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Agroekologija, ekološka poljoprivreda i zaštita okoliša

01

Agroecology, Organic Agriculture and Environment Protection

Impact of tillage management on weight of individual earthworms, their biomass and abundance in Slovakia

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ABSTRACT

Weight of individual earthworms, their biomass and abundance belongs to the important figure for specifying of the soil environment stability. Field experiment was established in Borovce Research Station (NAFC - RIPP Piešťany, Slovak Republic) in growing seasons 2013 - 2015. The experiment was conducted in four different soil tillage technologies: conventional, minimization, mulch and no-till technology. In experiment we watched average of weight of individuals earthworms, their biomass and abundance.

The highest average weight of the individual earthworms (g) were found in minimization technology (0.76 g), the lowest in no-till technology (0.55 g) and also there was observed the highest values of abundance and biomass of earthworms (219 pc.m^{-2} in 0,3 m, resp. 120 g.m^{-2} in 0,3 m). The lowest values of this parameters were found in the conventional technology (71 pc.m^{-2} in 0,3 m, resp. 43 g.m^{-2} in 0,3 m). Different tillage had statistically highly significant influence on weight of individuals earthworms, their biomass and abundance ($P<0.05$, ANOVA, Tukey-HSD).

This study provides new insights on the relationship tillage - soil - soil organisms. The results indicate that the minimization, mulch and no-till technologies have a positive impact on soil life (earthworms), which can lead to the improvement of soil physical and chemical properties, increasing the activity of macro and micro soil-edaphone, prevent against water and wind erosion and other properties, which will be benefits with national interest, particularly in the context of the ongoing climate change and the deterioration of global economic conditions.

Key words: soil tillage, earthworms, soil life, soil properties

Biodiversity of spiders in three orchards at the hunting reserve of Zeralda (Algeria)

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SUMMARY

Spiders are the most abundant order in all terrestrial ecosystems with very high species richness. They are known to lodge various ecological niches.

The aim of the present work is to study the biodiversity of the ground spiders in three different orchards (Medlar tree, Clementine tree and Fig tree) located in the hunting reserve of Zeralda (suburb of the city of Algiers in northern Algeria).

The epigean spiders were collected using thirty pitfall traps, filled third with a formaldehyde solution (4%) as fixative. The traps were checked monthly during 8 months in 2014 and 2015.

A total of 354 spiders were collected. In total, 271 adults were collected (190 males and 81 females) belonging to 14 families, 26 gender and 38 species.

The Gnaphosidae were represented by 6 species, the Lycosidae and the Dysderidae with 5 species each. The other families were collected with less species number. In terms of number of total individuals, the Lycosidae family is the most abundant, it represents 50% of total catch, 134 individuals belonging to this family have belong to 3 genera and 5 species.

The study of species diversity showed that the fig tree resort offers the diversity index and high equitability; therefore it is the most balanced.

The changes in richness and species diversity might be the results of the richness of the litter's flora. From our results we can consider the sampling sites as being organized according 2 abiotic factors: the soil humidity and the recovery rate of the herbaceous layer. However, this dual ordination did not explain the species distribution.

Keywords*:* Spiders, richness, abundance, Biodiversity, orchards.

Utjecaj Zračne luke Dubrovnik na onečišćenje tla teškim metalima i organskim onečišćujućim tvarima

Lepomir Čoga, Sanja Slunjski, Vesna Jurkić, Ivan Pavlović

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SAŽETAK

Provedena istraživanja imala su za cilj utvrditi utjecaj Zračne luke Dubrovnik i cestovnog prometa na onečišćenje tla Konavoskog polja teškim metalima (Cd, Pb, Ni, Cr, As, Co, Hg, Zn, Mn, Fe, Cu) i organskim onečišćujućim tvarima (PAH-ovi i PCB). Uzorci tla uzeti su na četiri lokacije u neposrednoj blizini uzletno sletne staze te na lokaciji Palje brdo (10800 m sjeveroistočno od uzletno sletne staze). Utvrđene su značajne razlike u količinama teških metala i organskih onečišćujućih tvari u tlu ovisno o lokaciji uzorkovanja, udaljenosti od uzletno-sletne staze, udaljenosti od državne ceste D8, tipu tla, dubini tla, nadmorskoj visini te strukturi biljne proizvodnje. Utvrđene količine Ni bile su značajno veće od maksimalno dozvoljenih koncentracija u svim uzorcima. Kako su najveće količine ukupnog Ni utvrđene na lokaciji Palje brdo, proizlazi da onečišćenje tla Ni, a slično i Cr nije rezultat zračnog i cestovnog prometa već je pod jačim utjecajem matičnog supstrata, što potvrđuju i veće količine Ni i Cr utvrđene u podoraničnom sloju u odnosu na oranični sloj tla. Za razliku od Ni i Cr, najveće količine ukupnog Cd, Pb i Zn, kao i najveće količine organskih onečišćujućih tvari (PAH i PCB) utvrđene su na lokacijama Močići (jugozapadno od uzletno sletne staze) i Čilipi (jugoistočno od uzletno sletne staze) koje su pod najjačim utjecajem zračnog i cestovnog prometa (najmanja udaljenost od uzletno sletne staze i državne ceste D8, dominantni smjer vjetra sjeveroistočni i istočni).

Ključne riječi: zračni promet, teški metali, organske onečišćujuće tvari, matični supstrat, smjer vjetra

The influence of the Dubrovnik Airport on soil contamination with heavy metals and organic pollutants

Lepomir Čoga, Sanja Slunjski, Vesna Jurkić, Ivan Pavlović

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SUMMARY

The aim of the research was to determine the influence of Dubrovnik Airport and road traffic on Konavli field soil contamination with heavy metals (Cd, Pb, Ni, Cr, As, Co, Hg, Zn, Mn, Fe, Cu) and organic pollutants (PAH and PCB). Soil samples were taken at four locations near the airdrome and at the location Palje Hill (10800 m northeast of the airdrome). Significant differences in the concentrations of heavy metals and organic pollutants in the soil depending on the location of sampling, the distance from the airdrome, the distance from the state road D8, soil type, soil depth, altitude and structure of plant production were determined. In all samples the determined concentrations of Ni were significantly higher than maximum permitted concentrations. Given that the largest concentration of total Ni was determined at Palje Hill, it can be concluded that soil contamination with Ni, and similar with Cr, is not a result of air and road traffic but stronger influence of parent material. This is confirmed by larger concentrations of Ni and Cr determined in subarable layer in relation to the upper layers of soil. Unlike Ni and Cr, the largest concentrations of total Cd, Pb and Zn, as well as the maximum amount of organic pollutants (PAH and PCB) were determined at locations Močići (southwest of the airdrome) and Čilipi (southeast of the airdrome), which are under the strongest influence of air and road traffic (minimum distance from the airdrome and the state road D8, the dominant northeast and east wind direction).

Key words: air traffic, heavy metals, organic pollutants, parent substrate, wind direction

Drosophila suzukii a new invasive pest of soft fruits in the Central Balkan Mountains region of Bulgaria-preliminary results

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ABSTRACT

The Spotted Wing Drosophila (SWD) (*Drosophila suzukii* Matsumura) as a new invasive pest in Europe since 2008, for the first time was detected in Bulgaria in 2014 in the regions of Southwest and Central South Bulgaria.

During the 2016 vegetation season the evaluation was carried out in the genetic resources collection of raspberry (0.1 ha) and blackberry (0.1 ha) in the Institute in Troyan, situated in Central Balkan Mountains. This region is the main berries growing area in our country. The experimental plots are situated on 360 m altitude where the mean air temperature during June 2016 was 20.0°C, relative humidity 78% and rainfall 56.9 mm. The meteorological data for July was 21.2°C, relative humidity 72% and 82.2 mm rainfall. The experimental plots were without irrigation system.

Monitoring of SWD was carried out by Hungarian `Csalomon` (VARL) traps were installed in the trial plot of raspberry - `Willamette` and `Shopska alena` cultivars and for blackberry - `Hull Thornless` and `Black Satin` cultivars. In each plot was planted in 2015 two rows with 50 plants per cultivar. The traps for adults were set up in the middle part of the rows - for raspberry on June 14 and for blackberry - on July 13, 2016 when the fruits start to ripe.

This first result after monitoring of SWD under Central Balkan Mountains show us that this new invasive pest for our region will be a problem for berry growers and monitoring of SWD will be continued during the next 2017 season.

Key words: *Drosophila suzukii*, raspberry, blackberry, cultivars, regions

Observing the Changes in Biochemical Composition of Fresh and Dried Chokeberry (Aronia melanocarpa) with Conventional and Organic Fertilizing

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ABSTRACT

Chokeberry belongs to the group of fruit species, whose fruits are distinguished by a rich biochemical composition and high antioxidant capacity and has potential positive influence on the health. The experiment was set up in 2016 in the Research Institute of Mountain Stockbreeding and Agriculture – Troyan. Six variants of fertilizing were applied in the experiment with using conventional and organic fertilizers – for soil and leaf.

The following indicators of the biochemical composition were determined for fresh and dried fruits: dry matter weight, refractometric determination of dry matter, total sugars, inverted sugar, sucrose, organic acids, ascorbic acid, anthocyanins, tannins and pectin. Antioxidant activity and total polyphenols of fruits in different fertilization variants were determined. The highest antioxidant activity had fruits with conventional leaf fertilizing – 933,33 μmolTE/100g and organic soil application – 750,00 μmolTE/100g. The dried fruits with organic soil and leaf fertilizing had the highest values of antioxidant activity, which were within the range from 916,67 - 1025,00 μmolTE/100g.

Key words: chokeberry, biochemical composition, antioxidant activity, total polyphenols

Influence of endophytic fungi isolated from symptomless weed on cherry plants

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ABSTRACT

The aim of this research was to determine whether endophytic *Fusarium* fungi *(F. solani*, *F. oxysporum*, *F. verticillioides* and *F. subglutinans*) isolated from weeds can have beneficial influence on growth and development of cherry plants grown in tissue culture system. The experiment was set up in Agricultural Institute Osijek in 2013 and 2014. In the first treatment, fungal inoculum was added to tissue culture growth media, and cherry shoots were placed into it. In the second treatment, after the rooting of tissue, culture plants were dipped into the fungal suspension for one hour and transplanted into the greenhouse. Plants were maintained in the greenhouse for two months and after that, stem length, length and width of the oldest leaf, number of leaves, root length and fresh plant weight were recorded. Our results showed significant differences between control plants and inoculated plants. Almost all isolates improved plant growth and weight. Isolate *F. solani* showed the highest positive influence on cherry plant development and in treatment1 improved leaf width by 166%, leaf length by 165%, stem length by 263% and fresh weight by 262%. Our conclusion is that endophytic *Fusarium* sp. isolated from weed made positive influence on growth and development of axenic cherry plants.

Key words**:** endophytic fungi, *Fusarium solani*, chery, tissue culture

The effect of different farming systems and intercropping patterns on qualitative characteristics of safflower and bitter vetch forage

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ABSTRACT

To evaluate some quality characteristics of forage in safflower (*Carthamus tinctorius* L.) and bitter vetch (*Vicia ervilia* L.) intercropping, a factorial field experiment was based on a randomized complete block design in Urmia University-Iran, in 2013. The first factor was two farming systems (high input and organic). The high-input system involved the use of fertilizers (N and P), and chemical control of pests and weeds with the use of Metasystox and Galant. The organic system used cow manure, bio fertilizers and no chemical material. The second factor was different intercropping patterns that alternated bitter vetch and safflower with row ratios of 2:2, 3:2, 4:2, 5:2, safflower and bitter vetch sole cropping. Results showed that the wet and dry weights of forage grown in sole cropping was more than in all the mixed patterns. The 2:4 planting pattern in the high-input system increased the percentage of crude protein and reduced the crude fiber content of the safflower forage. The most digestible dry matter and soluble carbohydrate in safflower (76.86% and 11.85 percent) and bitter vetch (61.38 and 16.31 percent) were obtained from High-input cropping systems. In general, the maximum crude protein content and soluble carbohydrates in bitter vetch forage, and the highest index of LER (1.87) in both plants were obtained from the 2:5 planting pattern in the organic farming system. Thus, two rows of safflower planted with five rows of bitter vetch is the best model regarding the quality and quantity of forage.

Key words: Cropping system, Crude protein, Forage wet and dry weight, Land Equivalent Ratio, Organic fertilizer

Evaluation of the insecticidal efficacy of the formulations based on inert dust and botanicals against rice weevil *Sitophilus oryzae* L.

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SUMMARY

Concerning the growing evidence of negative effects of pesticide usage in stored products protection, there is increasing demand for alternative methods without harmful effect on health and environment.

We developed (Croatian Science Foundation project IP-11-2013-5570) new formulations based on inert dusts and botanicals. In the preliminary testing their efficacy against the rice weevil *Sitophilus oryzae* (L.) was evaluated.

Five doses of each formulation were mixed separately with 100 g of wheat grain and the efficacy was estimated through adult mortality, after 7, 14 and 21 days and through the F1 progeny production, after 49 days. All treatments were set in three repetitions with 25 adult weevils, 7-21 days old in each repetition.

Formulation F1P caused 100% mortality of adults *S. oryzae* at 300 ppm after 7 days and at 200 ppm after 21 days of exposition. Formulation F3P reached maximum mortality at the highest dose (400 ppm after 21 days). After 21 days, LD_{50} and LD_{90} were 80.2 ppm and 126.3 ppm, respectively for F1P and 107.6 ppm and 270.7 ppm, respectively for F3P. Both formulation significantly reduced progeny production; with percentage of inhibition ranged from 82.0 to 99.6% for F1P, and from 81.7 to 96.5% for F3P, depending on dose.

Further testing should be done in order to evaluate their efficacy against other stored product insects under different conditions of grain moisture and temperature and also to test influence on bulk density reduction after mixing formulations with wheat grain.

Key words: botanicals, inert dust, stored products, efficacy, *Sitophilus oryzae*

Screening for the economic important viruses of beans accessions in collection in Gene Bank in Republic of Srpska

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SUMMARY

Checking the presence of 7 economic important viruses on beans was carried out from the collection in Gene Bank of the Institute of Genetic Resources, University of Banja Luka. Using commercial ELISA kits manufacturer LOEWE (Germany) were analyzed for the presence of the following viruses: *Alfalfa mosaic virus* (AMV); *Bean Common Mosaic Virus* (BCMV); *Bean Common Mosaic Necrosis Virus* (BCMNV); *Pea Enation Mosaic Virus* (PEMV); *Cucumber Mosaic Virus* (CMV); *Bean Yellow Mosaic Virus* (BYMV).

Commercial ELISA kit manufacturers Bioreba (Switzerland) has analyzed the presence of the virus: *Tobacco Streak Virus* (TSV).

We analyzed 55 beans accessions, of which was obtained: 7 accessions positive for the presence of AMV, 13 accessions positive for the presence of BCMNV, 18 accessions positive for the presence of BCMV, 36 accessions positive for the presence of BYMV, 18 accessions positive for the presence of CMV, 13 accessions positive for the presence of PEMV and 7 accessions suspicious positive for the presence of TSV. It was recorded 14 individual infections and 31 mixed infections. In 10 beans accessions tested viruses was not detected.

In the further work, preliminary results will be confirmed by molecular methods.

Key words: bean viruses, DAS-ELISA

Laboratorijska procjena insekticidne učinkovitosti biljnih ekstrakata u suzbijanju žitnog kukuljičara (*Rhyzopertha dominica* Fab.)

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SAŽETAK

Cilj istraživanja je razvoj prirodnih insekticida bez negativnog utjecaja na okoliš.

Laboratorijski je procijenjena insekticidnost biljnih ekstrakata na bazi mažurana i suncokreta u suzbijanju žitnog kukuljičara *Rhyzopertha dominica* (Fab.) apliciranjem na četiri različite površine (staklo, keramičke ploče, obrađeno drvo i sirovo drvo), u svrhu moguće praktične primjene u skladišnim objektima.

Biljni ekstrakti su aplicirani kistom na površinu od 78,54 cm^2 po uzorku, te je učinkovitost procjenjena mortalitetom odraslih jedinki *R. dominica*, nakon 4, 24 i 48 sati. Svi tretmani su postavljeni kroz tri ponavljanja s 20 jedinki *R. dominica* po tretmanu, starosti 7-21 dan.

Najveća učinkovitost pri najkraćoj ekspoziciji (4 sata) je zabilježena s ekstraktom mažurana na staklenoj površini s mortalitetom od 58,33%, zatim na keramičkim pločama (40,00%), a najmanja učinkovitost na obrađenoj drvenoj površini (5,00%) i neobrađenoj drvenoj površini (3,33%). Produljenjem ekspozicije mortalitet se nije statistički značajno mijenjao. Ekstrakt suncokreta postigao je najveću učinkovitost tek nakon 48 sati ekspozicije na staklenoj površini s mortalitetom od 56,67%, na keramičkim pločama (41,67%), na obrađenoj drvenoj površini (16,67%) i na neobrađenoj drvenoj površini (1,67%).

Potrebno je provesti daljnja istraživanja uporabom preciznije tehnike apliciranja kao i na drugim vrstama skladišnih površina.

Istraživanja su provedena u sklopu istraživačkog projekta Hrvatske zaklade za znanost IP-11-2013-5570.

Ključne riječi: mažuran, suncokret, biljni ekstrakt, *Rhyzopertha dominica*, insekticidna učinkovitost

Laboratory evaulation of insecticidal efficiency of plant extracts in lesser grain borer (*Rhyzopertha dominica* Fab.) suppression

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SUMMARY

The aim of research was to develop a natural insecticide which has no negative impact on the environment.

Laboratory assessment of insecticidal efficiency of marjoram and sunflower extracts in suppression of lesser grain borer *Rhyzopertha dominica* (Fab.) was conducted applying on four different storage surfaces (glass, ceramic plates, treated wood and raw wood), for possible practical application purposes in storage facilities.

Plant extracts were applied with a brush on a surface of 78.54 cm^2 per sample, while the effectiveness was estimated through mortality of *R. dominica* adults, after 4, 24 and 48 hours. All treatments were placed in three repetitions with 20 adults of *R. dominica* (7-21 days old) per sample.

The highest efficiency at the lowest exposure (4 hours) was observed by marjoram extract on glass surface with a mortality rate of 58.33%, followed by ceramic plates (40.00%), while the lowest efficiency was observed on treated wood (5.00%) and raw wood (3.33%). Extending the exposure mortality was not significantly different. Sunflower extract achieved maximum efficiency only after 48 hours on glass surface with a mortality rate of 56.67%, on ceramic plates (41.67%), on treated wood (16.67%) and on raw wood (1.67%).

It is necessary to carry out further research using more precise techniques of application as well as on other surfaces.

This research was conducted as a part of Croatian Science Foundation research project IP-11-2013-5570.

Key words: marjoram, sunflower, plant extract, *Rhyzopertha dominica*, insecticidal efficiency

Spatial variability of selected soil properties in the estuary of Neretva river, Croatia

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SUMMARY

An understanding of spatial variability of soil properties is increasingly needed, particularly for better soil management and optimal crop allocation. The objectives of this study were to quantify spatial variability of selected soil properties in the estuary of Neretva river and evaluate the appropriation of interpolation procedure for soil data mapping. Based on regionalized variable theory, experimental semivariograms were used to quantify the spatial variability of selected soil properties. In the study area (43°01′20″ N and 17°31′ 06″ E) covering 391 ha in total of 190 topsoil samples were taken and analyzed for pH, $CaCO_3$, soil organic carbon (SOC), electrical conductivity (EC dS/m in 1:1 soil : water) and clay content. Semivariograms of the SOC, EC and clay content were the best fitted with spherical model and characterized with a moderate nugget/sill ratios of 43.2%, 37.8% and 47.0% respectively. The ranges of these models for SOC, EC and clay content were 3338 m, 2641 m and 1963 m and exhibited a spatial continuity at the different scales. The soil pH and $CaCO_3$ content experimental semivariograms are the best fitted with exponential model and characterized with short range variation of 369 m and 393 m respectively. These indicate a high proportion of irregular and largely uncorrelated soil spatial variations. Our results suggest that interpolation techniques, like kriging, for making maps of pH and $CaCO_3$ are unsuitable.

Keywords: soil, semivariogram, nugget/sill, interpolation

Biomelioration rehabilitation measures in ash landfill in the municipality of Obrenovac (Serbia)

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SUMMARY

The task and objective of this research is focused on the field and laboratory analysis of the physical - chemical characteristics of ash, biological and ecological characteristics of certain plant species and their level of tolerance to certain conditions, and based on that, selection of species for the vegetation of the ash landfill is made. Many years of continued research are being conducted at the ash landfill thermal power plant "Nikola Tesla B", an area 600ha, located in the municipality of Obrenovac in Serbia. Laboratory tests and analysis have determined the mechanical and chemical composition of the ash and water: the total content of Fe, Mn, Cu, Zn, Pb, Cd, Ni and Cr, B, and water-soluble boron content in water. Eco-coenological vitality and adaptability of species in specific conditions of habitat varies. Accordingly, a different approach in selecting species for greening ash soil and restoring and establishing the primary structure of the habitat and functional use is practiced.

Eco-coenological vitality to the specific site conditions indicate: *Alnus glutinosa Artemisia arboratum, Atriplex halimus, Berberis Thunberg, Colutea arborescens, Elaeagnus angustifolia, Robinia pseudoacacia, Erica carnea, Gleditsia triacanthos, Populus alba, Populus nigra italica, Ribes aurem, Salix sp. Tamarix sp*. Of particular importance are plant species *Alnus glutinosa, Elaegnus angustifolia, Robinia pseudoacacia, Colutea arborescens, and Gleditsia triacanthos*. that have a symbiotic relationship with the organisms that bind nitrogen (N).

Key words: ash landfill, biomelioration rates vitality species, species selection

Procjena inertnog prašiva Protect-It® u kontroli žitnog kukuljičara *Rhyzopertha dominica* Fab. na različitim sortama pšenice, raži i zobi

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SAŽETAK

Laboratorijski je ispitan insekticidni učinak komercijalnog inertnog prašiva na bazi dijatomejske zemlje Protect-It® na skladišnog štetnika, žitnog kukuljičara *Rhyzopertha dominica* Fab. zaprašivanjem na tri različite sorte pšenice (Divana, Kraljica i Vulkan), zobi (BC Marta, Winnipeg i Winsent) i raži (Albedo, Marcelo i Picasso). Cilj je bio utvrditi da li Protect-It® ima jednaku djelotvornost kod različitih sorti žitarica, te utvrditi utjecaj prašiva na fizikalna svojstva sorata. Pri dozi od 500 ppm nakon 7 dana ekspozicije, najviši prosječni mortalitet žitnog kukuljičara je postignut kod raži (98,5 %), zatim kod pšenice (95,9 %), te najniži kod zobi (84,2 %). Značajna razlika u djelotvornosti uočena je jedino kod zobi; između sorti Winsent i BC Marta, te u vremenu ekspozicije (između 7 i 21 dan kod sorata BC Marta i Winnipeg, te između 7 i 14 dana kod sorte Winsent). Protect-It® je kod svih ispitivanih sorti žitarica djelovao na sniženje hektolitarske mase, posebice kod sorti pšenice (za 4,3-5,0 kg hl^{-1}). Najmanje sniženje hektolitarske mase uočeno je kod raži, i to kod sorte Marcelo (za 0,3 kg hl^{-1}). Također je kod tretiranih sorti žitarica (osim kod sorte zobi Winsent) zabilježeno blago sniženje vlage zrna (za 0,2 do 1,0%), kao i promjena temperature zrna od ± 0,1 do 0,4 °C. Temeljem dobivenih rezulata, vidljivo je da djelotvornost inertnog prašiva Protect-It® značajno varira ovisno o sorti žitarica koja se tretira.

Ključne riječi: inertno prašivo, žitni kukuljičar, sorte žitarica, hektolitarska masa

Assessment of inert dust Protect-It® in the control of lesser grain borer *Rhyzopertha dominica* Fab. on different varieties of wheat, rye and oats

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SUMMARY

Insecticidal effect of the commercial inert dust based on diatomaceous earth Protect-it® was tested in laboratory conditions against stored product pest, lesser grain borer *Ryzopertha dominica* Fab. on three different varieties of wheat (Divana, Kraljica i Vulkan), oats (BC Marta, Winnipeg i Winsent) and rye (Albedo, Marcelo i Picasso). The aim of this study was to determine whether Protect-it® has the same efficacy at different varieties of cereals, and to determine the impact of dust on physical properties of varieties.

At dose of 500 ppm after 7 days of exposure, the highest average mortality of lesser grain borer was achieved in rye (98.5 %), followed by wheat (95.9 %), and oats (84.2 %). A significant difference in efficacy was observed only in oats; between varieties Winsent and BC Marta, and in the exposure time (between 7 and 21 days in BC Martha and Winnipeg, and between 7 and 14 days at variety Winsent). Protect-it® reduced test weight of all tested varieties of cereals, especially of wheat varieties (for 4.3 to 5.0 kg hl^{-1}). A minimum test weight reduction was observed in rye, at Marcelo variety (for 0.3 kg hl^{-1}). Further, reduction in grain moisture (0.2 to 1.0%) and oscillation in grain temperature (± 0.1 to 0.4 °C) was noticed in all treated varieties of cereals (except for varieties Winsent). Results of this study showed that the efficiency of inert dust Protect-it® significantly depend on variety of cereals which is treated.

Key words: inert dust, lesser grain borer, cereal varieties, test weight

The application of ozonated water as a technology in vegetable storage and preservation

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SUMMARY

Plants are constantly in contact with the soil and other natural environment. That`s why on plants surface and in its tissues we can always find origins of microorganisms, which, under favourable conditions, multiply rapidly undermining the quality and security of harvested products. This fact poses a danger to human and livestock health.

Stored vegetables are cleaned, sorted, washed and dried before supplying to trade networks. In order to reduce mycological contamination on washable vegetables surface, it is appropriate to use ozone, which acts as a disinfectant and extends the safe storage period.

Rinsing carrots with ozonated water (concentration of ozone – 1.5 mg L^{-1}) for 5 minutes during preparation for a market and then storing them under favourable conditions it is possible to maintain their quality for longer period of time than washing them with tap water. Moreover, chemicals such as chlorine or similar which usually get back into the sewage system or environment are not used. Rinsing of the samples with ozonated water had minimal influence on variation of weight.

Key words: Ozone, ozonized water, vegetables, mold population

Izračun emisija stakleničkih plinova iz uzgoja uljane repice

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SAŽETAK

Cilj rada je prikazati rezultate izračuna emisije stakleničkih plinova uzgoja uljane repice te utvrditi najvažnije faktore koji doprinose ukupnoj emisiji.

U radu su korišteni podatci prikupljeni u 2016. godini metodom ankete sedam velikih poljoprivrednika s područja Istočne Hrvatske. Emisija stakleničkih plinova uzgoja uljane repice izračunata je kao kvocijent sume pojedinačnih emisija inputa u uzgoju uljane repice i N_2O emisije iz poljoprivrednih tala te prinosa uljane repice.

Rezultati izračuna emisije stakleničkih plinova u uzgoju uljane repice kretali su se u širokom rasponu od 379 do 533 kg $CO_{2\,eq}$ po toni uzgojene uljane repice. Prosječna izračunata vrijednost emisije stakleničkih plinova od 467 kg $CO_{2\,eq}$ t^{-1} repice znatno je manja od raščlanjene zadane vrijednosti od 674,41 kg $CO_{2\,eq}$ t^{-1} repice. Emisiji stakleničkih plinova uzgoja uljane repice najviše doprinose emisije proizvodnje dušičnih mineralnih gnojiva i N_2O emisija iz poljoprivrednih tala koje u ukupnom izračunu uzgoja uljane repice zajedno čine 76,5% ukupne izračunate prosječne emisije uzgoja uljane repice. U strukturi dušične mineralne gnojidbe dominirala su gnojiva KAN (37,4%), urea (30%), UAN (17,3%), amonijev sulfat (7,45%) te MAP (5,6%.).

Ključne riječi: uljana repica, staklenički plinovi, mineralna dušična gnojiva, emisija iz poljoprivrednih tala, raščlanjena zadana vrijednost

Calculation of greenhouse gas emissions from rapeseed cultivation

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SUMMARY

The aim of the paper is to present the results of the calculation of greenhouse gas emissions from cultivation of rapeseed and to identify the most important factors that contribute to the overall emissions.

Data presented in the paper was collected in 2016 from seven large farmers in Eastern Croatia using a survey method. Greenhouse gas emissions from rapeseed cultivation was calculated as the quotient of the sum of the emissions of each input data in the cultivation of rapeseed and N_2O emissions from agricultural soils, and rapeseed yield.

The results of the calculation of greenhouse gas emissions from cultivation of rapeseed ranged from 379 to 533 kg $CO_{2\ eq}$ per ton of cultivated rapeseed. The average calculated value of the greenhouse gas emissions of 467 kg $CO_{2\ eq}$ t^{-1} rapeseed is considerably lower than the disaggregated default value of 674.41 kg $CO_{2\ eq}$ t^{-1} rapeseed. Production of nitrogen fertilizers and N_2O emission from agricultural soils contribute most to greenhouse gas emissions from cultivation of rapeseed, with 76.5% of the total calculated average emission from cultivation of rapeseed. Fertilizers dominating in nitrogen mineral fertilization structure are KAN (37.4%), urea (30%), UAN (17.3%), ammonium sulfate (7.45%) and MAP (5.6%).

Key words: rapeseed, greenhouse gases, mineral nitrogen fertilizers, emission from agricultural soils, disaggregated default value

Biodiversity and ecology of chilopoda and diplopoda(arthropoda, myriapoda) in three orchards at hunting reserve of Zeralda (Algeria)

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SUMMARY

The hunting reserve at Zeralda (suburb of the city of Algiers in northern Algeria) is characterised by different types of habitats. Besides the natural ecosystems, the reserve has several agricultural ecosystems (cereal crops and orchards). This diverse environment is very favourable to different fauna in particular soil fauna.

Diplopoda and Chilopoda were collected from 3 different orchards (Fig trees, Medlar trees and Clementine trees) in the hunting reserve. Theywere sampled using pitfall traps. Ten traps were used per sampling site for a period of 8 months in 2014 and 2015.

A total of 320 specimens were collected of which 234 were adults (115 males and 119 females) and 86 were juveniles. Four families, 8 genera and 8 species were determined. *Scutigera coleoptrata* was the most abundant specie (38.72% respectively).

The three stations have different species richness, Clementine trees has the highest species richness (8 species) followed by the Fig trees with 6 species and the medlar trees with only 5 species.

According to Kruskal-Wallis test, there is no significant difference between species activity in the 3 orchards. Also the biotopes have no effect on this activity.

Sampled species appointed a preference for Clementine trees where diversification of vegetation provided a greater variety of microhabitats, and host a wide variety of prey available for Chilopoda predators which would diversify their diets and would result in the reduction of the competition.

Keywords:*Scutigera coleoptrata*, Richness, Clementine trees, Ecology, Microhabitats.

Pregled faune vretenaca (Odonata) i njihovih staništa na području Nevesinjskog polja

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SAŽETAK

Prema postojećoj literaturi i istraživačkim radovima o vretencima (Odonata) Bosne i Hercegovine koji još uvijek nisu kompletirani, postoji potreba za detaljnom, kompletnijom i sistematičnije određenom analizom. Prikupljanje vretenaca, metodom izlova entomološkom mrežom i metodom determiniranja prikupljenih jedinki, izvršeno je tijekom 11 terenskih istraživanja, na četiri lokaliteta. Primarnim istraživanjem određeno je 20 vrsta, klasificiranih u dva podreda i sedam porodica. Sistematskim istraživanjem faune vretenaca na području Nevesinjskog polja utvrđena je prisutnost 20 vrsta iz 13 rodova i sedam porodica. Podredu Zygoptera pripada 11 vrsta, dok podredu Anisoptera pripada 9 vrsta. Od ukupne brojnosti, porodica Libellulidae sa šest vrsta iz tri roda je najzastupljenija, zatim slijedi porodica Lestidae sa šest vrsta iz dva roda, dok su ostale porodice približne po broju rodova i vrsta. Na prostoru Nevesinjskog polja, kao kraškog staništa, u jugoistočnoj Hercegovini, istražena su četiri lokaliteta: jezero Alagovac, „Bare" koje se nalaze na Zlatcu, područje „srednje vode" i „Bratački lug", kao i jedan dio sliva Zalomke, na kome nije zabilježena niti jedna vrsta. Istraživanja su provedena u ljetnim mjesecima tijekom 2015. godine, na područjima sa bogatom vegetacijom. Degradacija prirodnih staništa, izgradnja brane i vještačke akumulacije uvjetovali su nepotpuniji kvantitativno-kvalitativni faunistički prikaz od očekivanog, što kao imperativ postavlja neophodnost implementacije dobro osmišljenih programa konzervacije vretenaca na području Nevesinjskog polja.

Ključne riječi: fauna vretenaca, Odonata, Nevesinjsko polje, staništa

An Overview of the Fauna of Dragonflies (Odonata) and Their Habitats Within Nevesinje Field

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ABSTRACT

According to existing literature and published research data on dragonflies (Odonata) in Bosnia and Herzegovina, which are not yet complete, there is a pressing need for a detailed, more complete and systematically more specific analysis. Collection of dragonflies by a method of sampling with entomological net and a method of determination of sampled individuals was conducted over 11 field investingations at four selected sites. Through primary research 20 species were determined, classified into two suborders and eight families. The presence of 20 species from 13 orders and seven families was established through systematic analysis of the fauna of Odonata at selected sites within Nevesinje field.

Eleven species were found to belong to the Zygoptera suborder, while nine species belong to the suborder Anisoptera. Total counts show that family Libellulidae with six species from three orders is the most prevalent, followed by Lestidae with six species from two genus. The other families were approximatelly evenly represented in the samples. Within the scope of Nevesinje field, a karst habitat in southeast Herzegovina, the four selected sites were investigated: lake Alagovac, „Bare" located at Zlatac, area know as „middle waters" and „Bratacki lug", as well as one part of the Zalomka river basin, at which none species were recorded. The research was conducted during summer of 2015 in areas with rich vegetation. Degradation of natural habitats, dam construction and hydroaccummulation have conditioned a quantitatively and qualitatively less complete faunistic review than expected, which as an imperative poses a necessity of implementing well planned dragonfly conservation programs in Herzegovina.

Keywords: fauna of dragonflies, Odonata, Nevesinje field, habitats

The possibility of using oriental tobacco stalks as lignocellulosic material

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SUMMARY

The interest in lignocellulosic biomasses as a material for conversion into bioproduct is steadily growing as well as the characterization of its constituent becomes even more important. The objective of this study was to determine the chemical composition of stalks rest from the production of oriental tobacco has been determined to optimize its utilization as a row material, as well as to compare with stalks of large leaf tobacco.

The laboratory procedures developed by the National Renewable Energy Laboratory (NREL) were applied at the determination of content of acid soluble lignin, acid insoluble lignin, moisture and ashes in the tobacco stalks. TAPPI standard method T203 was used in the analysis of insoluble in 17.5% w/v NaOH α-cellulose. The hemicellulose isolation was carried out by acid hydrolysis pretreatment (4.9 % H_2SO_4, 133 °C and 27 min). The proteins content was determined from the nitrogen content by Kjedahl method using factor 6.25.

The stalks of tobacco variety Yaka YV 125/3 (29.3%) and Djebel 38 (28.9 %) were the richest in cellulose compared to the cellulose content in (27.6 %). The highest content of total lignin in stalks of Prilep P 23 and Prilep P 66-7/9 was 20.3% and 20.1 %, respectively. The content of hemicellulose determine in Prilep P 23 was the highest that in other tobacco varieties. The highest content of proteins was determined in Prilep NS 72 (3.1%).

The results indicate that cellulose and hemicellulose content in oriental tobacco stalks are slightly lower, compared to those of Virginia and Burley. The obtained results point out that the stalks of all three oriental tobacco varieties are prospective raw materials of lignocellulose in the production the chemicals like xylan and ethanol.

