). On average, depending on the test year, the sugar content 17,5% and the total acid in the must of 7,02 g/l were found. The aim of this study was to recommend organic production based on the results of testing of production and biological values, interspecies table grapevine cultivated in Moldova with reduced chemical protection. Based on the tested characteristics of this variety, it was found that organic production can be economical and also to place quality and health-safe grapes on the market. Key words: grapevine, organic production, resistance, yield, quality.

Key words: grapevine, organic production, resistance, yield, quality, Moldova.

02_25

Influence of some enological treatments on *trans*-resveratrol and total phenolic content in wine

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Abstract

In this study, the influence of winemaking techniques and grape cultivars on *trans*-resveratrol and total phenolic content in wines was studied. The *trans*-isomer occurs in the berry skins of most grape cultivars, and its synthesis is stimulated by UV radiation, injury, and fungal infection. The *trans*-resveratrol content in wine depends of many different factors including variety, vintage, climatic conditions, UV radiation, storage conditions and winemaking process. Some wine making techniques were applied in order to investigate its impact to *trans*-resveratrol and total phenolic content. Addition of different combination of enzymes and wine yeasts, resulted in different content of these compounds. Yeast Uvaferm 299 (Lallemand, Canada) with the enzyme Lallzyme OE (Lallemand, Canada) indicated the best extraction of *trans*-resveratrol (1.56±0,04 mg/l) and total phenolic content (1774.20 mg GAE/l) in Prokupac wine samples. Also, biological deacidification, pasteurization and use of some clarifying agents (bentonite and gelatine) had no influence on *trans*-resveratrol and total phenolic content.

Key words: *Trans*-resveratrol, Total phenolic content, Wine yeasts, enzymes

P2_26

Polyphenol composition and antioxidant activity of plum cultivars traditionally grown in Serbia

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Abstract

Serbia is among the first five plum-producing countries worldwide. In recent years many new plum cultivars were produced, but there are some parts of Serbia where traditional autochthonous cultivars are still grown. Oxidative stress mediated damages of biomolecules accelerates many diseases, so balanced nutrition rich in antioxidants is important for normal function of the cells. Fruits are good source of natural antioxidants, such as polyphenol compounds. These phytochemicals, besides acting as antioxidants, manifest other biological activities, such as anti-inflammatory, cardioprotective, neuroprotective and antitumor activity. The aim of this study was to evaluate and compare polyphenol composition and antioxidant activity of fruits of different Serbian plum cultivars. There were assessed cultivar 'Čačanska rodna' (*P. domestica* L.) grown at the Rimski Šančevi locality and autochthonous cultivars 'Belošljiva' (*P. domestica* L.), 'Turgunja' and 'Vlaškača' (*P. domestica* L. subsp. *insititia* (L.) C. K. Scheider) grown in Itebej.Extracts were prepared from fully ripened lyophilized fresh fruits. Phenolic compounds assessment and antioxidant activity were measured by spectrophotometric methods. Fruit extracts of cultivars 'Vlaškača' and 'Turgunja' were highlighted with the highest content of total phenol, tannin and flavonoid compounds. Also, these two cultivars showed the highest antioxidant capacity, by the results of both, DPPH and FRAP test. Anthocyanin molecules were present in very small amounts or not detected at all (in fruits of 'Belošljiva'). They are probably dominant in the skin of the fruits, but not in the mesocarp, so their content was under the detection limit. Fruit extracts from all four examined plum cultivars showed moderate antioxidant activity and content of bioactive dietary polyphenols. Obtained results indicate that autochthonous cultivars, usually used as rootstocks, could be a promising source of functional food ingredients and the future breeding processes could be directed in this way.

Key words: plum, *Prunus domestica*, antioxidant activity, polyphenols

P2_27

Production of fruit planting material in the Republic of Srpska in the period 2009-2019

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Abstract

The development and success of fruit production is conditioned by a number of factors, and one of the most significant is the quality of planting material. The volume and structure of fruit nursery production is defined primarily by the market requirements, and, in addition, by the economic and biological characteristics of fruit species and varieties. The aim of this paper is to analyse the production of fruit planting material in the Republic of Srpska over multi-year period (2009-2019). Data for production analysis was obtained from documentation generated in the process of production supervision by the authorised institutions. Comparative analysis of fruit planting material production involves the tracking of changes in the percentage of fruit species and varieties in the production structure. A total of 23,103,920 fruit plants were produced in the Republic of Srpska in the observed period. Production of apple plants decreased significantly in the observed period. The production volume of stone fruit plants was generally uniform, except in the case of sour cherry, whose production showed significant oscillations. There was a significant increase in production of berry fruits, mainly raspberry plants, with the maximum amount of plants recorded in 2016. In addition, there is a significant change in the varietal structure, with the production of varieties 'Tulameen', 'Autumn Bliss' and 'Polka' in 2016, in addition to 'Willamete' and 'Meeker'. The expansion of the production of nut plants has been recorded in 2017. The analysis of the ten-year data showed that there has been a significant change in the volume and structure of fruit planting material production. Pome fruit planting material production had significant decrease over the observed period, while berry and nut planting material increased its share in total production. The percentage of stone fruit planting material remained at approximately the same level.

Key words: production volume, varietal structure, planting material production analysis

P2_29

Changes in apple ripeness parameters after cold storage without controlled atmosphere

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Abstract

Cold storage is necessary to preserve apple fruits for later marketing and thus increase the profitability of apple production. Many farmers use ordinary cold rooms without a controlled atmosphere since facilities like the ULO are very expensive. In this study, we investigated changes in ripeness parameters of different apples varieties (Gala, Idared, Topaz, Golden Delicious and Red Delicious) and production types (integrated and organic) during cold storage. Fruits were harvested one week before, at and one week after estimated technological ripeness in 2018 and 2019. Fruit hardness, starch content and soluble solids content were measured in samples of 10 apples and sweetness-to-acidity, aromaticity, juiciness, texture and roundness of taste were estimated by several evaluators. In 2019 colour was measured as the reflectance of defined light-wavelengths. Results showed rapid progression of ripening in normal cold storage as indicated by starch content and Streif index. Starch completely degraded and fruit hardness dropped significantly during the two month storage in most treatments. Soluble solid content increased except for over-ripped harvested Idared. During storage green colour (550 nm) reflectance decreased in Idared and red colour (600 and 650 nm) increased in Topaz.

Key words: apple storage, ripeness parameter, colour, cold storage, non-controlled atmosphere

P2_30

Application of phytohormone and its effect on the decorative properties of gladiolus (*Gladiolus sp.* L)

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Abstract

The influence of different concentrations of phytohormone (IAA) is investigated in this paper, using the preparation of - *Slavol* on the decorative properties of gladiolus *Gladiolus sp*. L. variety *Raven* (length of inflorescence and number of flowers in inflorescence). Research was carried out in the greenhouse of the Faculty of Agriculture in Zemun during spring 2018. Planting of corms was carried out in pots that are 33 cm in diameter. Before planting, gladiolus corms were treated with different concentrations of *Slavol*, by the following treatments: control-free *Slavol*, 400ml *Slavol* / l water, 500ml *Slavol* / l water and 600ml *Slavol* / l water, soaking for 1h. The obtained results indicated that the use of *Slavol* can be justified because it affects the decorative properties of gladiolus, increasing the length of the flower and the number of flowers in the inflorescence. By treating the corms with the highest test concentration, 600ml *Slavol* / l water, this increase is also significantly higher than the control less test concentrations.

Key words: concentration, decorative properties, IAA, *Gladiolus*

P2_31

Morphological characteristics of the leaves of autochthonous genotypes of sweet cherry (*Prunus Avium* L.)

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Abstract

Autochthonous genotypes have important genetic, cultural, socio-economic and environmental values, but most of them have a high risk of extinction. This paper considers description of morphological characteristics of leaves of five autochthonous genotypes of sweet cherry ('Ašlamka', 'Banjalučka crnica', 'Biljur-Bjelica', 'Cipov' and 'Crveni hrušt'), grown in the region of Banja Luka. The qualitative characteristics of the leaf are described by using UPOV descriptors for sweet cherry. The following characteristics were investigated: leaf length, leaf width, blade length/width ratio, petiole length, petiole width, leaf shape, leaf blade and leaf color. Statistical analysis was conducted by performing one-way analysis of variance. Significant differences between treatment means were analyzed by Fisher's LSD test. According to the analysis, the highest average leaf length was achieved in 'Ašlamka' (13.43 cm) and the lowest in 'Biljur-Bjelica' sweet cherry autochthonous genotypes (8.76 cm). The highest average leaf width was achieved in 'Banjalučka crnica' (6.54 cm) and the lowest in 'Biljur-Bjelica' sweet cherry genotype (4.85 cm). When it comes to the leaf petiole morphology, 'Ašlamka' achieved the highest average petiole length (4.19 cm), followed by 'Banjalučka crnica','Cipov', 'Biljur-Bjelica' and 'Crveni hrušt' genotypes. The petiole width was also the highest in 'Ašlamka' (0.31 cm), followed by 'Banjalučka crnica', 'Biljur-Bjelica', 'Cipov' and 'Crveni hrušt' genotypes. Autochthonous genotype of sweet cherry 'Cipov' had a unique morphological characteristics of the leaf. These results should be basis for further evaluation of sweet cherry germplasm.