Key words : stalks; tobacco, cellulose; hemicelluloses; lignin

Utjecaj selena na sustav biljka-tlo-gujavica

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SAŽETAK

Granica između pozitivnog učinka selena (Se) i njegove toksičnosti je vrlo mala i ovisi o njegovom kemijskom obliku, primijenjenoj koncentraciji i drugim ekološkim čimbenicima. S obzirom na potencijalni rizik od toksičnosti visokih koncentracija Se, cilj ovog istraživanja bio je procijeniti utjecaj povećane koncentracije različitih oblika Se na odgovor sustava pšenica- tlo-gujavica. Tlo, gujavice i zrna pšenice bili su izloženi različitim koncentracijama selenita i selenata. Kao pokazatelji oksidacijskog stresa u pšenici određeni su razina peroksidacije lipida i koncentracija ukupnog vodikovog peroksida, dok su kao dio antioksidativnog odgovora određene aktivnosti enzima katalaze, glutation-peroksidaze i glutation-reduktaze. U gujavicama su određene aktivnosti acetilkolinesteraze i karboksilesteraze te aktivnosti antioksidativnih enzima katalaze i glutation S-transferaze. Osim toga, pomoću protočne citometrije određeni su celomociti pozitivni na Annexin V i aktivnost kaspaza 3 čime je procijenjen postotak preživljavanja celomocita u gujavicama izloženim Se. Tretman selenitom i selenatom povećao je sadržaj Se u pšenici i gujavicama, pri čemu je primjena selenata bila učinkovitija, što ukazuje na veću bioakumulaciju ovog oblika Se. Oba oblika Se pokazala su značajan utjecaj na sve mjerene biokemijske parametre u pšenici i guajvicama, što ukazuje na poremećaj homeostaze, dok visoke koncentracije Se također mogu izazvati apoptozu celomocita u gujavicama. Dobiveni rezultati mogu poslužiti kao osnova za daljnja istraživanja i pomoći će u razumijevanju utjecaja Se na različite komponente ekološkog sustava tla.

Ključne riječi: selenit, selenat, *Triticum aestivum*, *Dendrobaena veneta*, oksidativni stres

Selenium impact on the plant-soil-earthworm system

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SUMMARY

The boundary between the selenium (Se) beneficial effect and its toxicity is narrow and depends on its chemical form, applied concentration, and other environmentally regulating factors. Due to the potential risk of toxicity in higher concentration, the aim of this study was to estimate the impact of increased concentrations of different forms of Se on the response of wheat-soil-earthworm system. Soil, earthworms and wheat grains were exposed to different concentrations of two different forms of Se, selenite and selenate. As an indicator of oxidative stress in wheat, lipid peroxidation level and total hydrogen peroxide content were determined, while antioxidative response was determined by catalase, glutathione peroxidase and glutathione reductase activities. The biomarker enzyme activities determined in earthworms were acetylcholinesterase and carboxylesterase, as well as antioxidative enzymes catalase and glutathione S-transferase. In addition, by means of flow cytometry the Annexin V positivity and caspase 3 activity has been assessed to evaluate the coelomocyte survival in earthworms exposed to high selenium concentrations. Selenite and selenate increased Se content in the wheat and earthworms, while selenate application was more efficient, indicating higher bioaccumulation of this Se form. Both Se forms showed significant impact on all measured biochemical parameters in wheat and earthworms, indicating the disruption of homeostasis while higher concentrations could also cause apoptotis-like cell death of coelomocytes from the exposed earthworms. Obtained results can serve as basis for further studies on Se effects and will help in including different aspects necessary for understanding of Se impact on different components of soil ecosystems.

Key words: selenate, selenite, *Triticum aestivum*, *Dendrobaena veneta*, oxidative stress

Effect of Crude Glycerol on the Properties Horn Meal Filled Poly(vinyl alcohol) Composites as Materials for Mulching Coatings

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SUMMARY

The composites of poly(vinyl alcohol), horn meal and crude glycerol were prepared and used for the formation of mulching coatings. The mass ratio of pol(vinyl alcohol) and horn meal was 0.67 and the mass ratios of crude glycerol and poly(vinyl alcohol) were 0.75, 1.5 and 2.25. Two fractions of horn meal were used for the preparation of the composites. The particle size of horn meal used for the preparation of the composites of one series was 250–160 μm and that of the filler used for the preparation of another series of the composites was ≤90 μm. The effect of the amount crude glycerol on the mechanical properties, solubility in water, swelling behavior and dimensional stability of the composite films was examined. The composites were used for the preparation of coatings for the mulching of plants cultivated in pots. The liquid mulching composition was spread out on the surface of the growing substrate. After evaporation of water the polymer coatings, acting as a mulch films, were obtained. The effect of the mulch films containing the different amount of crude glycerol on evaporation of water from the substrate, vegetation of tomato sprouts, soil properties and weed germination were examined. The lowest loss of moisture was observed for the substrates coated with the layers of the composites containing the highest amount of glycerol. Crude glycerol present in the composite coatings used for mulching of tomato sprouts exhibited a positive effect on their vegetation. It also prevented the germination of weeds and improved the properties of soil.

Key words: Crude Glycerol, Polymer Composites, Mulching Coatings

Acknowledgements

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Simultana inkapsulacija bioaktivnih komponenata za zaštitu i ishranu bilja

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SAŽETAK

Cilj ovog rada bio je ispitati utjecaj koncentracije bakrovih iona na oslobađanje spora *Trichoderma viride* iz pripremljenih kitozan/alginat mikrokapsula postupkom istovremene inkapsulacije s kemijskim i biološkim sredstvima s namjerom da se poboljša njihova dostupnost biljkama. Ispitan je utjecaj različitih koncentracija bakrovih iona na rast, razvoj i preživljavanje *Trichoderma viride*.

In vitro rezultati ukazuju na značajne razlike u ponašanju oslobađanja spora *Trichoderma viride* s obzirom na različitu koncentraciju bakrovih iona, te prisustvo kitozanskog sloja na površini ovojnice mikrokapsule. Povećanjem koncentracije bakrovih iona poboljšan je, a s kitozanskim slojem na površini ovojnice mikropasule usporeno je otpuštanje spora *Trichoderma viride*. Krivulje otpuštanja aktivnih komponenata su prilagođene Korsmeyer-Peppas empirijskom modelu. Utvrđeno je da Fickova difuzija kontrolira brzinu mehanizma otpuštnnja za mikrokapsule bez sloja kitozana, dok anomalni oblik kinetike (kombinacija mehanizama difuzije i Tip II transporta) kontrolira otpuštanje iz mikrokapsula s slojem kitozana.

Ključne riječi: kitozan/alginat mikrokapsule, simultana inkapsulacija bioaktivnih komponenata, bakrovi ioni, spore *Trichoderma viride,* održiva proizvodnja bilja

Simultaneous encapsulation of bioactive agents in protection and plant nutrition

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SUMMARY

The objective of this work was to investigate influence of copper cation concentration on *Trichoderma viride* spores releasing from novel chitosan/alginate microcapsules simultaneously loaded with chemical and biological agents with the intention to improve their delivery to the plants. The effects of different concentrations of copper ions on growth, development and survival of *Trichoderma viride* were investigated.

The *in vitro* results pointed out remarkable differences in the release behavior of *Trichoderma viride* on copper cation concentrations and the presence of chitosan layer on microcapsule surface. The increase in copper cation concentration promoted, but the chitosan layer on microcapsule surface layer slowed *Trichoderma viride* spores releasing. The releasing curves were fitted to Korsmeyer–Peppas empirical model. Fickian diffusion was found to be the rate-controlling mechanism at microcapsules without chitosan layer, whereas anomalous transport kinetics (combination of the diffusion mechanisms and Type II transport) controlled release from microcapsules with chitosan layer.

Key words: chitosan/alginate microcapsules, simultaneous encapsulation of bioactive agents, copper ions, *Trichoderma viride* spores, sustainable plant production

The role of agrometeorology in sustainable agriculture

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SUMMARY

Nowadays, when climate change and extreme weather causes great economic losses, and more than a billion people starve in the world, food production is a strategic issue of each country. Therefore, to ensure sufficient food, it is necessary to apply the agrometeorological research in sustainable agriculture. The impact of climate change on agricultural production and development of adaptation strategies to climate change can help farmers in their management and adjustment. Those results may also help to policy makers in planning economic development. The great importance is to get feedback how agrometeorological products (e.g. agrometeorological forecasts, drought monitoring, warnings of sudden natural disasters or of wildfire risk, etc.) are usable to users in practice. Agricultural production should be strictly planned. For instance the agrometeorological measurements in plantations help in taking appropriate agricultural measures (planning of sowing and harvest, irrigation, protection of disease, etc.). Thus, more emphasis should be placed on multidisciplinary research between agrometeorologist and agronomist and brought closer agrometeorological knowledge to the end users. Likewise, by investing in agrometeorological research we disseminate timely information that would be profitable in many ways for the benefit of the development in food production, protection of forests, environment and nature which would in turn improve the rural area and initiate an economic development.

Key words: agrometeorological research and information, agricultural production, climate change, adaptation

Cation exchange capacity of luvisol and gleysols

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SUMMARY

Cation exchange capacity (CEC) is a parameter of soil which represents the capability of soil to hold exchangeable cations and it is good indicator of soil quality and potential productivity. The aim of this investigations was to compare cation exchange capacity of two soil types. The study was conducted on 80 locations and 2 soil types (luvisol and gleysols) in Eastern Croatia including only topsoil horizon (depth 0-30 cm). Descriptive statistics showed that pH varied from 3.69 to 7.14 (average 4.71) on luvisol and 3.27 to 7,5 (average 5,7) on gleysols. Organic matter varied from 1.31% to 3.10% (average 1.91%) on luvisol and 1.2 % to 7.03 % (average 2.96 %) on gleysols, while clay content varied from 11.95 % to 27.11% (average 20.07 %) on luvisol and 22.00 % to 58.86 % (average 32.73 %) on gleysols. The average value of CEC on gleysols was 28.17 cmol(+)/kg) and values ranged from 17.63 to 46.21 cmol(+)/kg, while average value of luvisol was 15.76 cmol(+)/kg with range from 8.96 to 33.34 cmol(+)/kg. According to the obtained results we can state that the values of CEC significantly vary depending on soil type. Also soil type was found to have significant influence on soil pH, clay and organic matter percentage.

Key words: cation exchange capacity, luvisol, gleysol

Agroekonomika
i ruralna sociologija

02

Agricultural Economics
and Rural Sociology

Education for sustainability in rural Romania

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SUMMARY

Sustainability is a major challenge faced by society in our times, but also an issue which requires specific address from the educational system. Our paper investigates how sustainability is integrated in the educational framework and how effective is this approach.

Indeed, the issue of fostering sustainability through education programs and activities is very addressed in the literature. Consequently, we are briefly reviewing the literature, cases and examples in this regards, and then present our own research results. Basically, we present the results of a survey-based research carries on during 19-30 September 2016 among young students (16-18 years) learning in schools located in rural communities from western Romania, i.e. Bihor and Satu-Mare counties. The investigation was focused on issues such as main attitudes towards specific sustainability-related actions, main activities and projects were students have been involved, main sustainability-related behaviours among their families and their school communities etc.

Main conclusions suggest that, even the concept of sustainability is well known among them, there is little awareness on the importance of sustainability practices in every day life, and even less specific actions undertaken to promoting and supporting sustainable way of like and economic practices. Education system can and must play a considerable more important place in fostering young students' attitudes and behaviours related to sustainability.

Key words: sustainability behaviours, young students, rural areas, Romania, survey

Utjecaj promjenjivih troškova na ekonomske rezultate proizvodnje mlijeka

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SAŽETAK

Na ekonomske rezultate proizvodnje mlijeka utječe racionalno upravljanje proizvodnjom što podrazumijeva postupke u kojima se sredstva za proizvodnju koriste uz što niže troškove. Cilj istraživanja bio je utvrditi zastupljenost i utjecaj promjenjivih troškova u proizvodnji mlijeka Simental i Holstein Freisian pasmine. U radu su prikazani rezultati praćenja prihoda i troškova tijekom razdoblja od 2010. do 2015. godine. Korištena je metoda pokrića promjenjivih troškova. Relativne promjene u vrijednostima pokrića promjenjivih troškova praćene su verižnim i baznim indeksima. Prema istraživanju, vrijednost ukupnih prihoda viša je pri držanju Holstein Freisian pasmine u odnosu na Simentalsku pasminu za 17,28±24,96% što je povezano s većom proizvodnošću mlijeka i prihodom od prodaje mlijeka koji čini prosječno 85,58% cjelokupne vrijednosti ukupnih prihoda. Praćenjem promjena u indeksima za pokriće promjenjivih troškova utvrđene su značajne negativne stope. U proizvodnji mlijeka Simentalske pasmine ostvarena je negativna stopa promjene u 2012/11. godini, -9,07% kao i negativna stopa 2015/14. godine, -22,80% za pokriće varijabilnih troškova. U analiziranom razdoblju, za istu pasminu, bazni indeksi pokazuju relativne promjene u vrijednostima 7,32±54,94%. U proizvodnji mlijeka Holstein Freisian pasmine ostvarena je negativna stopa promjene 2012/11. godine, -23,47%, a ovakvo negativno razdoblje nastavljeno je s manjim stopama od -0,12 u 2014/13. godini i -0,06% u 2015/14. godini. Na ekonomske rezultate u proizvodnji mlijeka utječe pokriće varijabilnih troškova jer stope pokrića Holstein Friesian pasmine značajno osciliraju od 28,4% do 35,21%, a Simentalske pasmine s nižim vrijednostima od 18,64% do 20,34%.

Ključne riječi: mlijeko, promjenjivi troškovi, ekonomika proizvodnje

Influence of variable costs on economic results in milk production

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SUMMARY

The rational management, which includes procedures in which production resources are used with lowest possible costs, affects the economic results of milk production. The aim of the research was to determine the incidence and impact of variable costs in production of Simental and Holstein Freisian breeds' milk. The paper presents the results of the monitoring of revenues and expenses during the period from 2010 to 2015. Variable cost coverage was the method used in this study. The values cover variable costs and their changes were monitored with the chain and base indexes. According to the survey, the value of total income was 17.28 ± 24.96% higher in breeding Holstein Freisian compared to the Simmental breed, which is related to higher milk productivity and milk sales income, making an average of 85.58% of the total income value. Significant negative rates were determined by monitoring index changes to cover variable costs. In 2012/11, a negative rate of change in milk production of Simmental breed was determined, -9.07%, and a negative rate of -22.80% in 2015/14 for the coverage of variable costs. Basic indexes point to relative changes in the values of 7.32 ± 54.94% for the same breed during the analyzed period. The negative rate of change, -23.47%, in 2012/11, was determined for Holstein Freisian breed's milk production, while the same negative period continued with lower rates of -0.12 in 2014/13 and -0.06% in 2015/14. Variable cost coverage affects the economic results because the rate of coverage for the Holstein Friesian breed significantly oscillated from 28.42% to 35.21%, and for the Simmental breed the value was lower, from 18.64% to 20.34%.

Key words: milk, variable costs, production economics

Online Trading of Chilies in Pakistan: A step towards Market Transformation

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SUMMARY

Pakistan's horticulture market including vegetables is roughly estimated as $4.1 billion. Around 90 percent of this produce (by value) passes through the current system of value chain through wholesale markets and the remaining 10 percent is estimated to pass directly from farmers to exporters and to processors. Red chilies are most common and important kitchen items in Pakistan. The export market and diversification of product by processing is hindered by presence of Aflatoxins- poisonous and cancer-causing chemicals that are produced by certain molds (Aspergillus flavus and Aspergillus parasiticus) which grow in soil, decaying vegetation, hay and grains. Realizing the importance and complexity of chilies production and marketing, the idea of better post-harvest management for quality premium to the producers, online trading for chilies was initiated by the Government of Sindh, Pakistan so that chilies are traded across the region and globe. The harvest and post-harvest management of chilies was done by providing hand gloves to the chilies pickers from plant and green nets for manual drying of chilies so to reduce the contact of chilies with earth and dirt for controlling Aflatoxins. This small effort resulted positive results and all those farmers who practiced this method were able to reduce the levels of Aflatoxins much lower than the WHO standards. The trading platform devised a system to give quality premium to the producers in which quality testing at farmers' store, online biding and payments to the farmers through bank were introduced. The paper covers the case study of the new approach of online trading and value chain within the framework of market transformation and value chain.

Key words: Chilies, online trading, quality premium, case study, Pakistan

How to reduce the Amount of Food Waste – an Example of Good Practice

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SUMMARY

Europe recorded 100 million tons of food waste that amounts to 116 kg per capita in 2012. According to data provided by the Statistical Office of the Republic of Slovenia in 2013, the quantity of food waste decreased by 63% in the period from 2008 to 2013 in Slovenia. It decreased from 400.000 tons (in 2008) to 149.000 tons (in 2013), from 197 kg to 72 kg a year per capita. We claim that the amount of food waste can be reduced and our success at School center Šentjur is the proof of that. In the last two school years (2014/2015 and 2015/ 2016) specific planned activities were carried out, namely measuring the quantity of discarded meals, informing the students and their parents about the problems of food waste, engaging students in the creation of monthly menus and analyzing the causes of food waste. Recent measurements of the quantity of discarded meals showed that the amount of food waste decreased by more than 1/3 compared to the previous school year. The food waste decreased from 14,0 kg to 8,9 kg a day. The remaining quantity of food waste, in view of the energy value, could ensure the daily meals to ten students. We were surprised to find that a vast proportion of waste food constitutes of bread, of which the students take more than they can eat. They themselves see a solution to the problem of food waste in smaller amounts of acquired meals (according to the motto: »take as much as you can eat«). Such activities to reduce food waste will have to be implemented in the future as well, including a promotion of a more respectful attitude towards food. Our aim is to present the statistical data concerning the amount of food waste in Europe and Slovenia as well as an example of good practice showing how the public institution can reduce the amount of food waste.

Key words: food waste, School center Šentjur, school lunch, the amount of discarded meals, student survey

Evaluation of Economic and Social Impacts On the Agricultural Enterprises by Agricultural Irrigation in Turkey

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ABSTRACT

In this study, we will be examining Asartepe dam in Ankara province. We will evaluate the economic and social effects of agricultural irrigation and selected main variables are determined as a agricultural usage of water, agricultural production, agricultural productivity, income and environment effects, social-cultural design, migration, economical conditions and etc. A significant portion of the material used in the survey, which was composed of any farming in the area of agriculture to data obtained by the enterprise survey. Survey by interviewing enterprises questionnaire forms have been filled out by going into enterprise. Data for the period from 2015 and 2016 production of agricultural enterprises are collected by questionnaire. In addition to the primary data obtained well as research findings that are previously made on the subject, which has benefited from the secondary data records and published by various organizations. Studies and surveys identified and then a set of selected enterprises are to be implemented by the random sampling method (SRS). The information in the questionnaire data entry is made in the MS Office environment. The primary data analysis using SPSS and Eviews entered into the computer program and evaluated in the process of statistical tables are prepared.

Key words: Irrigation, Rantability, Economic and Social effects, Turkey

Analiza troškova i koristi u kontroli ambrozije za ublažavanje posljedica alergija

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SAŽETAK

Prema podatcima Zavoda za javno zdravstvo «Dr. Andrija Štampar» na području Hrvatske od peludnih alergija boluje oko 10% stanovništva. Među inhalacijskim alergenima na našem području dominira pelud ambrozije. Suzbijanje ovog korova na području RH regulirano je člankom 4. Stavka 4. Zakona o poljoprivrednom zemljištu (NN 39/13) i Naredbom o poduzimanju mjera obveznog uklanjanja ambrozije (NN 72/07).

Sukladno postojećoj nacionalnoj regulativi u cilju suzbijanja ambrozije Grad Vukovar organizira mjere mehaničkog suzbijanja ambrozije na širem gradskom području. Cijena koštanja jedne košnje ambrozije u gradu iznosi 441.000,00 kn, a ukupni trošak potpunog suzbijanja ambrozije u prosječnoj vegetacijskoj sezoni iznosi 5.292.000,00 kn.

Osobe koje pate od alergija u cilju ublažavanja zdravstvenih tegoba uzimaju, prema preporuci liječnika, odgovarajuće lijekove. Ukupni trošak terapije za ublažavanje simptoma alergije na području Grada Vukovara se kreće od 668.804,00 do 976.808,00 kn godišnje, od čega proračunski trošak HZZO-a iznosi od 398.841,00 do 552.838,00kn.

Suzbijanjem ambrozije u područjima u kojima je ona raširena mogao bi se smanjiti trošak lijekova i izostanci s posla ili škola. Preventivne mjere trebaju biti usmjerene na: uspostavu nacionalnih/lokalnih politika i smjernica za najbolju praksu, kartiranje i monitoring područja u kojima je ambrozija raširena te kampanje suzbijanja kako bi se populacija ove alergogene korovne vrste svela na tolerantnu razinu.

Ključne riječi: ambrozija, alergije, analiza troškova i koristi

Cost-benefit analysis of ragweed control designed to alleviate allergenic reactions

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SUMMARY

According to the data obtained from the Institute of Public Health "Dr. Andrija Štampar" it is estimated that 10% of Croatian population are afflicted with pollinosis. Among inhalant allergens in our region the most frequent one is ragweed pollen. Control of this noxious weed in the Republic of Croatia is regulated by Article 4 from Agricultural Land Act (NN 39/13) and Order on measures for compulsory removal of ragweed – *Ambrosia artemisiifolia* L. (NN 72/07).

Based on current national regulation for the purpose of ragweed control, City of Vukovar organizes mechanical ragweed control on the wide city area. The price of one mowing in the city area is 441.000,00 kn, and total cost for ragweed control during average vegetation season is 5.292.000.00 kn.

People who suffers from the allergy take medications according to the physician recommendations. Total cost of therapy for controlling these symptoms of inhalant allergens take out from 668.804,00 to 976.808,00 kn annually, and HZZO budget cost run over from 398.841,00 do 552.838,00 kn.

Successful ragweed control on infested areas could decrease the costs of medications and absence from work or schools. Preventive measure could be directed to: implementation of national and local policy and directions for good agricultural praxis, weed mapping and monitoring of ragweed infested areas as well as eradication campaigns in order to decrease ragweed population to tolerant level.

Key words: ragweed, allergy, cost-benefit analysis

Stavovi potrošača o deklariranju i označavanju povrća u Republici Hrvatskoj

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SAŽETAK

Prema Uredbi EU 1169/2011 nužno je osigurati primjereno informiranje potrošača u vezi s hranom koju konzumiraju. Osim toga, označavanje proizvoda predstavlja i važan marketinški alat koji služi za komunikaciju između proizvođača i potrošača.

U Hrvatskoj nije dovoljno istraženo jesu li kupci upoznati s podrijetlom povrća koje kupuju i koliku važnost pridaju pojedinim oznakama na povrću.

Cilj istraživanja je utvrditi koliko potrošači vjeruju deklaracijama na povrću i bi li oznaka hrvatskog podrijetla i kvalitete utjecala na njihovu odluku prilikom kupnje. Istražene su navike potrošača u kupnji povrća, važnost pojedinih obilježja povrća, te stavovi potrošača o hrvatskom povrću i oznakama podrijetla.

Rezultati anketnog ispitivanja ukazuju da više od 60% ispitanika često konzumira povrće, a najčešće ga kupuju u trgovačkim lancima i na tržnicama, a važnost pri kupnji daju podrijetlu, cijeni, kvaliteti i dodatnim oznakama. Deklaracije na svježem povrću često čita nešto više od trećine ispitanika, a informacijama na deklaracijama vjeruje oko 30% ispitanika. Velik udio ispitanika nije zadovoljan zastupljenošću povrća iz Hrvatske i smatraju da je ono loše deklarirano.

Uvođenje oznake „Povrće hrvatskih polja“ pozitivno bi utjecalo na odabir hrvatskog povrća pri kupnji, te je većina ispitanika izrazila spremnost platiti veću cijenu tako označenog povrća.

Rezultati istraživanja ukazuju na potrebu i opravdanost boljeg označavanja hrvatskog povrća što bi povećalo konkurentnost domaćih proizvođača povrća.

Ključne riječi: povrće, potrošači, deklaracija, označavanje, podrijetlo

Consumers attitudes about labeling and designation of vegetables in Croatia

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SUMMARY

According to the Regulation EU 1169/2011 it should be ensured that consumers are appropriately informed as regards the food they consume. Besides, labeling is an important marketing tool used for communication between producers and consumers.

There is a lack of studies about familiarity of Croatian consumers with the origin of vegetables they buy and about importance of vegetables labelling.

The goal of this research was to determine a confidence of consumers in vegetable labels and to explore if a designation of Croatian origin can influence purchasing decision. Additionally, we examined vegetable purchasing habits, importance of vegetable cues and consumers attitudes towards vegetables from Croatia and towards labeling in general.

The results indicate that more than 60% of the respondents frequently consume vegetables and buy it usually in retail chains and in open markets. Origin, price, quality and additional labels are the most important vegetable cues. A bit more than one third of the respondents often read labels and around 30% of the respondents trust them. Many respondents are unsatisfied with the offer of vegetables produced in Croatia. They also believe that Croatian vegetable is unproperly marked.

A label „Vegetables of Croatian fields" would positively affect a purchase of vegetables of Croatian origin and a majority of respondents would pay more for vegetables bearing such label.

The results justify a need for better labeling of Croatian vegetables that could increase a competitiveness of domestic vegetable producers.

Key words: vegetables, consumers, labeling, designation, origin

Genetika, oplemenjivanje bilja i sjemenarstvo

03

Genetics, Plant Breeding and Seed Production

Optimizacija testiranja ranih generacija u programu oplemenjivanja kukuruza

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SAŽETAK

U ranim fazama oplemenjivačkog procesa uobičajeno je testirati veliki broj genotipova. Oplemenjivače zanima identifikacija superiornih genotipova, međutim, nedostaci mogu biti nedovoljna količina sjemena i nedostupnost sredstava, pa se tada prakticira provođenje pokusa bez ponavljanja. U ovom istraživanju, korištenjem metode pokretnih prosjeka (PP) ispitivalo se 268 test-križanaca (S_2 linija × tester) i 8 hibrida standarda u pokusu bez ponavljanja s ukupno 320 članova. Cilj istraživanja bio je utvrditi je li prostorna metoda PP svrsishodna za procjenu prinosa usporedbom dva susjedna pokusa s identičnih 320 članova. Kako bi se obavila korekcija pomoću PP, izračunate su prosječne vrijednosti deset susjednih vrijednosti svake parcele u pokusu (četiri parcele lijevo, četiri desno, jedna iznad i jedna ispod pokusne parcele za koju se računa prosjek). Te srednje vrijednosti korištene su kao kovarijable ili prateće varijable. Prosječni prinos zrna iznosio je 10,6 ± 1,7 t/ha, odnosno 9,3 ± 1,8 t/ha u drugom pokusu. Koeficijenti korelacije između početnih i pratećih varijabli iznosili su 0,34, odnosno 0,26 u drugom pokusu. Budući da bi koeficijent korelacije trebao biti najmanje 0,30, rezultati pokazuju da je korekcija pomoću PP bila opravdana samo u prvom pokusu. Na temelju rezultata ovoga istraživanja može se zaključiti da na pokusnom polju Poljoprivrednoga instituta Osijek nije bilo značajnijih prostornih učinaka, te da korekcija pomoću PP nije uvijek opravdana u pokusima bez ponavljanja.

Ključne riječi: rani test, kukuruz, test-križanci, pokusi bez ponavljanja, prinos

Optimizing evaluation of the early generations in a maize breeding program

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ABSTRACT

In the early stages of plant breeding process, it is common to evaluate a large number (e.g. several hundreds) of genotypes. Breeders are mainly interested in identification of superior genotypes for further breeding, usually having small amount of seeds and low availability of resources. Consequently, unreplicated experiments are commonly adopted in such cases. Here, we considered controlling the local effects of field variation using moving average method to evaluate 268 testcrosses of S_2 maize lines along with 8 checks in an unreplicated experiment with total of 320 entries. Objective was to evaluate whether spatial moving average method is worthwhile for yield by comparing two adjacent experiments with identical 320 entries. Ten neighbored observations of each plot were averaged for adjusting, i.e., the four left and right lying plots and the plot above and below the test plot. These averages were used as covariable (concomitant variable). Mean grain yields were 10.6 ± 1.7 t/ha and 9.3 ± 1.8 t/ha in two respective experiments. Correlation coefficients between observed and concomitant variables were 0.34 and 0.26 in two respective experiments. Since the correlation coefficient should be at least 0.30, our results indicate that the moving average adjustment was justified only in the first experiment. It suggests that there was no notable spatial effect in the field of Agricultural institute Osijek and moving average adjustment is not always meaningful in unreplicated trials.

Key words: early generations, maize, testcrosses, unreplicated trials, yield

Način odabira hibrida kukuruza za službeno priznavanje u Turskoj

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SAŽETAK

Postupak priznavanja hibrida kukuruza u Turskoj traje 2 godine. Za prijavljeni hibrid može se tražiti dozvola za proizvodnju sjemena koja traje za vrijeme priznavanja i 2 godine nakon toga, te se produžava ako je hibrid priznat. Da bi hibrid ušao u postupak priznavanja mora proći tzv. pretkomisijske pokuse (PP), koji se po pravilima sortne komisije u Turskoj provode u jednoj godini na najmanje 2 lokacije. Na temelju tih rezultata procjenjuje se koji hibridi se mogu prijaviti u službene komisijske pokuse (KP). Cilj ovoga rada je pokazati način odabira hibrida kukuruza na temelju rezultata PP. U Turskoj je 2016. godine za ovo istraživanje posijano 20 hibrida. Pokusi su postavljeni po metodi slučajnog bloknog rasporeda u 4 ponavljanja, na 4 lokacije (Altınova, Manisa, Mersin, Adana). Analiza rezultata pokazuje da su uglavnom značajni utjecaji glavnih izvora variranja (hibrid i lokacija) i njihova interakcija. Ponavljanje se nije pokazalo značajnim. LSD test je pokazao značajne razlike između lokacija (najveća razlika između Manise i Altınove). Hibridi 8 i 15 imaju najviši prosječni prinos (15,90 t/ha i 15,85 t/ha). Prema dobivenim rezultatima mogu se izdvojiti dva hibrida iz PP koji će biti prijavljeni u službene KP 2017. godine. Poučeni višegodišnjim iskustvom postavljanja pokusa u Turskoj možemo zaključiti da odabir hibrida za služeno priznavanje, kao i tursko tržište, ne može biti baziran samo na selekciji u Hrvatskoj zbog bitno drugačijih agroklimatskih uvjeta.

Ključne riječi: kukuruz, hibrid, pokus, odabir, priznavanje

Selection of maize hybrids for official registration in Turkey

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SUMMARY

Registration of new maize hybrids in Turkey is carried out over period of two years. Seed production license can be issued for hybrids in the registration process, and it is valid throughout the registration process and two years after the hybrid is registered or rejected. According to Turkish variety commission regulation, in order to enter the registration process hybrids must be first evaluated through so called pre-commission trials (PT), which are conducted in one year on at least two locations. Based on PT results hybrids for official commission trials (CT) are selected. Goal of this paper is to present hybrid selection for CT based on results of PT. For this research 20 hybrids were planted in Turkey in 2016, using RCB design in 4 replications at 4 locations (Altınova, Manisa, Mersin, Adana). Results showed significant effects of main sources of variation (hybrid and location), as well as their interaction. Replication was not significant. The LSD test revealed significant differences between locations (highest difference was between Manisa and Altınova). Hybrids 8 and 15 had the highest average grain yield (15.90 t/ha and 15.85 t/ha). According to PT results, two hybrids were selected for official CT in 2017. On the basis of our long term experience in trial evaluation in Turkey, we concluded that selection of hybrids for official registration and Turkish market cannot be based on selection in Croatia only, due to significantly different agronomic and climate conditions.

Key words: maize, hybrid, trial, selection, registration

Stresne toplinske jedinice i prinosi zrna testkrižanaca kukuruza tijekom 20 godina oplemenjivanja

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SAŽETAK

Jedan od načina procjene stresa u usjevu kukuruza je računanje stresnih toplinskih jedinica (SDD) uz pomoć maksimalne dnevne temperature zraka (MDTZ). Temperatura od 30 °C uzeta je kao donja granica kod koje počinje stres uslijed nedostatka vode. Tijekom srpnja i kolovoza u našoj zemlji sve češće MDTZ rastu preko 30 °C. Ciljevi ovoga rada bili su: 1) identificirati godine s najvećim sumama SDD od 1. travnja do 30. rujna za Zagreb - Maksimir za razdoblje 1961.-2016. godina i 2) usporediti prosječne prinose zrna (PPZ) testkrižanaca kukuruza po FAO grupama (200-600) na lokaciji Rugvica (Zagreb) za nekoliko godina s najvećim sumama SDD s PPZ za razdoblje 1996. - 2015. godina.

Deset godina s najvećim sumama SDD za Zagreb-Maksimir za razdoblje 1961.-2016. godina bile su: 1992., 1994., 2000., 2003., 2006., 2007., 2011., 2012., 2013. i 2015. Najmanja suma SDD za Zagreb - Maksimir za razdoblje 1996. - 2015. godina zabilježena je 1997. godine (3,8), dok je za isto razdoblje najveća suma SDD zabilježena 2003. godine (85,7). Prosječni prinosi zrna kukuruza (1996. - 2015.) na lokaciji Rugvica kretali su se od 9,49 t/ha (FAO 200) do 10,06 t/ha (FAO 500). Najmanji prosječni prinos (PP) u FAO 200 zabilježen je 2011. godine (6,41 t/ha), u FAO 500 2015. godine (8,01 t/ha), dok je u FAO 600 najmanji PP zabilježen u 2005. godini (7,57 t/ha). U FAO 300 i FAO 400 najmanji PP zabilježen je u 2003. godini (6,70 t/ha odnosno 7,71 t/ha), kada je zabilježena i najveća suma SDD.

Ključne riječi: kukuruz, stresne toplinske jedinice, prosječni prinos zrna

Stress heat units and grain yields of maize testcrosses during 20 years of breeding

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SUMMARY

One way of assessing the stress on maize crop is calculation of stress heat units (Stress Degree Day-SDD), using maximum daily air temperature (MDAT). The temperature of 30 °C was set as the base temperature for water stress. During July and August in our country there is more often present an increase in MDAT above 30 °C. The aims of this study were: 1) to identify years with the largest sums of SDD from April 1 to September 30 for Zagreb - Maksimir for the period from 1961 to 2016 and 2) to compare the average grain yield (AGY) of maize testcrosses per FAO groups (200 - 600) at the location Rugvica (Zagreb) for several years with the largest sums of SDD with the AGY for the period 1996 - 2015.

Ten years with the largest sums of SDD for Zagreb-Maksimir for the period from 1961 to 2016 were 1992, 1994, 2000, 2003, 2006, 2007, 2011, 2012, 2013 and 2015. The lowest sum of SDD for Zagreb - Maksimir in the period from 1996 to 2015 was recorded in 1997 (3.8), while for the same period the largest sum of SDD was recorded in 2003 (85.7). Average grain yields of maize (1996-2015) in Rugvica ranged from 9.49 t/ha (FAO 200) to 10.06 t/ha (FAO 500). The lowest average grain yield (LAGY) in the FAO 200 was recorded in 2011 (6.41 t/ha), in the FAO 500 in 2015 (8.01 t/ha), while in the FAO 600 the LAGY was recorded in 2005 (7.57 t/ha). In the FAO 300 and FAO 400 groups the LAGY were recorded in 2003 (6.70 t/ha and 7.71 t/ha, respectively), when the largest sum of SDD was recorded.