Key words: UPOV descriptor, germplasm, characterization, breeding

P2_32

Influence of root pruning on vigour and fruit quality of apple cultivar Golden Delicious clon Rainders

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Abstract

The aims of this study was to evaluate influence of different level intensity of root pruning on vigour and fruit quality of apple cultivars 'Golden Delicious clon Rainders'. Root pruning was done two weeks before buds burst, on one (treatment 1) and both (treatment 2) side of rows, at a distance of 30 cm from the trunk and a depth of 40 cm. Non pruning rootstock trees was as control. Total lenght and number of shoots had control trees. Average lenght oh shoots ranged between 24.9 cm (treatment 1) to 31.3 cm (control). Significant difference between treatment did not recorded. Total number of fruits per tree ranged between 68.8 (treatment 1) to 81.2 (treatment 2). The highest yield per tree had control (16.7 kg), while the smallest had trees in treatment 1 (11.9 kg). The percentage of merkateble fruits, averege diameter of fruits >70 mm, ranged between 93% (control) and 76% (treatment 1). Also, control trees had significantly higher weight of fruits compared to treatment trees. Weight of fruits ranged between 161 g (treatment 2) to 210 g (control). The highest content of total soluble solids had fruits from treatment 2, while control trees had the lowest. Root pruning had strong influence to deacrease vigour of trees, but in another hand significantly decreased productivity of trees and quality of fruits.

Key words: apple, root pruning, yield, fruits quality

P2_33

Fertilizer effects on the container production of tomato seedlings

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Abstract

In these researches the plan is to look at the effect of different fertilizers on the quality of tomato seedlings made for open field production (cv. roker). Tomato nursery were grown in containers with 104 openings and saved during the seeding period with three types of fertilizes with: *fitofert kristal*, *fitofert humisuper* and *slavol*. They were used with different percentages, and the time of use was after sowing, with the appearance of first leaf that continued during those seven days from sprouting until the end of the seedling period.

The following parameters were determined: plant height (cm), number of leaves per plant, stem thickness (mm) and the weight of the plants' above-ground parts (g). With all of the tested parameters the best results were made with continuous usage of fertilizers. In the container production of tomato seedlings, where the seedlings was being produced in small volume of substrates in short period of time, usage of mineral fertilizers gives overall better results than organic-mineral and microbiological.

Key words: tomato, seedlings, fertilisation, quality.

P2_34

Apples on the banjaluka market

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Abstract

Apple production is a highly accumulative branch of agriculture. Apple producers need to follow not only novelties in the introduction of new cultivars in production but also consumer attitudes and preferences for better promotion. The aim of this paper is to investigate the supply of different apple cultivars on the Banja Luka market. The survey was carried out in 2019. from 10 to 20 th of November, at several different market locations: green markets, small-local markets, and large retail chains. During the visit, the following data about apple were recorded: the presence of certain cultivars on the market, the average price of fruits depending on the cultivar, subjective evaluation of the quality of the represented cultivars, method of marking the cultivar, method of packaging the fruit, the origin of the apple, as well as other observations that may be relevant for the general evaluation. The following apple cultivars are available on the market: Golden Delicious, Red Delicious, Idared, Pink lady, Gala, Fuji, Jonagold, Grany Smith, Pinova and Melrose. Price differences are very depending on the cultivar, quality and market type at which the apple is sold. The price of apples is very different and ranges from 0.50 to 2.2 BAM per kg. It was found that in most cases the price of an apple is determined by quality. The fruits are usually in bulk and not in the regular apple package – cardboard and wooden basket. Very rarely cultivars are labeled with their real name, and descriptive adjectives are often used. Domestic apple, in general, is of lower quality and less well presented than the imported apple. There is great potential for better promotion and presentation of apple on the Banja Luka market, which could significantly increase the consumption and efficiency of production.

Key words: the cultivar, quality, price

P2_35

Fertility as a parameter of value of table cultivars Ester and Palatina in the Kozaracko wine-growing area

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Abstract

Stone grape cultivars are exclusively intended for fresh consumption. Market demands for the highest quality grapes have imposed the need to create new table cultivars. Today, the emphasis of table grapes growing is on the "organic production" of grapes. Knowledge of table cultivars, their technological characteristics, as well as the requirement of agro-ecological conditions for their growth, is very important for production. The aim of this study is to analyze the economic and technological characteristics of interspecies table grape hybrids Esther and Palatine. The Chasselas cultivar was used as a comparative cultivar. The experimental part of the research was realized in the village of Sjeverovci, located in the Kozracko wine-growing area. The research was performed during the 2017-2018. Basic elements of fertility were monitored as the quality indicators. In addition, the characteristics of grapes and berries were monitored. The lowest value of the absolute coefficient of fertility had the cultivar Chasselas (1,13), while the cultivars Esther and Palatina had uniform values of the fertility coefficient (1,63). The highest average yield per vine had the Chasselas cultivar (3.12kg) and the lowest Esther cultivar (2.12kg). The highest average weight of the cluster was recorded in the Esther cultivar in 2018 (313.5 g) and the lowest in the Chasselas in 2017 (206.6 g). A relatively small number of seeds (1.2) were found in the berry of the Esther cultivar, and the highest average number of seeds was found in the Chasselas cultivar (2.0). The results of this work are of great importance as preliminary data in defining the appropriate ampelotechnics in the vineyard, as well as recommendations for the further expansion of these cultivars in production.

Key words: cultivar, cluster, interspecies hybrids, fertility elements

02_36

Susceptibility of *Grapholita molesta* Busck to insecticides in peach orchards

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Abstract

In Serbia, the oriental fruit moth (*Grapholita molesta* Busck) occurs regularly in peach orchards. In this study, its susceptibility to chlorantraniliprole, cyantraniliprole, spinetoram, indoxacarb and acetamiprid based insecticides was assessed. Field trials were carried out in the northern region of the Republic of Serbia, on the slopes of Fruška Gora mountain. Trials were conducted in 2019, according to the EPPO method. Products based on chlorantraniliprole (200 g/l), cyantraniliprole (100 g/l), spinetoram (250 g/kg), indoxacarb (150 g/l) and acetamiprid (200 g/kg) were foliar applied in an amount of 0.2, 0.6, 0.2, 0.33 and 0.25 l/kg ha^{-1}, respectively. Assessment of spray liquid efficacy was based on the number of fruit damaged by caterpillars, with an overview of 100 fruits per repetition. The results were processed using one-way ANOVA and Fisher LSD test, while the efficacy was determined according to Abbott. Applied spray liquids indicate a satisfactory efficacy at both localities ranging from 92-96% (chlorantraniliprole), 91-93% (cyantraniliprole), 87-90% (indoxacarb), 84-88% (acetamiprid) and 83-85% (spinetoram), in comparison to the control.

Key words: Grapholita molesta, peach, insecticide, efficacy

02_37

Dissipation dynamic of indoxacarb insecticide in peach fruits

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Abstract

The aim of this study was the evaluation of the safety use of insecticide indoxacarb in peach orchards, through the analysis of residues and dissipation dynamic. The field experiment was conducted at the locality Čerević (Republic of Serbia) according to EPPO methods. An indoxacarb based insecticide (150 g a.i./l) was applied in the quantity of 0.33 l/ha, when the peaches were in the BBCH 74 phenophase. Fruit sampling was performed one hour after the treatment and after 1, 3, 5, 7, 9, 11, 13 and 15 days. For the analysis of indoxacarb residues the QuEChERS method, followed with HPLC/DAD, was applied. The maximum level of indoxacarb residues in peaches was immediately after the drying deposit (2.21 mg/kg). Residues of indoxacarb in peach fruits at the MRL (1 mg/kg) were determined between the 7^{th} and 9^{th} day after the application. Based on the obtained results, the half-life of indoxacarb in peach fruits is 4.62 days.

Key words: pesticide residues, *Cydia molesta*, indoxacarb, peach fruits, MRL

02_38

Analysis of vitamin C content of pomegranate (*Punica granatum*) fruits in different localities of Herzegovina

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Abstract

The area of Herzegovina is known for the intensive cultivation of pomegranate, which is consumed fresh or processed into juice throughout the year. This study aimed to determine, through physico-chemical analysis, basic parameters on the quality of existing plantations of the investigated fruit species with special reference to the vitamin C content.

The sampling localities are approximately 40 km away from each other, and the following locations have been selected: Dubrave, Blagaj, Mostar, Zalik, Vrapčići, and Potoci. The analysis included pH% dry matter, acidity, % total sugars, and vitamin C content. The results of the analysis showed that pomegranate samples were sour fruits, with a small percentage of total sugars. The pH was quite low, while the vitamin C content is quite high. The content of vitamin C is slightly higher in four localities in mesocarp samples in comparison to pure grain samples, while in the other two localities its content was higher in pure grain samples. The highest amount of the vitamin C were determined in samples from the Mostar site, namely in a grain sample with mesocarp, as much as 11 mg / 100g.

Key words: pomegranate, physio-chemical properties, vitamin C

Section 2: HORTICULTURE SCIENCE

Oral Presentations

02_01

Fruits under the spotlight of analytical chemists

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Abstract

Many problems on which analytical chemists work originate in other fields, and agriculture is one of them. Analytical chemistry brings a unique perspective to the study of natural products and plant-based food. It is important to highlight the nutritional aspects and phytochemical compounds of fruits that confer human health benefits when they are consumed regularly, preventing development of several diseases. These diverse compounds include dietary fiber, minerals, vitamins, and primary and secondary metabolites that occur naturally in plants.

Various fruits, especially wild and indigenous, are recognized as an excellent source of phytochemicals with health-promoting properties. Our research group mainly focuses on polyphenolic compounds, and so far, we have established profiles of wild Serbian fruits, such as elderberry (*Sambucus nigra*), hawthorn (*Crataegus monogyna*), cornelian cherry (*Cornus mas*), and blackthorn (*Prunus spinosa*), and five different Rosa species (*R. canina*, *R. glutinosa*, *R. rubiginosa*, *R. multiflora*, and *R. spinosissima*). Results show classification of the fruit samples on the basis of variations in the content of individual flavonoids, phenolic acids and antioxidant capacity and pointed to some unfairly forgotten wild fruits as a great source of bioactive natural compounds. Similarly, we have studied chemical composition of mulberries, strawberries, raspberries, and blackberries. According to the health promoted compounds some genotypes were recommended for clonal propagation and commercialization.

Aside from quality and nutritional value, data gathered from the analysis of carbohydrates, minerals, trace elements and polyphenols could be valuable when questions regarding the differences in the type of the production regime (organic or integrated) should be answered. According to our results, some quantitative variations in individual phenolic compounds and their distribution in fruits and leaves was evident in organic and integrated farming of blueberry and strawberry cultivars.

To conclude, this work proved wild fruits to be an interesting field in the search for compounds with potential bioactivity. Due to uniqueness in terms of its phytonutrient content, some of investigated fruits were identified as "super-food", and may be considered particularly useful in food supplement production, particularly as a

source of natural antioxidants. Furthermore, some of these species could be used in blood sugar regulation and skin protection, or to extend the shelf life of food products and replace synthetic antioxidants, avoiding potential health risks and toxicity. However, additional bioactivity testing is needed, especially bearing in mind the synergistic effect among polyphenols as an important factor determining the functional properties.

Key words: Fruits, nutrition, chemical traits, phytochemicals

02_02

Uptake and translocation of heavy metals by ragweed (Ambrosia artemisiifolia L.)

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Abstract

This research was focused on the determination of metal uptake by ragweed (*Ambrosia atremisiifolia* L.), grown on agricultural soils. Plant material and the associated soil samples were collected on the seven locations in the north of the Republic of Srpska. Air-dried samples were digested with concentrated nitric acid and afterward was applied flame atomic absorption spectrophotometry for quantification of the heavy metals. Metal concentrations in the soils increased as follows: Cd<Pb<Cu<Zn<Cr<Ni<Mn<Fe and were under the allowed maximum for unpolluted soils, except for Ni. However, Ni transfer from the soil to the shoots was not intensive. The index of bioaccumulation (IBA/metal concentration ratio in shoots and soil) for this element was low (mean IBA=0.13). On the other side, Zn showed a tendency to accumulate in the shoots (mean IBA=1.43, TF=2.31, TF-translocation factor/ metal concentration ratio in shoots and roots). Determined concentrations of other examined metals were higher in the roots. TF values decreased in the follow order: Fe<Pb<Ni<Cr<Cd<Cu<Mn<Zn.

Key words: ragweed; agricultural soil; trace elements; bioavailability;

02_03

The presence of leafminers on different apple varieties in the location Kula (East Sarajevo)

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Abstract

Lepidopteran leaf miners are economically important pests in areas where apple are grown. The damage is caused by larvae that are feed on the leaf parenchyma below the epidermis, leaving empty couloirs, or "mine" of different shapes and sizes. The presence of mines on leaves reduces assimilation and transpiration surface, which adversely affects the yield, fruit quality and, in general, physiological condition of plants.

The presence of leafminers on different apple varieties (Idared, Jonagold, Golden Delicious, Gloster, Melrose, Elstar and Granny Smith) was examined in 2018 in intensive plantations in the location Kula. Six species of leafminers from four families was determined.

Family Lithocolletidae is presented with three species: *Lithocoletis blancardella* Fabricius, *Lithocoletis corylifoliella* Haworth, *Callisto denticulella* Thunberg and family Lyonetiidae with one species: *Lyonetia clerkella* Linne. Also, one species was belong family Leucopteridae: *Leucoptera malifoliella* (Costa (1836)) and *Stigmella malella* Stainton from family Nepticulidae.

Six species of leafminers were determined. The highest number of damaged leaves was found on the cultivar Idared, and the smallest number was found on the cultivar Gloster. The most numerous species was *L. malifoliella*, and the least numerous was *L. corylifoliella.*

Key words: leafminers, apple, East Sarajevo.

02_04

Isolation and identification of *Fusarium oxysporum* f.sp. *solani* (Mart.) Sacc. from soil on modified Nash and Snyder's medium

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Abstract

Modified Nash and Snyder's medium (MNSM) has been used to isolate fungus *Fusarium oxysporum* f.sp. *solani* (Mart.) Sacc. causing wilt of potato from soil. However, no studies have been conducted to apply this technique to isolate Fusarium spp. in Bosnia and Herzegovina agroecosystem. Soil was collected from plot with a potato wilt history. The field was located in Vilusi, Gradiska municipality (Bosnia and Herzegovina). Soil samples were collected in December 2019 following zig zag pattern on depth of 15 cm using a 2.5-cm-diameter soil probe. The 10- and 20-fold soil dilutions were prepared and from each of the dilutions, a 1-ml aliquot was spread over the surface of MNSM in petri dishes. The colony morphology of these isolates was compared on MNSM, Spezieller Nahrstoffarmer agar (*SNA*) and on potato dextrose agar (PDA). These isolates, were tested for pathogenicity on potato in the greenhouse. In addition, pathogen identity was confirmed by the sequence analysis of DNA fragments obtained by application of pair of universal primers ITS1/ITS4. The obtained isolates were compared to *F. oxysporum* for colony morphology, presence of macro- and microconidia on SNA and PDA and for pathogenicity. There was a significant relationship between symptom severity between inoculated and non-inoculated potato plants. Sequence analyses of ITS1/ITS4 PCR product established nucleotide 100 % identity with several *F. oxysporum* isolates from GenBank. The results of this study demonstrated that soil populations of *F.* oxysporum can be accurately isolate using MNSM.

Key words: potato, soil detection method, PCR, causal agent,

02_05

Possibility of improving vegetable production in Republic of Srpska

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Abstract

Globally, there is a growing need for high quality vegetables, produced in a safe and economical way. Vegetable production is complex and additional complicated by climate changes. In BiH and Republic of Srpska, there has been a trend of decreasing areas under vegetables in the open field production over the last 10 years, while production in the greenhouses is increasing. It is increasingly common to use temporary sheltered spaces without supporting structures (use of agro-textiles and low tunnels). Vegetable production in Republika Srpska in 2017 covered an area of 30,990 hectares. The largest areas were under potatoes, then beans, cabbages (cabbage, kale, cauliflower), where the importance of late cabbage should be especially emphasized as a post-harvest crop, followed by tomatoes and peppers. The area under the watermelon, melon and cucumber gherkin is significant. By the end of 2018 29 producers engaged in registrated organic farming. In the vegetable sector, organic production is performed by smaller producers and accounts for only 2% of total organic production, mainly in the greenhouses. There are different reasons why vegetable production in Republic of Srpska is at an unsatisfactory level. Problems are mostly identical in the last 25 years. The underdeveloped food industry, precarious marketing, limited markets and small exports are the main causes of the slow development of vegetable production. In addition, small parcels, a large share of human labor, and now migration and insufficient workforce, then outdated mechanization, lack of specialized vegetable mechanization, insufficient knowledge of producers make vegetable production expensive and uncompetitive in the foreign market. For the faster development of vegetable production in the Republic of Srpska, better linking of education and research institutions with producers is needed. In addition, production needs to be improved with the introduction of new technologies that support sustainable vegetable production systems.

Key words: vegetable growing, new technologies, sustainable systems

02_06

Multilocus typing of phytoplasmas isolates from 16SrI and 16SrV groups from forest species

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Abstract

Multilocus typing (MLT) was performed on four phytoplasma strains obtained from poplar (*Populus nigra cv. italica*), sycamores (*Platanus acerifolia*), alder (*Alnus spp.*) and elm (*Ulmus spp.*) specimens collected in Banjaluka, Kostajnica and Gradiska localities. In previous study, in poplar and sycamores phytoplasma from 16SrI group was previously identified, while in alder and elm strains from 16SrV group were confirmed. Sequence analyses of nested-PCR products obtained with groel (poplar and sycamores), ribosomal protein (rp), uvrB-degV and map (alder and elm) genes allowed to differentiate isolates according to their host and geographical origins. Hence, AY isolates from poplar were 97,36% and 99,7%, respectively identical with Populus decline phytoplasma Serbia. Based on characterization of phytoplasma isolates from 16SrV group with rp gen alder isolate was 100% identical Corylus avellana' phytoplasma D1469/18" from Slovenia and elm isolate 100% with 'Candidatus Phytoplasma ulmi' from Serbia and USA. MLT of the same isolates with map gen showed that isolate from alder belongs to 16SrV-C revealing 100% identity with Alnus glutinosa phytoplasma from BiH and Germany, while elm isolate highly cope with isolate from Ulmus glabra from France. Finally, similar observation was with uvrB-degV gen where alder isolate best matched with Flavescence dorée isolate from Vitis vinifera from Croatia and elm with 'Candidatus Phytoplasma ulmi' isolate from Ulmus. spp from France, Italy and USA. All in all these isolates where identified in forest species from spontaneous flora and according to the results they present phytoplasma reservoirs and therefore a serious treat to the plant production area

Key words: groel, map, rp, uvrB-degV, gen, poplar, sycamores, alder, elm

This work has been done through Euphresco project \"Study on the diversity of phytoplasmas detected in European forests (PhyFor)\"

02_07

Characteristics of some white and red grapevine cultivars IN Fruška Gora wine region

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Abstract

Fruška Gora is one of the most famous Serbian wine regions, recognized for the grape and wine quality of both red and white cultivars. However, highly variable climate conditions among the seasons affect the grape and wine quality. Thus, productive characteristics of five white (Bačka, Kosmopolita, Morava, Panonia, Riesling italico) and three red cultivars (Cabernet sauvignon, Dionis, Merlot) were investigated during three consecutive seasons (2017-2019). The experiment was conducted at the Experimental field of University of Novi Sad, Faculty of Agriculture. The vines were Guyot pruned, with one cane and one spur (14 buds per vine). On average, white cultivars were harvested one month earlier compared to red cultivars (25. August and 25. September, respectively). The highest yield showed Merlot (1.37 kg/m^2), followed by local cultivars Bačka and Panonia with 1.20 kg/m^2. The highest yield per cultivar was in 2018 (1.23 kg/m^2), while the lowest was observed in rainy 2019 (0.87 kg/m^2). During the research period, Bačka showed the highest cluster weight (217 g).