Keywords: maize, stress heat units, average grain yield

Komponente varijance analizirane mješovitim modelom u zajedničkim pokusima kukuruza dvaju hrvatskih instituta

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SAŽETAK

Bc Institut Zagreb i Poljoprivredni institut Osijek već više od desetljeća postavljaju zajedničke pretkomisijske pokuse kukuruza na nekoliko lokacija u Hrvatskoj. Ovi pokusi uključuju najnovije i najprinosnije hibridne kombinacije pojedinih oplemenjivača iz dvaju instituta, a set hibrida se mijenja iz godine u godinu. Pokusi su balansirani unutar jedne godine, no uobičajena analiza varijance kroz više godina nije moguća zbog izrazite inherentne nebalansiranosti. Cilj ovoga rada je bio procijeniti komponente varijance za prinos zrna ovih pokusa postavljenih u razdoblju od 2012. do 2015. godine na lokacijama Osijek, Rugvica i Šašinovec pomoću mješovitog statističkog modela koristeći metodu ograničene maksimalne izglednosti (REML). Medijan, prva i treća kvartila svih pokusa su bili 10,1, odnosno 8,6 i 12,3 t/ha, dok je srednja vrijednost iznosila 10,3 t/ha. Struktura komponenti varijance je bila slična onoj dobivenoj u službenim komisijskim pokusima kukuruza Zavoda za sjemenarstvo, s udjelom genotipske komponente varijance od oko 10% ukupnoga variranja. Iako se čini da je taj udio mali, on je ekvivalentan udjelima genotipske varijance za prinos zrna procijenjenih u službenim komisijskim pokusima u Zapadnoj Europi. Ovi rezultati ukazuju da višegodišnji zajednički pretkomisijski pokusi kukuruza dvaju instituta predstavljaju kvalitetan test za hibride koji se namjeravaju uvrstiti u službene sortne pokuse Republike Hrvatske.

Ključne riječi: komponente varijance, kukuruz, mješoviti model, pretkomisijski pokusi, prinos

Variance components analysed by mixed model in common maize trials of two Croatian institutes

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SUMMARY

Bc Institute Zagreb and Agricultural Institute Osijek perform joint pre-registration maize yield trials in several locations of Croatia for more than a decade. The trials include the newest and the highest yielding hybrid combinations of each maize breeder from the institutes changing their genotypes every year. Trials are balanced within a year, but usual combined analysis of variance across several years is not possible since trials are inherently severely unbalanced. Objective of this study was to estimate variance components for grain yield of the trials planted from 2012 to 2015 in three locations of Osijek, Rugvica and Šašinovec using the mixed model and method of restricted maximum likelihood (REML). Median, the first and the third quartile of all experiments were 10.1, 8.6 i 12.3 t/ha respectively, while the mean was 10.3 t/ha. The structure of variance components was similar to those obtained in official registration variety trials by Croatian Institute for seed and seeedlings, whereby the genotypic variance was about 10% of the total variation. Although the percentage seems small, it is equivalent to the genotypic component of variance for grain estimated in official variety trials of Western Europe. Our results indicate that the multi-year pre-registration maize yield trials of the two institutes is a worthwhile test for hybrids that are planned be included into the official variety trials of the Republic of Croatia.

Key words: variance components, maize, mixed model, pre-registration trials, yield

Agronomska vrijednost oplemenjivačkih linija i sorti jarog stočnog graška za proizvodnju voluminozne krme

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SAŽETAK

Jari stočni grašak je jedna od najznačajnijih krupnozrnih mahunarki. Kod većine oplemenjivačkih programa graška, selekcijski proces je usmjeren na razvoj visokoprinosnog i kvalitetnog sortimenta za proizvodnju zrna i/ili visokokvalitetne voluminozne stočne hrane. Proizvodnja zrna bogatog bjelančevinama uglavnom je povezana s jarim sortama, dok je proizvodnja voluminozne mase, odnosno korištenje cijele biljke koja je osim bjelančevina značajan izvor minerala i vitamina odlika ozimih sorti. Zbog nemogućnosti jesenje sjetve (kasno napuštanje polja prethodne kulture, obilne kiše u vrijeme pripreme tla i sjetve, promjena poslovnog plana, veći broj stoke i sl.) sve su češći zahtjevi proizvođača za jarim sortama graška koji daju veliku masu u kratkom periodu (100 dana) i omogućuju sjetvu druge kulture na istoj površini. Ciljevi ovoga istraživanja bili su: tijekom dvije uzastopne godine (2012. i 2013.) procijenti agronomsku vrijednost sorti (jarih, fakultativno ozimih) i novostvorenih oplemenjivačkih linija jarog stočnog graška (7 linja, 6 sorti) te odabrati najperspektivnije linije za daljnji selekcijski proces i/ili pokretanje postupka prijave nove potencijalne sorte jarog graška za proizvodnju voluminoznog krmiva. Najveće prosječne prinose zelene mase i suhe tvari te povoljne vrijednosti ostalih promatranih svojstava ostvarile su oplemenjivačke linije MBK-7, MBK 41 i MBK-51 te sorte Dora i Poneka. Navedene sorte predstavljaju vrijedan materijal za daljnji oplemenjivački rad, a identificirane superiorne linije imaju potencijal za nove sorte.

Ključne riječi: jari stočni grašak, prinos zelene mase, linija, sorta

Agronomic value of spring field pea breeding lines and varieties for green forage production

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SUMMARY

Spring field pea is one of the most important coarse legumes. In most pea breeding programs selection process is focused on development of high-yielding and top-quality varieties for grain and/or green forage production. Production of protein rich grain is mainly associated with spring varieties, while production of green mass rich in protein, minerals and vitamins is characteristic for winter varieties. Due to problems with planting in autumn (late harvest of previous crop, heavy rains during soil preparation and planting, business plan modifications, abundance of cattle etc.), farmers often prefer spring pea varieties that can produce large green mass over shorter period of time, as well as ensure planting of the next crop at the same field. Objectives of this research were: agronomic value assessment of (spring and potentially winter) varieties and new breeding lines of spring field pea over two year-period (2012-2013), as well as selection of lines with most potential for further breeding process and/or registration of new spring field varieties for green forage production. Highest mean yields of green mass and dry matter, as well as favorable values of other assessed traits were scored by breeding lines MBK-7, MBK-41, MBK-51, and varieties Dora and Poneka. These varieties represent valuable germplasm for further breeding process, while selected lines have high potential for development of new varieties.

Key words: spring field pea, green mass yield, line, variety

Produktivnost i kompeticija različitih tipova stočnog graška u združenim usjevima

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SAŽETAK

Cilj ovog istraživanja bio je utvrditi kompeticijske odnose između polulisnog tipa graška i žitarica te usporediti ga s konvencionalnim lisnim tipom. U istraživanju su korištena dva tipa graška (lisni i polulisni), i tri vrste potpornih usjeva (talijanski ljulj, zob i pšenica). Usjevi su bili posijani kao čiste kulture i u omjeru grašak/potpora (70:30). Odnosi između združenih usjeva ocjenjivani su na temelju prinosa, ekvivalentnog odnosa zemljišta (LER) i kompeticijskih odnosa (CR). Opravdane razlike su utvrđene unutar kombinacija podusjeva, a između tipova graška. Vrijednosti prinosa bile su veće u svim kombinacijama lisnog tipa graška (61,5 t/ha) u odnosu na polulisne kombinacije (37,8 t/ha). U prosjeku dvije godine veću učinkovitost u iskorištenja zemljišta (LER) u odnosu na monokulturu imale su kombinacije s lisnim tipom graška, dok su u drugoj godini pokusa znatno veću učinkovitost iskorišenja imale polulisne kombinacije. Kompeticijski odnos (CR) po godinama i po svim kombinacijama je bio veći kod polulisnog tipa graška i kretao se od 0,37 do 1,19. Na osnovu dobivenih vrijednosti možemo reći da je polulisni tip graška jači kompetitor te da je manje osjetljiv na kompeticiju od običnog tipa graška, dok je obični lisni tip produktivniji. Rezultati istraživanja ukazuju da selekcijom i oplemenjivanjem možemo unaprijediti produktivnost polulisnih tipova graška s obzirom na visoke kompeticijske osobine.

Ključne riječi: polulisni grašak, prinos , učinkovitost, kompeticija

Productivity and competitiveness and of different types field pea in intercrops

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SUMMARY

The goal of this study was to determine competitive relations between the semileaf type pea and the cereals and to compare it with the conventional leaf type. In the research we used two types of peas (leaf, semileaf), and three types of supporting crop (Italian ryegrass, oats and wheat). The crops were sowing as pure crops and ratio of the peas/supporting crop (70:30). The relations between combinations crops are evaluated on the basis of the yield, land equivalent ratio (LER), competitive ratio (CR). Significant differences were found within combination of the supporting crops between types of peas. The values of yields were higher in all of the combinations of the normal pea (61.5 t/ha) compared with those of the semileaf combination (37.8 t/ha). In the average of two year higher efficiency in utilization of LED compared to the monoculture they had combinations with normal leaf type, while in the second year of research the greater efficiency had combinations with semileaf type. Competitive ratio (CR) per year in all of the combinations was higher in the semileaf type and ranged from 0.37 to 1.19. Based on the gathered values we can say that the semileaf type pea is a stronger competitor and less sensible to the competition with cereals than the normal leaf types of pea, also normal leaf type is much more productive .The research results indicate that selection and breeding can improve productivity semileaf types of peas with considering to high competitive properties.

Key words: semi-leaf pea, yield, effectiveness, competitiveness

Intenzitet fuzarijske truleži klipa i sadržaj fumonizina u zrnu kod testkrižanaca IBM populacije kukuruza u tri okoline

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SAŽETAK

Fuzarijska trulež klipa je jedna od najzastupljenijih bolesti kukuruza u Hrvatskoj. Gljivični uzročnik bolesti, *Fusarium verticillioides* dobro je poznat zbog proizvodnje mikotoksina iz skupine fumonizina. Fuzarijska trulež klipa je sekundarni stresor jer podložnost biljke za bolest raste proporcionalno utjecaju drugih uzročnika stresa. Visoka gustoća sklopa kao i visoka vlažnost pojačavaju simptome bolesti. Cilj našeg istraživanja bio je procijeniti utjecaj tri različite okoline na intenzitet zaraze fuzarijskom truleži klipa i sadržaj fumonizina u zrnu. Pokusi su provedeni proizvodnih sezona 2014 i 2015 koje su se razlikovale u količini i distribuciji oborina. Korišteno je 212 testkrižanaca IBM (*Intermated B73x Mo17*) populacije i 4 standarda. Okoline su bile: 1 (~ 57000 biljaka/ha^{-1} 2014), 2 (~ 86000 biljaka/ha^{-1} 2014) i 3 (~ 57000 biljaka/ha^{-1} 2015). Intenzitet zaraze procijenjen je vizualno. Sadržaj fumonizina izmjeren je metodom lateralnog protočnog imunokromatografskog testa (Charm$^{®}$ ROSA$^{®}$). Statistički značajne razlike zapažene su između okolina za intenzitet zaraze (7.67 % u okolini 1, 14.82% u 2 i 2.60% u 3) kao i za sadržaj fumonizina (3711 mg/kg^{-1} u okolini 1, 7990 mg/kg^{-1} u 2 i 961 mg/kg^{-1} u 3). Prosječni prinos značajno se razlikovao između okolina (12.22 t/ha^{-1} u okolini 1, 13.48 t/ha^{-1} u 2 i 10.90 t/ha^{-1} u 3). Visoka gustoća sklopa pogoduje razvoju vrste *Fusarium verticillioides* modulacijama mikroklime unutar sklopa. Nedostatak vode tokom vegetacije ne pogoduje razvoju ove bolesti premda uzrokuje stres kod biljaka.

Ključne riječi: fusarium, fumonizini, kukuruz, IBM populacija, test križanci

Fusarium ear rot intensity and grain fumonisin content in testcrosses of maize IBM population in three environments

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SUMMARY

Fusarium ear rot is one of the most prevalent maize diseases in Croatia. *Fusarium verticillioides*, its fungi causative is well known for production of mycotoxins from group of fumonisins. Fusarium ear rot is a secondary stressor, since plant becomes more susceptible to it as it becomes weakened by other stresses. High planting density as well as high moisture boosts disease symptoms. The aim of our study was to evaluate three different environments in their effects on Fusarium ear rot disease intensity and fumonisin contents in grain. Experiments were conducted in growing seasons 2014 and 2015 differing in rainfall and rainfall distribution in Osijek. 212 testcrosses of maize IBM population (*Intermated B73x Mo17*) and 4 checks were used. Environments were: 1 (~ 57000 plants/ha^{-1} 2014), 2 (~ 86000 plants/ha^{-1} 2014) and 3 (~ 57000 plants/ha^{-1} 2015). Disease intensity was visually rated. Fumonisin content was measured by lateral flow assay (Charm® ROSA®). Statistical differences were observed between environments in disease intensity (7.67 % in 1, 14.82% in 2 and 2.60% in 3), as well as fumonisine contents (3711 mg/kg^{-1} in 1, 7990 mg/kg^{-1} in 2 and 961 mg/kg^{-1} in 3). Average yield differed significantly between environments (12.22 t/ha^{-1} in 1, 13.48 t/ha^{-1} in 2 and 10.90 t/ha^{-1} in 3). High planting density enhances development of *Fusarium verticilioides* by modulating microclimate in the field. Shortage of water in growing season does not enhance disease development although it stresses the plant.

Key words: fusarium, fumonisins, maize, IBM population, testcrosses

Maternalno porijeklo parametara fluorescence klorofila *a* u UPGMA grupiranju recipročnih križanaca kukuruza

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SAŽETAK

Maternalno porijeklo kloroplasta ima ulogu u određivanju svojstava procesa fotosinteze potomstva. Proces fotosinteze nije u potpunosti kontroliran kloroplastnim genima nego njegov status ovisi o ukupnom fiziološkom stanju biljke kao i o komponentama fotosintetskog aparata pod utjecajem jezgre. Hierarhijsko grupiranje je metoda korištena za klasifikaciju primki prema stupnju njihove sličnosti ili različitosti. Odnose između udaljenosti svih mogućih parova primki moguće je procjeniti korištenjem kofenetskih koeficijenata koji uspoređuju linearne odnose između jedinki s odnosima izračunatim korištenjem metode grupiranja. Cilj našeg istraživanja bio je procjeniti mogućnost UPGMA (*Unweighted Pair Group Method with Arithmetic mean*) metode grupiranja u razlikovanju recipročnih križanaca inbred linija kukuruza prema maternalnom roditelju koristeći parametre JIP testa florescence klorofila *a*. Inbred linije korištene za razvoj recipročnih križanaca značajno su se razlikovale s PI (indeks fotosintetske učinkovitosti) vrijednostima od 4.63 ± 0.28 kod linije 346, 3.83 ± 0.12 kod PHG29 i 2.83 ± 0.12 kod 622448. UPGMA algoritam grupirao je recipročne križance sukladno prema maternalnom roditelju. Visoka vrijednost kofenetskog koeficijenta (0.91) potvrdila je opravdanost rezultata grupiranja. Daljnja istraživanja na većem setu recipročnih križanaca su potrebna kako bi se utvrdilo postojanje maternalnog naslijeđivanja parametara fluorescence klorofila *a*.

Ključne riječi: maternalno naslijeđivanje, fluorescenca klorofila a, UPGMA, kukuruz

Maternal inheritance of chlorophyll a fluorescence parameters in UPGMA clustering of maize reciprocal crosses

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SUMMARY

Maternal inheritance of chloroplasts makes its role in determining some photosynthetic properties of offspring. Photosynthesis is not a process solely controlled by chloroplast genes, but its state depends on overall physiological state of plant, as well as on some nuclear mediated components of photosynthetic apparatus. Hierarchical clustering is a method used for classifying accessions based on degree of their similarity or dissimilarity. Relationships between distances among all possible pairs of accessions can be evaluated by using cophenetic coefficients which compare linear relations of individuals with relations calculated using clustering methods. The aim of our study was to evaluate whether or not the UPGMA (*Unweighted Pair Group Method with Arithmetic mean*) clustering method can distinguish reciprocal crosses of maize inbreds according to their maternal parent using chlorophyll *a* fluorescence parameters of JIP-test. Inbreds used to develop reciprocal crosses differed significantly in their fluorescence parameters with average PI (photosynthetic performance index) of 4.63 ± 0.28 in inbred 346, 3.83 ± 0.12 in PHG29 and 2.83 ± 0.12 in 622448 respectively. UPGMA algorithm clustered reciprocal crosses according to maternal parent. Validity of grouping results was supported by very high value of cophenetic coefficient (0.91). Further research in a larger set of reciprocal crosses is needed to elucidate if maternal inheritance is present for chlorophyll *a* fluorescence parameters.

Key words: maternal inheritance, chlorophyll a fluorescence, UPGMA, maize

Morfometrijska svojstva sjemena pšenice

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SAŽETAK

Cilj rada bio je istražiti osnovna morfometrijska svojstva sjemena (dužina, širina, površina i opseg) 16 sorti pšenice Poljoprivrednog instituta Osijek putem analize digitalnog zapisa sa svrhom (I) procjene vrijednosti mjerenih svojstava kao deskriptora sorti, (II) utvrđivanja korelacija mjerenih svojstava sa standardnim svojstvima kvalitete sjemena (masom tisuću zrna i klijavosti) te (III) procjene učinkovitost i pouzdanost digitalne analize u utvrđivanju identiteta i klasa sjemena pšenice. Korištenjem javno dostupnih računalnih programa za analizu digitalnih zapisa i statističku obradu podataka ((ImageJ, SHAPE 1.3., STAR 2.0.1.) utvrđen je značajan učinak (p=0,01) sorte na sva mjerena svojstva. Dužina sjemena bila je u rasponu od 5,36 do 6,99 mm, širina sjemena u rasponu od 3,05 do 4,00 mm, površina sjemena u rasponu od 13,46 do 21,92 mm^2, a opseg sjemena u rasponu od 13,65 do 17,56 mm. Prosječno najduže, najšire te površinom i opsegom najveće sjeme utvrđeno je za sortu Klasan. Korelacije osnovnih morfometrijskih svojstava sa standardnim svojstvima kvalitete sjemena bile su značajno (p=0,01) pozitivne (r=0,55-0,76). Rezultati su ukazali na različitost odnosa mjerenih svojstava na razini sorte te naglasili vrijednost morfometrijskih svojstava u deskripciji sorti. Digitalna analiza morfometrijskih svojstava bila je učinkovita i pouzdana u prikupljanju novih informacija o identitetu i klasama sjemena istraženih sorti pšenice.

Ključne riječi: pšenica, sjeme, svojstva, morfometrija

Morphometric traits of wheat seed

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SUMMARY

The aim of this paper was to investigate the basic morphometric seed traits (length, width, surface and perimeter) of 16 Agricultural Institute Osijek wheat varieties by digital image analysis in order (I) to assess the value of measured traits as a variety descriptors, (II) to estimate correlations between measured traits and standard traits of seed quality (thousand seed weight and germination), and to (III) evaluate the efficiency and reliability of digital analysis in determination of wheat seed identity and classification. The significant effect (p=0.01) of variety on all measured traits was found by freely available software for digital image and statistical data analyses (ImageJ, SHAPE 1.3., STAR 2.0.1.). Seed length was in range 5.36 – 6.99 mm, seed width in range 3.05 - 4,00 mm, seed surface in range 13.46 - 21.92 mm^2, and seed perimeter in range 13.65 – 17.56 mm. In average, the highest values of length, width, surface and perimeter was found for variety Klasan. Correlations between basic morphometric traits and standard seed quality traits were significantly (p=0.01) positive (r=0.55-0.76). Results indicated that there are differences in relationships among measured traits at the level of variety, and emphasises the value of morphometric traits in variety description. Digital analysis of morphometric traits was efficient and reliable in collection of new data on identity and seed classes of investigated wheat varieties.

Key words: wheat, seed, traits, morphometry

In vitro propagation of some *Prunus mahaleb* L. genotypes

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SUMMARY

The aim of this research was to facilitate propagation of some Turkish mahaleb genotypes by *in vitro* techniques. Shoot tips of annual shoots were used as explants. MS medium was used as base nutrient with 30 g L^{-1} sucrose, and 7 g L^{-1} agar. The pH was adjusted to 5.6. The explants were transferred to MS medium after the tissue culture. The explants were exposed to 16 h light and 8 h dark period at 24 ± 1°C temperature in growth chamber. The explants were subcultured every 30 days and shoot length, number of leaves and multiplication were observed every 20 days.

In multiplication periods, 10 mediums that differed in type and concentrations were tested. From these mediums 3 were selected and used in experiment. The optimum medium for multiplication was obtained when used MS media supplemented with 4.4 µM BAP + 0.49 µM IBA + 0.29 µM GA_3. The optimum rooting was obtained at medium with 0.3 mg L^{-1} NAA.

Keywords: Mahleb, tissue culture, propagation, plant growth regulator

Hyoscyamine and scopolamine production from hairy roots of *Hyoscyamus reticulatus* elicited by iron nanoparticles

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SUMMARY

Hyoscyamus reticulatus L. is a rich source of tropane alkaloids, mainly hyoscyamine and scopolamine. There is a considerable interest in production of these compounds by hairy root cultures because of their stable production of tropane alkaloids. Elicitation of secondary metabolites biosynthetic pathways is an effective strategy to increase secondary metabolites production. Cotyledon-derived hairy root cultures transformed by *Agrobacterium rhizogenes*, elicited with iron oxide nanoparticles (FeNPs) at different concentrations (0, 450, 900, 1800, and 3600 mg FeNPs l^{-1}) in different exposure times (24, 48 and 72 h) were investigated. According to the results, the highest hyoscyamine and scopolamine production (about 5-fold increase over the control) was achieved with 900 and 450 mg FeNPs l^{-1} at 24 and 48 hours of exposure time, respectively. This is the first report of FeNPs elicitation effects on hairy root cultures of a medicinal plant. We suggest that FeNPs could be used as an effective elicitor in hairy root cultures for increasing the production of tropane alkaloids.

Keywords elicitation, hairy root, *Hyoscyamus reticulatus* L., iron oxide nanoparticles, tropane alkaloids

Selekcija kukuruza na tolerantnost prema suši pomoću sekundarnih svojstava

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SAŽETAK

Suša kao abiotski faktor je oblik stresa koji najznačajnje smanjuje prinose zrna kukuruza. Statistički podaci pokazuju da su se od 1970. do 2000. područja izložena suši udvostručila. Smanjenje prinosa uslijed suše ovisi o nekoliko faktora kao što su: vrijeme pojave suše, trajanje i intenzitet suše. Najveća smanjenja prinosa možemo očekivati u vrijeme cvatnje (do 50%) i u fazi nalijevanja zrna (do 26%). Poznato je da se 20 - 25% gubitka prinosa u suši može nadoknaditi genetskim napretkom, isto toliko boljim iskorištavanjem pristupačne vode, a ostalih 50 - 60% gubitka se mogu nadoknaditi jedino navodnjavanjem. Iz ovih razloga potrebno je povećati intenzitet rada na selekciji kukuruza na tolerantnost prema suši. Zbog niske heritabilnosti svojstva prinosa u stresnim okolinama sve se više radi na selekciji na tolerantnost prema suši preko sekundarnih svojstava. Da bi određeno sekundarno svojstvo bilo upotrebljivo u selekciji ono mora zadovoljavati sljedeće kriterije: 1) povezanost s prinosom u stresnim okolinama, 2) da se može lako i brzo mjeriti, 3) da je visoko heritabilno i 4) da je stabilno u ekspresiji i da nije negativno povezano s gubitkom prinosa u ne stresnim okolinama. Sekundarna svojstva koja možemo izdvojiti kao učinkovita i povezana s prinosom su: broj klipova po biljci (r = 0,8), ASI gdje je korelacija s prinosom do -0,7, a s brojem klipova po biljci i do -0,9, veličina metlice, propadanje lišća odnosno staygreen efekt, te rolanje lišća.

Ključne riječi: kukuruz, suša, sekundarna svojstva, prinos zrna

Maize breeding for drought tolerance through the secondary traits

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SUMMARY

Drought as an abiotic stressor is the most important factor which reduces maize yield. Statistical data shows that globally area subjected to drought stress has doubled from 1970 to 2000. Yield reduction caused by drought depends on few factors such as time of appearance, duration and intensity of drought. The highest reduction of yield caused by drought is in flowering (50%) and during the grain filling time (25%). Iti s known that 20-25% of drought yield loses could be eliminated by genetic improvement in drought tolerance, 20-25% with better agronomic practices and the remaining 50-60% can only be met by irrigation. For these reasons it is necessary to increase the intensity of work on maize breeding for drought tolerance. Due to low grain yield heritability in stress environments, breeding maize for drought tolerance through the secondary traits is very often. Useful secondary drought tolerance traits must be: 1) correlated with yield in stress environments, 2) easy and fast to measure, 3) highly heritable, and 4) stable in expression and not correlated with yield loss in unstressed environments. Important secondary traits correlated with yield are: number of ears/plant (r = 0.8), ASI where correlation with yield is -0.7, and with ears/plant -0.9, tessel size, leaf senescence or stay green effect and leaf rolling.

Key words: maize, drought, secondary traits, grain yield

Selection of the best barley genotypes to multi and special environments by AMMI and GGE biplot models

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SUMMARY

The stability of genotypes is significant in selection and improvement of new varieties. The effect of genotype x environment interaction is revealed by different analysis methods. Nowadays, majority of researchers are using AMMI and GGE biplot analysis in multi-environmental trials. Ten barley advanced lines and cultivars were used in this study. The experiments were performed according to a complete randomized block design with four replications at six environments in 2010-2011 season. The stability and superiority of genotypes for yield was determined using AMMI and GGE biplot analysis. Factors (G, GE, and GEI) were found to be highly significant (P<0.01) for grain yield. AMMI analysis indicated that the major contributions to treatment sum of squares were environment (89.77%), genotype (7.25%) and GE (2.96%), respectively, suggesting that grain yield was affected by environmental conditions. The GGE biplot indicated that PCA 1 axes was significant (P<0.01) with 75.33% due to GxE interaction. The AMMI indicated that G6 was stable for grain yield in across environments, while G10 and G9 were high yielding. Moreover, E1 and E4 were high yielding, while E2, E5 and E6 low yielding as predicted. On the other hand, GGE biplot indicated that three groups occurred among environments, first group (E1, E2 and E6), second group (E3, and E4), and third group (only E5). The study showed that G6 and G9 were the best genotypes for the first environment, G10 for second and G1 for third, while other genotypes didn't show any relation with environments. The results of AMMI and GGE biplot models indicated that G6 was stabile in all environments. Therefore this genotype can be recommended for production in all tested environments, while G9 for first group and G10 for second group.

Key words: barley, AMMI, GGE biplot, grain yield, stability.

Comparison of planting on bed and flat surface systems in wheat and barley

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SUMMARY

The main principle of bed planting system is sowing crops on beds or ridges instead of sowing on the flat surface. The aim of the study was to compare the new (bed) and traditional planting system for wheat and barley in Southeastern Anatolia Region and to identify and quantify potential of grain yield and quality. This type of planting system is very common in farm area. We also compared the cost of sowing, seed, irrigation, crop protection costs as well as harvest and germination of seeds in both system. All agricultural applications were used in sowing of flat surface as traditional, but special applications were used in bed planting system. The study was conducted in Diyarbakir ecological conditions in 2010-2011 production season. According to combined analysis, significant differences were determined at the level of 99% and 95%, in terms of planting system, genotype and genotype x planting system interactions in terms of grain yield and quality parameters in wheat and barley. The results showed that grain yield and quality were high in conventional method than planting on bed (new) system, but, irrigation, weed, disease and pest management, the operation of harvesting can be made more comfortable in the bed planting than conventional system. According to the result in this study, bed planting system can be applied successfully as a way of economical savings for farmers through reduced crop inputs and improved production efficiency in wheat and barley. But if the growing conditions differ, like in alternation planting cotton, irrigated areas and when the price of seed is high.

Key words: Planting, bed, conventional, barley, wheat, biplot

Varijabilnost koncentracija mikroelemenata i fitata u zrnu različitih genotipova ozime pšenice

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SAŽETAK

Značajan dio svjetskog stanovništva izložen je nedostatku Fe i Zn u prehrani te je cilj provedenog istraživanja utvrditi postoji li varijabilnost genotipova ozime pšenice prema koncentracijama i bioraspoloživosti Fe i Zn, što je analizirano u zrnu 343 genotipa.

Raspon (24,33-95,75 mg/kg) i prosjek (38,79 mg/kg) koncentracija Fe bili su znatno veći nego koncentracije Zn (raspon 13,30-38,93 i prosjek 21,35 mg/kg). Koncentracije Fe varirale su nešto više (koef. var. 25,4 %) nego Zn (21,1 %), a značajno veći koeficijent varijabilnosti (45,3 %) utvrđen je za koncentracije fitata (prosjek 11,37g/kg, raspon 3,62-23,68 g/kg).

Odnos fitat/Fe bio je prosječno 25 (raspon 6,7 – 59,9), a odnos fitat/Zn 55 (16,5-140). Kod 65 genotipova (19 % analiziranih genotipova) utvrđen je odnos fitat/Fe < 15 (niži odnos je indikator veće bioraspoloživosti). Nije utvrđen odnos fitat/Zn < 15, ali je kod 7 genotipova odnos bio < 20.

Klasterskom analizom izdvojena su 3 klastera iznadprosječnih bioraspoloživosti: 4 genotipa s iznadprosječnim koncentracijama Fe i Zn i ispodprosječnim odnosima fitat/Fe i fitat/Zn; 49 genotipova s ispodprosječnim odnosima fitat/Fe i fitat/Zn, ali s nešto nižim koncentracijama Fe i Zn; još 13 genotipova iznadprosječne bioraspoloživosti. Najveći je klaster sa 175 genotipova prosječnih koncentracija Fe, Zn i fitata, a kod 102 preostala genotipa mogu se očekivati vrlo niske bioraspoloživosti Fe i Zn.

Rezultati dokazuju varijabilnost analiziranih genotipova pšenice prema svojstvima koja značajno utječu na sadržaj bioraspoloživog Fe i Zn u cjelovitom zrnu pšenice.

Ključne riječi: cink, željezo, fitat, bioraspoloživost

The variability of the trace elements and phytate content of different winter wheat genotypes

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SUMMARY

World population is in signifficant portion exposed to Fe and Zn insufficiency in their nutrition, and therefore total and bioavailable concentrations of these micronutrients are very important component of the food quality.

The purpose of conducted research was to answer is there genotype variability according to Fe and Zn concentrations and bioavailability. Therefore Fe and Zn, but also phytates as important bioavailability inhibitors, were being tested in whole grain of 343 winter wheat genotypes. Range (24,33 - 95,75 mg/kg) and average (38,79 mg/kg) of Fe were signifficantly higher than of Zn concentrations (range 13,30 – 38,93 and average 21,35 mg/kg). Analysed genotypes varied more in Fe (variation coefficient 25,4 %) than in Zn concentration (21,1 %), though much higher variation coefficient (45,3 %) was established for phytates (11,37 g/kg in average, range 3,62 – 23,68 g/kg).

Phytates/Fe ratio was 25 in average (range 6,7 – 59,9) and phytates/Zn was 55 (range 16,5 – 140). Moderate and increasing bioavailability indicate ratios phytates/Zn and phytates/Fe 15 or lower, and has been determined for 65 genotypes for Fe (19 % analysed genotypes). It has not been determined for Zn, but phytates/Zn ratio of 7 genotypes was lower than 20.

Cluster analysis isolated 4 genotypes with concentrations of Fe & Zn higher and phytates/Fe & phytates/Zn ratios lower than average. Another 49 genotypes were also atributed with phytates/Fe and phytates/Zn ratios lower than average, but with a slightly lower concentrations of Fe and Zn. Additional 13 genotypes have 2 or 3 characteristics that point to bioavailability higher than average. The biggest cluster has 175 genotypes characterized with average Fe, Zn and phytate concentrations. Within 102 reamining genotypes could be expected very low Fe and Zn bioavailability.

The results prove variability of analysed genotypes of winter wheat according to the characteristics that significantly influence the content of bioavailable Fe and Zn in whole wheat grain.

Key words: zinc, iron, phytates, bioavailability

Varijabilnost sadržaja ukupnih karotenoida i boje zrna genotipova kukuruza kokičara

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SAŽETAK

Kukuruz kokičar je popularna grickalica koja se konzumira širom svijeta. U oplemenjivačkim programima kukuruza kokičara sve se veća pozornost pridaje unapređenju nutritivne vrijednosti zrna. Potencijalni zdravstveni učinci kukuruza kokičara dovode se u svezu s bioaktivnim antioksidacijskim tvarima u zrnu kao što su karotenoidi. Ciljevi ovoga rada bili su procijeniti učinke genotipa (G), okoline (E) i interakcije genotipa i okoline (G x E) na sadržaj ukupnih karotenoda u zrnu te ispitati je li sadržaj ukupnih karotenoida u korelaciji s bojom zrna. Pokus s osam hibrida kukuruza kokičara postavljen je u Osijeku i Altinovi (Turska) u 2015. godini. Sadržaj ukupnih karotenoida određen je spektrofotometrijski pomoću apsorpcijskog koeficijenta β-karotena. Boja endosperma je mjerena uređajem Minolta CR-400 Chroma Meter prema CIE L* a* b* sustavu. Prosječni sadržaj ukupnih karotenoida kod hibrida kokičara kretao se rasponu od 20,32 do 35,78 µg /g ST. Utvrđeni su visokoopravdani učinci G, E i interakcije G x E na sadržaj ukupnih karotenoida u zrnu pri čemu je učinak G bio znatno veći od učinka E i interakcije G x E. Utvrđen je opravdan učinak G za parametre boje CIE a* (crvena) and CIE b* (žuta) i neopravdan učinak G za parametar CIE L*(svjetlina). Dobivena je vrlo jaka pozitivna korelacija između sadržaja ukupnih karotenoida i parametara boje CIE a* i CIE b* (r=0,88 i r =0,89). Rezultati ukazuju na mogućnost selekcije genotipova s većim sadržajem ukupnih karotenoida u zrnu na osnovu parametara boje, kako bi se izbjegle dugotrajne i skupe kemijske analize.

Ključne riječi: kukuruz kokičar, genotipovi, ukupni karotenoidi, boja zrna

Variability in total carotenoids content and grain color among popcorn genotypes

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SUMMARY

Popcorn is a popular snack food which is consumed worldwide. Currently more attention is given to the nutritional value of popcorn grain and its improvement through breeding programs. The potential health benefits of popcorn are linked to the bioactive antioxidants in grain such as carotenoids. The objectives of this study were to evaluate the effects of genotype (G), growing environment (E) and G x E interaction for total carotenoids content and to determine the relation between total carotenoids content and grain color. Trial with eight popcorn hybrids was set up in Osijek and Altinova (Turkey) in 2015. Total carotenoids were quantified spectrophotometrically as β-carotene equivalents. Colour measurements were recorded using a i Minolta CR-400 Chroma Meter n the CIE L* a* b* color space. Means for total carotenoids content of popcorn genotypes, across two locations, ranged from 20.32 to 35.78 μg βC/g DW. G, E, as well as the G x E interaction, significantly influenced total carotenoids content and G effect was considerably larger then E and G x E effects. Significant effects of genotype for colour parameters CIE a* (redness) and CIE b* (yellowness) were obtained. There was no significant difference among genotypes for parameter CIE L* (lightness). Total carotenoids content strongly correlated with CIE a* value and CIE b* value (r=0.88 and 0.89, respectively). Results suggests that there is a possibility to select genotypes with higher carotenoids level from simple colour measurements avoiding time consuming, high cost analysis.

Key words: popcorn, genotypes, total carotenoids, grain color

Novosti iz programa oplemenjivanja strnih žitarica Bc Instituta d.d.