The highest sugar content in the must was recorded in Panonia (23.9%), while the lowest was in Morava (21.4%). All red cultivars accumulated between 23 and 24% of sugar. Panonia had the highest titratable acidity (7.8 g/l), while the lowest was measured in Bačka (5.6 g/l). Among the red cultivars, Cabernet Sauvignon and Dionis showed higher titratable acidity (6.5 g/l), compared to Merlot (5.7 g/l). Dionis, a new resistant cultivar released in 2017, was the only red cultivar in the experiment grown organically. However, Dionis showed the grape quality at the level of remarkable *V.vinifera* cultivars in the conventional production.

Moreover, the best red wine quality showed Dionis (18.8 points - on the scale up to 20), followed by Cabernet sauvignon (18.7). The best wine quality among the white cultivars showed Riesling italico (18.9).

Key words: grapevine cultivars, yield, quality, sugar, titratable acidity

02_08

Vitalising ict relevance in agricultural learning

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Abstract

Modern agriculture is largely based on new technological solutions closely related to the increasing use of information and communication technologies (ICT) and various software solutions, not only for monitoring but also for managing production processes. In Bosnia and Herzegovina and Montenegro agriculture remains largely dependent on manual farming, with technical and technological solutions being poorly explored. At the same time, both countries have strong ICT sectors employing a sizeable number of highly educated professionals who develop front-end software solutions. Building a sustainable regional future for the large extent hence depends on the intersection of the two which, even though a concern that should be addressed in all parts of society as a critical strategic area for development and economic activity, has in so far not been given fair attention in educational and training practices. With this in mind Erasmus+ "VIRAL" (Vitalising ICT Relevance in Agriculture Learning) project aims to trigger a higher level of knowledge, skills, and application with reference to the use of ICT in agricultural education and training in both formal and informal settings. Henceforth, VIRAL connects key HEIs and industry learning communities' participants in the process of co-creating and testing new in and out of the classroom methods and practices, initiating professional pitch competitions (hackathons), and spinning off a distinctive regional university-business collaboration platform. Core learning experience involving agricultural and IT engineering teaching staff and students and passing on the knowledge gained onto professional advisory services and collaboration practices with the companies in the field is realized through intensive training experience and study visits to European universities. On the impact, level boosted ICTs use in agriculture underpins sustainable rural development, increases the resilience of rural families, improves access of farmers to needed services, and further empowers women and youth living prospects in rural areas.

Key words: agriculture, information and communication technologies

SECTION: ANIMAL SCIENCE

Poster Presentations

P3_01

Incidence of reproductive pathogens in breeding pigs population on selected farms in Republic of Srpska

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Abstract

The aim of the study was to determine the incidence of reproductive pathogens in the breeding pig population on selected farms in the Republic of Srpska. The survey included a total of 11 farms from the Republic of Srpska (Bijeljina - 4, Gradiška - 3, Prnjavor - 2, Foča - 1, Ljubinje - 1), from which a total of 50 blood samples of sows and boars was taken. All samples tested were serologically negative for the causative agents of leptospirosis and brucellosis. The presence of PRRS virus was detected in 54.55% of farms tested and 40% of blood samples tested, circoviruses on 81.18% of farms and 66% of blood samples tested, and Aujeczcky disease virus was found on 9.09% of farms and 10% of blood samples tested. The results of this study indicate the presence of mixed infections with these pathogens, resulting in a vague clinical picture in pigs on the farms included in study. Also, there is need for systematic monitoring and active surveillance of these diseases, with the aim of reducing of their negative impact on the productive and reproductive parameters of pigs.

Key words: breeding pigs population, reproductive pathogens, monitoring

P3_02

Determination of the presence of aflatoxin b1 in feed in Republic of Srpska (BiH) in the period of 2017-2019.

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Abstract

Aflatoxins are a mixture of related chemical compounds of bisfokumarine type. They are synthesized in a variety of agricultural and food products such as oilseeds, spices, cereals and other products.

In the period of year 2017– year 2019, 418 samples were analysed for the presence of aflatoxin B1, using the ELISA method. The analysis included samples of maize (370 samples), concentrated feed (284 samples), and other types of feed (silage, cereals, soy bean, etc.) (240 samples). The presence of aflatoxin B1 was determined in all of the analysed samples. The highest detected concentration of aflatoxin B1 was 30 μg/kg, in the maize samples, 25 μg/kg in the concentrated feed samples, and 15 μg/kg in the other analysed samples. Higher concentration of aflatoxin B1 from maximum residual level specified in valid document was detected in samples of concentrated feed.

Key words: Aflatoxin B1, ELISA, food, feed

P3_03

Microbiological criteria in the production of sterilised milk

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Abstract

Ultra high temperature milk processing is generally defined as heating milk between 135 and 145ºC for 1-10 s. The product defined in this way indicates that it does not contain vegetative forms of microorganisms and it has been packaged in a hermetically sealed container to be stable at room temperature. This is difficult to achieve 100% of the time and so some ultra-high temperature milks contain microorganisms. Many of these are thermophilic spore-forming bacteria, whose spores survive the heat treatment. Samples of sterilized milk come from a dairy from the Republic of Srpska (Bosnia and Herzegovina), and were sampled over a six-month period. Within self-control, 302 samples from production and 21 samples from the distribution centre were tested. The aim of the research was to determine the safety of sterilized milk and hygiene conditions in the production process based on the test results of sterilized milk in the production process, as well as to consider a proposal for recommended microorganisms to be tested in the sterilized milk production process.For microbiological testing of sterilized milk were used methods BAS EN ISO 4833-1, BAS ISO 15213 and BAS EN ISO 11290-1. In the self-control of sterilized milk, 12.30% of the samples were unsatisfactory according to the recommended criteria. An increased colony count was the cause in 97.30% of unsatisfactory samples, while in 2.70% of the samples the cause was sulphite-reducing anaerobic bacteria. *Listeria monocytogenes* was not detected in the tested samples. The main cause of unsatisfactory samples of sterilized milk are aerobic bacteria, with or without the possibility of spore formation. In the self-control of sterilized milk, it is justified to test the colony count and sulphite-reducing anaerobic bacteria according to the recommended criteria.

Key words: sterilised milk, microbiological criteria, hygiene process

P3_04

Studbook from state-owned stud Vučijak: errors and corrections

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Abstract

The Lipizzaner horse, as one of the oldest and most famous horse breeds in Europe. Originated as a result of a long and systematic selection. State-owned stud, primarily considering the breeding of elite genetic material of the Lipizzaner breed, are a national asset and heritage. The aim of this work was to detect and correct errors in the studbook. The goal is also to categorize the detected errors into groups according to the impact on the quality of the studbook. The five mare families was analyzed (Janja, Pliva, Lipa, Sitnica and Sutjeska). The pedigree information of the animals currently living on the stud were used for each mare families. A total of 21 animals was analyzed. All errors were categorized into 5 groups. The results showed that the most common errors in keeping the studbook are the lack of information about the place of birth of some ancestors which are brought to the stud. Correction of studbook is a prerequisite for the membership of the stud Vucijak in a Lipizzan International Federation (LIF). Work on corrections should continue for another mare families as well as line sires.

Key words: Lipizzan, mare families, pedigree information, corrections

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

P3_05

Yolk sac conversion efficiency of brown trout (Salmo trutta m. fario) and rainbow trout (Oncorhynchus mykiss) during endogenous nutrition

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Abstract

The subject of this paper's research is endogenous nutrition for brown trout (Salmo trutta m. fario) and rainbow trout (Oncorhynchus mykiss). The goal of the paper was to determine the efficiency of yolk sac conversion in brown and rainbow trout during endogenous nutrition. The experiment was conducted in the Aquaculture Laboratory of the Faculty of Agriculture, University of Banja Luka. The eggs was placed in trays with three repetitions for brown trout, and three for rainbow trout. Standard body length, length and height of yolk sac were measured after hatching, 27th day of incubation (357 dd) of the rainbow trout (n = 20) and 30th day of incubation (492 dd) for the brown trout (n = 20) and before swimming, 36th day of incubation (492 dd) of rainbow trout (n = 20) and 43rd day of incubation (571 dd) for the brown trout (n = 20). Obtained data was used for determining volume and yolk sac conversion efficiency for the brown and rainbow trout. Standard body length of brown trout after hatching was not in corellation with the yolk sac volume (Pearson's r = 0.25; P = 0.141), and the rainbow trout standard body length was in corellation with the yolk sac volume after hatching (Pearson r = 0.47; P = 0.019; α=0,05). Standard body length, and the yolk sac length and height for brown trout from hatching to swimming were higher, but the yolks sac conversion efficiency for brown trout was lower. Yolk sac conversion efficiency for brown trout from hatching to swimming was 0.121, and for rainbow trout it was 0.178.