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SAŽETAK

Sedamdesetogodišnji kontinuirani rad na oplemenjivanju strnih žitarica u tvrtki Bc Institut d.d. rezultirao je priznavanjem novih sorata strnih žitarica. Sorta ozime pšenice BC Ljepotica, sorta dvorednog ozimog ječma BC Gospodar i višerednog ozimog ječma BC Srećko novosti su u sortimentu tvrtke Bc Institut d.d. BC Ljepotica je brkulja, nižeg habitusa sa prosječnom visinom od 82 cm i odlične je otpornosti na polijeganje. Glavna karakteristika ove pšenice je vrhunski urod zrna što potvrđuju rezultati Komisije za priznavanje sorata Republike Hrvatske gdje je u dvogodišnjem ispitivanju, na četiri lokacije, ostvarila prosječni urod zrna od 10 968 kg/ha što je 23 - 31% više od standardnih sorata u Komisiji. Prema kriterijima Kodeksa otkupa žitarica i uljarica svojom kvalitetom BC Ljepotica pripada u II. klasu pšenice. Dvoredni ozimi ječam BC Gospodar u komisijskim pokusima postigao je prosječni urod zrna na razini standarda od 8 339 kg/ha, dok su vrijednosti hektolitarske mase na svim pokusnim lokacijama Komisije bile veće u odnosu na vrijednosti standarda i prosječno su iznosile 66,38 kg. Vrijednost hektolitarske mase novopriznatog višerednog ječma BC Srećko bila je na razini višerednog standarda u Komisiji i u prosjeku je iznosila 59,61 kg. Postizanje visokih uroda BC Srećka je njegova glavna karakteristika. Prema rezultatima Komisije prosječan urod BC Srećka bio je 8 503 kg/ha te je vrijednost uroda zrna bila veća u odnosu na obje standardne sorte.

Ključne riječi: ozima pšenica, ozimi ječam, urod, hektolitarska masa, sorta

Novelties from cereal breeding programs in Bc Institute d.d.

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SUMMARY

Seventy-year long, continuous work in breeding of cereals in Bc Institute, resulted in the release of new varieties. Variety of winter wheat BC Ljepotica, variety of two-row barley BC Gospodar and six-row barley BC Srećko are the novelties in product assortment of Bc Institute. BC Ljepotica is awned wheat with shorter growth habitus in average of 82 cm and excellent resistance to lodging. Its main characteristic is high yield which was confirmed by the two-year trial results conducted by the Commission for Varieties Recognition of Republic of Croatia at four locations. BC Ljepotica yielded in average 10 968 kg/ha which is 23 - 31% higher compared to standards. Considering the criteria of the Croatian Codex of Wheat Purchase it belongs to the II. class. Two-row winter barley BC Gospodar yielded in average 8 339 kg/ha which was within the standards' yield range, whereas the test weight was higher than that of standards - 66.38 kg in average at all Commission's locations. Test weight values of newly released six-row barley BC Srećko was 59.61 kg, which was within the average value range of the six-row standard. BC Srećko's main characteristic is high yield. According to the results of Commission for Varieties Recognition of Republic of Croatia, BC Srećko yielded 8 503 kg/ha in average, which is higher than the yield of both standard varieties.

Key words: winter wheat, winter barley, yield, test weight, variety

Study of the genetic variation of tall fescue varieties using AFLP markers

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SUMMARY

Little information is available regarding genetic variation in tall fescue (*Festuca arundinacea* Schreb.). Such information is important in construction of mapping populations and targeting germplasm collection and its utilization. The objective of this study was to evaluate the genetic diversity among seven tall fescue accessions from diverse geographic origins. Tall fescue accessions were assayed by a fluorescence-labeled amplified fragment length polymorphism (AFLP) detection method using DNA samples bulked from each accession. On the basis of 105 AFLP markers from two primer combinations, the seven accessions were clustered in groups that largely supported the known origins of these plants. Fraydo and Lutine are genetically the most divergent; Tanit and Sisa are genetically very similar. Whereas Centurion has a very similar structure to the genotypes Flecha and endophyte-infected Flecha (E542), and a large genetic distance with Lutine although they have the same origin.

Keywords: AFLP, genetic diversity, *Festuca arundinacea,* germplasm

Salt stress resilience potential of *Trichoderma* spp. in maize crop

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SUMMARY

Sustainability of agricultural crop production using stress resistant and good quality crops is essential for feeding mankind which is struggling with constant population explosion and reduction of available clean water supplies. Non-organic commercial/chemicals has been developed in order protect crops. Since this type of chemicals may be risky for the food and/or water security due to the remaining pollution in the product after application, or by physical contact and accumulated toxins through the food web, agriculture have to use organic and environment safe products. Cost-effective and organic fungal plant growth promoting agents may be used for this purpose. Mycorrhizal *Trichoderma spp.* is one of the best candidates in agriculture for stress management caused by an extensive spectrum of abiotic environmental factors, specially including NaCl.

We isolated the fungal strain from the soil of tea plants. The strain was determined via 5.8S rDNA gene with internal transcribed spacer ITS-1 and ITS-2 regions. The target stain was named ID20G (TA). TA seed biopriming significantly increased the lengths, fresh and dry weights of root/shoots and decreased the lipid peroxidation. Maize seedlings bioprimed with TA had higher soluble protein and proline contents and losses of total chlorophyll, carotenoid, RWC and higher MDA levels are prevented under NaCl. Furthermore, SOD, GPX and GR activities were much more increased in root and leaves in TA primed seedlings, however CAT activity did not significantly change.

Identifying local biocontrol agents and understanding the mechanisms underlying the antagonistic effect of *Trichoderma spp.* on environmental stresses are important in creating effective and safe bio-control strategies especially in agro-economically important crops such as maize.

Key words: Salinity, *Trichoderma atroviride* ID20G, maize, seed biopriming, antioxidant machinery

Grouping of red clover genotypes based on parameters of chemical quality

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SUMMARY

Red clover breeding is usually directed at improving productive traits, but recently it is also oriented to the quality traits, including the content and the stability of proteins, content of soluble carbohydrates and digestibility of cell wall. The main part of the structural carbohydrates is found in the plant cell walls, and it is defined through the concept of fiber. The parameters ADF (acid detergent fiber) and NDF (neutral detergent fiber) represent fiber fractions that are only partially available to animals and which are indicators of the consumption and digestibility of the dry matter. The aim of this study was determination of the crude protein, ADF and NDF content for 46 red clover varieties and populations, classification of genotypes based on the estimated quality parameters and selection of the most promising genotypes for further breeding. On the basis of these three parameters, the analyzed red clover genotypes were clearly grouped into two clusters, while one cluster was without subclusters and the another one was composed of two subclusters. Classification of genotypes, as well as group composition based on the analysis of quality parameters, may be important for understanding the variability of genotypes at the quality level and for future breeding programs for quality improvement.

Key words: red clover, crude protein, acid detergent fiber, neutral detergent fiber, cluster analysis

Zahtjevi CPVO tehničkog protokola za DUS ispitivanje pšenice u postupku dodjeljivanja oplemenjivačkog prava u Europskoj zajednici

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SAŽETAK

Ispitivanje različitosti, ujednačenosti i postojanosti (DUS) novih sorti pšenice u postupku dodjeljivanja oplemenjivačkog prava u Europskoj zajednici uključuje ispitivanje u poljskim pokusima i laboratoriju, te se izvodi prema tehničkom protokolu Ureda za biljne sorte Europske zajednice (CPVO).

Referentnu kolekciju sorti u svrhu utvrđivanja različitosti sorti kandidata može činiti i živi materijal i opisne informacije. Sastav referentne kolekcije svakog Ureda za ispitivanje sorti ovisi o agro-klimatskim uvjetima u odnosu na lokaciju ispitivanja. Osnova referentne kolekcije treba biti sljedeća: sorte priznate ili zaštićene na razini EZ, sorte zaštićene u drugim zemljama članicama Međunarodne unije za zaštitu novih biljnih sorti (UPOV), druge opće poznate sorte, te u slučaju hibrida sve komponente hibridne sorte moraju biti dio referentne kolekcije.

Prema trenutno važećem protokolu CPVO-TP/003/4Rev.2, broj svojstava koji se koristi za DUS ispitivanje i pripremu opisa sorti je 25. Svojstva dobivena ispitivanjem elektroforezom trebaju biti samo nadopuna morfološkim svojstvima. U usporedbi sa prethodnim protokolom za DUS ispitivanje, definirani su standardi ujednačenosti za hibridne sorte kao i dopušteni broj atipova za ponovnu dostavu biljnog materijala za dalji nastavak DUS ispitivanja.

Ključne riječi: pšenica, DUS, ispitivanje, tehnički protokol, CPVO, oplemenjivačko pravo

Requirements of CPVO technical protocol for DUS testing of wheat in process of granting plant breeder's rights in European Union

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SUMMARY

Testing of distinctness, uniformity and stability (DUS) of new varieties of wheat for granting plant breeder's rights in the European Union includes testing in the experimental field and laboratory, and it is performed according to the technical protocol of the Community Plant Variety Office (CPVO).

The reference collection of varieties for the purposes of determining the distinctness of candidate varieties may contain both living material and descriptive information. The composition of the variety collection in each Examination Office depends on the agro-climatic conditions in relation to the location of the testing. The basis for variety collection should be the following: varieties listed or protected at EU level, the varieties protected in other member states of the International Union for the Protection of New Varieties of Plants (UPOV), other varieties of common knowledge, and in the case of hybrids, all components of hybrid varieties must be considered as part of the reference collection.

According to current technical protocol CPVO-TP/003/4Rev.2, the number of characteristics used for DUS testing and preparing the description of varieties is 25. Characteristics derived from electrophoresis should only be used only as a complement to the morphological characteristics. Compared to the previous technical protocol for DUS testing of wheat, the uniformity standards for hybrid varieties are defined as well as the allowed number of off-types for re-submission of plant material for further continuation of DUS tests.

Key words: wheat, DUS, testing, technical protocol, CPVO, plant breeder's rights

Genetska varijabilnost izoflavona u populacijama višegodišnjih krmnih leguminoza

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SAŽETAK

Lucerna i crvena djetelina sadrže izoflavone kao bioaktivne komponente. Izoflavoni pozitivno utječu na zdravlje ljudi, kao antioksidansi značajno sudjeluju u obrani biljaka od različitih abiotskih stresova, ali također mogu i štetno utjecati na reproduktivnu sposobnost nekih preživača. Ciljevi istraživanja su bili 1) odrediti sastav i udio izoflavona u populacijama lucerne i crvene djeteline, 2) procijeniti stupanj varijabilnosti izoflavona u populacijama kod obje vrste, 3) identificirati najzanimljivije populacije lucerne i crvene djeteline, koje će se koristiti u oplemenjivanju na poboljšanje kvalitete te razvoj nove germplazme specifične namjene. U istraživanje je bilo uključeno ukupno 49 populacija (20 lucerna, 29 crvena djetelina). Uzorci su prikupljeni iz populacija u poljskom pokusu tijekom dvije uzastopne godine kod lucerne (2014., 2015.), a kod crvene djeteline tijekom 2014. Za identifikaciju i kvantifikaciju izoflavona (daidzein, glicitein, genistein, kumestrol, kemferol, formononetin, biohanin A) korištena je HPLC metoda. Izoflavoni su ekstrahirani iz liofiliziranih i samljevenih listova leguminoza. Kod obje vrste su utvrđene značajne razlike između populacija u udjelu većine pojedinačnih te ukupnih izoflavona. Kod populacija lucerne udio ukupnih izoflavona se kretao od 1907-2701 µg/g suhe tvari (ST), a kod crvene djeteline od 6575-11847 µg/g ST. U populacijama lucerne najzastupljeniji je bio genistein (prosječno 688 µg/g ST; 29,5% od ukupne količine), a kod crvene djeteline formononetin (prosječno 5210 µg/g ST; 61,8% od ukupne količine). Kod obje vrste identificirano je nekoliko populacija visokog i niskog udjela izoflavona, koje će se koristiti u oplemenjivačke svrhe za razvoj nove germplazme specifične namjene za potrebe stočarstva i farmaceutske industrije.

Ključne riječi: lucerna, crvena djetelina, izoflavoni, varijabilnost, HPLC

Genetic variability of isoflavones in perennial forage legumes populations

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SUMMARY

Alfalfa and red clover contain isoflavones as bioactivne components. Isoflavones have a positive impact on human health, as well as antioxidants significantly contribute in the plants protection of various abiotic stresses, but they can adverse effects on the fertility of some ruminant animals. The objectives of the study were 1) to determine the component and content of isoflavones in alfalfa and red clover populations, 2) to estimate level variability of isoflavones in populations of both species, 3) to identify the most interesting populations of alfalfa and red clover to be used in breeding to improve quality and development of new germplasm for specific purposes. The study included a total of 49 populations (20 alfalfa, 29 red clover). The samples were collected from populations in a field experiment during two consecutive years for alfalfa (2014, 2015) and 2014 for red clover. HPLC method was used to identification and quantification of isoflavones (daidzein, glycetein, genistein, coumestrol, kaempferol, formononetin, biochanin A). Isoflavones were extracted from lyophilized and milled leaves of legumes. Significant differences between the populations in the content of most of the individual and total isoflavones were obtained in both species. The total content of isoflavones in alfalfa populations varied from 1907 to 2701 μg/g of dry matter (DM), and in red clover from 6575 to 11847 μg/g of DM. In alfalfa populations genistein was dominant (on average 688 μg/g of DM, 29.5% of the total amount), and formononetin (on average 5210 μg/g of DM, 61.8% of the total amount) in red clover populations. Several populations of high and low content of isoflavones have been identified in both species to be used in breeding purposes for the development of new germplasm for specific purpose in livestock and pharmaceutical industries.

Key words: alfalfa, red clover, isoflavones, variability, HPLC

Povrćarstvo, ukrasno, aromatično i ljekovito bilje

04

Vegetable growing, Ornamental, Aromatic and Medicinal Plants

Antioxidant activity and total phenolics of some *Hericium* spp.

Funda Atila

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ABSTRACT

Total phenolic contents and antioxidant capasity occurring in methanolic extracts of dried fruitbodies of eight *Hericium* isolates (six isolates of *Hericium erinaceus*, one isolate of *Hericium coralloides* and one isolate of *Hericium americanum*) have been evaluated by the Folin–Ciocalteau method and by Ferric Reducing Antioksidant Power (FRAP) method, respectively. Generally, the assayed isolates contained between 10.5 ±0.58 and 17.06±0.68 µmol TE antioxidant capability per gram of dried mushroom, while the total flavonoid content ranged between 230.8±1.3 and 326.9±1.1 mg GAE per 100 gram of dried matter. *Hericium erinaceus*-TA found to have the highest antioxidant activity. Total phenolic content of *Hericium coralloides* was the superior to the other isolates. On the other hand, the lowest antioxidant capability was determined in *Hericium erinaceus*-Denizli extract, whereas *Hericium americanum* the species gave lowest reading of total fenolic content. Positive correlations were found between total phenolic content in the mushroom extracts and their antioxidant activities. Based on the results obtained, methanolic extracts from these eight *Hericium* isolates effective in antioxidant properties.

Keywords: *Hericium erinaceus, Hericium coralloides, Hericium americanum*, antioxidant activity, total phenol content

Juniperus communis L., *Juniperus oxycedrus* and *Cupressaceae* their spread and values in Kosovo

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ABSTRACT

Juniperus communis L., *Cupressaceae*, *Juniperus oxycedrus* L., and *Primula veris* L., *Primulaceae*, are found in various regions of Kosovo, they are popular and valuable known medical plants in therapeutic aspect all over the world. In Kosovo *Juniperus communis* L., *Cupresaceae*, is found in hilly and mountainous regions in silicate fields, very rarely can be found in carbonate fields and in serpentine. *Juniperus communis* L., has a great deal of usage as: anti-inflammatory, antidiarrheal, astringent, antidiabetic, antilipidemic, antioxsidant, antimicrobial, antibacterial and antiseptic. Active substances for *Juniperus communis* L., are: acid melic, pyruvic, formic acid, juniperin mastic, etheric oils, tannin, sugars, α-pineni, β-pineni, apigenin, sabineni, β-sitosterol, campesterol, limonene, campesterol, cupressuflavone, flavonoid and many other ingredients.

Juniperus oxycedrus L., plant has a wide usage as: Carminative, emenagoge, sudorific and fruits has high healing values for human body with therapeutic effects as: antiseptic, diuretic, anti-diabetic, spasmolytic, antioxidants and anti-asthmatic. Substances biologically active in the leaves of *Juniperus oxicedrus* L., are etheric oils, flavonoids, lipids and carotenoids. The fruits contains flavonoid etheric oil which includes: luteolin, caempferol, quercetin and izoquercitrin, it also contains macro elements K, Ca, Mg, Na, and microelements Si, Fe, Al. They possess diuretic effects and anti-inflammatory, as well as high antibacterial and anti-microbial effects. Flavonoids from the leaves of *Juniperus oxycedrus* L., have anti-inflammatory effects, diuretic, fungicidal, antimicrobial and antibacterial.

Key words: *Juniperus communis* L., *Cupressaceae*, *Juniperus oxycedrus* L., microelements

Morphological characterization of bay laurel leaf in turkey: urla/çeşme peninsula

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ABSTRACT

Laurus nobilis L. native to Mediterranean regions is also known as sweet bay, bay laurel, Grecian laurel, true bay, and bay. Bay laurel has been used as a spice since antiquity, primarily because of its oil content of leaves and fruits. There is an increasing global demand to dried of bay laurel leaf. Many bay laurel areas, primarily in the Aegean region of Turkey, have been destroyed because of several factors: Therefore, new bay laurel areas should be established: New plantations should be formed by genotype(s) with superior characteristics. The present study was undertaken to examine leaf characteristics of natural laurel genotypes in Urla, İzmir/Turkey. One and two year's old leaves samples were taken in the middle of March, June, September and December from 49 different trees. Leaf size and thickness, leaf area and leaf color were determined.

As a result of study, average length and width of one year old leaves were found that ranged between 4,95 and 9,40 cm and 2,22 and 4,75 cm, respectively. Leaf areas of same leaves changed between 9,05 and 22,86 cm^2. Two years old leaves' average length, width and area were ranged between 5,43 and 9,26 cm, 2,35 and 6,22 cm; 11,28 and 21,18 cm^2 respectively. Thickness of one and two-year old leaves was changed 0,257-0,428 cm and 0,254-0,399 cm, respectively. In general length and width and area of one year old leaves were smaller than two year- old although one year old leaves were thicker. As a result of study there were found differences among bay laurel genotypes grown in Urla district of **Çeşme** peninsula.

Keywords: *Laurus nobilis L.,* Çeşme peninsula, Urla, leaf property, leaf color

Treatment of emulsion from natural products on fungal skin infection in dogs

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ABSTRACT

Fungal infection is frequently observed in dog skin disease among other causes by infection with bacteria or allergic reactions. To avoid risks of antifungal drug toxicity and environment pollution by antibiotics, herbal medicine is an alternative. This study investigated the effectiveness of natural product emulsion consisted of essential oil from galangal rhizome (*Alpinia galangal* L.*)* and rice bran oil (*Oryza sativa* L.) at the proportion of 5%+5% on dog skin fungal infection. Dogs clinically presented with skin lesion were recruited to the study. Emulsion was sprayed on the dog skin lesion once a day and carried on for 4 weeks. The skin lesions were evaluated by macroscopic and microscopic examinations using potassium hydroxide and lactophenol cotton blue staining. After the treatment, two-third of the skin lesions were improved or cured. Identification of microorganism species at the skin lesions revealed mixed infections, mainly fungi and yeasts. The cured lesions correlate well with fungal infections but not yeast infection. Therefore, further studies are warranted for the improvement of treatment effectiveness in the dog skin diseases using natural products.

Keywords: natural product, infection, dog skin, oil *Oryza sativa*

Percepcije i stavovi građana o primjeni i održavanju cvjetnih vrsta na terasama i balkonima Knina

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SAŽETAK

Od uvijek je poznato kako se uređenju terasa i balkona poklanjala velika pažnja, ali prije svega i znanje o pojedinim vrstama cvijeća, kako ih uzgajati, njegovati i održavati. Njega o cvjetnim lončanicama ovisi o mjestu na kojem se uzgajaju, supstratu te vremenskim uvjetima koji djeluju na njihov rast i razvoj. Biljke koje se uzgajaju na balkonima i terasama najčešće dolaze iz Sredozemlja, tropskih ili suptropskih područja. Grad Knin ima submediteransku klimu, koju karakteriziraju duge zime s velikom količinom kiše te vruća ljeta s malo oborina. Cilj rada je bio istražiti percepciju nabave, uporabe, primjene i održavanja cvjetnih vrsta na balkonima i terasama grada Knina metodom anketnog istraživanja. Istraživanje je provedeno tijekom mjeseca lipnja 2016. godine. Na temelju anketnog istraživanja provedenog na građanima Knina i okolice utvrđeni su njihovi stavovi i mišljenja o nabavi, uporabi i primjeni cvjetnih lončanica na terasama i balkonima. Građani su ocjenom vrlo dobar (4,37) među ostalim ocijenili važnost dekoriranja balkona ili terasa cvjetnim lončanicama kako bi se unaprijedila ukupna estetska slika grada. 47,5 % građana grada Knina navodi kako za ukrašavanje svojih balkona i terasa koristi kombinaciju trajnica, jedno i dvogodišnjih cvjetnih vrsta te lukovičastih vrsta. Boravak na balkonu ili terasi ukrašenim cvjetnim lončanicama kao zamjenu za boravak u prirodi ocijenili su ocjenom 4,12. Najmanje preferiraju uporabu cvjetnih lončanica u visećim žardinjerama (3,42).

Ključne riječi: cvjetne lončanice, ekološke i uzgojne mjere, balkoni i terase, anketno istraživanje, Knin.

The perception and opinions of citizens regarding the application and maintenance of floral species on terraces and balconies of the city of Knin

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SUMMARY

The arrangement of terraces and balconies has always been a topic of great interest, but first and foremost,much regard was taken regarding the growth, care and maintenance of various species of flowers. The care of potted plants depends on the place where they are grown, the substrate and weather conditions which affect their growth and development. Plants cultivated on balconies and terraces most often are of Mediterranean, tropic or subtropic origin. The city of Knin enjoys a submediterranean climate, characterised by long winters with large amounts of rain and hot summers with very little percipitation. The aim of the paper was to investigate the perception of acquisition, usage, application and maintenance of floral species on the balconies and terraces of the city of Knin using the method of survey research. The research was undertaken during the month of June in 2016. Survey research conducted on the citizens of Knin and its surrounding areas revealed the citizens' views and opinions regarding the acquisiton, usage and application of flowering potted plants on terraces and balconies. The citizens judged as 'very good' (grade 4,37) the importance of the decoration of balconies or terraces with flower pots in the effort to enhance the aestethic image of the city. 47,5% of the citizens of Knin stated that they use a combination of perennial, annual and biennial floral species as well as bulbuos plant species. Staying at balconies or terraces decorated with flowering pot plants as substitution for nature sojourns was judged by citizens with a grade of 4,12. The least preferred method of decoration was the use of flowering pot plants in hanging flower boxes (graded 3,42).

Key words: flowering pot plants, ecological and breeding measures, balconies and terraces, survey research, Knin.

Green coulered shade nets effects on soil water content and plant root distributions on tomato cultivars

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ABSTRACT

Netting is frequently used to protect agricultural crops from excessive solar radiation, environmental hazards, or pests (bird, or insect-proof nets). It is either applied by itself over net-house constructions, or combined with greenhouse tecnologies. In Turkey, Black and green coloured nets were commonly used for shading from Spring to Autumn. The aim of the present study was to study the influence of four shade factors (95%, 75%, 55% and 40%) of green shade netting on soil water content and plant root distributions (mg dry root per cm^3 of soil) in two different tomato cultivars: Industrial ankon and Beef tomato. In irrigation, amount of irrigation water were calculated by using the measurements taken from Class-A Evaporation Pan located outside. The plant-root zone soil water status was monitored by PR2 profile probe device and readings were checked gravimetrically fifteen days interval.

Keywords: shade net, solar radiation, tomato, soil water content, root distribution

Utjecaj supstrata na rast i razvoj bosiljka (*Ocimum basilicum* L.)

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SAŽETAK

Bosiljak (*Ocimum basilicum* L.) je jednogodišnja zeljasta biljka iz porodice *Lamiaceae*. Visine je do 80 cm, dobro razvijenog korijenovog sustava, uspravne i zeljaste stabljike. U uzgoju zahtijeva dosta vlage i osjetljiv je na niske temperature. Cvijeta od početka lipnja do kraja kolovoza bijele do svijetloružičaste boje. Razmnožava se direktnom sjetvom i presadnicama. Koristi se u kulinarstvu, prehrambenoj industriji i farmaciji. Veliku važnost u proizvodnji kvalitetnih presadnica ima odabir supstrata određenih fizikalnih i kemijskih svojstava. Također, u uzgoju je bitno da supstrat sadrži dovoljno vlage i odgovarajućih hranjiva. Cilj ovog istraživanja je ispitati utjecaj pet različitih supstrata na rast i razvoj bosiljka. Za sjetvu je korišteno sjeme bosiljka Bazilika. Sjetva je obavljena u polistirenski kontejener od 60 sjetvenih mjesta dimenzija 532 x 323 x 60 mm u supstrat Klasmann. Biljke su presađene u lonce promjera 10 cm u pet različitih supstrata: Klasmann TS 1, Klasmnn TS 2, Klasmann TS 3, Potgrond P i Potgrond H. Tijekom istraživanja provedena su mjerenja visine biljaka, promjera biljaka i broja listova u pet termina. Istraživanjem je utvrđeno da su najbolji rezultati ostvareni kod biljaka uzgojenih u supstratu TS 2.

Ključne riječi: bosiljak (*Ocimum basilicum* L.), supstrati, rast i razvoj

Impact of Substrate on Growth and Development of Basil (*Ocimum basilicum* L.)

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SUMMARY

Basil is an annual herbaceous plant from *Lamiaceae* family. Its height goes as high as 80 cm, it has a well developed root system, straight, vertical stem and flowers which may vary from white to light-pink colour. It is not highly resistant to low temperatures and it flowers from the beginning of June until the end of August. It needs a lot of moisture. The basil reproduces by direct sowing and by seedlings. It is used in cookery, food industry, pharmacy and folk medicine. The substrates play an important role in the production of quality plants. When choosing a substrate it is important to pay attention to both its physical and chemical properties. A quality substrate should be moist enough and contain certain amount of suitable nutritious elements. In this research, 5 different substrates' impact on growth and development of basil was tested. „Basilica" seed was used for sowing, along with „Klasmann" substrate. The sowing was done into a polystyrene containter with 60 sow-places of 532x323x60 mm dimensions. The plants were then transplanted into pots with 10 cm diameter and 5 different substrates were used: Klasmann TS 1, Klasmnn TS 2, Klasmann TS 3, Potgrond P and Potgrond H. During the research, the height of the plants, their diameter and number of leaves were measured in five consecutive measurements. The research determined that the best results were acheived by using the „TS 2" substrate.

Key words: Basil (*Ocimum basilicum* L.), Substrates, Growth and Development

Proizvodnja sjemena blitve u Republici Hrvatskoj u zadnjih 15 godina

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SAŽETAK

Hrvatska ima vrlo povoljne agoekološke uvjete za proizvodnju kvalitetnog sjemena blitve. Blitva uz grašak i grah ima najveći značaj u proizvodnji sjemena povrća u Hrvatskoj. Sjeme blitve najviše se proizvodi u sjeverozapadnoj Hrvatskoj u Podravini. Sjeme blitve se izvozi u Italiju i Sloveniju, a također se pakirano sjeme uvozi i distribuira po Hrvatskoj. Ukupna proizvodnja sjemena blitve u razdoblju od 15 godina od 2002. do 2016. godine iznosila je 330 t, što prosječno iznosi 22 t godišnje. Sjemenaka blitva se u Hrvatskoj proizvodi na prosječnoj površini od 11,83 ha godišnje. Ovisno o agroklimatskim prilikama, prosječni prinosi sjemena blitve varirali su od 978 kg/ha 2003. godine, do 2355 kg/ha 2002. godine. U promatranom razdoblju prosječni prinos sjemena blitve u Republici Hrvatskoj iznosio je 1857 kg/ha. Hrvatska može proizvesti dovoljne količine kvalitetnog sjemana blitve i za vlastite potrebe i za izvoz.

Ključne riječi: sjeme, *Beta vulgaris var. cycla,* blitva, proizvodnja sjemena, prinos sjemena,

Swiss chard seed production in Croatia in last 15 years

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SUMMARY

Croatia has remarkably convenient agro ecological conditions for production of a high-grade swiss chard seed. Along with pea and common bean, swiss chard has significant importance in vegetable seed production in Croatia. Swiss chard seed is mainly produced in north-western Croatia, in region Podravina. It is exported to Italy and Slovenia, but is also imported and distributed as packed seed throughout Croatia. Total production of a swiss chard seed in the last 15 years, in period 2002.-2016., was 330 t what is 22 t on an average annually. In Croatia, swiss chard seed is produced on an average area of 11.83 ha annually. Depending on agro-climatic conditions, average production of swiss chard seed fluctuated from 978 kg/ha in 2003. to 2355 kg/ha in 2002. In observed period of time, average contribution of swiss chard seed in Croatia was 1857 kg/ha. Croatia could produce sufficient amount of high-grade swiss chard seed for export while filling her own needs.

Key words: seed, *Beta vulgaris var. cycla,* swiss chard, seed production, yield seed

Utjecaj statusa hraniva u tlu i biljci na arhitekturu korijenovog sustava travnog busena

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SAŽETAK

U proizvodnji travnog busena za izgradnju travnjaka važno je, pored zelene boje, osigurati dobro razgranat korijenov sustav kako u rezanju, transportu i polaganju na drugo mjesto ne bi došlo do pucanja trake travnog busena. Na navedeno utječe status hraniva pa je, stoga, cilj istraživanja bio utvrditi utjecaj različitih oblika i količina mineralnih gnojiva na status hraniva u tlu i biljci, kao i na parametre arhitekture korijenovog sustava travnog busena, a time i na što raniju mogućnost rezanja i presađivanja na drugo mjesto. Poljski pokus (2014. i 2015.) proveden je na pokusnom poligonu za proizvodnju travnog busena-tepiha u tvrtki 'Hortikultura Ćustić' s tri gnojidbena tretmana: T1 (standardno mineralno gnojivo: 100 kg ha^{-1} NPK 10-20-30 (studeni 2014.); 200 kg ha^{-1} NPK 15-15-15 (ožujak 2015.); 100 kg ha^{-1} KANa i 100 kg ha^{-1} uree (travanj i lipanj 2015.)), T2 (standardno mineralno gnojivo: 1000 kg ha^{-1} NPK 10-20-30 (studeni 2014.); 100 kg ha^{-1} NPK 15-15-15 (ožujak 2015.)) i T3 (sporootpuštajuće mineralno gnojivo s produženim djelovanjem: 350 kg ha^{-1} New grass NPK 20-20-8 (studeni 2014. i ožujak 2015.)). Utvrđeno je povećanje količine P i K u tlu, te povećanje količine P u listu travnog busena u T2 i T3 tretmanu što je bitno za razvoj korijena. Utvrđen je i trend povećanja parametara arhitekture korijenovog sustava tijekom vegetacije u T2, a osobito u T3 tretmanu. Zaključuje se da je sporotpuštajuće gnojivo pozitivno djelovalo na arhitekturu korijena, ali i na status hraniva u tlu i lišću travnog busena.

Ključne riječi: duljina korijena, makroelementi, sporootpuštajuće mineralno gnojivo, travnjak

The effect of the nutrients' status in soil and plant on the root system architecture of turfgrass

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SUMMARY

In the turfgrass production for the construction of the lawn is important, in addition to green color, to secure well-branched root system in order to prevent cracking of turfgrass stripes during the cutting, transport and transplantation on the another place. On above mentioned affect the nutrients' status and, therefore, the aim of this investigation was to determine the effect of different forms and amounts of mineral fertilizers on the nutrients' status in the soil and plant, as well as on the parameters of the turfgrass root system architecture, and thus the possibility of earlier cutting and transplantation on the another place. Field trial (2014 and 2015) was conducted on experimental field site for the turfgrass production at the company 'Hortikultura Ćustić' with three fertilizer treatments: T1 (standard fertilizer: 100 kg ha^{-1} NPK 10-20-30 (November 2014), 200 kg ha^{-1} NPK 15-15-15 (March 2015), 100 kg ha^{-1} KAN and 100 kg ha^{-1} of UREA (April and June 2015)), T2 (standard fertilizer: 1000 kg ha^{-1} NPK 10-20-30 (November 2014), 100 kg ha^{-1} NPK 15-15-15 (March 2015)) and T3 (slow-release mineral fertilizer with prolonged action: 350 kg ha^{-1} New grass NPK 20-20-8 (November 2014 and March 2015)). It was determined the increase of P and K content in the soil, and the increase of P content in the turfgrass leaves in T2 and T3 treatment which is essential for root development. Also, it was determined the increasing trend of the parameters of root system architecture during the growing season in T2 and especially in T3 treatment. It can be concluded that the slow-release fertilizer positively affected the root system architecture and as well as the status of nutrients in the soil and the leaves of turfgrass.

Key words: macroelements, lawn, root length, slow-release mineral fertilizer

The phytochemical screening and determination of antioxidant activity and phenol content in extracts of selected plant species

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SUMMARY

Medical plants are traditionally used for curing of various diseases trough history and large number of modern medicines has been isolated from natural sources. The protective role of plants against many chronic diseases, including cancer and cardiovascular disease, is reflected in the presence of different phytochemicals that have antioxidant properties. The present study involves seven different medicinal plants *Paliarus spina-christi* L., *Mentha piperita* L., *Melissa officinalis* L., *Thymus serpyllum* L., *Salvia officinalis* L., *Urtica diolica* L. and *Achillea millefolium* L. locally available in Herzegovina region. Determination of antioxidant activity was performed using DPPH and FRAP method. It was observed that the plant species *Mentha piperita* L. and *Melissa officinalis* L. showed the highest antioxidant activity. Aqueous, ethanol and methanol extract of leaf samples were used for the preliminary screening of phytochemicals and their detection in order to relate their presence with bioactivities of the plants. The results of the phytochemical analysis of these medicinal plants showed that the terpenoids, phlobatannins, reducing sugar, flavonoids and alkaloids were found to be present in afore mentioned medicinal plants. As phenolic compounds are one of the most important groups of natural antioxidants in the plants, we determined total phenolic contents spectrophotometrically. Phenolic constituents were also determined using HPLC. There was a strong correlation between antioxidant activity and total phenolic contents, and the results indicate that this plant species can serve as an important source of phenols and phenolic acids for medical purposes, but also as a source of antioxidants for use in food.

Key words: medicinal plants, phytochemicals screening, antioxidant activity, phenolic compounds

Timokinon u ulju crnog kima

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SAŽETAK

Dodaci prehrani zauzeli su visoko mjesto u trendu samoliječenja. Biljni dodaci prehrani daju potrošaču vjeru da konzumira prirodne proizvode. Konzumacija ulja sjemenki crnog kima je već tradicionalno zastupljena u cijelom svijetu, i to u narodnoj medicini kao prikladnog za prevenciju ali i kao pomoć protiv različitih stanja organizma. Dobiva se hladnim prešanjem sjemenki crnoga kima (*Nigella sativa* L). Prema kemijskom sastavu, od svih sastavnica, najznačajniji je udio masnog ulja koje sadrži 0,4-2,5% biološki aktivnog eteričnog ulja. Timokinon je jedan od najzastupljenijih kinonskih derivata eteričnog ulja crnog kima, te farmakološki je najdjelotvornijeg utjecaja na organizam potrošača. Udio timokinona u ulju određuje se metodom tekućinske kromatografije visokog učinka nakon ekstrakcije na čvrstoj fazi. Upravo ta metoda je korištena prilikom istraživanja i analize 18 proizvoda s tržišta Republike Hrvatske. Deklaracije isključivo sadrže količine samog ulja u preporučenoj dnevnoj dozi, tako da se dobiveni rezultati ne mogu direktno usporediti s navodima na deklaraciji, već samo sa literaturnim podacima o udjelu timokinona (raspon 0,1-2,5%). Analizom u Hrvatskom zavodu za javno zdravstvo i dobivenim rasponom timokinona od 0,1% do 1,58%, može se zaključiti da su proizvodi s tržišta Republike Hrvatske farmakološki visokovrijedni, no smatramo da bi se trebao navoditi udio timokinona na deklaraciji proizvoda.

Ključne riječi: ulje sjemenki crnog kima, kemijski sastav, sadržaj timokinona, SPE HPLC analiza, tržište RH

Thymoquinone in black cumin oli

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ABSTRACT

Food supplements poses high place in the self-healing trend. Herbal supplements provide the consumer belief that consuming natural products. Consumption of black cumin oil seeds is traditionally represent all over the world, as suitable for prevention as well as help against the various states of the organism. Oil is producing by cold pressing the seeds of black cumin (*Nigella sativa* L). According to the chemical composition of all components, the most significant proportion is of fatty oil, which contains 0.4-2.5% of biologically active essential oils. Thymoquinone (TQ) is one of the most present quinone derivatives of essential oil of black cumin, and has pharmacologically the most effective influence on the body of consumers. Quantity of the oil is determining by the method of high performance liquid chromatography (HPLC) after solid phase extraction. That method was used during the research and analysis of the 18 products within the Croatian market. On the label of product written is only the amount of oil in the recommended daily dose. That is why the results from analyses cannot be directly compared with the information in the declaration, but only with the literature data on the proportion of TQ (range 0.1 to 2.5%). According the analysis provided in the Croatian Institute for Public Health and TQ range of 0.1% to 1.58%, it can be concluded that the products from the Croatian market have pharmacological high-quality, but we think that quantity of TQ should be named on the label.

Keywords: black cumin seed oil, chemical composition, thymoquinone content, SPE HPLC analysis, market

Intezitet zaraze (atraktivnost) različitih vrsta povrća i začinskog bilja štitastim moljcem *Trialeurodes vaporariorum* (Hem. Aleyrodidae)

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SAŽETAK

Štitasti moljac *Trialeurodes vaporariorum* (Westwood 1856) je polifagni štetnik, a različite biljke hraniteljice mu nisu jednako atraktivne. Cilj istraživanja je bio ustanoviti intezitet zaraze povrća (bamija, dinja, grah, paprika, patlidžan i rajčica) i začinskog bilja (korijander, crveni i zeleni bosiljak) s *T. vaporariorum*, kao osnovu za razvoj *trap cropping* metode za suzbijanje ovog štetnika. Pokus je postavljen u vegetacijskoj sezoni ljeto - jesen 2016., u hidroponskom uzgoju.

Umjetna zaraza s *T. vaporariorum* je obavljena 18. rujna. Brojnost odraslih oblika po biljci je određena 1, 3 i 5 dana nakon zaraze (DNZ), a broj broj jaja po biljci 8 DNZ. Broj odraslih jedinki *T. vaporariorum* bio je manji na začinskom bilju nego na povrću. Patlidžan je kroz sva tri uzorkovanja privlačio veći broj odraslih oblika od bamije, dinje, paprike, rajčice i začinskog bilja. Grah se nije značajno razlikovao, po broju odraslih kukaca od patlidžana, a po atraktivnosti slijedi bamija. Najmanji broj jaja po biljci imao je korijander a najveći bamija. Broj jaja po biljci kod bamije bio je veći u odnosu na patlidžan, papriku, rajčicu, dinju i začinsko bilje. Značajne razlike u broju položenih jaja između graha i bamije nije bilo.

Grah, bamija i patlidžan su atraktivniji domaćini *T. vaporariorum* od ostalih biljnih vrsta u istraživanju. Stoga ove biljke imaju izražen potencijal, kao lovne biljke, za budući razvoj tehnike *trap cropping* u zaštiti rajčice od *T. vaporariorum*.

Ključne riječi: populacija, *Trialeurodes vaporariorum*, povrće, začinsko bilje

An infestation rate of *Trialeurodes vaporariorum* (Hem. Aleyrodidae) on different vegetables and herbs

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SUMMARY

Whitefly *Trialeurodes vaporariorum* (Westwood, 1856) is a polyphagous pest although it does not equally prefers different hosts. The aim of the study was to record the infestation rate of *T. vaporariorum* on vegetables (okra, melon, pea, pepper, eggplant and tomato) and herbs (coriander, red and green basil) as the basis for development of trap cropping method for the pest control. The experiment was conducted in a hydroponic system during the summer-autumn season of 2016.

The artificial infection with *T. vaporariorum* was done on 18 September. Assessments of adult number per plant were conducted 1, 3 and 5 days after infestation (DAI) while egg number per plant was recorded at 8 DAI.

Number of *T. vaporariorum* adult individuals was lower on herbs than on vegetables. Eggplant attracted a larger number of adult forms than okra, melon, pepper, tomato and herbs at three sampling. Related to host attractiveness, bean did not significantly differ from the eggplant, followed by okra. The lowest number of eggs was recorded on coriander while okra was the most attractive host for oviposition. Egg number on okra was higher compared to eggplant, pepper, tomato, melon and herbs, whereas there was no difference between pea and okra.

Pea, okra and eggplant were more attractive hosts to *T. vaporariorum* than other assessed plant species. These plants have significant potential as a trap plants for further developing of trap cropping technique in management of *T. vaporariorum* within tomato crops.

Key words: population, *Trialeurodes vaporariorum*, vegetables, herbs

Promjene gospodarskih svojstava, sadržaja polifenolnih spojeva i genetske strukture čuvane sorte Varaždinski kupus tijekom zadnjih pedeset godina

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SAŽETAK

Varaždinski kupus jedna je od najpoznatijih i ekonomski najznačajnijih hrvatskih tradicijskih sorti povrća. Najvjerojatnije je nastao spontanim križanjima lokalnih ekopopulacija kupusa i njemačkih sorti Amager i Brauschweiger koje su se na širem području Varaždina počele uzgajati neposredno nakon Prvog svjetskog rata. Prva je hrvatska sorta povrća čije je sjeme još 1959. godine deponirano u jednoj stranoj banci biljnih gena, te prva čuvana sorta upisana na Sortnu listu Republike Hrvatske. Prosječna masa tehnološki zrelih glavica najranije deponiranog sjeme pokazuje trend smanjenje i najmanja je bila kod komercijalnog sjemena, 1.810 g uz najveće variranje unutar populacije od 37%. Zahvaljujući većem postotku tehnološki zrelih glavica u berbi u odnosu na ukupan broj biljaka kod kasnijih generacija prinos je bio dosta ujednačen i u odnosu na najranije deponirano sjeme pokazuje blagi trend povećanja. Prinos tehnološki zrelih glavica najranije deponiranog sjeme od preko 44 t/ha ukazuje na njegovu visoku gospodarsku vrijednost. Sadržaj ukupnih polifenola ovojnih listova glavica kod svih uzoraka bio je dosta ujednačen s blago izraženim trendom smanjenja u kasnijim generacijama. Nešto niži sadržaj flavonoida i fenolnih kiselina utvrđen je kod uzorka sjemena deponiranog 1999. godine što je uvjetovalo i njegov nešto niži antioksidacijski kapacitet. Genetskim analizama provedenih AFLP molekularnim markerima s četiri kombinacije polimorfnih početnica utvrđena je statistički značajna razlika između najranije deponiranog sjemena i ostalih uzoraka koji se genetski međusobno nisu značajno razlikovali.

Provedenim je istraživanjima utvrđeno da unatoč određenih promjena u genetskoj strukturi kod Varaždinskog kupusa tijekom pedesetak godina nije došlo do značajnijih promjena u gospodarskim i fitokemijskim svojstvima.

Ključne riječi: kupus, sorta Varaždinski kupus, gospodarska svojstva, fitokemijska vrijednost, genetska struktura

Changes in agronomic traits, polyphenol content and genetic structure of conservation cabbage variety Varaždinski kupus during the last fifty years

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SUMMARY

Varaždinski kupus is one of the most known and economically the most important Croatian traditional vegetable variety. It has probably originated in spontaneous crossing between local cabbage eco-populations and German varieties Amager and Brauschweiger that were grown in Varaždin area immediately after the First World War. It is the first Croatian vegetable variety whose seed was deposited in foreign plant gene bank since 1959, and the first variety registered in Croatian Variety List as conservation variety. The average weight of technically ripe heads showed the downward trends in the plants from the earliest deposed seeds to the recent generation. Lowest value of 1.810 g was observed for samples from commercial seed, which had the largest variation of head weight in population, that was 37%. Due to the higher percentage of technologically ripe heads during harvest time compared to the total number of plants with later generations, yield was quite uniform and with respect to the earliest deposited seed showed a slight upward trend. High yield of technologically ripe heads grown from earliest deposited seeds of over 44 t/ha indicated a high agronomic value of the variety. The content of total polyphenols in leaves in all samples was quite uniform with slight downward trend in later generations. Slightly lower content of flavonoids and phenolic acids were found in the sample originated from seeds deposited in 1999 which caused his slightly lower antioxidant capacity. Genetic analysis using AFLP molecular markers with four polymorphic primers combinations showed differences between samples grown from earliest deposited seeds while other samples did not show statistically significant differences.

The results have shown that despite certain changes in the genetic structure accumulated through fifty years, there were no significant changes in the agronomic and phytochemical traits in the white cabbage var. Varaždinski kupus.

Key words: cabbage, variety Varaždinski kupus, agronomic traits, phytochemical value, gene structure

The possibility of the peat replacing with vermicompost in a container production of organic tomato seedlings (*Lycopersicon esculentum Mill.)*

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ABSTRACT

Because of the growing concern for environmental conservation, replacement of peat with other organic materials is a growing requirement in a container production of vegetable seedlings. A particular challenge is organic farming, where the use of fertilizers and supplements, which could replace the use of peat, has been further limited.

The study included analysis of four substrates with different amounts of vermicomposts (100%, 85%, 60% i 0%) and garden soil, as well as a commercial substrat that is a mixture of peat and nutrients. The influence of the substrate on the tomatoes quality: the speed and performance of germination, length and mass of above-ground parts of seedlings, length of epicotyl, hypocotyl length and root mass were studied.

The research of listed parameters, showed that the best results have been achieved with a substrate consisting of 60% vermicopmost and 40% garden soil.

Keywords: tomato, seedlings, vermicompost, substrate

Regeneration of chickpea (*Cicer arietinum* L.) plant from embryogenic and stem calli: a novel source to select fungal resistant plantlets

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ABSTRACT

The results indicate that the addition of $CaCl_2$ to the water- soaked chickpea seeds facilitated the separation of seed coats and cotyledons. This is help to excise embryos easily. Each of embryogenic and stem calli was produced on the same induction medium MS+2.0 mgL^{-1} benzyl adenine (BA) and naphthalene acetic acid (NAA). Stems elongation of regenerated shoots successed on MS provided with 2.0 mgL^{-1} BA in the presence of 3.0 mgL^{-1} GA. Both types of shoots behaved similarly in rooting medium consisted of MS supplied with 2.0 mgL^{-1} of indole butyric acid (IBA).Chickpea plantlets were adapted and survive for a week in soil-peat-moss mixture then they died.

Key word: *Cicer arietinum* L, Regeneration, fungal resistant plantlets

Effects of LED light on the growth and secondary metabolite production in Catharanthus roseus medicinal plants

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ABSTRACT

Catharanthus roseus G. Don is an important medicinal plant which accumulates pharmacologically important terpenoid indole alkaloids (TIA). TIA of *C. roseus* includes more than 130 substances. Ajmalicine and serpentine are used for arterial hypertension treatment. Vinblastine and vincristine are well known as antineoplastic drugs used in chemotherapy of cancer diseases.

Light-Emitting Diodes (LEDs) are modern sources of energy allowing production of the light wavelengths corresponding to the absorption peaks of plants photosynthesis and photomorphogenesis. LEDs unique spectra could stimulate vegetative growth, flower or fruits formation etc. Influence of different LED light regimes on the growth and biosynthesis processes in *C. roseus* was studied.

Our results have demonstrated that some LEDs light regimes strongly stimulated *C. roseus* growth and biomass production. fullerene-arginine were shown to regulate seeds germination, seedlings growth, and water transport. We found different effects of LEDs light regimes fullerene derivatives on TIA and phenolic compounds accumulations in plant tissues. The influence of LEDs light regimes on ajmalicine, vinblastine and vincristine compounds content in different organs of C. roseus plants were also studied. The LEDs light regimes stimulating of TIA production were determinated. It was observed that phenolic and antiradical scavenging compounds content in barley seedlings could be reduced in presence of fullerenol or fullerene-arginine. Physiological and biochemical effects of fullerene derivatives were depended on their concentration as well as temperature and light conditions of plant growth.The results of this work can be used in the creation of techniques for optimization of ornamental and medicinal plants cultivation.

Keywords: *Catharanthus roseus*, LED, Terpenoid Indole Alkaloids (TIA)

Ljekovita svojstva medicinskog kanabisa (*Cannabis indica* var. Bedica)

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SAŽETAK

Rod *Cannabis* se na osnovi razvitka i oblika sjemenke, perioda rasta i cvjetanja klasificira u tri vrste – *sativa*, *indica* i *ruderalis*. Medicinski kanabis je termin koji se upotrebljava za vrste koje sadrže THC i poseban omjer drugih kanabinoida u svrhu liječenja pacijenata. Liječnici ga prepisuju na osnovi Pravilnika međunarodnog udruženje za proučavanje boli (IASP), koje ima svoju podružnicu u Republici Hrvatskoj, Hrvatsko društvo za liječenje boli (HDLB). Istraživanje ljekovitih svojstava rađeno je na Institutu za biologiju u Leidenu, Nizozemska. Cvjetovi biljaka ovog roda sadržavaju tetrahidrokanabinol, poznat kao THC, Δ9THC, Δ9-tetrahidrokanabinol (delta-9-tetrahidrokanabinol) ili dronabinol koji je ujedno i najpoznatiji kanabinoid pronađen u biljci te kanabinoid kanabidiol poznatiji kao CBD koji je zaslužan za sedativne učinke. Cvjetovi biljaka također sadrže i kanabigerolnu kiselinu (CBGA) koja ima protuupalne učinke u organizmu i CBCA kanabikromeničnu kiselinu koja bi po svojim svojstvima razaranja nekrotičnih stanica mogla biti jedna od glavnih komponenti (potrebna daljnja istraživanja) u proizvodnji tinkture (ulja) od biljaka roda *Cannabis*. Osim kanabinoida, u biljkama je do sada identificirano preko 120 terpenoida od koji svi pokazuju biološku aktivnost i daju specifičan miris biljkama. Ljekovita svojstva komponenti koje su praćena u kliničkim ispitivanjima uključuje multiplu sklerozu, ozljede leđne moždine), mučninu i povraćanje (koje se mogu pojaviti zbog kemoterapije, radioterapije, HIV), kronična bol (osobito neurogene boli) , Tourette sindrom i palijativno liječenje raka i AIDS-a.

Ključne riječi: Ljekovita svojstva, *Cannabis indica* var. Bedica, liječenje boli

Medicinal properties of cannabis (*Cannabis indica* var. Bedica)

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SUMMARY

Cannabis sp. plants are classified in three species based on their development, shape of seeds and a period of growth and flowering - *sativa*, *indica* i *ruderalis*. Medical cannabis is a term used for those species that contain THC and special ratio of cannabinoids to treat patients. Doctors prescribe it on the basis of the rules of the International Association for the Study of Pain (IASP), which has a branch in the Republic of Croatia, Croatian Society for the treatment of pain (HDLB). The study of medicinal properties has been done at the Institute of Biology in Leiden, Netherlands. The flowers of plants of the genus contain tetrahydrocannabinol, known as THC, Δ9THC, Δ9-tetrahydrocannabinol or dronabinol, which is also the best known cannabinoid found in the plant and the cannabinoids cannabidiol known as CBD, which is responsible for sedative effects. The flowers of plants also contain kanabigerolnu acid (CBGA), which has anti-inflammatory effects in the body and CBCA acid that by its properties of destruction necrotic cells could be one of the main components (further research needed) in the production of tinctures (oil) of plants of the *Cannabis* genus. In addition to cannabinoid, in plants has been identified over 120 terpenoids which all exhibit biological activity and give a specific smell of plants. The medicinal properties of these components have been proven in clinical trials for disorders involving spasticity and pain (multiple sclerosis, spinal cord injury), nausea and vomiting (which can occur due to chemotherapy, radiotherapy, HIV), chronic pain (especially neurogenic pain), Tourette's syndrome and palliative treatment of cancer and AIDS.

Key words: medicinal properties, *Cannabis indica* var. Bedica, pain treatment

Harvesting time affects yield and chemical composition of *Cichorium spinosum* L.

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ABSTRACT

In the present study, the effect of the number of harvests on yield and chemical composition of *Cichorium spinosum* L. plants was examined. Seeds of were sown in seed trays containing peat and young seedlings were transplanted in 2L pots containing peat and perlite (1:1 v/v). Plants were harvested two or three times during the growing period, while control plants (no prior harvests) were also harvested at the same time. Rosette diameter, number of leaves, SPAD index, and fresh and dry weight were recorded at harvest, while chemical composition of leaves was also assessed (fatty-acids, sugars, organic acids, and tocopherols content). Regardless of the number of harvests, total fresh weight and number of leaves were higher comparing to control plants, whereas dry weight and rosette diameter were higher in control plants. SPAD index was mostly affected by harvesting time (growth stage) and decreased during the growing season. Significant differences were also observed in chemical composition of the aerial parts of plants in relation to the number of harvests, with control treatment for the third cutting having the higher content in sugars, organic acids, saturated and monounsaturated fatty acids, and 1st cutting showed the best results for tocopherols. In conclusion, successive harvests (two or three harvests) increased total yield of *C. spinosum* plants, comparing to control plants, whereas they had a negative effect on sugar, organic and fatty acids content.

Keywords: *Cichorium spinosum* L., harvesting time, organic acids, sugars, tocopherols

Trajnice kao činitelj smanjenja troškova zasnivanja i održavanja cvjetnih gredica zagrebačke Zelene potkove

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SAŽETAK

Većinu cvjetnih gredica na javnim zelenim površinama sačinjavaju sezonske cvjetne vrste (jednogodišnje i dvogodišnje). Ovo istraživanje provedeno je kako bi se utvrdila mogućnost uvođenja trajnica u cvjetne gredice zagrebačke Zelene potkove s ciljem unošenja dinamike u javni prostor te s pretpostavkom pozitivnog utjecaja na smanjenje troškova zasnivanja i održavanja cvjetnih gredica. Pri odabiru trajnica u obzir su uzete slijedeće varijable: ekološki uvjeti, funkcionalnost, estetski kriteriji, ekonomičnost i *genius loci*. Izrađen je komparativni troškovnik u slučaju sadnje jednogodišnjih i dvogodišnjih cvjetnih vrsta te trajnica na uzorku cvjetnih gredica na Trgu Kralja Tomislava. Razlike u troškovima sadnje sezonskih cvjetnih vrsta i trajnica preračunate su na temelju ukupnih troškova zasnivanja i održavanja cvjetnih gredica spomenutog trga. Rezultati istraživanja ukazuju da bi se sadnjom trajnica ostvarila značajna ušteda u usporedbi sa standardnom sadnjom sezonskih cvjetnih vrsta. U razdoblju od deset godina, troškovi zasnivanja i održavanja gredica s trajnicama bili bi 77% niži u odnosu na gredice s jednogodišnjim i dvogodišnjim cvjetnim vrstama. Rezultati potvrđuju da bi uvođenje trajnica imalo pozitivan utjecaj na troškove gradskog proračuna zasnivanje i održavanje cvjetnih gredica.

Ključne riječi: cvjetne gredice, trajnice, gradske zelene površine, troškovnik

Perennials as a factor for reducing the costs of establishing and maintaining flower beds of Zagreb's Green Horseshoe

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SUMMARY

Most of the flower beds in public green areas are composed of seasonal flower species (annual and biennial flowers). This research was conducted in order to determine the possibility of introducing perennials to flower beds of Zagreb's Green Horseshoe with the aim of introducing dynamics to public green areas and assuming a positive impact on reducing the costs of establishing and maintaining flower beds. When choosing perennials for the flower beds of squares of the "Green Horseshoe", the following factors are taken into consideration: ecological factors, aesthetic factors, cost-effectiveness and genius loci. A comparative cost estimate has been made in case of planting annual, biennial and perennial plant species on example of flower beds of King Tomislav Square. Differences in costs in case of planting seasonal flowers and perennials are calculated on basis of total costs of establishing and maintaining flower beds of King Tomislav Square. According to the results of the study it is determined that planting perennials would accomplish a significant cost reduction when compared to the usual planting of annual and biennial plant species. For the period of ten years the costs of establishing and maintaining flower beds with perennials would be 77% lower than the costs of establishing and maintaining flower beds with seasonal flowers. Results point that the introduction of perennials would have a positive effect on city's budget for establishment and maintenance of flower beds.

Key words: flower beds, perennials, urban green spaces, cost estimate

Impact of substrate salinity levels in the early growth, quality and yield of tomato (*Lycopersicon esculentum* Mill.)

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SUMMARY

Concerning tomato production, the production in different types of protected areas is ranked among the most intensive in plant production. The occurrence of salt stress often happens as a result of inadequate application of certain agro technical measures, particularly intensive fertilising and irrigation. Increased salinity of soil has negative effect on tomato growth and development. Exposing tomato to high salt concentrations causes different disturbances in plant metabolism ultimately leading to the changes in the quality of fruit, reduction of the size of the fruit and total yield. Changes in the early growth, parameters of fruit quality (total sugars and total acidity) and total yield were examined in Berberana F1 tomato hybrid (Enza Zaden, The Netherlands) grown from grafted and non-grafted plants at different levels of the salt stress (EC 1.92 dS m^{-1} , 3.80 dS m^{-1}, 6.95 dS m^{-1} and 9.12 dS m^{-1}). The early growth was more pronounced in varieties with higher salinity level, as well as the level of total sugars (by 1-2%) and total acidity in fruits (0.1-0.2 %) than in control substrate, regardless of whether it was grafted or non-grafted variety. At the same time, grafted varieties had higher fruit weight, which resulted also in higher yield. The highest total yield, with harvests up to 4 nodes of fruit, was achieved at the salt level of 3,80 dS m^{-1} (6,9 kg m^{-1}). Based on this we can conclude that the use of grafted plants in production is one of the ways for overcoming the stress caused by increased level of salt in the substrate.

Key words: tomato, salinity, early growth, quality, yield

ACKNOWLEDGEMENTS

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CHANGES IN THE GROWTH AND DEVELOPMENT OF TOMATO (Lycopersicon esculentum Mill.) CAUSED BY PHYSIOLOGICAL STRESS OF SALTY SOIL, financed by the Ministry of Science and Technology of the RS Government

Utjecaj deficitarnog navodnjavanja na uzgoj cijepljene rajčice

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SAŽETAK

Deficitarno navodnjavanje (DI) i izmjenično djelomično zasušivanje korijena (PRD) su tehnike uštede vode, dok je cijepljenje na podloge koristan alat za prevladavanje abiotskih stresova u plodovitom povrću. Cilj ovog rada bio je utvrditi utjecaj deficitarnog navodnjavanja i djelomičnog zasušivanja korijena na rast i prinos cijepljene rajčice. Rajčice sorte Clarabella, cijepljene na vlastitom korijenu i cijepljene na dvije *Solanum* podloge Emperador i Maxifort, uzgajane su tlu u plasteniku s tri tipa navodnjavanja: DI; PRD i potpuno navodnjavanje (FI). Visina biljaka rajčice nije se razlikovala među tretmanima, dok su biljaka cijepljene na podloge imale više listova u odnosu na samocijepljene rajčice. Uzmajući u obzir sva tri tipa navodnjavanja najveći prinos je zabilježen kod biljaka na podlozi Emperador (6,54 kg), a najmanje rajčice je ubrano kod samocijepljenih biljaka (4,90 kg). Biljke navodnjavane s DI i PRD imale su više plodova od FI biljaka. Najveći rani prinos imale su biljke na podlozi Maxifort pri DI, dok su iste biljke imale najmanji rani prinos pri PRD. Najveću prosječnu masu ploda (317 g) imale su biljke na podlozi Emperador uzgajane sa PRD dok su najmanju masu ploda (263 g) ostvarile samocijepljene biljke pri FI i DI. Rezultati pokazuju efikasnost DI i PRD vezano za poboljšani rast i ostvareni prinos cijepljenih rajčica u odnosu na potpuno navodnjavanje.

Ključne riječi: *Solanum lycopersicum* L., vodni stres, podloge, djelomično zasušivanje korijena, prinos

Effect of deficit irrigation on grafted tomato cultivation

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SUMMARY

Deficit and alternate partial root-zone drying (PRD) irrigation are the water-saving techniques, while grafting onto some rootstocks is a usefull tool to overcome abiotic stresses in fruit vegetables. The aim of this study was to investigate the effect of deficit irrigation (DI) and partial root-zone drying on grafted tomato growth and yield parameters. The tomato plants (cv. Clarabella) self-grafted and grafted onto Emperador and Maxifort rootstocks were soil grown in greenhouse under three irrigation regimes, DI, PRD and full irrigation (FI). There were no differences in plant height between the treatments, while plants grafted on rootstocks had more leaves compared to self-grafted plants. On average in all three irrigation treatments plants on Emperador rootstock had highest yield (6,54 kg) and the least tomatoes were harvested on self-grafted plants (4,9 kg). More fruits were noted in grafted plants grown under DI and PRD. Highest early yield had plants grafted on Maxiforf under DI, while in the same plants was lowest under PRD. Highest average fruit mass had plants on Emperador grown under PRD (317 g), while smallest fruits were measured in self-grafted plants under DI and FI (263 g). These results show the effectiveness of DI and PRD with respect to upgrading growth and yield of grafted tomato compared to full irrigation.

Key words: Solanum lycopersicum L., water stress, rootstocks, partial-root drying, yield

Utjecaj okolišnih i genetskih čimbenika na antioksidativne komponente u začinskoj paprici

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SAŽETAK

Začinska paprika (*Capsicum annuum* L.) je bogata različitim aktivnim komponentama koje pozitivno utječu na kvalitetu proizvoda te ljudsko zdravlje. Biološki aktivne komponente se nalaze u različitim organima paprike, ali se najveća koncentracija nalazi upravo u plodu koji se koristi kao začin. Među važnijim komponentama su fenoli i flavonoidi koji imaju značajnu ulogu u sastavu paprike. Posjeduju značajna antioksidativna svojstva i primjenu u medicini, a najznačajniji među flavonoidima su luteolin i kvercetin. Najvažniji fenoli su galna kiselina, kafeinska kiselina, hidrokinon, katehol, cimetna kiselina, eugenol i dr. Cilj ovog istraživanja je bio utvrditi utjecaj okolišnih i genetskih faktora kao što su godina proizvodnje, lokacija i sorta na sadržaj fenola i flavonoida u mljevenoj začinskoj paprici. Tijekom istraživanja je utvrđeno da svi istraživani faktori utječu značajno na koncentraciju fenolnih spojeva i flavonoida. Međutim, tijekom dvije godine istraživanja je utvrđena različita koncentracija fenola i flavonoida na istraživanim lokacijama u ovisnosti o vegetacijskoj godini. Također, u usporedbi s 2012. tijekom 2103. godine koja je bila popraćena nižim temperaturama zraka tijekom intenzivnog plodonošenja, utvrđena je značajno veća koncentracija fenola. Na kraju, iz dobivenih rezultata laboratorijskih i statističkih analiza se može zaključiti da je koncentracija fenola i flavonoida pod značajnim utjecajem okolišnih faktora kao dio odgovora biljke na okolišni stres.

Ključne riječi: paprika, fenoli, flavonoidi, okolišni i genetski faktori

Influence of environmental and genetic factors on antioxidative components in red pepper

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SUMMARY

Red spice pepper (*Capsicum annuum* L.) is rich in active compounds, which positively effects on product quality and human health. Important biological active compounds such as phenols and flavonoids can be found in different plant organs but most of their quantity is being synthesized in pepper fruit, which is used as a spice. They have significant antioxidative properties and application in medicine. Most known flavonoids are gallic acid, caffeic acid, hydroquinone, catechol, cinnamic acid, eugenol etc. The aim of this investigation was to determine the influence of environmental and genetic factors such as production year, location and cultivar on concentration of phenols and flavonoids in grounded red spice pepper. During the trial, it was determined that all investigated factors significantly effects on concentration of these active compounds. However, during two years of investigation, concentration of phenols and flavonoids was found to have different concentration pattern amongst location depending on production year. Also, significantly higher concentration of phenols was obtained during 2013 which had lower temperatures during stage of intensive fruit set and harvesting compared to 2012. At the end, results of laboratory and statistical analysis revealed that concentration of phenols and flavonoids are under significant influence of environmental factors as part of plant response to environmental stress.

Key words: pepper, phenols, flavonoids, environmental and genetic factors

Productivity and quality of bulgarian lavender varieties

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SUMMARY

Bulgarian lavender varieties / Lavandula vera / are well known to the world aromatic, chemical and pharmaceutical industry. Specific climatic conditions characterized by cold winters, short springs and hot summers are very favourable for rapid growth and development of lavender plants. Genetic material created under these conditions was demonstrated with varieties: Sevtopolis, Druzhba, Yubileyna, Raya, Hemus, Hebar and Karlovo, the potential of which in the form of the amount of harvested flowers varies from 560 to 690 kg in that with high content of essential oil in the range of 1.9 to 2.6 percent. Bulgarian lavender oil is high quality and is in direct competition with French oil. In recent years, Bulgaria has reached a leading position in the world production of quality lavender essential oil from 200 t in 2015 to 250 t in 2016, compared to the production per capita it is leading in the world ranking. It is the high quality of Bulgarian lavender oil which determines its application in the global perfume and cosmetics industry. Quantities produced in other countries except France have a lower quality indicators based on the higher content of camphor and are used for the production of fresheners mainly. During the period 2013-2015 in the region of Plovdiv and experimental base AU - Plovdiv, field trials have been carried out to establish specific productive features and detailed qualitative parameters of Bulgarian lavender production. The results for productivity, presented as average values according to different varieties during the research period, are as follows: Sevtopolis 560 kg/1000 square metre, essential oil 2%, yield 49.2, late-flowering variety, Druzhba 637 kg/1000 square metre, essential oil 1.9%, yield 52.8 medium flowering variety, Yubileyna 625 kg/1000 square metre, essential oil 1.9%, yield 52.8 suitable for dry flower, Hemus 560kg/1000 square metre, essential oil 1.6%, yield 61.2, early flowering variety, Karlovo 690 kg/1000 square metre, essential oil 1.3%, yield 76.9, suitable for dry flower, Hebar is selected simultaneously with the Raya variety with very high productivity and high in linalyl acetate 59-60%, the volume of essential oil of 1/da reaches 18 l.

Key words: lavender, varieties, yield, oil, quality, morphology, chemical elements

Utjecaj tehnologije uzgoja na profil masnih kiselina ploda rajčice (*Lycopersicum esculentum* Mill.)

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SAŽETAK

Biljne stanice sadrže male količine lipida, većinom u staničnim membranama. Masne kiseline u biljkama građene su od lanca sa 16 ili 18 atoma ugljika te jednom do tri dvostruke veze. Glavni biljni lipidi su zasićene masne kiseline kao što su palmitinska (C 16:0) i stearinska (C 18:0), zatim jednostruko nezasićene masne kiseline kao što je oleinska (C 18:1; n-9), te višestruko nezasićene masne kiseline kao što su linolna (C 18:2; n-6) i α-linolenska (C 18:3; n-3). Industrijalizacija proizvodnje hrane i modernizacija poljoprivrede dovele su do promjena u sustavu opskrbe hranom. Tijekom evolucije povećana je potrošnja n-6 masnih kiselina, a smanjena potrošnja n-3 masnih kiselina, od 1:1 (n-6:n-3) do 10:1, ili čak 20-25:1. Ova promjena je povezana s povećanim rizikom od niza bolesti.

Glavni cilj istraživanja bio je utvrditi sastav esencijalnih masnih kiselina ploda rajčice. Dva kultivara rajčice (Jaguar i Volovsko Srce) uzgojena su u hidroponu na kamenoj vuni te u tlu klasičnom tehnologijom. Sadržaj masnih kiselina određen je ekstrakcijom metilnih estera masnih kiselina i analiziran plinskom kromatografijom. Palmitinska kiselina bila je najzastupljenija zasićena masna kiselina u mesu i sjemenkama ploda rajčice kod obje sorte i načina uzgoja. Također, meso i sjemenke ploda sadržavali su esencijalnu linolnu kiselinu. Masne kiseline u sjemenkama rajčice mogu biti izvor esencijalnih masnih kiselina koje se mogu koristiti kao dodatak u svakodnevnoj prehrani.

Ključne riječi: linolna, *Lycopersicum esculentum*, masne kiseline, palmitinska, rajčica

Cultivation impact on the fatty acid profile of tomato fruits (*Lycopersicum esculentum* Mill.)

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SUMMARY

Plant cells contain small amounts of lipids, mostly in cell membranes. Plant fatty acids consist of only a few structures that have carbon chain lengths of 16 or 18, and one to three double bonds. The main plant lipids are the saturated fatty acids palmitic (C 16:0) and stearic (C 18:0) acids, the monounsaturated fatty acid oleic acid (C 18:1; n-9), and the polyunsaturated fatty acids linoleic (C 18:2; n-6) and α-linolenic (C 18:3; n-3) acids. Food industrialization and modern agriculture have led to changes in the composition of the food supply for Western diets. In particular, during evolution, the consumption of n-6 fatty acids has increased and that of n-3 fatty acids has decreased, from 1:1 (n-6: n-3) to 10:1, or even 20-25:1. This change has been associated with increased risk of many diseases.

The objective was to determine the composition of essential fatty acids of tomato fruits. The trial with two tomato cultivars (Jaguar and Volovsko srce) was conducted in a hydroponic system on rockwool and on the classic soil cultivation. The fatty acids content was determined by the extraction of fatty acid methyl esters and analyzed by gas chromatography. Palmitic acid, was the most represented saturated fatty acid in the fruits flesh and seeds in both varieties and methods of growing. Also, flash and fruit seeds contained essential linoleic acid. Fatty acids in seeds of tomato represent a source of essential fatty acids that can be used as supplement in the daily diet.

Key words: fatty acids, linoleic, *Lycopersicum esculentum*, palmitic, tomatoes

Ratarstvo

05

Field Crop
Production

Svojstva smjesa ječmenog brašna i tropa jabuke modificiranih postupkom ekstruzije

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SAŽETAK

Ekstruzija je proces koji se primjenjuje za proizvodnju širokog spektra gotovih proizvoda (tjestenina, snack proizvodi, mesne prerađevine, konditorski proizvodi i dr.), ali i za modifikaciju različitih vrsta brašna s ciljem poboljšanja njihovih svojstava. Cilj ovog rada bio je utvrditi utjecaj procesa ekstruzije na svojstva smjesa ječmenog brašna i tropa jabuke. Omjeri smjesa (ječmeno brašno : trop jabuke) korištenih u istraživanju su iznosili 85 : 15, 70 : 30 i 55 : 45. Smjese vlažnosti 30 % ekstrudirane su pri temperaturnom profilu 70/90/110 °C. Istraživanje je obuhvatilo određivanje fizikalnih i reoloških svojstava neekstrudiranih i ekstrudiranih uzoraka.

Istraživanjem je utvrđeno da je dodatkom tropa jabuke došlo do smanjenja viskoznosti ekstrudata. Ekstruzija je uzrokovala smanjenje broja padanja, a povećanjem udjela tropa jabuke trend opadanja se nastavio. Sedimentacijske vrijednosti bile su niske i kod ekstrudiranih i neekstrudiranih uzoraka, vjerojatno zbog malog sadržaja proteina u sastavu smjese. Ekstrudirani uzorci imali su veću sposobnost upijanja vode, a ona se smanjivala povećanjem udjela tropa jabuke. Stabilnost tijesta bila je 0, zbog malog sadržaja i narušenosti kvalitete glutena. Farinografski broj kvalitete bio je značajno veći kod ekstrudiranih uzoraka, a povećavao se s povećanjem udjela tropa jabuke.

Ključne riječi: ekstruzija, ječmeno brašno, trop jabuke

Properties of barley flour and apple pomace mixtures modified by extrusion process

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SUMMARY

Extrusion is the process which is used for the production of a wide range of final products (pasta, snacks, meat products, confectionery, etc.), as well as for modification of various types of flours in order to improve their properties. The aim of this study was to determine the effect of extrusion process on the properties of mixtures of barley flour and apple pomace. Mixture ratios (barley flour : apple pomace) used in this study were 85 : 15, 70 : 30 and 55 : 45. Mixtures with 30 % moisture content were extruded at the temperature regime 70/90/110°C. The research included determination of physical and rheological properties of non-extruded and extruded samples.