Key words: yolk sac conversion efficiency, brown and rainbow trout

P3_06

Embryotransfer in cattle

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Abstract

The aim of the study was to investigate the possibility of improving cattle breeding in Republic of Srpska by using embryotransfer. The survey, started in 2017, covered 13 dairy farms, of which a total of three farms were selected. The experimental animals (13 to 15 months old heifers, in breeding condition, with well-developed sexual organs and the regular appearance of oestrus) were Simmental and Holstein (farm A), crossbreeds of Norwegian Red, Simmental and Holstein (farm B), and Holstein (farm C). All heifers were marked with ear tags and data about their age, body weight and occurrence of oestrus were taken from farm records. The experiment lasted from May 10, 2018 to February 20, 2019. Total of 85 heifers were analyzed, of which, after rectal and ultrasound examination of the reproductive organs, 44 heifers were included in the estrus induction and synchronization program. The selected heifers were treated twice with prostaglandins (PGF2α) at 11-day interval to bring them to the same stage of the oestrus cycle, and the occurrence of oestrus was observed within three days of the second prostaglandin application. On the seventh day after the occurrence of oestrus, a ultrasound re-examination of the heifers and embryotransfer was performed, in order to adjust the phase of the uterine cycle and the age of embryos. The embryos were transferred only to the heifers with full-developed yellow body. On farms A and C, embryos were transferred to all selected heifers (100%), while at farm B in only 31.25% of the number of selected heifers. The transfer of embryos was performed transcervically and ipsilaterally, using a rounded tip catheter (Cassou, France), and 35 days later heifers were examined for pregnancy. The percentage of pregnancy on Farm A was 64.28% (9 heifers), while there was no pregnancy developed on farms B and C.

Key words: embryotransfer, cattle, Republic of Srpska

P3_07

Antibacterial activity of different types of honey on pathogenic bacteria

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Abstract

Honey has been used as a food and natural sweetener since ancient times. Thus, its application is mentioned in Sumerian records, and this not only as food but also as a therapeutic agent. Between in many crops and civilizations during the history of use in medicine and for the improvement of the general physiological state. However, only in recent times have medically recognized and its positive drug activity. The composition of honey is variable and depends primarily on the botanical origin, but also the same can affect multiple environmental factors that are holders of such activities that constitute the main obstacle to its possible clinical application. It is necessary to investigate the antibacterial properties of different types of honey due to the botanical and geographical origin for several consecutive years.

The aim of this study was to determine the antibacterial activity of five samples of honey from different geographic origin, from the Republic of Srpska (Bosnia and Herzegovina), Slovenia and New Zealand and also to deterimine the type of antibacterial activity. The disc diffusion method on agar was used to test the honey samples with incubation at 37ºC for 24 hours.

The results showed that all tested types of honey (acacia honey, acacia comb honey, floral honey, chestnut honey and manuka honey) demonstrated good inhibitory properties on *Streptococcus* group D, *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* Enteritidis and *Salmonella* Typhymurium (clinical isolate) and *Staphylococcus aureus* WDCM 00034 (certified reference material), except acacia honey and acacia honey comb which are not acting inhibitory at clinical isolate of *Staphylococcus aureus.* The best antimicrobial effect was manifested by manuka and flower honey, with the strongest bacteriostatic effect, while chestnut honey showed the strongest bactericidal effect.

Key words: honey, antibacterial activity, pathogens

P3_08

Production results of broiler chicken farms of different capacities in region of Banja Luka

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Abstract

The aim of this paper was to investigate influence of broiler chicken farms capacity on main production results. A total of six farms were categorized according to capacity (chickens per round) in three equal groups as small (6,000), medium (10,000) and large (20,000), and production records of total 60 fattening rounds were analyzed using descriptive statistics and ANOVA. There were no statistical differences among farms of different capacity regarding fattening duration, initial and final chicken weight, feed conversion ratio, total mortality and European production efficiency factor, whereas first-week mortality was significantly higher on large compared to small and medium capacity farms ($p<0.05$). Based on the obtained results, it can be concluded that similarities in used technologies and a model of cooperation that seeks to ensure uniform input quality and production control probably contributed to similar farm performances, but further research are advised.

Key words: Broiler, farm capacity, productive results, Banja Luka

SECTION: ANIMAL SCIENCE

Oral Presentations

03_01

The variation in milk composition of dairy goats due to n-3 unsaturated fatty acids supplementation

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Abstract

The objective of this research was to determine the effect of addition of n-3 unsaturated fatty acids (α-linoleic, eicosapentaenoic and docosahexaenoic) in dairy goats' ration on milk composition (fat and protein content). Also, the persistence of the effect after supplementation was analysed. The research was conducted on dairy goats (Alpine and Saanen) bred at an indoor farm. Regarding the experimental period, the milk sampling at milking (morning and evening) was performed in the period before supplementation (BS), during supplementation (S), and after supplementation (AS). Accordingly, to the added supplement, animals were randomly allocated into control group (G-4) with no added supplement and three test groups (G-1; G-2; G-3) where a supplement containing n-3 unsaturated fatty acid was added over a period of five days. The results of this research indicate that the addition of PUFA in goats' ration changes the milk composition. The supplementation of α-linoleic resulted in increase of both, milk fat and protein content. Furthermore, the addition of eicosapentaenoic and docosahexaenoic resulted in decrease of fat but increase of protein content in milk. Observed trends also persisted after the supplementation period.

Key words: dairy goats, milk composition, n-3 unsaturated fatty acids supplementation

03_02

Fleece weightand physical-mechanical properties of wool of dupska pramenka sheep

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Abstract

The aim of this study is to determine the actual weightof fleecein one-year shearing, length of fleece tuftsand physical-mechanical properties of wool: height and length of wool fiber, the ratio of length to height of wool fibers and fineness of wool fibers of dupska pramenka sheep. The average weight of fleecewas 2.12 kg in sheep and 3.34 kg in rams. The length of the tuftswas 20.92 cm at the shoulder, 21.75 cm on the posterior rib and 22.25 cm on the sheep, and 23.50 cm at the shoulder, 22.14 cm on the posterior rib and 23.64 cm on the pelvis. The height and length of the wool fiber insheep were 21,97 cm and 22.85 cm at the shoulder, 22.38 cm and 23.10 cm on the posterior rib and 23.06 cm and 23.77 cm, respectively. The rams had the height and length of a woolen tuftsof 22.00 cm and 22.89 cmon the shoulder, 22.54 cm and 23.26 cm on the posterior rib and 22.61 cm and 23.40 cm onthe pelvis. The average fineness of the wool fiberfor sheep was 43.08 μ and 45.43 μ for rams. Based on the measurement of the thickness of the woolen fiber, it has been established that the fleece in examined sheep consists of mixed fibers: axillary (over 45μ) 51.64%in sheep and 54.91% in rams, transitional (30 - 45μ) 28.76% in sheep, and 32,80%rams. The fluff fiber (10 -30μ) fleece was 19.83% in sheep and 12.98%in rams

Key words: dupska pramenka sheep, wool yield, physical-mechanical properties of wool

03_03

The impact of trade balance of agri-food products on the state's ability to withstand the crisis

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Abstract

The crisis represents a disorder that in contemporary society increasingly occurs. Crises are often the result of some earlier solutions. The situation in agricultural production in Croatia has been negative for years. Inadequate tax and high administrative burdens act to discourage the production process and impede the competitiveness of farmers. Furthermore, the measures taken to create added value are not enough, they can even be said to be wrong. The current crisis Covide-19 caused a disturbance on the market in terms of trends of supply and demand. The crisis period will show whether the country has an adequate strategy to overcome all the economic problems ahead. The aim of this paper was to analyse the readiness of the Republic of Croatia for crisis periods in terms of food security by analysing the volume of agricultural production, the balance of foreign trade of agri-food products as well as the structure of total agri-food product trade. The determined trend of increasing deficits in agri-food products in foreign trade balance, particularly with EU countries implies the state's unenviable position regarding the food security indicating the need for implementation of adequate measures in the direction of the market organization and to facilitate investment in sustainable agriculture production systems.

Key words: crisis, agricultural production, competitiveness, import, export, business efficiency

03_04

Impact of the training process on the level of stress in horses

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Abstract

The aim of this study is to examine stress level of horses impacted by training process. Sample included 82 horses from five countries (RS=36.6%, MNE=11.0%, CRO=8.5%, BiH=29.3%, NM=14.6%), age (4-7y=22%, from 8 to 15y=43.9%, above 16y=34.1%) and various breeds (Axx=6.1%, Exx=4.9%, Ex=89%). Out of total sample, 37.8% are involved in police service and 62.2% in sports. T-test of paired samples examined the impact of intervention on stress test results. Significant increase of stress was detected between the first (M=37.00, SD=4.84) and the second measurement (M=43.71, SD=6.96), t= -10.61, p=0.00. Average increase of stress value was 2.53, while the interval of 95-percent trust stretches from -7.96 to -5.45. Value of eta square (0.58) shows that the impact of training process on increase of horses stress level is very high. Actions to eliminate potential distraction factors were implemented during measurements. In explored case, research would be enhanced by introducing control sample, that would not be impacted by training process, but would resemble this sample in all other aspects.