It was found that with addition of apple pomace viscosity of extrudates decreased. Extrusion caused reduction of falling number. Increasing of apple pomace content in mixtures resulted in decrease of falling number. Sedimentation values were low both in non-extruded and extruded samples, probably due to low content of proteins in mixtures. Extrusion also resulted in increase of water absorption index. Dough stability was 0, due to lower quantity and poor quality of gluten. Extruded samples had higher farinograph quality number, which increased with increasing of apple pomace content.

Key words: extrusion, barley flour, apple pomace

Utjecaj veličine i oblika vegetacijskog prostora na prinos križanaca sirka i sudanske trave

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SAŽETAK

Prinos voluminozne mase sirka ovisi o agroklimatskim čimbenicima i uvjetima rasta pri čemu je vrlo značajna veličina, ali i oblik vegetacijskog prostora. Cilj dvogodišnjeg istraživanja bio je utvrditi prinos suhe tvari te udio lista, stabljike i metlice u prinosu križanaca sirka i sudanske trave SUSU i Grazer N uzgajanih na razmake 13x8, 26x4 i 39x3 cm. Istraživanja su provedena tijekom 2008. i 2009. godine u poljskim pokusima u Velikoj Pisanici. Sjetva je obavljena 10. svibnja 2008. i 28. svibnja 2009., a košnja 16. srpnja 2008. i 14. kolovoza 2009. Usjev je košen u metličanju i sadržavao je u prosjeku 19,2% suhe tvari u 2008. i 25,9% suhe tvari u 2009. godini.

U obje godine istraživanja najviši prinos suhe tvari postignut je kod vegetacijskog prostora 13x8 cm (22,1 t ha^{-1} u 2008, odnosno 22,7 t ha^{-1} u 2009.), a najmanji prinos kod vegetacijskog prostora 39x3 cm (9,2 t ha^{-1} u 2008, odnosno 9,3 t ha^{-1} u 2009.). Razlike u prinosima i komponentama prinosa između križanaca nisu bile značajne ni u jednoj godini istraživanja. Značajan utjecaj na udio lista i metlice, ali ne i na udio stabljike, imala je godina uzgoja. Tako je u 2008. utvrđen udio lista od 31,2, a udio metlice 5,3%, dok je u 2009. prosječan udio lista iznosio 27,6, a metlice 12,6%.

Rezultati su pokazali da gustoća sjetve i oblik vegetacijskog prostora imaju signifikantan utjecaj na prinos suhe tvari križanaca sirka i sudanske trave uzgajanih za voluminoznu masu.

Ključne riječi: sirak, gustoća sjetve, vegetacijski prostor, prinos

Effect of sowing density and spatial distribution of plants on sorghum- sudan grass hybrid yield and yield components

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SUMMARY

The yield of forage sorghum depends on growing conditions among which sowing density and spatial distribution of plants are very important.

The aim of two-year study was to determine the yield of dry matter (d.m.) and the share of leaf, stem and panicle in the yield of sorghum Sudan grass hybrids Grazer N and SUSU, grown on 13x8, 26x4 and 39x3 cm. The investigations were carried out on the field trials in Velika Pisanica (Bjelovar-Bilogora County). The sowing dates were on 10 May, 2008 and 28 May, 2009. The crop was mowed in the panicle stage on 16 July, 2008 and 14 August, 2009 with average content of dry mater 19.2 % in 2008 and 25.9 % of dray matter in 2009.

The highest yield in both years was achieved by 13x8 cm sowing pattern (22.1 t ha^{-1} in 2008, and 22.7 t ha^{-1} in 2009) and the smallest by 39x3 cm (22.1 t ha^{-1} in 2008 and 7 t ha^{-1} in 2009, respectively). The differences in yield and yield components among the hybrids and years were not significant. The year influenced significantly on the leaf and panicle share, but not on the share of steam. The average share of leaf in 2008 was 31.2% and the share of panicle was 5.3%, while in 2009 the share of leaf was 27.6, and the share of panicle was 12.6%.

The results show that sowing density and spatial distribution of plants have significant influence on sorghum-sudan grass hybrid d. m. yield.

Key words: sorghum, sowing density, plant spatial distribution, yield

Quality parameters and using of white poppy seeds in Slovak Republic

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SUMMARY

Poppy (*Papaver somniferum* L.) is worldwide cultivated as a basic raw material for manufacture of pharmaceutically important narcotics as well as for production of seeds. In 2012, the Czech Republic was a leading producer of poppy seeds in the world with a total production of 12,814 tons. On the other hand, the Slovak Republic reached a production of 296 tons. In Slovakia, poppy is cultivated mainly for oily seeds containing 50 % of oil. Seeds are used especially in the food industry as sprinklings and fillings in confectionary and bakery.

In our experiment we evaluated the basic quality parameters of the seed such as oil content, fatty acids composition, micronutrients such as calcium content, phosphorus content in selected white poppy seed variety named Albin cultivated in Slovakia. This variety was selected after screening of 16 poppy varieties and was chosen for the highest calcium content. The aim of the study was application of white poppy seed into bakery products made from composite flours, where we added to wheat flour grinded white poppy seed at 0 % (control), 5 %, 8 %, 10 % and 12% level of substitution.

We evaluated basic technological parameters of composite flours (sedimentation index, falling number), rheological properties of dough (water absorption, dough development time and stability, farinograph quality number), quality parameters of bakery products (loaf specific volume, ratio length/high, sensory parameters). According our results we can state, that with increasing of level of substitution significantly ($P<0.05$) decreased values of basic parameters, rheological parameters and bakery parameters, too. Value of sedimentation index of control was 46 ml, falling number 330 s, poppy seeds substitution at 12 % level of sedimentation index was 27 ml, falling number 290 s. Value of water absorption were decreased from 56.8 % near control to 50.8 % near 12 % level of poppy substitution. Specific volume of bread was reduced about 1.7 % at 5 % level and about 8.6 % at 10 % level of substitution. But sensory evaluation of bakery products was very positive, flavour and taste of bakery products with white poppy seed was better than control. Overall acceptance addition of grinded white poppy seed was at 10 % level. On the base of our results, our author collective obtained utility model which was published by Industrial Property Office of the Slovak Republic in the year 2014, with name "Composite flour for preparation bread and buns with higher content of calcium". Composite flour with 10 % level of white poppy seeds contains 183 mg/100g of calcium against wheat flour 21 mg/100g and higher content of polyunsaturated fatty acids 4.05 g/100 g against wheat flour 0.73 g/100 g. In the competition DANUBIUS GASTRO 2015 in Slovakia (bakery competition) was awarded to decree for using marking "Excellent round cake 2015" for bakery product "Potato round cake with white poppy seed".

Key words: white poppy, bakery quality, farinograph, bread, calcium

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Naknadni učinak kalcizacije na prinos zrna kukuruza

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SAŽETAK

Kukuruz je jedna od najrasprostranjenijih žitarica, visokog genetskog potencijala. Međutim, nepovoljna svojstva tla kao i vremenske prilike, uzrokuju značajnu varijabilnost prinosa i snižavaju prinos zrna. Kiselost tla te nepristupačnost pojedinih biljnih hraniva povezana s niskom pH vrijednosti tla često predstavljaju ograničavajuće čimbenike postizanja zadovoljavajućih prinosa ratarskih usjeva koji se mogu popraviti primjenom različitih vapnenih materijala. Cilj ovog istraživanja je bio utvrditi naknadni učinak kalcizacije na prinos zrna kukuruza primjenom granuliranog vapnenog materijala (trgovački naziv Fertdolomit) koji sadrži 24 % CaO, 16 % MgO te 3 % N, 2,5 % P_2O_5 i 3% K_2O.

Poljski pokus prema slučajnom bloknom rasporedu s četiri repeticije je postavljen 2008. godine na kiselom tlu (pH_{KCl} 4,69) na području istočne Hrvatske. Ukupno je bilo šest tretmana: kontrola (bez kalcizacije), 5, 10, 20, 30 i 40 t ha^{-1} Fertdolomita. Uzgajan je hibrid kukuruza FAO skupine 400. Vegetacijsko razdoblje 2015 je bilo manje povoljno za uzgoj kukuruza sa stajališta vremenskih prilika zbog nepovoljnog rasporeda oborina i ekstremno vrućeg ljeta.

Sedam godina nakon kalcizacije, utvrđeno je signifikantno povećanje prinosa zrna kukuruza. Primjena 20 t ha^{-1} Fertdolomita povećala je prinos zrna u 2015 godini za 15 % (9.40 t ha^{-1}) dok je primjenom 30 t ha^{-1} prinos povećan za 21 % (9.88 t ha^{-1}) u usporedbi s kontrolnim tretmanom (8.14 t ha^{-1}). Međutim, kalcizacija nije značajno utjecala na naturalnu vlagu zrna, premda je u prethodnim godinama istraživanja utvrđena statistički signifikantna razlika između tretmana. Temeljem naših ranijih istraživanja, kalcizacija i visoke količine vapnenih materijala imaju dugogodišnji pozitivni učinak na prinos zrna mnogih ratarskih usjeva.

Ključne riječi: kukuruz, kalcizacija, naknadni učinak

Residual effect of liming on maize grain yield

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SUMMARY

Maize is one of the most important cereal worldwide with high genetic potential. However, unfavorable soil properties or weather conditions lead to great yield variability and decrease grain yield. Very often, limiting factors of field crops yield is soil acidity and unbalanced nutrients supply associated with it, which can be solved by liming. Aim of this study was to determine the residual effect of liming with granulated lime material (trade name Fertdolomit) containing 24 % CaO, 16 % MgO, 3 % N, 2.5 % P_2O_5 and 3% K_2O on maize yield.

Field experiment was set up in 2008 in a RCBD with four repetitions on a very acid soil (pH_{KCl} 4.69) in the east Croatia. In total six treatments were used: control (without liming), 5 t ha^{-1}, 10 t ha^{-1}, 20 t ha^{-1}, 30 t ha^{-1} and 40 t ha^{-1} of lime. Maize hybrid belonging to FAO 400 group was growing. The growing season of 2015 was less favorable for maize growing regarding weather conditions. Main characteristics were extremely hot summer and inadequate distribution of rainfall.

Seven years after application, liming significantly increase grain yield of maize. Application of 20 t ha^{-1} increased grain yield in 2015 by 15 % (9.40 t ha^{-1}) and 30 t ha^{-1} of lime by 21 % (9.88 t ha^{-1}) in comparison to control treatment (8.14 t ha^{-1}). At the same time, liming didn't affect grain moisture, although in previous years of research statistically significant differences were found among treatments. Based on our previously research, liming and high dose of lime material have long term positively effect on grain yield of many field crops.

Key words: maize, liming, residual effect

Vrijeme tijekom vegetacije kukuruza u 2016. godini

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SAŽETAK

Nakon godine s ekstremno toplim ljetom uslijedila je povoljna godina za proizvodnju kukuruza. Cilj ovoga rada je bio: 1) uz pomoć temperature tla na 5 cm dubine, oborine i dnevne vrijednosti minimalne i maksimalne temperature zraka prikazati vrijeme tijekom vegetacije kukuruza 2016. godine, i 2) utvrditi akumuliranu toplinu (TS), ukupni temperaturni stres (SDD), količine oborine (RR) i ukupno trajanje sijanja Sunca (SS) u razdoblju od 1. travnja do 30. rujna po godinama za razdoblje 1961. - 2016. za meteorološke postaje Zagreb-Maksimir (Zg) i Osijek (Os).

Rezultati otkrivaju kako je u vremenskom nizu 1961. - 2016. na meteorološkoj postaji Zagreb-Maksimir po TS 2015. godina na 5., a 2016. godina na 8. mjestu. Ukupna količina oborine spomenutog vremenskog niza bila je najmanja 1992. godine, dok je 2016. godina 15. po redu. Po SDD 2016. godina je na 22. mjestu. U istočnom dijelu Hrvatske (Os) TS je 2016. godine bio na 10. mjestu dok je oborine bilo znatno više nego prethodnih godina (428 mm). Na 1. mjestu je 2000. godina kad je tijekom vegetacije ukupno izmjereno samo 155 mm oborine. Akumulirane SDD jedinice 2016. godine nalaze se na 33. mjestu.

Iz svega navedenog zaključujemo kako je vrijeme tijekom vegetacije kukuruza u 2016. godini bilo znatno povoljnije nego u većini od posljednjih 10, a pogotovo nezaboravne 2015. godine. Međutim, zbog mraza, a ponegdje i tuče urod ove žitarice u 2016. godini na nekim je lokalitetima prepolovljen ili ga uopće nema.

Ključne riječi: kukuruz, akumulirana toplina, temperaturni stres, oborine, sijanje sunca

Weather conditions during the growing season of maize in 2016

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SUMMARY

After the year with an extremely hot summer this year was favourable for maize production. The aim of this study was: 1) to show weather conditions during growing season of maize in 2016 by using the soil temperature at 5 cm below ground, precipitation and the daily value of the minimum and maximum air temperatures, and 2) to determine the accumulated heat (HU), total heat stress (SDD), precipitation (P) and total number of sunshine hours (SH) for the period from April 1 to September 30 for each year from 1961 to 2016 for Zagreb-Maksimir (Zg) and Osijek (Os).

The results reveal that in the period from 1961 to 2016, in Zg 2015 by TS was at the 5th place and 2016 at 8th place. The total amount of precipitation for the same period was the lowest in 1992, while 2016 was at 15th place (starting with the lowest amount of precipitation). By SDD 2016 was at 22nd place. In the eastern part of Croatia (Os) TS was in 2016 at 10th place. There were considerably more precipitations than in previous years (428mm). At first place was 2000 when during growing season was measured only 155 mm precipitations. According to SDD units 2016 was at 33rd place.

We can conclude that weather conditions during growing season in 2016 were more favourable than in the most of the past 10 years, especially in unforgettable 2015. However, due to frost and hail grain yields at some locations were halved or crops were even completely destroyed.

Keywords: maize, accumulated heat, heat stress, precipitation, sunshine

Prinos zelene mase i sjemena talijanskog ljulja u ovisnosti o gnojidbi dušikom i roku košnje

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SAŽETAK

Optimalna gnojidba dušikom je jedan od najvažnijih čimbenika za ostvarivanje visokih prinosa, kako zelene mase, tako i sjemena talijanskog ljulja (*Lolium multiflorum* Lam.). Stoga je glavni cilj provedenog istraživanja bio utvrditi utjecaj gnojidbe dušikom i roka košnje na prinos zelene mase i sjemena talijanskog ljulja. Dvofaktorijalni poljski pokus proveden je na pokušalištu Maksimir Agronomskog fakulteta Zagreb tijekom dvije vegetacijske sezone. Prvi istraživani faktor bio je rok košnje (dva roka i to u punom vlatanju i pred klasanje), a drugi faktor gnojidba dušikom (0, 60, 120 i 180 kg ha^{-1}). Vegetacijska sezona značajno je utjecala na prinose zelene mase i sjemena te većinu istraživanih svojstava. Očekivano, u kasnijem roku košnje (pred klasanje) utvrđen je značajno veći prinos zelene mase u usporedbi s ranijim rokom košnje. Intenzivnija gnojidba dušikom značajno je povećala prinose zelene mase, ali je signifikantnost interakcije gnojidba × rok košnje ukazala na različitu reakciju za dva istraživana roka košnje. Značajno veći prinosi sjemena ostvareni su na parcelama gdje je prethodno obavljena košnja usjeva za krmu u punom vlatanju. Nadalje, pri višim razinama gnojidbe dušikom utvrđeni su veći prinosi sjemena i to prvenstveno kao rezultat povećenog broja klasova po jedinici površine.

Ključne riječi: talijanski ljulj, prinos zelene mase, prinos sjemena, gnojidba dušikom, rok košnje

Effect of nitrogen fertilization and cutting date on forage and seed yield of Italian ryegrass

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SUMMARY

After first cut for forage Italian ryegrass (*Lolium multiflorum* Lam.) crop can be used for production of seeds in the second regrowth. Nitrogen fertilization is one of the most important factors for achieving high yields. The main aim of this study was to determine the influence of cutting date and nitrogen fertilization on the forage and seed yield of Italian ryegrass. Field trials with two factors were conducted at the Experimental field station Maksimir of the Faculty of Agriculture in Zagreb during two growing seasons. First factor was cutting date for forage (stem elongation and booting stage) and second factor was nitrogen fertilization rate (0, 60, 120 and 180 kg ha^{-1}). Growing season significantly influenced forage and seed yields as well as most studied traits. As expected, significantly higher forage yield was recorded at a later cutting date (booting stage) compared to earlier cutting date. Nitrogen fertilization significantly increased forage yield. However, a significant fertilization × cutting date interaction for forage yield indicated varied reaction to nitrogen fertilization at different cutting dates. Opposite to the forage responses, higher seed yield was achieved at early cutting date. Higher rates of nitrogen fertilization resulted in higher seed yields, primarily as a result of greater number of spikes per unit area.

Key words: Italian ryegrass, forage yield, seed yield, nitrogen fertilization, cutting date

Myzus persicae sulzer on tobacco

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SUMMARY

Myzus persicae has appears in great quantitative representation on tobacco. The main goal of the investigations was to perform analysis of population dynamics of aphids on tobacco and their control.

Observations were made on tobacco plants in the region of Prilep, Macedonia during the growing season in 2011-2013, applying the method of 20 tobacco stalks. Field treatments were carried out for aphid control with: Acetamiprid (0.02%), Imidacloprid (0.03%), Thiamethoxam (0.02%), Chlorpiriphos (0.15%), Lambda-cyhalothrin (0.025%) and Methomyl (0.06%).

The *Myzus persicae* population grew from 79630 in 2011 to 93414 in 2012 and declined to 74440 in 2013, which is 247484 on 600 tobacco stalks. The diet of the aphids on the leaves influences the reduction of carbon hydrates and soluble sugars. The maximum incidence of aphids was within 1th and 20th of August.

For management of aphids, monitoring of tobacco leaves and regularly checks for aphid colonies are necessary. Treatments as part of IPM are recommended if the populations reach economic threshold levels, i.e., when at least 10 of 100 plants are infested, with small aphid colonies.

Neonicotinoides: Imidacloprid, Acetamiprid and Thiamtexam provide effective long-lasting protection of aphids, because of their systemic nature. They reached 100 % effectiveness, visible from the first check 24 hours after application. The efficacy is excellent up to the 21st day. Contact insecticides Chlorpyrifos (organophosphate), Lambda-cyhalothrin (pyrethroid) and Methomyl (carbamate) gave good aphid control, 95 %, 90 % and 98 % respectively.

The aphids usually feed on the underside of tobacco leaves and are difficult to kill with contact insecticide, therefore careful application of insecticides with knapsack sprayer is necessary.

Growers should use insecticides only when essential for the control, using a correct label rates, application procedures and avoiding unnecessary or excessive spraying. To avoid the possibility of resistance, a change of chemicals during the same growing period is recommended.

Key words: *Myzus persicae*, tobacco, population dynamics, control

BC hibridi kukuruza u proizvodnim pokusima u 2016. godini

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SAŽETAK

Pokusi BC hibrida kukuruza u 2016. godini postavljeni su na raznim lokacijama u različitim agroekološkim uvjetima na ukupno 98 lokacija na području cijele Hrvatske. U nicanju i za vrijeme ranog porasta kukuruza uvjeti su bili relativno povoljni, ali uslijed jednog kratkotrajnog hladnog vala s temperaturama oko 0 °C dio usjeva je pretrpio štete što dovodi do toga da na nekim lokacijama nisu ostvareni preporučeni sklopovi. Pred cvatnju i u cvatnji, klimatski uvjeti su bili povoljni na svim područjima uzgoja kukuruza. Tijekom perioda vegetacije u lipnju i srpnju usjevi kukuruza su primali optimalne količine oborina dok su temperature bile na razini višegodišnjih prosjeka što je omogućilo pravilan rast i razvoj biljaka. U kolovozu i rujnu nastavlja se razdoblje učestalih oborina, s ne previsokim temperaturama što je rezultiralo nešto kasnijm berbama i sporijim dozrijevanjem kukuruza, ali i vrlo dobrim ispoljenjem proizvodnog potencijala hibrida.

Rezultati obrađenih 98 pokusa i 21 hibrida pokazuju prosječni urod od 12,07 t/ha i 21,4 % vode u zrnu pri berbi, uz ostvarenje sklopa na razini 66 000 biljaka/ha, a pokazuje se i prirodna distribucija rezultata rodnosti na način da s duljinom vegetacije raste i urod, a povećava se sadržaj vode u zrnu.

Sagledavajući ostvareni urod u odnosu na brzinu otpuštanja vode iz zrna u ovakvim proizvodnim uvjetima novi BC hibridi FAO 300 i 400 pokazali su vidljivu prednost pred onima kasnije ili ranije vegetacije te starijim komercijalnim hibridima.

Ključne riječi: proizvodni pokusi, kukuruz, hibridi, urod

BC maize hybrids in production trials in 2016

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ABSTRACT

Trials with BC maize hybrids in 2016 were conducted at various locations in different environmental conditions at 98 locations in the entire Croatian corn production area. The conditions for early phases of growth and developement were relatively favorable, but part of the crop suffered damage due to one short cold weather wave with temperatures around 0 °C and that is why some locations did not achieve the desired plant density. Climatic conditions were favorable in all areas for flowering and in the polination period. During the June and July corn crops received the optimum amount of rainfall while temperatures were at the level of multi-year average which allowed proper growth and development. In August and September we had a period of frequent rainfall with no excessive heat resulting in a bit later harvests and slower maturing, but also a very good manifestation of the productive potential of hybrids. Results gathered from 98 trials and 21 hybrid showed an average yield of 12.07t/ha, with 21.4% grain moisture at harvest, and the realization of a plant density at the level of 66,000 plants/ha. The results were distributed in a such way that the length of the growing season increased the yield and water content in the grain. Considering the achieved yield in relation to the water content at the harvest the new BC hybrids from FAO group 300 and 400 showed a visible advantage compared with later or earlier hybrids just as well as older commercial hybrids.

Keywords: Production trials, maize, hybrids, yield

Utjecaj međurednog razmaka na korovnu zajednicu u soji

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SAŽETAK

Poljski pokus je postavljen 2014. i 2015. godine na obiteljskom gospodarstvu „Zeleno polje" u okolici Vukovara po slučajnom blok rasporedu u četiri ponavljanja. „Aditive-removal" metodom praćena je različita dužina zakorovljenosti kultivara soje Ika (Poljoprivredni institut Osijek) pri međurednom razmaku od 25, 50 i 70 cm. Korovi su se neometano razvijali različiti vremenski period, i to 0, 2, 4, 6, 8 10, 12, 14, 16, i 18 tjedana nakon nicanja i zatim odstranjivali. Pri tome je unutar 1 m^2 odstranjena sva nadzemna masa korova, razdvojena po vrstama te prebrojana.

Tijekom vegetacije utvrđeno je 36 različitih korovnih vrsta, među kojima su dominirali predstavnici porodice *Asteraceae* (9) i *Poaceae* (4). Brojnošću su se isticali *Sorghum halepense* (L.) Pers. i *Chenopodium album* L. tijekom obje godine istraživanja, a u 2015. godini subdominantni su bili i *Amaranthus retroflexus* L. i *Datura stamonium* L.

Brojnost korova tijekom vegetacijske sezone rasla je s dužinom zakorovljenosti parcela u obje godine istraživanja. Međuredni razmak nije samo utjecao na sposobnost kompeticije usjeva s korovima, nego su uočene i promjene u početku i trajanju kritičnog razdoblja zakorovljenosti. Interakcija dužine zakorovljenosti i međurednog razmaka soje utjecala je i na prinos zrna, posebice na dugo zakorovljenim parcelama s međurednim razmakom sjetve od 25 cm.

Ključne riječi: soja, korovi, međuredni razmak

The effect of row spacing on weed community in soybean

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SUMMARY

Field experiment was established at family farm "Zeleno polje" near Vukovar in a randomized complete block design with four replications during 2014 and 2015. Weed community response in soybean cv. IKA (Agriculture Institute in Osijek) was studied in different row spacing (20, 50 and 70 cm) using an "Aditive –removal" model. For that purpose, weeds were allowed to develop for different period of time, i.e. 0, 2, 4, 6, 8 10, 12, 14, 16, and 18 weeks after emergence, and then were removed. Aboveground weed biomass from 1 m^2 were removed by hand, divided by species and counted.

Thirty-six weeds were determined during investigated period with dominant families *Asteraceae* (9 species) and *Poaceae* (4 species). In both vegetation seasons *Sorghum halepense* (L.) Pers. and *Chenopodium album* L. were the most abundant, while in 2015. subdominant were also *Amaranthus retroflexus* L. and *Datura stamonium* L.

Weed density increases with duration of weediness of the plots in vegetation season of both study years.Different row spacing was not only influenced on weed-crop competition, but changes in beginning and duration of critical timing for weed removal was also observed. Interaction of duration of weediness and row spacing in soybean affected grain yield, particularly on seasonlong weed presence in soybean plots grown in narrow rows (25 cm).

Key words: soybean, weeds, row spacing

Loss of birdsfoot trefoil seed due to pod shattering

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SUMMARY

Birdsfoot trefoil (*Lotus corniculatus* L.) is a perennial legume characterized by a high propensity of pod shattering and waste of seed during maturing. The aim of this study was to determine seed loss due to pod shattering until the moment of harvest in birdsfoot trefoil cultivars grown on acid soil (pH_{H2O} 4.8), as well as the possible impact of the soil liming (control - without CaO and treatment with 3 t ha^{-1} CaO) on the amount of seed loss. A field experiment was set up in 2012 in Čačak. The cultivars of birdsfoot trefoil K-37 and Rocco, were planted at a row spacing of 20 cm and a seeding rate of 10 kg ha^{-1}. Analyses were carried out on the second growth in the second year of cultivation. The amount of seed loss due to pod shattering was determined by collecting of seed in the plastic containers placed between the rows of plants at the beginning of the maturity of first pods.

The results indicate that the amount of seed loss due to pod shattering was 24.8 % of the potential seed yield (calculated on the basis of yield components) in the cultivar K-37 and 15.4 % in the cultivar Rocco. The liming did not have a significant impact on the amount of seed loss due to pod shattering in both cultivars. The results indicate that, in addition to the yield and quality of the harvested seed, important parameter in the choice of birdsfoot trefoil cultivars for seed production may be their tendency towards waste of seed.

Key words: birdsfoot trefoil, liming, pod shattering, seed yield

Dynamics of moisture movement in Prilep and Yaka tobacco

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SUMMARY

Dried and fermented tobacco as colloidal capillary-porous body possesses certain hygroscopic properties, which determine its moisture-accepting qualities, i.e. the ability to absorb moisture from the air and to maintain and transfer it in the environment. Up to 50 % relative humidity, tobacco moisture increases slowly and poorly, after which the process of humidification increases, but still insignificantly, and over 80 % the process is much more rapid and significant.

Fermented and dry powdered tobacco of the types Yaka and Prilep was used for the aims of investigation. Tobacco samples were taken from lower, middle and upper insertions. Our investigation of the dynamics of moisture movement was carried out at 10°, 20°, 30° and 40° C, for a time period of 24, 48, 72, 168, 192, 216 and 240 hours. The lower primings of Yaka tobacco receive maximum moisture amount (24.69 %) at 30°C, for a period of 72 hours. At 40°C the maximum of 19.41% is received after 72 hours. Middle primings of Yaka tobacco also receive the maximum moisture amount (24.69 %) at 30°C in a period of 72 hours. These leaves, receive the maximum moisture intensity at 40°C. At this temperature they receive the maximum of 22.42% in 24 hours. In the upper primings, the maximum moisture of 25.16% is also received at 30°C, but in a period of 48 hours.

The type Prilep to some extent deviates from the regularities observed in Yaka tobacco. Thus, lower primings receive the maximum moisture amount at 40°C (33.99 %) in 24 hours. In the middle primings of Prilep tobacco, the highest intensity of moisture uptake was recorded at 30°C (22,78%) in a period of 24 hours and, similar to lower primings, the maximum amount of moisture was observed at 40°C (28,22%) in 72 hours.

It can be noticed from comparison of the results that both Prilep and Yaka tobaccos receive the moisture with the highest intensity at 40°C. Yaka tobacco receives the maximum moisture amount at 30°C in 72 hours for the lower and middle primings and in 48 hours for the upper primings. Prilep tobacco receives the maximum moisture amount along with maximum intensity of moisture uptake at 40°C. The lower primings reach the maximum uptake in 24 hours (33,99%), which is also the highest percentage of received moisture in general, whereas the middle and the upper primings reach the maximum amount of moisture in 72 hours. The middle primings of Prilep tobacco show some deviation with regard to the intensity of received moisture, i.e. moisture is received with the highest intensity (22.78 %) at 30°C in 24 hours.

Key words: fermented tobacco, temperature, moisture, hygroscopic properties, insertions

Relationship among nitrogen fertilizer doses, fiber yield and some fruit characteristics of luffa

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SUMMARY

The aim of this study was to determine the relationship among different nitrogen fertilizer doses (0, 6, 12, 18, 24 and 36 kg da^{-1}), fiber yield and some fruit characteristics of luffa (*Luffa cylindrica* M. Roem syn *L. aegyptiaca* Mill) using the linear regression model. A luffa population which grown in Hatay, Turkey used as a material and 13 characteristics were evaluated.

The experiment was conducted in a randomized complete block design with three replications under the farmer's conditions in 2015. Plants were grown on trellises with 4 m among rows spaced and 4 m apart.

Among the different nitrogen fertilizer doses, favorable variation were determined for 204.77 % number of fruits per plant, 208.95 % fiber yield (g $plant^{-1}$), 24.40 % stem diameter (mm), 10.53 % fruit fresh weight (g), 10.66 % fruit dry weight (g), 4.67 % fruit length (mm), 2.71 % average fruit diameter (mm), 7.38 % fruit stem length (mm), -7.9 % fruit-fiber ratio (%), 5.18 % fruit-seed ratio (%), -11.45 % fiber-seed ratio (%), 14.82 % number of seed per fruit and 0.63 % weight of 1000 seed (g) characteristics. Correlation analysis shown that the different nitrogen fertilizer doses have significant contributions to number of fruits per plant ($r= 0.99$, $p<0.001$), fiber yield ($r=0.976$, $P<0.001$), fruit-fiber ratio ($r= -0.963$, $P<0.01$) and stem diameter ($r= 0.856$, $P<0.05$).

As a result, it can be said that increases of fiber yield resulted from the increases in the number of fruits per plant with rising nitrogen fertilizer doses. Moreover, rising nitrogen fertilizer doses increased stem diameter while decreased fruit-fiber ratio.

Key words: luffa, nitrogen fertilization, fiber yield

Ribarstvo, lovstvo i pčelarstvo

06

Fisheries, Game Management and Beekeeping

Determination of brown trout resistance against some of the bacterial fish diseases

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SUMMARY

In this study, following brown trout species: Black Sea trout, *Salmo trutta labrax* (Pallas, 1811), Caspian brown trout, *Salmo trutta caspius* (Kessler, 1877), Abant trout, *Salmo trutta abanticus* (Tortonese, 1954) and their mutual hybrids were challenged with common bacterial fish diseases agents found in salmonids. The aim of the study was to determine resistant and susceptible brown trout species or their hybrids against yersiniosis caused by *Yersinia ruckeri*, lactococcosis caused by *Lactococcus garvieae* and vibriosis caused by *Listonella anguillarum*. In the study, 180 fish were used for each group of each bacterial infection. To determine the LD_{50} of bacteria, $1x10^{10}$, $1x10^{8}$, $1x10^{6}$, $1x10^{4}$, 10^{2} CFU of the bacteria were injected into the abdominal cavity of the fish. The infected fish were observed for 30 days. LD_{50} values in fish exposed to *Y. ruckeri* ranged from $1x10^{4,234}$ and $1x10^{7,574}$ CFU/fish, for *L. garvieae* ranged from $1x10^{6,795}$ and $10^{8.561}$ CFU/fish, and for *L. anguillarum* ranged from $1x10^{3,773}$ to $1x10^{5,325}$ CFU/fish. There were significant differences in terms of survival among challenged fish groups for *L. garvieae*, *L. anguillarum* and *Y. ruckeri*. The most resistant species for *Y. ruckeri*, *L. garvieae* and *L. anguillarum* were *Salmo t. labrax* x *Salmo t. labrax,* and *S. t. caspius* x *S. t. abanticus* and *S. t. labrax* x *S. t. labrax* and *S. t. caspius* x *S. t. abanticus,* respectively. The most susceptible species against *Y. ruckeri* were *S. t. caspius* x *S. t. abanticus* and *S. t. abanticus* x *S. t. abanticus,* against *L. anguillarum* were *S. t. caspius* x *S. t. labrax* and *S. t. abanticus* x *S. t. abanticus,* and against *L. garvieae* were *S. t. caspius* x *S. t. abanticus*. In conclusion some of the hybrids such as *S. t. caspius* x *S. t. abanticus* were more resistant than their parent to some diseases; therefore, they can be used in aquaculture.

Key words: brown trout, bacteria, disease, hybrid, resistance

Acknowledgement:

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Preliminarno istraživanje varijabilnosti gena DRB1 MHC klase II u srne obične (*Capreolus capreolus* L.) u Hrvatskoj

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SAŽETAK

MHC geni su imuni geni koji kodiraju za glikoproteinske receptore koji vežu antigen i predočuju ga limfocitima T, što inicira specifičan imunološki odgovor. Zbog izuzetne varijabilnosti MHC geni se kao pokazatelji sposobnosti prilagodbe koriste u istraživanjima u područjima populacijske genetike, evolucije, molekularne ekologije, konzervacijske genetike i epidemiologije. Tijekom proteklih desetljeća srna obična je u Europi proširila područje svoje rasprostranjenosti što povećava mogućnost izlaganja novim patogenima. Cilj ovog istraživanja je utvrditi varijabilnost egzona 2, najpolimorfnijeg dijela gena DRB1 klase II. Do sada smo analizirali 22 jedinke u kojih je egzon 2 umnožen PCR-om, nakon čega su sekvence analizirane u BioEdit programu, dok je SeqScape program korišten za utvrđivanje alela kod heterozigotnih jedinki. Identificirali smo ukupno četiri alela, svi su otprije poznati u srne obične u Europi. Međutim, samo šest jedinki (27 %) su bile heterozigoti, a dodatno je Hardy-Weinberg testom utvrđen statistički značajan manjak heterozigota. Na temelju tog pretpostavljamo da početnice koje smo koristili nisu umnožile sve alele u uzorku te je nužno isprobati više parova novih početnica radi utvrđivanja optimalnih početnica koje će umnožiti sve alele u istraživanom uzorku. Dobiveni rezultati upućuju na mogućnost prilagodbe populacije srne obične na promjene u okolišu. Nadalje, rezultati će u budućim istraživanjima poslužiti za utvrđivanje veze između varijabilnosti na MHC lokusima i oboljenja koja su prisutna u srne obične.

Ključne riječi: glavni sustav tkivne podudarnosti, MHC, *Capreolus capreolus*, imunogenetika

Zahvala

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Preliminary study on variability of MHC class II DRB1 locus in roe deer (*Capreolus capreolus* L.) from Croatia

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SUMMARY

MHC genes are immune genes which encode cell-surface glycoproteins that bind and present antigens to T cells, triggering an appropriate immune response. Due to extreme variability MHC genes have been used as indicators of evolutionary and adaptive potential of populations in studies of population genetics, evolution, molecular ecology, conservation genetics and epidemiology. Roe deer has considerably expanded its distribution range over the last decades, which is likely to have led to increased exposure to a new range of pathogens. In this study we aimed to investigate variability of MHC class II DRB1 locus exon2, the most polymorphic gene part. In our preliminary research, second exon of DRB1 locus was PCR amplified in 22 individuals. Sequence were analysed in BioEdit programme, while SeqScape software was used to genotype heterozygous individuals. We identified four alleles, all of which were known previously in European roe deer. However, only six animals were heterozygous (27%) and Hardy-Weinberg test confirmed significant heterozygote deficiency implicating existence of null-alleles. Testing of new primers is necessary to successfully amplify alleles present in a population. Our results will help us to gain insight into the capacity of the roe deer's population for adaptation to changes in the environment. Moreover, in future investigations the results will serve to inquire correlation between DRB1 locus variability and parasitic diseases in roe deer.