Key words: Stress, horse, training, pulse, space.

03_05

The generation intervals in Lipizzan horse from state - owned stud Vučijak

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Abstract

The success of selection depends largely on genetic variability, selection intensity and generation intervals (GI). The aim of this work was to determine the generation intervals in Lipizzan horses from stud Vučijak using pedigree information, and based on it to determine selection intensity. Pedigree information from a total of 615 Lipizzan horse was used. In this study the total GI was calculated, as well as the generation intervals only for animals that are later included in the reproduction. In addition to the average values, the generation interval between: father-son, father-daughter, mother-son, and mother-daughter was also calculated. Results showed that there no significant differences in the GI between mares and stallions, as well as between mare families. The ANOVA showed that there are differences in GI between the stallion line. Obtained GI values indicate low selection intensity on the stud Vučijak.

Key words: Pedigree information, generation intervals, selection

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03_06

Trends in populations of the most common large game in a hunting area in Eastern Croatia in interval 2008 – 2018

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Abstract

Red deer, roe deer and wild boar belong to the group of large game and are the most common species of game in the hunting area in Eastern Croatia. The research was conducted in the Osijek-Baranja County, area of Kućanci. The analyzed data in the article is the property of Gavran d.o.o. company and investigation was made by the hunting staff of the company. Founded on performed research in a hunting area in Eastern Croatia in the interval from the year 2008 to the year 2018, the following could be pointed out: the highest number of deers was recorded in 2016 and the largest number of hinds was in 2015; the biggest number of roe deer, males (bucks) and females (does) was recorded in 2009; the smallest number of bucks and does was recorded in 2017, same situation as red deer, reduction because of research study; the total number of wild boar population ranged from 89 to 102; the biggest number of males (boars) was recorded in years 2009, 2012 and 2013; the highest number of females (sows) was recorded in 2013. Knowing the number of wildlife in the hunting area is the base for establishing growth and planning shootings. It is important to keep the balance in the hunting ground to avoid transmission and spreading of diseases and reduce traffic accidents as well as vehicle and wildlife damages. Given the fact that populations of large game have great importance in Croatia, the objective of study was to determine population trends of red deer, roe deer and wild boar in hunting ground in Eastern Croatia in interval 2008 – 2018.

Key words: red deer, roe deer, wild boar, population, hunting area

Section 4: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

Poster Presentations

P4_01

The impact of some socio - demographic factors on consumer attitudes toward organic seed in the Republic of Serbia

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Abstract

In the Republic of Serbia, there may be noticed an increase in the interest of the population for agricultural and food products produced in the so-called organic production system. For this reason, the main goal of the study was to examine the attitudes and opinions of the respondents on organic seed depending on their sex, professional qualifications and age. In order to collect data on the attitudes and opinions of the respondents, the survey method was used through questionnaires, in several cities on the territory of the Republic of Serbia. The study was conducted on a simple random sample of 369 respondents. For the collection, processing and analysis of collected data, other research methods were also used: content analysis, tabular analysis, comparative analysis, and hypothetico-deductive method. In addition to the abovementioned methods, $\chi 2$ test was also used to examine assumptions. The results of the research indicate that the analyzed demographic factors have a certain impact on the opinion and attitudes of the respondents on organic seed.

Key words: agriculture, food, organic. seed, attitudes

P4_02

Analysis of production, export and import of tomatoes in Serbia

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Abstract

Tomato is one of the most important vegetable crops in Serbia. Average yields in Serbia were in the range of 13-20 t ha-1. The aim of this research is to realize the position of Serbia in relation to the neighbors from where importing tomatoes is increasing. As the source of data domestic and international statistical data bases were used: Statistical Office of the Republic of Serbia, Trade statistics for international business development, FAOSTAT, and EUROSTAT, for period from 2008 to 2018 year. Changes and tendencies in the tomato export and import were analyzed using an exponential trend equation. In terms of average yield, Serbia is at 109th place, in terms of areas at 50th, and quantities at 70th place. As a potential exporter of this crop Serbia is at 33rd place.

There is a big difference in the realized export of 5.4 mil dollars and the projected potential for export of 13.0 mil dollars. It is interesting that the structure of exporters and importers has changed in recent years. In 2018. Serbia has exported the largest quantities of tomatoes to Greece (about 45%), Montenegro (about 32%) and Bosnia and Herzegovina (about 9%). In terms of imports, the majority of tomatoes arrived in Serbia from Albania, which is about 46% of total imports, almost 12% from Northern Macedonia and about 11% from Greece. According to the research, despite favorable environmental conditions, Serbia imports tomatoes worth 2 million euros. Serbia imports tomatoes in worth of 0.3% of world imports, and exports in worth of 0.1% of the world market. At the same time, the areas under this crop are decreasing from year to year. In order to stop this negative trend, it is necessary to apply new production technology, which would result in higher yield, which is currently 15 t ha-1, more than twice less than the world average of 36 t ha-1.

Key words: Serbia, tomato, production, import, export

P4_03

Entrepreneurship development by lean startup methodology

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Abstract

The purpose of this work is to show in what ways contemporary Informatic Technology (IT) can affect the development of entrepreneurial ventures. In this work, a new lean startup methodology is presented, whose application in practice has proven exceedingly successful in the early stages of technological entrepreneurial ventures. Likewise, it highlights the connection between using modern IT to more quickly and easily, manifest entrepreneurial ideas into successful entrepreneurial ventures. Technology Entrepreneurship is within itself highly specific and rapidly evolving. The concept of lean startup enables early product launch on the market, while simultaneously allowing for product improvement and advancement. Introducing this new concept should initiate higher utilization of this methodology in various practices. Secondary sources were used in the writing of this review, primarily scientific and expert journals from this particular field, along with online resources for practical examples

Key words: entrepreneurship, technology entrepreneurship, Lean startup methodology

P4_04

Drought analysis for the region of North Backa, Serbia

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Abstract

This study aims to investigate the characteristics of meteorological and agricultural drought conditions in North Backa. The meteorological data for weather station Palic over the period 1966-2018 were used to calculate several drought indices. According to the Aridity Index, semi-arid growing seasons are more frequent in the last two decades of the studied period. Drought was present in 14% of growing seasons (according to both SPI and RDI) and 16% cases (according to SPI) and 17% (according RDI) during July and August. De Martonne Index revealed that irrigation was required every second year from July through September, except for crops resistant to drought. The Climatic Precipitation Deficiency Index indicated that water shortage was present during the whole growing season in the studied period. The largest water deficit was recorded in July (83mm) and August (76mm) when crops have the largest water requirements.

Key words: Drought, Drought indices, Lowland, Palic, Serbia.

P4_05

Bosnia and Herzegovina's wine foreign trade and market

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Abstract

This work analyze the foreign trade and wine market of Bosnia and Herzegovina during the eight years period (from 2012 to 2019). The aim of this work is to observe the trade exchange with the wine products (CT 2204) of Bosnia and Herzegovina and the most common destinations concerning the export and import. Also the aim was to show results about country production for this period of time. The work used the data of the trade map data, wine institute data, Bosnia and Herzegovina institute of statistics, Republic of Srpska institute of statistics data and Federation of Bosnia and Herzegovina institute of statistics data. For the research was used the method of so called "desk research". Standard mathematical-statistic methods were applied for the analysis of collected secondary data (time series analysis, descriptive statistics of the observed period and data). Also Relative Trade Advantage index was applied also to analyze the international competitiveness of wine production in Bosnia and Herzegovina. The results of the research provide information that the values of import are several times larger than the values of export, meaning that Bosnia and Herzegovina records clear deficit in foreign trade exchange for analyzed product group of the harmonised customs tariff system. The trade is based on the former Yugoslavia countries (Serbia, Montenegro, Slovenia, Croatia and North Macedonia). RTA index has values from (-0.674) to (-0.408). The negative values of calculated results of RTA indicator shows that Bosnia and Herzegovina has a comparative disadvantage in wine trade. The lowest level of trade advantage Bosnia and Herzegovina has in the trade with North Macedonia. The best position in trade, when it's about former Yugoslavia countries, Bosnia and Herzegovina has in trade with Montenegro. The export and import with these countries take a stake from 60 % to 95 % of overall trade. Likewise results of this paper provide information that on average level imported wine prices are 1.6 times higher than exported wines. Average consumption per capita for the period 2012. to 2019. is about 15 liters (52.000.000 liters in total per year).

Key words: Export, import, wine market, Bosnia and Herzegovina

P4_06

Improving the economic efficiency of family farms by introducing a new line of livestock production

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Abstract

Republic of Serbia is characterized by low consumption of meat and meat products, as well as a constant dependence on meat imports. According to FAO data (2017), about 53 kg of meat per capita annually is consumed in Serbia, which is significantly less than the EU average (76 kg). Serbia exported meat worth about $55 million in 2017 and imported $94 million, resulting in a foreign trade deficit of about $40 million. Although there is a foreign trade deficit, instead of increasing the number of heads, it is constantly decreasing. The aim of this paper is to determine the cost-effectiveness of pig fattening as a supplementary activity of the family farm focused on crop production. The survey was conducted on a farm with 92ha of arable land used for growing arable crops. Near the observed farm, there are facilities where pig fattening can be organized, at very low investment and rental costs. In order to obtain the most accurate solution to the set problem, optimization models for both crop production and crop-livestock production were constructed. The first model - crop production showed that, due to adequate equipment of mechanization and labor force, there are no working peaks in production process. Also, a very low level of utilization of available working hours of workers and mechanization was observed, which averaged less than 17%. The second model predicted the introduction of pig fattening as an additional activity. With the introduction of this production line, the realized gross margin of the farm would increase more than 2 times, and the utilization rate of the available number of workers would increase to about 60%. Based on the results obtained, it can be concluded that it is possible to use the working hours more rationally and significantly increase the farm income.