Key words: major histocompatibility complex, MHC, *Capreolus capreolus*, immunogenetics

Acknowledgement

Study was fully supported by Croatian Science Foundation, grant UIP 3421: Molecular epidemiology of selected parasitic diseases of wildlife.

Utjecaj ribnjaka na kakvoću vode rijeke Šanice pri niskom i visokom vodostaju

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SAŽETAK

Cilj istraživanja bio je utvrditi utjecaj vode iz ribnjaka „Eko-fish" na rijeku Šanicu tijekom trajanja niskog i visokog vodostaja. Istraživanje je obuhvatilo utvrđivanje fizikalnih, kemijskih i bioloških značajki vode rijeke Šanice prije ulaska i nakon izlaska vodotoka iz ribnjaka. Istraživanje je urađeno tijekom kolovoza 2015. i travnja 2016. godine, na šest odabranih lokaliteta. Dva lokaliteta nalaze se uzvodno od ribnjaka, dva nizvodno od ribnjaka i dva u samom ribnjaku. Rezultati istraživanja su pokazali određene prostorne varijacije istraživanih značajki duž toka rijeke Šanice pri niskom vodostaju u odnosu na visoki vodostaj. Koncentracija otopljenog kisika iznosila je 4,8 – 8,9 mg/l pri niskom vodostaju i 5,1 – 11,3 mg/l pri visokom vodostaju; koncentracija nitrita u vodi iznosila je 0,03 – 0,08 mg/l pri niskom i 0,01 – 0,05 mg/l pri visokom vodostaju. Iako izmjereni parametri pokazuju različite vrijednosti tijekom trajanja niskog, odnosno visokog vodostaja, utjecaj ribnjaka na promjenu vrijednosti određivanih parametara nije značajan.

Ključne riječi: ribnjak, rijeka, Šanica, kakvoća vode

The impact of the fish farm on water quality of the Šanica River at high and low water levels

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ABSTRACT

The aim of this study was to determine the effect of water from the fish farm "Eco-fish" on the Šanica River during high and low water levels. Research comprised determination of physical, chemical and biological characteristics of water in the Šanica River before entering and after leaving the fish farm. Research was carried out during August 2015, and April 2016, at six selected sites. Two sites are located upstream of the fish farm, two downstream and two within fish farm. The results showed certain spatial variation of investigated characteristics along the course of the Šanica River at low water level in relation to high water level. Concentration of dissolved oxygen ranged 4.9 - 8.9 mg/l at low water level and 5.1 – 11.3 mg/l at high water level. Concentration of nitrites in water ranged 0.03 – 0.08 mg/l at low water level and 0.01 – 0.05 mg/l at high water level. Although measured parameters show different values during the period of low and high water level, the impact of the fish farm on changes in values of measured parameters is not significant.

Keywords: fish farm, river, Šanica, water quality

Povezanost trofejne kvalitete svinje divlje (*Sus scrofa* L.) sa stanišnim uvjetima u lovištima Splitsko-dalmatinske županije

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SAŽETAK

Svinja divlja (*Sus scrofa* L.) najraširenija je i najbrojnija vrsta krupne divljači u Hrvatskoj. Uspješna prilagodba različitim staništima, dostupnost izvora hrane i reproduktivna sposobnost omogućili su joj opstanak i širenje u nova područja. U Splitsko-dalmatinskoj županiji ustanovljena su 83 lovišta, od kojih 20 državnih i 63 zajednička otvorena lovišta. Područje županije osobito je raznoliko prema reljefnim, geomorfološkim, klimatskim i hidrografskim uvjetima, što utječe na sastav i zastupljenost staništa pogodnih za obitavanje populacije divlje svinje. U strukturi stanišnih tipova prevladavaju: termofilne mješovite šume i šikare medunca sa bijelim grabom, šume i šikare medunca sa crnim grabom, dračici i suhi vapnenački kamenjarski travnjaci. Zajedno pružaju dobar zaklon te obilje biljne i animalne hrane divljoj svinji u lovištu. Zbog prisutnosti predatora (vuk, čagalj), lovišta kopnenog dijela županije svrstana su u III. bonitetni razred, dok je na otocima utvrđen II. bonitetni razred za gospodarenje divljom svinjom. Raznolikost povoljnih prirodnih, prvenstveno šumskih staništa te mir u lovištu, naročito u teže dostupnim područjima, preduvjeti su kvalitetnog gospodarenja divljom svinjom, na što upućuje i struktura trofeja. Analizirana je trofejna i dobna struktura veprova odstrijeljenih tijekom osam lovnih godina (2008./2009.-2015./2016.) u zajedničkim otvorenim lovištima. Ukupno je ocijenjen 221 trofej, a raspon ocjena iznosio je od 95,05 do 136,40 CIC točaka. Kapitalnih trofeja s ocjenom ≥ 110,00 CIC točaka bilo je 92 (42 % ocijenjenih), od kojih je 50 steklo brončanu medalju, 18 srebrnu i 24 zlatnu medalju. Prosječna dob svih ocijenjenih veprova iznosila je oko 6 godina, dok je u veprova sa brončanom ili srebrnom medaljom iznosila oko 8 godina, a sa zlatnom medaljom oko 9 godina. Prosječni porast trofejne vrijednosti iznosi dvostruko, za 20 CIC točaka u dobi od 3. do 7. godine, u odnosu na porast od 10 CIC točaka u dobi od 7. do 10. godine. Preporuka je primijeniti 7. godinu života kao najnižu gospodarsku dob vepra, koji tada postiže kapitalni trofej.

Ključne riječi: *Sus scrofa*, trofej, lovište, stanište

Relationship between trophy quality of wild boar (*Sus scrofa* L.) and habitat conditions in the hunting grounds of Splitsko-Dalmatinska County

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SAŽETAK

The wild boar (*Sus scrofa* L.) is the most numerous and widespread big game animal in Croatia. Successful adaptation to various habitats, food sources availability and reproductive performance enabled its survival and spreading in the new areas. In Splitsko-Dalmatinska County there are 83 established hunting grounds, 20 of which are state-owned and 63 are joint open hunting grounds. The area of the county is particularly diverse when considering relief, geomorphological, climatic and hydrographic conditions, which effects on the composition and distribution of habitats that are suitable for living of wild boar population. In the composition of habitat types, following are dominating: thermophilic mixed forest and scrubs of pubescent oak and oriental hornbeam, forests and scrubs of pubescent oak and hop hornbeam, scrubs consisting of thorny and spinous plants such is the Jerusalem thorn; and dry calcareous grasslands. Together, they provide good shelter and plentiful plant and animal foods for wild boar in the hunting ground. Due to presence of predator species (grey wolf, golden jackal) in the hunting ground of the continental part of county, bonitet for wild boar management is estimated to third class, while on the islands it is second class. Diversity of favourable natural, primarily forest habitats, and low disturbance in the hunting ground, especially in hardly accessible areas, are preconditions for quality management with wild boar, on which a trophy structure pointed out.

Trophy and age structure of boar hunted during eight hunting years (2008/2009-2015/2016) in the joint hunting grounds was analysed. Total of 221 trophies were scored, and scores ranged from 95.05 to 136.40 CIC points. There were 92 capital trophies (42% of scored) with scored value ≥ 110.00 CIC points, 50 of which won bronze medal, 18 won silver and 24 gold medal. All scored boars were aged 6 year in average. In boar which won bronze or silver medal it was 8 year, and 9 year in those with gold medal.

An average increase in trophy worthiness in age from 3 to 7 year was twofold by 20 CIC points, in comparison to increase of 10 CIC points in age 7-10 year. Recommendation is to apply age of seventh year as an economic age of a wild boar, when it reaches the capital trophy.

Ključne riječi: *Sus scrofa*, trophy, hunting ground, habitat

Istraživanje pokazatelja reprodukcije jelena običnog (*Cervus elaphus* L.) u lovištu XIV/9 „Podunavlje-Podravlje“

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SAŽETAK

Jelen obični (*Cervus elaphus* Linnaeus, 1758) autohtona je divljač u Hrvatskoj, iznimno cijenjena zbog kvalitetnog mesa i atraktivnosti trofeja. Svrha prirodnog uzgoja jelenske divljači je održavanje zdrave i stabilne populacije sukladno kapacitetu i uvjetima staništa, kao i postizanje vrlo kvalitetne i visoke trofejne vrijednosti. Istraživani su odabrani pokazatelji reprodukcije jelena običnog koji su značajni za unaprjeđenje uzgoja kvalitetne jelenske divljači u lovištima u hrvatskom Podunavlju. Istraživanja su provedena u jedinici za kontrolirani uzgoj jelena, u državnom lovištu XIV/9 „Podunavlje-Podravlje“, u razdoblju od 2012. do 2016. godine. Lovište je nizinskoga tipa, a prevladavaju vodena, vlažna i šumska staništa u poplavnim dolinama rijeka Dunava i Drave. Istraživani su sljedeći pokazatelji: broj košuta u parenju, broj teladi, tjelesna masa teladi od okota do 9. mjeseca života. Rezultati su pokazali kako smanjenjem broja košuta u parenju, pri jednakim uvjetima dolazi do povećanja tjelesne mase teladi pri okotu.Tijekom razdoblja istraživanja, 2012. zabilježeno je 45 okoćene teladi, srednje tjelesne mase pri okotu 10,61 kg; dok je 2016. bilo 27 teladi, srednje tjelesne mase 12,40 kg. Utvrđeno je da postoji određeni vremenski interval kada košute okote telad s najvećom tjelesnom masom.

Ključne riječi: jelen obični, parenje, telad, tjelesna masa, lovno gospodarenje

Study of reproductive parameters of red deer (*Cervus elaphus* L.) in the hunting ground XIV/9 „Podunavlje-Podravlje“

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SUMMARY

Red deer (*Cervus elaphus* Linnaeus, 1758) is autochthonous game in Croatia, which is exceptionally valued due to quality meat and trophy attractiveness. Purpose of the natural breeding of red deer game is keeping a healthy and stabile population, according to habitat characteristics and capacity, and achieving very quality and highly valuable trophies. Selected reproductive parameters of red deer were researched, which are important for improvement in breeding of quality red deer game in the hunting grounds in the Croatian Danube Region. Researches were carried out in the unit for controlled deer breeding in the hunting ground XIV/9 „Podunavlje-Podravlje“in the period from 2012 to 2016. It is a lowland hunting ground in which prevailing are aquatic, wetland and forest habitats in the floodplains of the Danube and the Drava Rivers. Following parameters were researched: number of hinds involved in mating; number of calves; calf weight from moment of birth up to age of 9 month. Results obtained indicate that decreasing in number of hinds involved in mating, under identical conditions, caused an increase of calf weight at calving. During the research period, in year 2012 number of calves born was 45, with mean weight of 10.61 kg, and in year 2016 number of calves was 27, with mean weight of 12.40 kg.

It was determined that certain time period exists when hinds born calves with highest weight.

Key words: red deer, mating, calves, body weight, hunting management

Adaptivna genetička raznolikost čaglja (*Canis aureus* L.) u Hrvatskoj

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SAŽETAK

Za istraživanja adaptivne raznolikosti nemodelnih kralježnjaka sve više se koriste geni glavnog sustava tkivne podudarnosti (MHC) koji kodiraju glikoproteine na površini stanica koje prikazuju antigen limfocitima T, čime se započinje prikladni imunosni odgovor. Pripadaju među najvarijabilnije gene u kralježnjaka, a tu njihovu raznolikost oblikuju dugotrajni evolucijski procesi, dok ona odražava sposobnost populacije da se suprotstavi raznim patogenima. Čagalj (*Canis aureus* Linnaeus, 1758) je relativno slabo istražena divlja vrsta sisavaca iz reda zvijeri. Nakon opadanja brojnosti u prvoj polovini 20. stoljeća, europske populacije čaglja se oporavljaju i šire svoje područje rasprostranjenosti. Cilj ovog rada je istražiti alelnu raznolikost i djelovanje prirodne selekcije na lokuse DRB1, DQA1 i DQB1 MHC klase II čaglja u Hrvatskoj, koristeći uzorke iz Slavonije i Dalmacije. DNA je izolirana iz 54 jedinke a metode sekvenciranja i molekularnog kloniranja su korištene za analizu eksona 2 triju lokusa. Pronađena su samo četiri DRB1 alela, dva DQA1 i tri DQB1 alela, što ukazuje na nisku razinu raznolikosti na svim istraženim lokusima. Međutim, evolucijske udaljenosti među alelima lokusa DRB1 i DQB1 su dosta visoke (16.3 % i 8.5 %) i za značajan broj kodona je pretpostavljeno da su pod djelovanjem pozitivne selekcije (11 na DRB1 lokusu i 9 na DQB1) što ukazuje da populacija čaglja u Hrvatskoj i dalje sadrži relativno visoku razinu funkcionalne raznolikosti.

Ključne riječi: *Canis aureus*, geni, raznolikost, populacija, Hrvatska

Adaptive genetic variability of the golden jackal (*Canis aureus* L.) from Croatia

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SUMMARY

The study of adaptive variation in non-model vertebrates increasingly uses genes of the major histocompatibility complex (MHC) which encode cell-surface glycoproteins that present antigens to T cells, a process essential for triggering an appropriate immune response. They are among the most variable genes in vertebrates, whose diversity has been driven by evolutionary processes over long period of time, while it reflects the ability of a population to confront various pathogens. The golden jackal (*Canis aureus* Linnaeus, 1758) is one of the less studied wild mammal species from the order Carnivora. After a decline of population size in the first half of the 20th century, the European populations have recovered and have been expanding its distribution area since. The aim of this study was to examine patterns of allelic diversity and natural selection on MHC class II DRB1, DQA1 and DQB1 loci in the golden jackal using samples from two Croatian regions – Slavonia and Dalmatia. DNA was extracted from 54 golden jackals and exon 2 of all three investigated loci was analysed using the cloning-sequencing method. We found low diversity as only four DRB1, two DQA1 and three DQB1 alleles were identified. However, we also found substantially high evolutionary distances (16.3% for DRB1 and 8.5% for DQB1) and a substantial number of codons predicted to be under the influence of positive selection (11 for DRB1 and 9 for DQB1) which suggests that the golden jackal population from Croatia still contains a considerable functional diversity.

Key words: *Canis aureus*, genes, diversity, population, Croatia

Lead distrubution in red swamp crayfish, *Procambarus clarkii* (Girard, 1852) tissues: the relationships between Pb levels and body weight

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SUMMARY

The objectives of research were to determine levels of Pb in red swamp crayfish (*Procambarus clarkii*) from different production practices and to assess the relationships between crayfish size (weight) and Pb concentration in various tissues. Lead (Pb) levels in muscle, hepatopancreas, gill and exoskeleton tissues of red swamp crayfish collected from crayfish farming systems in Crowley, Louisiana (USA) representing a complete growing season (from November 2013 to April 2014) were measured. The relationships between Pb levels in the tissues and crayfish weight were evaluated by linear regression analysis. Lead accumulation levels in the crayfish tissues were in the following order: hepatopancreas (H) > gill (G) > muscle (M) exoskeleton (D). The results of comparisons between Pb concentrations in the tissues and crayfish weight showed positive relationships, but significant ($p<0.001$) positive relationship were found between crayfish weight and Pb concentration in hepatopancreas and muscle tissues.

Key words: Crayfish, lead, accumulation, tissues

Nutritional value of fish soup from brook trout (*Salvelinus fontinalis* Mitchill 1814)

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SUMMARY

Fish soup is mainly produced from various fish species and commonly consumed around the world. It is known as nutritious product due to its nutritional value and functional properties. Because of preparing this soup is time-consuming at household productions, extensive use is limited. Therefore, seafood industry demands a ready-to eat soup in order to increase fish consumption in the world. There are many types of fish soup containing various types of fish species and also other ingredients. However, the studies on the nutritional value of different types of fish soups are limited. Therefore, this study aimed to identify nutritional value of a commonly used fish soup formulized from brook trout (*Salvelinus fontinalis* Mitchill 1814). Fish was obtained from an aquaculture unit and brought in ice within 30 minutes to the laboratory. The size and weight of fish were 17.5-32.7 cm and 162.7-410.5 g, respectively. Proximate composition, fatty acid profile, mineral contents some vitamin and carotenoid contents were examined. Low saturated fat was determined and highly polyunsaturated fatty acid contents were observed. The results showed that trout soup contains about 88.72% moisture, 7.86% crude protein, 3.00% total fat, 0.52% minerals, 0.74% carbohydrates. The energy value was low as 61.4 kcal/100g. Total saturated fatty acids (SFA), total monounsaturated fatty acids (MUFA) and total polyunsaturated fatty acids (PUFA) were found as 7.4%, 47.3% and 39.8%, respectively. About 51% of PUFA were accounted as omega 3 fatty acids. The main PUFA was linoleic acid as 18.9% followed by docosahexaenoic acid (DHA) as 14.3% which is known for its health benefits in the human diet. The values of alpha and beta tocopherol were obtained as 89 and 385 as wet weight, respectively. The values were 901 and 3899 mg/100g dry weight bases, respectively. Results for mineral contents showed that values of Ca, Na, K and Mg were higher than other minerals identified in this study for the fish soup. The results imply that trout fish soup has high nutritional value and also it is suitable for low energy diet due to its low energy value.

Key words: fish soup, *Salvelinus fontinalis*, nutritional value

Acknowledgement

This study was conducted by a collaborative project between Karadeniz Technical University, Faculty of Marine Science and University of Ljubljana, Faculty of Chemistry and Chemical Technology – Department of Chemistry and Biochemistry, supported by Turkish Scientific and Technical Research Council (TÜBİTAK, Project no: 213O112) and Slovenian Research Agency (ARRS, Project no. BI-SLO-TR-14-16/08).

Consumer response on fish soup from brook trout (*Salvelinus fontinalis* Mitchill, 1814) after addition of lavitol V as natural antioxidant

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SUMMARY

Fish soup is a well-known product commonly consumed around the world. It is known as nutritious product due to its nutritional value and functional properties. Because of preparing this soup is time-consuming at household productions, extensive use is limited. Main consumption of this type of soup is usually take place at restaurants. Therefore, seafood industry demands a ready-to eat soup in order to increase fish consumption in the world. Different types of industrial soup exist in the world. These are categorized into two types as canned fish soup and dried product. However, these products are easily produced by small sized companies due to high technical costs for production. Ready to eat fish soup without canning is also possible. However, its shelf-life is limited even at refrigerated conditions. Therefore, recently we aimed to investigate the role of lavitol V, an antioxidant compound, to increase the shelf life of trout soup. However, such compound is not commonly used in food production as antioxidant. Therefore, this study aimed to identify consumer response of fish soup after addition of lavitol V in the product. Brook trout (*Salvelinus fontinalis* Mitchill, 1814) was obtained from an aquaculture unit at the Faculty. The fish was kept without feeding for a while before harvesting. After harvesting, the processing was carried out within the same day. The size and weight of fish were 33-38 cm and 350-740 g, respectively. The soup was prepared at the processing unit of the Faculty. The soup was divided into two groups. The first, control group was without lavitol. The second group was lavitol group with 0.06 mg added lavitol V. Each group was added to the 3 liter of glass jars to be distributed to the location of survey points. The soups were tested for its sensory acceptance by about 200 persons. The products were subjected to the test as warm but if necessary the product was kept at refrigerated conditions for the following days. Survey was carried out within the city of Trabzon at the location of restaurants, cafes of some business or food industry areas, and also student cafes and dormitories. The results showed that trout soup containing lavitol V and control group had similar consumer acceptance within the first two days after production, then the soup with lavitol V had higher acceptance after 3 days with the extended time. Different studies were carried out on the shelf life extension of Lavitol V proved the shelf life extension of this antioxidant compound. Therefore, the results imply that addition of a natural lavitol V to the trout fish soup can improve the product quality as well as increase consumer acceptability.

Key words: *Salvelinus fontinalis*, soup, Lavitol V, antioxidant, consumer survey

Acknowledgement

This study was conducted by a collaborative project between Karadeniz Technical University, Faculty of Marine Science and University of Ljubljana, Faculty of Chemistry and Chemical Technology – Department of Chemistry and Biochemistry, supported by Turkish Scientific and Technical Research Council (TÜBİTAK, Project no: 213O112) and Slovenian Research Agency (ARRS, Project no. BI-SLO-TR-14-16/08).

Određivanje razine zaraženosti medonosne pčele (*Apis mellifera* Linnaeus, 1758) s varoom (*Varroa destructor* Anderson and Trueman, 2000) na različitim mjestima u košnici

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SAŽETAK

Procjena razine zaraženosti pčela s grinjom *Varroa destructor* ovisi u uporabi pravilne metode za utvrđivanje prisutnosti grinje. Tri preporučene metode su praćenje prirodnog dnevnog pada varoe, utvrđivanje zaraženosti pčela i legla. Kako bi utvrdili mjesto u košnici odakle uzorak pčela predstavlja najreprezentativniju procjenu zaraženosti zajednice, na 40 košnica je uspoređena zaraženost pčela iz tri dijela iste košnice: pčele iz medišta (PM), sa središnjeg okvira legla u plodištu (PL) i s rubnog okvira u plodištu (PR). Prirodni dnevni pad varoe (PPV) praćen je dva tjedna prije i dva tjedna nakon uzimanja uzorka. Ukupna zaraženost pčela (UZ) izračunata je kao prosjek zaraženosti tri uzorka iz košnice. Rezultati Pearsonove korelacije pokazali su visoku povezanost zaraženosti pčela između svih uzoraka: PM-PL ($r=0,894$, $R^2=0,799$), PM-PR ($r=0,83$, $R^2=0,69$), PL-PR ($r=0,893$, $R^2=0,797$). Najviša korelacija PPV utvrđena je s uzorkom pčela s rubnog okvira ($r=0,942$, $R^2=0,887$), dok je najniža ali još vrlo visoka korelacija utvrđena između PPV I PM ($r=0,859$, $R^2=0,737$). Također, utvrđena je vrlo visoka korelacija UZ sa sva tri uzorka pčela ($r>0,95$). Na osnovu dobivenih rezultata, uzorkovanje pčela iz medište za utvrđivanje zaraženosti pčela varoom predstavlja vrlo jednostavnu i pouzdanu metodu.

Ključne riječi: *Apis mellifera*, *Varroa destructor*, zaraženost, košnica, korelacija

Determining the infestation rate of honey bees (*Apis mellifera* Linnaeus, 1758) with Varroa mite (*Varroa destructor* Anderson and Trueman, 2000) at different location in the hive

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ABSTRACT

Evaluation of the colony infestation level with *Varroa destructor* mites depends on the use of methods for determining mite population. Currently, three most commonly used methods are: natural daily mite fall, adult bee infestation rate and brood infestation rate. Aiming to determine from which location in the hive is best to take a sample of bees, on 40 colonies we compared infestation level in bees taken from three different parts: the honey chamber (HF), central brood frame (BF) and from the edge frame in brood chamber (EF). Natural daily mite fall (NMF) two weeks before and after sampling was monitored, and daily mite fall was calculated. Total infestation rate (IR) was calculated as an avarage infestation of three samples from the same colony. Results of the Pearson correlation showed high correlation of infestation rate between all samples: HF-BF (r=0,894, R^2=0,799), HF-EF (r=0,83, R^2=0,69), BF-EF (r=0,893, R^2=0,797). The highest correlation of the natural mite fall was with infestation rate of bees from the edge frame (r=0,942, R^2=0,887), while the lowest, but still high correlation was found between NMF and HF (r=0,859, R^2=0,737). Correlation of total IR with all three samples was very high (r>0,95). Results obtained suggests that sampling of bees from honey chamber is a simple and reliable method for estimating infestation rate with Varroa mites in adult bees.

Key words: *Apis mellifera*, *Varroa destructor*, infestation, hive, correlation

Rasprostranjenost i reproduktivna obilježja sipice iglate (*Sepia orbignyana* Férussac, 1826) u sjevernom i srednjem Jadranu

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SAŽETAK

Cilj istraživanja je upoznavanje bioloških obilježja sipice iglate (*Sepia orbignyana* Férussac, 1826), vrste glavonošca iz porodice Sepiidae koju se redovito izlovljava pridnenom povlačnom mrežom koćom, a čija je biologija u Jadranu potpuno neistražena. Na području sjevernog i srednjeg Jadrana je tijekom istraživanja provedenih u razdoblju od 1996. do 2011. godine vrsta lovljena na dubinama između 22 i 237 m. Najveća brojnost nađena je na dubinama 50-100 m (36 N/km^2) te 100-200 m (18 N/km^2) i to na području srednjeg Jadrana, dok je u plitkim dijelovima sjevernog Jadrana lovljena samo sporadično. Sipica iglata se razmnožava tijekom cijele godine, a iznimno veliki udio zrelih jedinki (83 % ženki i 64 % mužjaka) zabilježen je u proljetno-ljetnom razdoblju. Nađeno je da mužjaci u prosjeku sazrijevaju pri manjoj dužini plašta od ženki i da u adultnoj fazi dosežu manje dužine tijela. Dužinsko-maseni odnos ukazuje na negativni alometrijski rast vrste (b=2,5749). Omjer spolova odstupa od očekivanog 1:1 uz značajno veći udio mužjaka u uzorku (1,27:1). Analizom gonada utvrđena je reproduktivna strategija poznata kao terminalno razmnožavanje s prekidima koju karakterizira polaganje jaja u odvojenim grupama tijekom jednog razdoblja razmnožavanja u kojem nema somatskog rasta ni regeneracije gonada. Rezultati ovog istraživanja su naročito važni za praćenje stanja pridnenih ekosustava Jadrana koja su ugrožena preintenzivnim ribolovnim aktivnostima.

Ključne riječi: *Sepia orbignyana*, distribucija, biologija, razmnožavanje, Jadransko more

Distribution and reproductive characteristics of the pink cuttlefish (*Sepia orbignyana* Férussac, 1826) in the Northern and Central Adriatic Sea

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ABSTRACT

The main goal of the study was to get insight into the biological characteristics of the pink cuttlefish (*Sepia orbignyana* Férussac, 1826), a cephalopod species from the family Sepiidae that is regularly caught with bottom trawl nets in the Adriatic Sea. Biology of this species in the Adriatic Sea is completely unexplored. During surveys conducted from 1996 to 2011 in the Northern and Central Adriatic, the species was caught at depths between 22 and 237 m. The highest abundance of 36 N/km^2 was found at depths 50-100 m, and 18 N/km^2 at 100-200 mm in the area of the Middle Adriatic, while it was caught only sporadic in the shallow parts of the Northern Adriatic. Pink Cuttlefish is reproducing during the whole year and exceptionally high portion of mature individuals (83% females and 64% males) were recorded in the spring-summer period. It was found that males became mature at mantle length smaller than females, and that males reach smaller body length in the adult stage. Length-weight relationships indicate a negative allometric growth in species (b=2,5749). Sex ratio differs from expected 1:1 with significantly high portion of males in the sample (1,27:1). Analysis of gonads indicated the reproductive strategy known as a terminal intermittent spawning. Results of this study are very important in monitoring state of the near-bottom ecosystems in the Adriatic Sea, which are threatened by over-intensive fishing activities.

Key words: *Sepia orbignyana*, distribution, biology, reproduction, Adriatic Sea

Rast i kondicija slatkovodnih školjkaša (Bivalvia, Unionoida) donjeg toka rijeke Neretve

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SAŽETAK

Slatkovodni školjkaši su primarni konzumenti koji imaju veliki utjecaj na strukturu i funkcioniranje vodenih ekosustava, a njihova sve manja brojnost uzrokovana je sve većim antropogenim utjecajima. Zbog nedostatka podataka o prisutnosti i rasprostranjenosti ove skupine organizama u rijeci Neretvi i šire, provedeno je istraživanje čiji je cilj bio odrediti sastav i strukturu populacije školjkaša donjeg toka Neretve. Uzorci su prikupljani sezonski, od ljeta 2015. do ljeta 2016. godine na pet postaja. Ukupno je obrađeno 236 jedinki bezupke (*Anodonta cygnea* Linnaeus 1758) i 566 jedinki slikarske lisanke (*Unio pictorum* Linnaeus, 1758). Ukupna duljina bezupke iznosila je od 31,19 mm do 136,55 mm, a slikarske lisanke od 14,88 mm do 130,19 mm. Najniže vrijednosti indeksa kondicije pojedinih jedinki slikarske lisanke zabilježene su ljeti, što je posljedica izbacivanja spolnih produkata u tom periodu, dok je najviša prosječna vrijednost indeksa kondicije zabilježena u jesenskim uzorcima, što ukazuje da bi mriješćenje ponovno moglo uslijediti. Jedinkama su određeni dužinsko-maseni odnosi pri čemu je utvrđen negativan alometrijski rast. Pomoću godišnjih prstenova rasta određena je dob svake pojedine jedinke. Utvrđeno je da su u populacijama obiju vrsta najbrojnije jedinke mlađe od tri godine. Najstarije jedinke slikarske lisanke dostigle su 7 godina, a pronađena je i jedinka bezupke stara 11 godina.

Ključne riječi: Neretva, školjkaš, *Anodonta, Unio*, struktura populacije

Growth and condition of freshwater mussels (Bivalvia, Unionoida) in the lower course of the Neretva River

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SUMMARY

Freshwater bivalve molluscs are primary consumers with a major impact on the aquatic ecosystem structure and functioning, and reducing of their abundance is caused by increasing anthropogenic impacts. Due to lack of records on presence and distribution of this group of organisms in the Neretva River, a study was done with an aim to determine composition and population structure of the bivalves of the lower course of the Neretva River. Samples were collected seasonally, from summer 2015 to summer 2016 at five sites. A total of 236 individuals of swan mussel (*Anodonta cygnea* Linnaeus 1758) and 566 individuals of painter's mussel (*Unio pictorum* Linnaeus, 1758) were processed. The total length of swan mussel ranged from 31.19 mm to 136.55 mm, and of the painter's mussel from 14.88 mm to 130.19 mm. The lowest condition index value of painter's mussel specimen was recorded in the summer, after release of gametes in this period, while the highest average value of the condition index was recorded in samples collected in autumn, indicating that spawning can be happened again. The relationship between shell length and flesh weight was estimated and the negative allometric growth was determined. Observing the annual growth rings provided age data of each individual. The populations of both species were abundant with the individuals under the age of three years. The oldest individual of painter's mussel reached seven years, and the oldest swan mussel was 11 years old.

Key words: Neretva River, mussel, *Anodonta*, *Unio*, population structure

Toksični metali u mišićnom tkivu kapitalnog primjerka Europskog soma (*Silurus glanis* Linnaeus, 1758*)* iz rijeke Drave, Hrvatska

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SAŽETAK

U ribama i proizvodima od ribe može se pronaći preko 20 različitih teških metala, među kojima su po toksičnosti najznačajniji olovo, živa, kadmij, arsen i krom. Ukoliko konzumacijom dospiju u organizam mogu izazvati niz štetnih učinaka na ljudsko zdravlje. Rezultati brojnih dostupnih znanstvenih istraživanja ukazuju na statistički značajnu pozitivnu korelaciju između voda onečišćenih teškim i toksičnim metalima i njihovim koncentracijama u akvatičnim organizmima koji žive u toj vodi. Som je jedna od najvećih slatkovodnih vrsta riba, koja je zbog dugog životnog vijeka i kao grabežljiva vrsta (tercijarni potrošači) na vrhu hranidbenog lanca u ribolovnim vodama. Kako bi se dobio uvid u razinu kontaminiranosti mesa kapitalnog primjerka Europskog soma (*Silurus glanis* Linnaues, 1758) te procijenio rizik za zdravlje potencijalnih potrošača u odnosu prema preporučenim maksimalno dopuštenim količinama pojedinih toksičnih teških metala u ribama i ribljim proizvodima, urađena je toksikološka analiza mišićnog tkiva. Som je ulovljen ribarskom mrežom u svibnju 2016. godine u rijeci Dravi kod Aljmaša. Tjelesna masa iznosila je 158,0 kg a totalna dužina 278,0 cm. Primjenom standardiziranih analitičkih metoda mjerene su koncentracije olova, kadmija, arsena i žive. Najvišu koncentraciju imala je živa (2,58 mg/kg), što za pet puta premašuje vrijednost preporučenih maksimalno dopuštenih količina pojedinih teških metala u ribama i ribljim proizvodima. Također, koncentracija teških i toksičnih metala u mesu riba pouzdan je indikator za praćenje zdravlja vodenog ekosustava rijeke Drave jer su akvatični organizmi pogodni bioindikatori onečišćenosti okoliša teškim metalima.

Ključne riječi: teški metali, riba, som, meso, Drava

Toxic metals in muscle tissue of the capital specimen of wels catfish (*Silurus glanis* Linnaeus, 1758) from the Drava River, Croatia

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SUMMARY

Over 20 different heavy metals, among which the most toxic are: lead, mercury, cadmium, arsenic and chromium, can be found in the fish and fish products. If they are taken by consummation in the organism, they can have a number of adverse effects on human health. Numerous available scientific studies show a significant positive correlation between water contaminated with heavy and toxic metals and their concentrations in aquatic organisms living in that water. Wels catfish is one of the largest freshwater fish species, which have a long lifespan and as a predatory species (tertiary consumers) is on the top of the food chain in the fishing waters. To gain insight into the level of meat contamination of the capital specimen of wels catfish (*Silurus glanis* Linnaeus, 1758) and to assess the risk to the health of potential consumers in relation to the recommended maximum permitted levels of certain toxic heavy metals in fish and fish products, a toxicological analysis of muscle tissue was performed. Wels catfish was caught with gill nets in May 2016 on the Drava River near Aljmaš in Croatia. It weighed 158.0 kg and its total length was 278.0 cm. By applying the standardized analytical methods, concentrations of lead, cadmium, arsenic and mercury, were measured. The highest concentration was that of mercury with 2.58 mg/kg, which is five times higher than the recommended maximum permitted level for the mercury in fish and fishery products. The concentration of heavy and toxic metals in the fish meat is reliable indicator for monitoring the health of the aquatic ecosystem of the Drava River since aquatic organisms are suitable bioindicators of environmental pollution by heavy metals.

Key words: heavy metals, fish, catfish, meat, Drava River

Uporaba lovačkih kamera u istraživanju lovne faune na području grada Slatine

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SAŽETAK

Raznolikost vrsta divljači i njihova rasprostranjenost na širem području grada Slatine istraživani su u razdoblju od prosinca 2015. do rujna 2016. godine. Korištena su dva modela lovačkih kamera: Bushnell Trophy Cam HD 119677 te Moultrie D-80 White Flash, kojima je na različitim lokalitetima praćena aktivnost divljači, u prosjeku 14 dana po lokalitetu. Na većini lokaliteta apliciran je mamac kako bi se povećala vjerojatnost posjećenosti divljači. Kamere su dosad zabilježile pojavnost: divlje svinje, srne obične, jelena običnog i lisice, dok su rjeđe zabilježeni: jazavac, kuna, divlja mačka, zec obični, vjeverica te nekoliko vrsta ptica. Prema brojnosti zabilježenih jedinki, utvrđena je dominacija divlje svinje i lisice, dok su jelen obični i srna obična zastupljeni na značajno manjem broju snimaka. Srna obična i lisica zabilježene su na svim istraživanim lokalitetima, dok je divlja svinja izostala jedino s prostranog agrikulturnog sjevernog dijela. Jelen obični preferira nizinska područja sa staništima lužnjakove šume, naročito površine sjeverno od grada. Prema prikupljenim podacima o praćenju dnevne aktivnosti divljači izdvaja se divlja svinja s vrhuncem aktivnosti od 20:00 do 04:00 sati; srna obična najaktivnija je od 04:00 do 08:00 sati, nakon čega dolazi period slabije aktivnosti od 12:00 do 22:00 sata. Jelen obični zabilježen je najčešće između 22:00 i 06:00 sati. Lisica, iako aktivna cijeli dan, najčešće je zabilježena od 00:00 do 06:00 sati. Lovačke kamere kontinuirano se postavlja na nova područja s ciljem potpunijeg uvida u zastupljenost, rasprostranjenost i dinamiku kretanja divljači na području Slatine.