Key words: economic efficiency, family farms, optimization models

P4_07

Wine production in Serbia and competitiveness on international market

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Abstract

The market environment in Serbia is characterized by integration with the international market, and this brings a numerous changes in the level of competitiveness of individual segment of food sector. Namely, as Serbia has been in the process of market liberalization for a long period of time, there have been numerous changes in the food market resulting from the integration (free trade agreements with European Union, CEFTA, Eurasian Union,...), which has not bypassed the wine sector as well. Serbia is a significant wine producer in the world, and according to FAO, Serbia is the 20th largest wine producer in the world by production quantity. However, wines from Serbia face stiff competition on the international market, where wine producers from other countries are more competitive that Serbian producers, both in quality and price. The main aim of this paper is to determine the potential for exporting Serbian wine to the international market, and to consider the competitiveness of this sector. The results of this research indicate unfavorable tendencies in the export of wine from Serbia, especially to EU countries. In that context, the potentials for further exchange, as well as recommendations for improving competitiveness in the international market, have been considered.

Key words: wine, Serbia, competitiveness.

P4_08

The significance of agricultural advisors for the development of agriculture in the Toplica district

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Abstract

The paper aims to present the role and importance of agricultural advisors in the development of agriculture by analysing the performance of professional agricultural services through the engagement of agricultural consultants. Furthermore, the paper seeks to inquire into the interests of agricultural producers in co-operation with agricultural advisors. The research presented in this paper was conducted in three municipalities on the territory of the Toplica District: Prokuplje, Kuršumlija, and Blace. The research was conducted on 102 respondents, on a random sample of 34 respondents per each aforementioned municipality. Data processing was performed by utilizing a non-experimental method, i.e. by a survey, whereby the researchers resorted to a questionnaire comprising 20 questions. The first segment of the questionnaire comprised inquiry into general data, while the second segment comprised specific questions relating to the amount of information that agricultural producers possess regarding the work of agricultural advisors and how the knowledge was transferred and acquired. The obtained data were statistically processed and presented by employing tables and graphs. Research results showed that 72.5% of respondents collaborated with agricultural advisors, while 27.5% continued with this kind of collaboration. The contact between agricultural advisors and producers was established through various media, as well as by visiting farms. This assertion was confirmed by farmers who participated in this research, i.e. 61.8% of respondents confirmed that they regularly kept in touch with agricultural advisors by phone, while 40.2% confirmed that they were regularly visited by the advisors. Surveyed farmers provided positive assessments of the work of agricultural advisors, whereby 50.9% of respondents assessed the work of advisors as excellent and very good, 19.6% believe that their performance is good, while 29.4% expressed dissatisfaction with the work of advisors by assessing their performance as insufficient good or poor.

Key words: agriculture, counseling, awareness, transfer, knowledge

Section 4: AGRICULTURAL ECONOMICS AND RURAL DEVELOPMENT

Oral Presentations

04_01

Assessment of wheat self-sufficiency in Bosnia and Herzegovina

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Abstract

Wheat and corn are the dominant cereals in Bosnia and Herzegovina (BiH), and the additional importance of wheat is that it is the most important bread grain. In Bosnia and Herzegovina, there is no official calculations on production and consumption comparison of agricultural products. Therefore, the aim of the paper is to determine the degree of self-sufficiency of Bosnia and Herzegovina and wheat in the period 2014-2018. A descriptive method is used to describe production, foreign trade, and consumption. Wheat self-sufficiency balance is calculated using formulas recommended by FAO. The research was conducted based on a secondary data. The Republic of Srpska (RS) has a larger role in production, than in wheat consumption within Bosnia and Herzegovina. Foreign trade in wheat as well as wheat products has great economic importance in BiH. Consequently, this analysis is essential from the aspect of reconciling wheat production and consumption. Bosnia and Herzegovina had a deficit in foreign trade of wheat grain and flour in the analyzed period. In the analyzed period BiH had a low degree of self-sufficiency in wheat (29-48%). Since wheat consumption is fairly stable, if the balance of production and consumption wants to be improved, BiH would have to produce more wheat by increasing sown areas and/or yields.

Key words: wheat, production, consumption, self-sufficiency, BiH.

04_02

Agricultural and rural cooperatives development – the latest trends

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Abstract

The aim of the research is to look at the latest trends in the development of agriculture and rural cooperatives, primarily in the countries of the European Union but also in the neighboring countries to Bosnia and Herzegovina. The research was conducted on the basis of the analysis of available sources of literature and statistical data and includes the analysis of trends in relation to the following indicators: structure and number of agricultural and rural cooperatives, organizational and legal structure, cooperative legislation, financing of cooperatives and decision-making principals.
The survey results show that the position of agricultural cooperatives in Europe has changed greatly over the last ten years. From the prevailing form of ownership in agriculture, cooperatives have come into the position of only one of the possible forms of business in agriculture. Cooperatives are also associations of producers and businesses. They are an extended arm of agricultural production because they allow producers to concentrate their power on buying raw materials, as well as on buying, processing and marketing products of their members. However, with respect to classic cooperatives, new types of cooperatives have evolved that differ on the issues of open membership, member shares, degree of responsibility, outsourcing opportunities, decision making, and revenue sharing. These types differ fundamentally in the application of basic cooperative values and principles.
In conclusion it can be sad the challenges that cooperatives have faced in recent years and which are still ongoing have led to introducing innovative financial instruments as well as different legal frameworks as a tool to overcome the difficulties encountered in the agricultural market.

Key words: trends, cooperative development, the European Union, agriculture and rural development

04_03

Implementation of gender budgeting in agriculture and rural development in Bosnia and Herzegovina and the surrounding countries

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Abstract

The aim of the research is to analyze agricultural and rural development measures from a gender sensitivity perspective, as well as to analyze the structure of budget allocations for agriculture and rural development and the impact that such structure has on the position of women in rural areas. The analysis was carried out using gender budgeting methods and tools developed by international organizations such as the United Nations Gender Equality-UNWOMEN and the Organization of Economically Developed Countries-OECD. Gender responsive budgeting is an internationally recognized tool that ensures the achievement of de-facto gender equality and contributes to the effectiveness of allocation of public funds. In Bosnia and Herzegovina, about 20.5% of the female workforce is engaged in the agricultural sector, 16,9% in non-agriculture or industry and 62,6% in services (Labor Survey, 2019), with employment rate for women being twice lower as for man and unemployment higher for women compared to man. Women own and co-own around 30% of agriculture land. There is an increasing trend of the share of women headed households in the Farm register, with that share being 9,97% in 2016, reached 17,76% in 2019. The level of reporting, monitoring and evaluation in the agriculture and rural development sector is not sufficiently developed in any of the countries in the region, the situation reports in the sector are not publicly available or promoted, and to a limited extent or do not even contain gender disaggregated data. The consultation process in passing legislative, strategic acts, programs and budgets, although carried out on a regular basis, does not provide sufficient opportunities for participation by organizations other than Republic Farmers' Associations. Individual examples of gender-sensitive measures, activities and projects, mostly implemented in Republika Srpska (Bosnia and Herzegovina) represent a good practices that can be disseminated, popularized and promoted.

Key words: gender budgeting, agriculture, gender mainstreaming, women in rural areas

04_04

Analysis and prediction of productive and economic characteristics of watermelon production in Vojvodina region

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Abstract

The aim of this paper is to analyze the changes in production (area, production, yields) and economic (absolute and relative prices) characteristics of watermelon in Vojvodina region. All analyses refer to the period 1991-2017, and the forecast to the period 2018-2022. Source of data is Statistical Institute of Serbia. ARIMA model is used for prediction. The results obtained by the authors show that areas under watermelon tend to decrease sharply (average annual rate of -3.17%). Furthermore, the annual production of watermelon tends to be symbolically increased, almost stagnant. The variability of annual production of watermelon shows moderate intensity (CV 18.8%). Watermelon yields tend to increase markedly at an average annual rate of 3.51%. Yield variation is very strong, which is confirmed by the extremely high coefficient of variation (47.2%). Moreover, the yield of watermelon was 22.1 t/ha in the last year of the observed period which is 2.3 times higher than in the first year. Furthermore, the maximum yield of watermelon was in 2013 and the minimum was in 1992. Also, watermelon yields tend to increase markedly at an average annual rate of 3.51%. The predicted values of watermelon indicate that the area will be around 3,280 ha by the end of 2022, production around 144,000t and yield around 32 t/ha. In the analyzed period, the average annual price of watermelon was 118.1 euro per ton. The price of watermelon ranged from 68.4 euro/t in 2004 to 213 euro/t in 2010. The average annual rate of change of the price of watermelon was moderately high, amounting to 2.84%. In 2022, the price of watermelon will be 145.65 euro/t. The average annual parity price of watermelon converted to wheat was 1.09. The parity varied in the interval from 0.63 in 2002, to 2.17 in 1994. The relative variation of the price of watermelon was far more pronounced than the absolute.

Key words: watermelon, production, economic characteristics, Vojvodina

04_05

The effect of weed control in poplar plantations

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Abstract

The effect of weed control is presented in the paper in Populus x euramericana I-214 plantations, along the Tamiš River. The study was conducted in the period (2011-2019) on three permanent test surfaces. Weed control was performed by applying total herbicide (glyphosate)as the active substance, on a circural surface of 1 m around the seedling. Herbicide treatment was performed in the first three years of the poplar plantation. The diameters of the poplar seedlings on the treated surfaces are significantly larger than the control surface. In the eighth and ninth years of poplar age, diameters on all test surfaces are larger than 4,2 - 5,2 cm.

Key words: poplar plantation, herbicide, diameter

04_06

Analysis of net working capital of agricultural enterprises of Vojvodina

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Abstract

In this paper trends of net working capital (NWC) of entities in the field of agriculture and food industry of Autonomous Province of Vojvodina from 2012 to 2018 were analyzed. The aim of the paper is to estimate the status and trends of NWC as one of the most important financial position indicators of agricultural enterprises. Also, the analysis of basic resources trends of entities in the field of agriculture and food industry was performed. Various methods of balance analysis were used in this paper, primarily parsing and comparison. In 2018, there was 2,872 enterprises in total, wherein 64.0% were agricultural enterprises and 36.0% were companies in the field of food industry. In 2018, the value of NWC in agriculture amounted to 55.8 million euros, whereby inventories were covered only by 8.7% of NWC. On the other side, in the first four years of the observed period (2012-2015) NWC was negative, i.e. inventories were completely financed from short-term capital. This means that situation is slightly better now, but still not good enough, because inventories should be covered by NWC in total. Companies in the field of food industry had slightly better position meaning that NWC was positive throughout the whole period, while in 2018 inventories were covered by 20.0% of NWC. Extremely low percentage of inventories coverage and negative NWC in some years, indicate financial imbalance of the observed enterprises, which capital structure is moved to the favor of short-term liabilities. Unfavorable financial position of enterprises could be improved by changing the structure of capital, i.e. by increasing the rate of self-financing. Besides that, conversion of short-term loans into the long-term ones and constant further growth of net profit would be of great importance for the observed companies.

Key words: Net working capital (NWC), financial balance, financial position, AP Vojvodina.

04_07

Type of waste as a factor of economic development of households and environmental protection in rural environments

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Abstract

The research was conducted in the villages of Jablanica district Orašac, Jarsenovo and Stupnica, a rural area on the territory of the City of Leskovac. The paper aims to determine the mortality rate, to identify significant farmers in rural areas and to maintain sustainable agricultural agriculture to the economic development of the local community and the protection of the environment in which they live. On that occasion, they used the farmer survey method to identify and describe the factors that use the amount of waste they generate on farms and their impact on the environment. Appropriate methods were used to separate and separate the waste, into organic and inorganic, which was later used as a mineral additive in the fields (organic) or harmlessly removed (inorganic). A random sample of 60 agricultural farms was surveyed on the topic: Determining the impact of waste of different origins on the environment. The results of the research show that the factors that use the amount and types of waste influenced the perception of agricultural producers. It was found to be reliable, the Cronbach's alpha coefficient is 0.539 (Cronbach's Alpha, 539). At the same time, the way in which waste is collected, stored, classified and used is important for its utilization with the necessary economic upgrade per production unit and reduction of harmful work in the environment, proper use

Key words: farmers, economic development, waste, environmental protection.

O4_08

The significance of agricultural advisors for agricultural development in the toplica district

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Abstract

The aim of this paper is to demonstrate the role and significance of agricultural advisors for agricultural development by means of analyzing the work of agricultural expert services from the standpoint of engagement of agricultural advisors and the interest of agricultural producers in co-operating with agricultural advisors. Research studies presented in this paper have been performed in three municipalities of the Toplica District, namely in Prokuplje, Kuršumlija and Blace. The aforementioned municipalities are perceived as underdeveloped areas of the Republic of Serbia. The research included 102 randomly selected respondents, i.e. 34 respondents per municipality. The obtained data have been statistically analyzed and represented in the form of tables and graphs. The results showed that 72, 5% of respondents had had some form of co-operation with an agricultural advisor, while 27, 5% of them maintained this co-operation. The contact between agricultural producers and advisors had been established by means of various media and by visiting agricultural farms. Agricultural producers confirmed such assertion in this research, i.e. 61, 8% of respondents confirmed that they regularly communicated with agricultural advisors by telephone, while 40, 2% confirmed that they were regularly visited by advisors. Surveyed agricultural producers assessed the work of agricultural advisors in a rather affirmative manner. Namely, 50, 9% of respondents stated that advisors´ work was excellent and very good, 19, 6% of respondents considered their work to be good while 29, 4% of surveyed respondents expressed dissatisfaction with the work of agricultural advisors by rating their performance as insufficiently good and/or poor. Bearing in mind the amount of information, attitudes and assessments of agricultural producers regarding agricultural advisors, the authors conclude that the role of agricultural advisors is significant and satisfactory, first and foremost with respect to agricultural production in the Toplica District.

Key words: agriculture, advisory role, awareness, transfer, knowledge.

04_09

Agricultural Support Policies of Bosnia and Herzegovina and International Economic Integrations

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Abstract

In international economic integrations, there are two main challenges of adjustments of entity agricultural policies in Bosnia and Herzegovina. The first one presents the adjustments of domestic support models to agriculture with requirements of WTO and the second with CAP EU. The paper provides an overview of the required adjustments in domestic support to agriculture and rural development of Bosnia and Herzegovina related to WTO and EU, based on using of secondary data sources. In terms of the structure of domestic budgetary support for agriculture are prevailing the measures of *amber box, i.e. market and direct producer support measures*. The results of research point out that it is necessary to make changes in direction of further models of subventions of domestic agriculture production in Bosnia and Herzegovina.

Key words: agricultural policy, models of subventions, Bosnia and Herzegovina, WTO, EU

04_10

Intermediation in increase of agricultural land use by ICT support

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Abstract

Competitiveness is one of the main sources of profitability and sustainability in open economies. In agriculture, competitiveness is based on specialization and the effect of the economy of scale. In a situation of dominance of small and fragmented land holdings, market opening and creating chances to generate opportunity income have resulted in, among other things, reduced use of agricultural land. The subject of the research presented in the paper is non-utilized agricultural land in the conditions of its imperfect mobility. The aim of the research was to determine the area of non-utilized agricultural land in the world and in Bosnia and Herzegovina and to find ways to increase its use. The research was conducted combining literature review and modelling of the increase of the utilization of agriculture land by its virtual consolidation, i.e. temporary renting using intermediaries, also known as land bank. Business Process Modelling Notification (BPMN) was used to graphically interpret information flows. The City of Trebinje was taken as an example for the case study. The result is developed and a schematically elaborated model of communication, information and cash flows between landowners and renters with the mediation of the Agrarian Fund and the involvement of several other institutions. The financial effects of applying that model were also evaluated by the simulation method is presented. The conclusion is that applying proposed solution of intermediation in the temporary renting of agricultural land could have multiple effects for land owners, renters, the local community and the state.

Key words: agriculture land, land abandonment, intermediation, ICT.

04_11

Measuring of Technical Efficiency of Agricultural Holdings in Serbia Using DEA Method

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Abstract

The concept of technical efficiency (TE) is based on achieving optimal production and/or economic results with minimal expenditure. It is calculated as the ratio of achieved and optimal production under given conditions and takes values in the interval from 0 to 1. In accordance with previous, the subject of this research are agricultural holdings in 2018 which are classified into 10 types of farming. On the other hand, the aim of this research is to determine the level of TE of agricultural holdings in Serbia for the observed year. The variable which represents the output is total revenue, while on the input side re: Total utilised agricultural area, total labour input, total assets value and total inputs. Data envelopment analysis (DEA) method is used in calculations. This method implements comparative analysis of related entities (variables have different units of measure) with common inputs and outputs to evaluate their relative efficiency. The idea of the DEA method is to define the efficiency border with available data, while the inefficiency is quantified by determining the distance of the observation units from that border. FADN data for 2018 were used as the data source. It was found that optimum efficiency is achieved in poultry farming in Serbia North and farms specialized in poultry and horticulture outdoor in Serbia South. On the other hand, the lowest level of TE in Serbia North has mixed crops and livestock type of farming (TE coef. was 0.6420). In Serbia South, farms which are specialized for fruits production are the most inefficient (0.5888). The obtained results indicate that a high degree of specialization and an intensive form of production contribute to a more efficient use of available resources on farms in Serbia. The inputs are not fully utilized, so it is possible to achieve a higher level of output for the existing level of input. For certain types of farming, the result can be improved by 40%.

Key words: technical efficiency, DEA, FADN, Serbia.

04_12

Treatment of other gainful activities and marketing costs according to various FADN regulations

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Abstract

FADN accounting system is specific because it covers not only regular activities in agricultural production but also other gainful activities (OGA) and some technical indicators. The goal of this paper is to present recording of OGA throughout different FADN regulations. Besides, the goal is to present recording of marketing (sales) costs in FADN methodology (related not only to agricultural products but also to products gained through processing activities). To clarify the issue, authors compared methodological approaches presented in the following EU regulations – 868/2008, 385/2012 and 2015/220. It has been determined that there are not significant differences between given regulations in terms of recording marketing costs, whereas in newer regulations much more attention is paid to OGA. New research should be directed to a more detailed analysis of costs related to OGA. Comparing to an average farm in the EU, farms in Serbia should increase participation of OGA in total output.

Key words: Other gainful activities, Processing, Marketing, Costs, FADN