Ključne riječi: lovačka kamera, divljač, fauna, Slatina

Use of trail cameras in survey of the hunt fauna in the area of the City of Slatina

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SUMMARY

The diversity of game animal species and their distribution in the wider area of the City of Slatina was surveyed in the period from December 2015 to September 2016. Two trail camera models, Bushnell Trophy Cam HD 119677 and Moultrie D-80 White Flash, were used for tracking game activity on various locations, 14 days per location on average. At most localities, a bait was applied in order to increase the likelihood of game occurrence. So far, the trail cameras recorded wild boar, roe deer, red deer and red fox, while the occurrence of european badger, marten, wild cat, european hare, red squirrel and several bird species was rare. According to number of recorded individuals, the dominance of wild boar and red fox was observed, while red deer and roe deer were represented on significantly lower number of images. Roe deer and red fox were recorded at all surveyed localities, and wild boar was absent only in the extensive agricultural northern part. Red deer prefered lowland areas with habitats of pedunculate oak forests, particularly areas north of Slatina. Based on collected records on monitoring the daily activity of game, wild boar stands out with peak activity between 20:00 and 04:00; roe deer was most active from 04:00 to 08:00, followed by a period of low activity from 12:00 to 22:00 h. Red deer was usually observed from 22:00 to 06:00. Red fox, although active throughout the day, was recorded most frequently from 00:00 to 06:00. Hunting trail cameras are being regularly placed on new sites in order to obtain a more complete insight into the presence, distribution and migration dynamics of wild game in the area of City of Slatina.

Key words: trail camera, game animal, fauna, Slatina

Artifical reef performance in the Black Sea

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SUMMARY

Artificial reefs are anthropogenic underwater structure built to promote marine life, especially in unproductive environments. The aim of undertaken study was to identify macroorganisms around artificial reefs in October 2016, for the first time after planting the reefs in a previous year. Observations were performed by scuba diving at four artificial reefs, which were placed at 17m depth and in their surroundings in Surmene, Trabzon. Observed macroorgainsms were photographed using underwater camera. Taxonomical identification of observed species was done by analysis of the morphological characteristics. Most suitable taxa/taxon was identified after repeated observations and compared with species described in literature. Most of the surface of the artificial reef was covered with Mediterranean mussel, *Mytilus galloprovincialis* and its predatory marine snail, *Rapana venosa.* Beside mollusks, six fish and four crustacean were observed during two diving events, which are: *Diogenes pugilator, Eriphia verrucosa, Palaemon elegans, Parablennius* sp.*, Symphodus tinca, Scorpaena porcus, Chromis chromis, Pomatomus saltatrix* and *Solea solea.*

Key words: artificial reef, biodiversity, macroorganism, Black Sea

Divlja mačka (*Felis silvestris* Schreber) u Hrvatskoj: stanje i perspektiva

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SAŽETAK

Hrvatska je zemlja s gotovo 50 % udjela šuma i šumskih zemljišta u ukupnoj kopnenoj površini. Velika šumovitost osigurava dobra staništa za vrste krupne i sitne divljači pa i divlju mačku (*Felis silvestris* Schreber, 1775). Kao članica Europske unije, Republika Hrvatska u obvezi je primjenjivati i Direktivu o očuvanju prirodnih staništa i divlje faune i flore. Prema ovoj Direktivi, divlja mačka pripada među ugrožene vrste te je zaštićena lovostajom cijelu godinu. Istraživanje je provedeno radi utvrđivanja stanja populacije divlje mačke u Hrvatskoj. Svim lovoovlaštenicima poslan je upitnik u kojem su tražene osnovne informacije o divljoj mački u lovištima. Ukupno je vraćeno 523 ili 49 % ispunjenih upitnika. Divlja mačka je stalna vrsta u 70 % istraživanih lovišta, povremena u 18 % dok nije prisutna u 12 % lovišta. Čak 75 % lovoovlaštenika ističe da je brojnost divlje mačke u opadanju, 18 % bilježi porast dok u 7 % lovišta populacija stagnira. Razlozi smanjenja brojnosti divlje mačke tijekom posljednjih godina su: promjene staništa (36 %); nezainteresiranost lovaca (26 %); uznemiravanje (20 %) i negativni utjecaj konkurentnih vrsta (16 %). Temeljem podataka prikupljenih upitnikom, brojnost divlje mačke u Hrvatskoj procijenjena je na 3100 jedinki. Prema podacima dostupnim u Središnjoj lovnoj evidenciji Ministarstva poljoprivrede, brojnost divlje mačke tijekom posljednjih pet godina, varira u rasponu od 1800 do 2100 jedinki, Neistraženim je ostao stupanj hibridizacije divlje i domaće mačke, posebice ako se uzme u obzir da 88 % lovoovlaštenika ističe prisutnost domaće mačke u svojim lovištima

Ključne riječi: *Felis silvestris*, populacija, Hrvatska, lovstvo

The status and perspective of the European wildcat (*Felis silvestris* Schreber) in Croatia

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SUMMARY

Republic of Croatia is country with almost 50% share of forest and forest land in total land surface. Large forest cover provides optimal habitats for species of big and small game animals, including the European wildcat (*Felis silvestris* Schreber, 1775). As a member state of the European Union, Republic of Croatia is obliged to implement Directive on the conservation of natural habitats and of wild fauna and flora. According to this Directive, wildcat is classified among endangered species, protected by the closed hunting season throughout the complete year. Survey was done with an aim to determine population status of wildcat in Croatia. A questionnaire was dispatched to all holders of the hunting right in Croatia, requesting the basic information on wildcat in the hunting grounds. Total of 523 or 49% of questionnaires containing replies had been received. Wildcat is permanent species in 70% of the surveyed hunting grounds; in 18% it is temporary, while it is not present in 12% of the hunting grounds. Even 75% of the holders of the hunting right emphasized that population size of wildcat is declining; increase is reported in 18% while the population is in stagnation in 7% of the hunting grounds. Following factors had been identified as causes of decline in population size of wildcat during the last year: habitat changes (36%), lack of interest in hunters (26%), disturbance (20%) and negative effect of the competing species (16%). Based on data collected by a questionnaire, population size of wildcat in Croatia is estimated to 3,100 individuals. According to data available in the Central Hunting Registry of Ministry of Agriculture, population size of wildcat vary from 1,800 to 2,100 individuals, during the last years. Hybridization level between wildcat and domestic cat is still unexplored, especially when considering that 88% of holders of the hunting grounds reported presence of domestic cat in their hunting grounds.

Ključne riječi: *Felis silvestris*, population, Croatia, hunting

Irreversible starvation level by RNA/DNA on lab-grown Black Sea larval anchovy (*Engraulis encrasicolus* Linnaeus, 1758*)*

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SUMMARY

The recruitment of European anchovy (*Engraulis encrasicolus* Linnaeus, 1758), the most important forage fish in the Black Sea ecosystem, has exhibited dramatic changes during the 1990s and in addition to fluctuating recruitment for last decades its overexploitation has affected Black Sea ecosystem as a whole. Enhanced rates of early survival and growth have a cumulative effect that can translate into a greatly increased probability of subsequent recruitment. For further tracking of its recruitment, we tried to clarify the irreversible starvation (IS) level based on RNA/DNA of lab-grown larval anchovy by collecting fertilized eggs from the sea. Five feeding levels applied to produce the IS: fed control (FC), unfed control (UC), delayed first feeding for 1 (1DF), 2 (2DF) and 3 days (3DF). Newly hatched larvae had mean notochord length 3.25±0.04 mm, first feeding started on day 3 after hatching. The whole body RNA/DNA ratio and the daily protein growth rate were individually analyzed. No larvae left in unfed group on day 6. The IS was on the first day after first feeding and the critical RNA/DNA of the larvae at IS level was 1.022±0.20. Survival rate in unfed control was similar to the other delayed groups. The highest growth rates in protein were on day 6 with 43.45% for FC. By using IS based on RNA/DNA derived from this research, survival probability can be detected for field-caught larvae in future researches.

Key words: forage fish, *Engraulis encrasicolus*, Black Sea, RNA/DNA, starvation

Stočarstvo

07

Animal Husbandry

Investigations Feed Value of Vetch (*Vicia Narbonensis*) Silage

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SUMMARY

Narbon vetch (*Vicia narbonensis L.*) is an important forage species among vetches of central Europe, Mediterranean, Near East, Ethiopia, central Asia and İndia. Vetch was used in this trial as the silage material. The aim of this study was to carried out to determine the effects of lactic acid bacteria and inoculants as silage additives, on the fermentation and aerobic stability of grass silage. Vicia narbonensis was harvested early flowering period (flowering 1/10) and ensiled in silos type of glass containers. Each application consists of 3 parallel. Chemical and microbiological analyses, were conducted on the silage which was opened on the 45th day after it was ensiled. According to the analysis; control, LAB and LAB + enzyme groups of KM 13.16±0.05, 12.28±0.22, 13.47±0.32, pH 4.57±0.01, 4.51±0.01, 4.41±0.01, NH_3-N: 87.29±3.14, 90.19±1.43, 92.86±1.22 found. In conclusion, it was evaluated that chemical, pyhsical and microbiological qualities increease with the addition of LAB and LAB + enzyme to the narbon vetch silage. Also use to narbon vetch sliage material useful for storage conditions.

Key words: Vetch, silage, silage additive, silage quality

Utjecaj pasminske strukture krava u mliječnim stadima na svojstva mliječnosti

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SAŽETAK

Cilj rada je bio istražiti utjecaj pasminske strukture stada na svojstva mliječnosti krava holstein i simentalske pasmine u tri tipa farmi: samo holstein krave (HOL), samo simentalske krave (SIM) i farme s mliječnim kravama ove dvije pasmine HOL/SIM). Analizirana su laktacijska svojstva mliječnosti (količina mlijeka, količina i udio mliječne masti i bjelančevina u standardnoj 305 danskoj laktaciji) koristeći podatke 211776 laktacija uzetih iz središnje baze podataka Hrvatske poljoprivredne agencije. Za provjeru značajnosti i uključenje utjecaja u model korištena je metoda najmanjih kvadrata temeljem procedure GLM u SAS statističkom programu. Za svako je svojstvo izračunata korigirana srednja vrijednost. Pasminska struktura imala je značajan utjecaj na svojstva mliječnosti ($P<0.0001$). Holstein krave u HOL farmama imale su veću laktacijsku proizvodnju mlijeka (936,2 kg), mliječne masti (36,7 kg) i bjelančevina (32,6 kg), isti udio bjelančevina (3,28 %), ali manji udio mliječne masti (0,03%), u odnosu na holstein krave u HOL/SIM farmama. Simentalske krave u SIM farmama proizvode manju laktacijsku količinu mlijeka (473,7 kg), mliječne masti (20,2 kg) i bjelančevina (18,2 kg), ali imaju i manji udio mliječne masti (0,03 %) i bjelančevina (0,06 %) u odnosu na simentalske krave na HOL/SIM farmama. Rezultati istraživanja ukazuju da holstein krave imaju bolja, a simentalske lošija svojstva mliječnosti u jednopasminskim farmama. Moguće objašnjenje su različite proizvodne potrebe krava ove dvije pasmine, kao i viši stupanj tehnologije na specijaliziranim većim mliječnim farmama.

Ključne riječi: mliječne farme, pasminska struktura, svojstva mliječnosti

The effect of breed on milk production traits in dairy herds

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SUMMARY

The objective of this paper was to determine the breed effect on milk production traits in three types of farms as follows: Holstein cows only (HOL), Simmental cows only (SIM), and farms rearing cows of both breeds (HOL/SIM). Milk production traits in standard 305-d lactation (milk yield, milk fat and protein yield and content) were analysed using data of 211776 completed lactations taken from the central database of Croatian Agricultural Agency. The GLM procedure in the statistical package SAS based on Least Square Method was used to determine the significant effects which affected the differences in production of analysed traits. Least square means were computed for each trait. The breed had significant effect (P<0.0001) on milk production traits. Holstein cows on HOL farms had larger lacatation milk yield (936.2 kg), as well as milk fat (36.7 kg) and protein yield (32.6 kg). Protein content (3.28 %) was the same, while milk fat content was smaller (0,03%) compared to Holstein cows in HOL/SIM farms. Simmental cows in SIM farms produced smaller amount of lactation milk yield (473.7 kg), milk fat (20.2 kg) and protein yield (18.2 kg), as well as smaller milk fat (0.03 %) and protein content (0.06 %) than Simmental cows on HOL/SIM farms. These results show that Holstein cows had better, and Simmental cows worse milk production traits on single breed farms. Possible explanation was atributted to different production needs of cows coming from different breeds, as well as higher technology level on specialized larger dairy farms.

Key words:dairy farms, breed structure, dairy characteristics

Growth performance of rabbits supplemented with Maralfalfa grass (*Pennisetum sp.*), Elephant grass (*Pennisetum purpureum*) and hydroponically-grown barley (*Hordeum vulgare*)

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SUMMARY

Animal production is increasingly reliant on supplemental feeding, the cost of many traditional feeds restricts their use in many countries, and producers are therefore turning to alternative feed sources. The voluntary intake, feed conversion rate (FCR), average daily gain (ADG) and total growth gain of rabbits fed with commercial diets supplemented with Maralfalfa (*Pennisetum sp.),* Elephant grass (*Pennisetum purpureum*) and hydroponically-grown barley (*Hordeum vulgare*) were assessed. The research was conducted on 24 New Zealander rabbits of 35 days of age and 950g of weight. The animals were housed in four different pens and were randomly assigned for four different diets in each group, forming 4 lots (L) with 3 males and 3 females each. The 4 diets comprised: L1 Commercial diet, L2 Commercial diet + Maralfalfa grass (*Pennisetum sp*.), L3 Commercial diet + Elephant grass (*Pennisetum purpureum*) and L4 Commercial diet + hydroponically-grown barley (*Hordeum vulgare*). In all groups, the feed and refusals were weighed and recorded daily during 15 days. Then the total feed intake, total growth gain of rabbits, average daily gain (ADG) of rabbits and feed conversion rate was calculated. Each animal from lot 1 gained 626.6 g and 41.7 g ADG, from lot 2 gained 544 g and 36.3g ADG, from lot 3 gained 556.6 g and 37.1 g of ADG, and from lot 4 each animal gained 503.3 g and 33.5 g ADG. The average body weight (BW) per lot at the end of the study was as follows: 1613 g (L1), 1504 g (L2), 1526 g (L3) and 1476 g (L4). The highest BW and ADG were obtained in L1 (commercial diet); L2 and L3 gave the similar results, and the lowest BW and ADG were obtained in L4 (hydroponically-grown crops).While daily feed intake and feed conversion rate (FCR) were: 188 g and 4.5(L1), 50.6 g and 1.4(L2), 155.3 g and 4.1(L3) and 164.2 g and 4.8 in (L4).

Keywords: rabbits, feed fattening, Maralfalfa grass, Elephant grass, hydroponically-grown barley

Autentifikacija proizvoda primjenom molekularno-genetskih metoda

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SAŽETAK

Postupak autentifikacije proizvoda ima višestruko značenje za proizvođače te za krajnje potrošače. Upravo je postupak autentifikacije ključni čimbenik zaštite i razdvajanja tradicionalnih proizvoda od onih patvorenih. Razvoj novih metoda koje se temelje na anlizi DNK otvaraju mogućnost za bržim dobivanjem točnijih podataka. Konvencionalni sustavi autentifikacije i sljedivosti prate određeni proizvod od farme do krajnjeg potrošača, a obzirom na veliki broj koraka postoji mogućnost i pogreške. Prednost korištenja DNK u postupcima analize se ogledaju u potrebi za malom količinom uzorka za analizu, relativno jednostavnoj izolaciji DNK iz tkiva te činjenici da se DNK nalazi u svim stanicama. Molekularni markeri koji se koriste pri autentifikaciji proizvoda su mitohondrijska DNK (mtDNK), mikrosatelitski markeri, polimorfizam jednog nukleotida (SNP) i polimorfizam dužine jednog fragmenta (RFLP). Osnovne metode analize DNK koje se primjenjuju u postupcima autentifikacije proizvoda temelje se na uporabi lančane reakcije polimerzom (PCR) koju zatim slijede gel elektroforeza i hibridizacija sa specifičnim sondama. Nadalje, provjera PCR produkata izvodi se uz primjenu različitih metoda kao što su sekvenciranje PCR produkata, simultano umnažanje više fragmenata s različitim probama (združeni PCR), analiza polimorfizma dužine restrikcijskog fragmenta (PCR-RFLP), DNK čipovima vrstu i analiza slučajno umnoženog polimorfnog fragmenta (PCR-RAPD).

Ključne riječi: autentifikacija, molekularano genetske metode, tradicionalni proizvodi, DNK

Application of molecular genetic methods for food authentication

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SUMMARY

The authentication of traditional products with protected designation of origin (PDO) has a great significance for manufacturers and consumers. Process of authentication is a key factor for the differentiation of protected product from those that are adulterated or mislabeled. The development of new methods based on the analysis of DNA opens the possibility for faster obtaining of more accurate data. Conventional systems for food authentication trace a particular product from the farm to the final consumer through multiple number of steps which allows greater possibility of errors during the process. Advantage of methods based on the DNA analysis is a small amount of the test sample needed, relative ease of DNA isolation and the fact that all cells contains the DNA. Molecular markers that are most used in food authentication process are mitochondrial DNA (mtDNA), microsatellite markers, single nucleotide polymorphism (SNP) and restriction fragment length polymorphism (RFLP). The basic methods of DNA analysis that are applied in the process of food authentication are based on the performance of polymerase chain reaction (PCR) followed by gel electrophoresis and hybridization with specific probes. Furthermore, verification of PCR products may be carried out by various methods such as sequencing of the PCR products, simultaneous amplification of multiple different fragments with specific probes (multiplex PCR) analysis of fragment length polymorphism (PCR-RFLP), DNA chips primers and randomly amplified polymorphic DNA markers (PCR-RAPD).

Key words: authentication, molecular genetic methods, traditional products, DNA

Effect of dietary yeast supplementation on lambs growth and carcass traits

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SUMMARY

The objectives of this study were to evaluate the effect of levels yeast supplementation as a natural feed additive on growth performance, carcasses characteristic and some blood metabolites of growing Sohagi lambs. Twenty-one Sohagi lambs (27.00±0.75 kg body weight, 6 months old) were randomly assigned to three dietary treatments with seven lambs per treatment. The treatment groups were as follows:(G1) was kept as a control and fed a basal diet consisting of roughage and concentrate mixture. (G2) fed the basal diet supplemented with 0.5 % of yeast culture (YC) (Saccharomyces cerevisiae) to the mixture, while (G3) received the same basal diet supplemented with 1% of YC. All animals were fed 60% of their requirements as concentrate mixture with crushed corn stover given ad libitum. The quantity of concentrate mixture was adjusted every month according to change in body weight. The results indicated that dietary supplementation of YC (0.5 or 1%) did not significantly effect on body weight and daily gain. However, dry matter intake (DMI) of concentrate, roughage and total dry matter intake were significantly ($P<0.05$) higher for lambs fed YC than control. Supplemented YC to lambs rations decreased significantly ($P<0.05$) feed conversion ratio in comparison with the control treatment. Serum glucose and urea nitrogen were increased significantly ($P<0.05$) in YC groups. However, the concentration of triglycerides and cholesterol decreased significantly ($p<0.05$) when feeding YC diets. No differences were observed between treatments for hot carcass and carcass cuts with respect to flank, which recorded higher ($p<0.05$) value for YC groups compared to control. Supplemented YC at level of 0.5% or 1% significantly ($P<0.05$) increased dry matter and fat in meat compared with control groups. Water-holding capacity was significantly ($P<0.05$) lower for YC groups than control. It was concluded that improvement productive performance of sheep, blood metabolites and carcass characteristics via dietary yeast supplementation. Also, YC may be more useful as a feed additive for growing lambs rations.

Key words: lambs, growth performance, carcass characteristics, yeast culture

Changes in activity of glutathione peroxidase and superoxide dismutase in weaned pigs fed with addition different sources of selenium

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SUMMARY

Selenium is trace element of high importance for animals and human. Soil is the major source of Se, but soils in Croatia are poor with selenium. Therefore animals eating cereals from such soils are deficit in selenium and there is a neediness and practice for dietary supplementation. Until recently the supplemental form of selenium has been inorganic form, as selenite or selenate. Many studies have shown the most effective organic selenium because of selenium incorporation in selenoamino acids, like selenomethionine.

On the basis of that fact, the aim of this investigation was to find out whether different sources of dietary selenium supplement had influence on antioxidative enzymes' activity in plasma and erythrocytes of weaned piglets.

The trial was conducted with 120 weaned PIC piglets, aged 28 days, fed with foder mixtures with 17.5 % crude proteins and 13.95 MJ ME, divided into four groups. Dietary selenium addition were prepared with different source and form of selenium: C-without selenium addition, E1-Se from biofortrified corn, E2- chelated sodium selenite, E3- selenium yeast. The productive performances and analyses of antioxidative status were measured at 0, 22nd and 42nd day of the trial.

There was no differences in growing performances between groups. The highest GPx activity was determined in piglets sera fed by biofortified corn in feed mixture related to other groups at the end of the trial. GPx activity in erythrocytes differed statistically between groups and date of the trial in favor of E1 group. SOD activity in erythrocytes did not differ between groups, only between days during experimental period.

Considering the activity of the major antioxidative enzymes related to selenium concentration (GPx), the best results were achieved in group fed with selenium enriched corn.

Key words: selenium, biofortified corn, antioxidation, glutathione peroxidase

Proizvodni pokazatelji i zdravstveno stanje teladi hranjene različitim udjelima u buragu razgradivog škroba i bjelančevina

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SAŽETAK

Cilj ovog istraživanja bio je utvrditi kako povećan udio u buragu nerazgradivog škroba i bjelančevina utječe na proizvodni učinak i zdravstveno stanje teladi. Pokus je proveden na 36 teladi holstein pasmine prosječne starosne dobi 7 dana podijeljene u tri skupine sa po 12 teladi, uz jednak omjer spolova. Pokus je podijeljen u dva razdoblja: 1) razdoblje pokusa - starter smjesa, i 2) razdoblje pokusa - grover smjesa. U starter razdoblju telad je napajana punim pasteriziranim mlijekom i mliječnom zamjenicom i dohranjivana starter smjesom, čiji se sirovinski sastav razlikovao ovisno o udjelu u buragu nerazgradivog škroba i bjelančevina: skupina I (36,6% BNP i 16,5% BNŠ), skupina II (49,1% BNP i 27,6 % BNŠ) i skupina III (53,5% BNP i 36,5% BNŠ). U grover razdoblju telad je hranjena mliječnom zamjenicom i grover smjesom koja se razlikovala po skupinama ovisno o udjelu u buragu nerazgradivog škroba i bjelančevina: skupina I (33,5% BNP i 15,8% BNŠ), skupina II (48% BNP i 26,3% BNŠ) i skupina III (54,3% BNP i 34,6% BNŠ). Iz dobivenih rezultata utvrđeno je da je u starter razdoblju telad skupine III postigla statistički vrlo značajno veću (P<0,01) tjelesnu masu i dnevni prirast u odnosu na telad skupine I i II. Na kraju pokusa nije bilo značajnih razlika u tjelesnoj masi i dnevnom prirastu. Telad skupine I i III postigla je statistički visoko značajno veću potrošnju starter smjese (P<0,01) u odnosu na telad skupine II, te značajno veću (P<0,05) ukupnu potrošnju krmne smjese u odnosu na telad skupine II. Telad skupine II i III postigla je značajno bolju (P<0,05) konverziju hrane u odnosu na telad skupine I. Zdravstveno stanje teladi, praćeno kroz pojavnost proljeva i pneumonije, pokazalo je bolje vrijednosti u skupini II.

Ključne riječi: telad, nerazgradivi škrob u buragu, nerazgradive bjelančevine u buragu, hranidba

Production characteristics and health status of calves fed different amounts of rumen degradable starch and protein

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SUMMARY

The object of this research has been to set out how the increased portion of the rumen-undegradable starch and protein (RUP), affects on the production characteristics and the health status of the calves. The experiment has been carried out on 36 Holstein calves of 7 days average age divided in three groups each with 12 calves with the equal sex ratio. The experiment has been divided in two periods: 1) the experiment period – the Starter mixture and 2) the experiment period – the Grover mixture. During the Starter period the calves were fed by the whole pasteurized milk and the milk substitution and fed starter mixture as well, whose the raw materials composition was different depending of the rumen undegradable starch and proteins: the group I (36,6% rumen undegradable protein (RUP) and 16,5% rumen undegradable starch (RUS), the group II (49,1% rumen undegradable protein (RUP) and 27,6% rumen undegradable starch (RUS), and the group III (53,5% rumen undegradable protein (RUP) and 36,5% rumen undegradable starch (RUS). During the grover mixture period the calves were fed by the milk replacer (MR) and grover mixture that were different in each group depending by the portion of the rumen undegradable starch (RUS) and the rumen undegradable protein (RUP): the group I (33,5% RUP and 15,8% RUS), the group II (48% RUP and 26,3% RUS) and the group III (54,3% RUP and 34,6% RUS). From the obtained results it was found out that during the starter period the calves of the group III obtained the statistically and significantly higher ($P< 0,01$) body weight and daily gain in relation to the calves of the groups I and II. At the end of the experiment period there were no significant differences in the body weights and the daily gains of the calves. The calves from the group I and the group III statistically attained the highly significant higher consumption of the starter mixture ($P<0,01$) in relation to the calves of the group II, and significantly higher ($P<0,05$) total consumption of the fodder mixture in the relation to the calves from the group II. The calves from the groups II and III achieved significantly better ($P<0,05$) food conversion in the relation to the calves from the group I. The calves' health state, followed through the manifestation of the diarrhea and the pneumonia, showed the better values in the group II.

Key words: calves, rumen undegradable starch (RUS), rumen undegradable protein (RUP), feeding

The morpholocigal characterisation of donkey population in Montenegro

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SUMMARY

Donkey is a very durable and with regard to nutrition not demanding farm animal, thus it is commonly reared in the coastal area and central part of Montenegro, where sources of feed are very scarce. Economic importance of donkey in Montenegro has been changed over time. In the past it was used only as working animal in poorly accessible areas. Due to abandonment of the village and use of machinery the population had drastic reduced.

Based on the results of the Census of Agriculture, the existing donkey's population is below 500 head, so that this species is now at risk of extinction.

This study included a total of 46 male and 34 female animals, the most important exterior features and eight body measures were determined for all of these animals. The average age of female animals (17 years) was significantly higher than males (13.5 years). The population is dominated by grey to brown animals, although there are dark- black and light gray to white animals. The dark stripe along the back and a cross on the whither were recorded in gray and brown animals.

In terms of body development, statistically significant differences ($P<0.05$) between the sexes in favor of males were found only for fore lag circumference (13.35 : 12.9). Females are on average had a higher wither height, the chest depth (99.1 cm and 42.5 cm) than males (97.9 cm and 42.3 cm), while for all other measures the greater values were determined in males, but the differences were not significant ($P>0.05$). Indices of body development indicate that it is a very compact animal with rather square to slightly rectangular format body.

Key words: donkey population, exterior, body measures

Raw camel milk production in four Algerians southeastern arid provinces: composition and physico-chemical quality, constraints related to collection, storage and transport

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SUMMARY

Background: Camel the most adapted species to arid's areas. Camel's milk, has nutritional, therapeutic properties, rich in salts, enzymes, inhibiting microbial activity, hence it's long shelf life and low ability coagulation. In Algeria, disert covers more than 85% of the total area. Dromedary is the only species able to valorize this disert ecosystem. Camel's population is about 315000 heads, distributed over seventeen provinces, with 75% in eight disert provinces and 25% in nine steppe provinces. Camel breeding, practiced in extensive, (Nomadic) dependent on climatic conditions, low milk productivity, because of the lack of collection system, intended more to camel's meat production. Although this milk, highly required in urban areas and Northern provinces, for therapeutic use. However, the collection and transport for long-distance alters it's physico-chemical quality. Aim : The study aimed to explore ten physicochemical parameters (pH, titratable acidity, viscosity, density, conductivity, total azote, protein, fat, whey and dry meter) during milking collection, transport and storage, for a total of forty-one raw camel milk sample's, collected in four provinces in the South-eastern of Algeria : M'sila, Biskara, Ouargla and El Oued. Results : after statistical treatment by ANOVA program, results showed the heterogeneity and instability of physico-chemical tests explored. Freezing seems the ideal method for the collection, storage, preservation and transportation of raw camel milk which is accessible only in arid areas.

Key words: Camel milk, Stability, Physico chemical, Analysis, ANOVA.

Analyse of the degree covering of young bull carcass with fat tissue according to EU standard

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SUMMARY

The Domestic Simmental cattle is the cattle breed which is mostly represented in the area of the Republic of Serbia. The quality of the carcasses have been the subject of interest, both primary production and the meat industry. The aim of this research was to analyse the degree of covering of carcass with fat tissue at the young bull slaughtered in a slaughterhouse in Raški district, according to the standard which was applied in the EU countries (Council Regulation (EC) N° 1234/2007, Commission Regulation (EC) N° 1249/2008; Commission European, Directorate-General for Agriculture and Rural Development). The rules defining the quality of meat are partially applied in Serbia (The rule book Official paper SFRJ 34/74,26/75,13/78). The study was conducted on 123 young bulls carcasses The quality assesment and the fat tissue degree check was done immediatelly after the veterinary examination and measurement of carcasses. The correctness of the butchery procedure done in the given premises was valued as acceptable. As far as the degree of the coverage is concerned, there were three categories stated (2, 3, 4). Only one carcasses was of the category 2. The 3. category was found at 107 carcasses, which is significantly more ($p<0,01$) than in the category 2 and in category 4 (15 trunks). The given results show that it is necessary to intensify the primary production upgrading in order to achieve better meat quality.

Key words: Domestic Simmental breed, carcasses, fat tissue

Stanje i perspektiva uzgoja Banijske šare svinje

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SAŽETAK

Smatra se da je Banijska šara (BŠ) svinja nastala 40-ih godina prošlog stoljeća na području Banovine križanjem domaće bijele svinje s klopavim ušima te Turopoljske svinje i crnog berkšira. BŠ spada u skupinu svinja kombiniranih proizvodnih svojstava tj. namijenjene su za proizvodnju mesa i masti visoke kakvoće. Budući da BŠ nije službeno priznata pasmina te da nije postojao sustavni plan uzgoja broj ovih svinja se u posljednjih dvadesetak godina drastično smanjio. Planom revitalizacije uzgoja BŠ svinje koji je započeo 2014. godine u uzgojima sa područja Banovine (Petrinja, Dvor, Sunja) odabrane su jedinke BŠ svinje koje su upisane u novootvorenu matičnu knjigu BŠ. Temeljem morfoloških osobina i njihove podudarnosti s povijesnim opisom pasmine odabrana su grla za ciljno sparivanje u cilju dobivanja uniformnih potomaka karakterističnih osobina. Ukupno je u prvoj godini umatičeno 34 krmače i 11 nerastova koji su temeljem podataka o srodnosti razvrstani u 4 linije i 7 rodova. Nadalje, proizvedeno je ukupno 56 legala čija prasad je ocijenjena s obzirom na pripadnost tipu (BŠ) i koja će poslužiti za odabir rasplodnih grla (nerastovi i nazimice) kao osnova buduće populacije. Temeljem navedenog može se zaključiti da je stvorena osnova za povećanje populacije BS svinje kao jednog od važnih kriterija u pokretanju postupka za priznavanje pasmine.

Ključne riječi: Banijska šara, svinja, uzgoj, stanje, revitalizacija

Current state and perspective of Banija spotted pig breed

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SUMMARY

It is believed that Banija spotted pig breed (BS) was created in forties last century by crossing domestic white pigs as well as Turopolje pig with black Berkshire. BS belongs to a group of dual purpose pig breed and are suitable for the production of pork of high quality. Because BS is not officially recognized as breed and that there was no plan for preservation of this breed, the number of BS pigs was drastically reduced in the last twenty years. In 2014 based on morphological characteristics and their similarities with the historical description of the breed, selected animals were registered in the newly opened Herd book. During the first year were registered 34 sows and 11 boars that are based on origin divided into four lines and seven genera. In addition, a total of 56 litters were produced from which piglets were evaluated regard to presence of BS characteristics and selected as a base for enlargement of population. It could be conclude that was established a base for the increase of BS pig population as one of the important criteria to initiate the procedure for registration of the breed.

Key words: Banija spotted pig, breed, current state, revitalization

Utjecaj završne tjelesne mase na kakvoću polovica, mesa i kulena od crnih slavonskih svinja

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SAŽETAK

Istraživanje je provedeno na 32 crne slavonske svinje. Svinje su podijeljene u dvije skupine po 16 svinja. Prva skupina tovljena je do završne tjelesne mase od oko 100 kg, a druga skupina do završne tjelesne mase od oko 130 kg. Tijekom prvog razdoblja tova (25-60 kg), svinje su hranjene krmnom smjesom s 12% sirovih proteina i 13,30 MJ, ME/kg, a tijekom drugog razdoblja tova (60 kg pa do kraja tova) krmnom smjesom s 10 % sirovih proteina i 13,23 MJ, ME/kg. Tijekom cijelog tova svinje obje skupine konzumirale su zelenu masu lucernu (ad libitum). Svinje su tijekom tova držane u poluotvorenom sustavu, a omjer spolova u obje skupine bio je jednak. Nakon klanja svinja, na ohlađenim (+4°C) desnim svinjskim polovicama obavljena je disekcija prema modificiranoj metodi Weniger i sur. (1963.). Pokazatelji kakvoće mesa istraživani su na dugom leđnom mišiću. Uslijedila je proizvodnja kulena, nakon koje je provedena njegova kemijska analiza. Na temelju istraživanja zaključeno je da su svinje niže završne tjelesne mase (100 kg) imale statistički vrlo značajno ($p<0,01$) povećani udio mišićnog (46,29%:38,76%) i koštanog tkiva (9,82%:8,99%), a smanjen udio masnog tkiva (34,69%:43,64%) u svinjskim polovicama. Svinjske polovice svinja od 100 kg imale su statistički značajno ($p>0,05$) veći udio mesa plećke (7,68%:6,87%) i buta (15,19%:13,62%), a manji udio mesa vrata (6,31%:7,79%) u odnosu na svinjske polovice svinja od 130 kg. Meso (MLD) svinja obje skupine imalo je vrlo dobru kvalitetu s obzirom na analizirane pokazatelje (pH1, pH2, sposobnost vezanja vode, boja). Meso svinja niže težinske skupine (100 kg) imalo je statistički vrlo značajno ($p<0,01$) veći sadržaj sirovih proteina (23,76%:20,07%), vode (67,51%:62,04%) i pepela (1,03%:0,91%) te manji sadržaj sirovih masti (7,70%:16.98%). Kulenje svinja završne tjelesne mase od 100 kg imalo je statistički vrlo značajno ($p<0,01$) veći sadržaj sirovih proteina (45,74%:43,00%), dok kod ostalih fizikalno-kemijskih pokazatelja kulena nisu zabilježene statistički značajne razlike ($p>0,05$) s obzirom na završnu tjelesnu masu. S obzirom na rezultate istraživanja možemo zaključiti da završna tjelesna masa utječe na kakvoću polovica, mesa i kulena kod crnih slavonskih svinja.

Ključne riječi: crna slavonska svinja, kakvoća polovica, kakvoća mesa, kakvoća kulena

Influence of final body weight on quality of carcasses, meat and kulen of the Black Slavonian pigs

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SUMMARY

The study was conducted on 32 Black Slavonian pigs. The pigs were divided into two groups, with 16 pigs in each group. Pigs in the first group were fattened up to about 100 kg of the final body weight, and pigs in the second group were fattened up to about 130 kg of the final body weight. During the first fattening period (25-60 kg), pigs were fed forage mixture containing 12% crude protein and 13.30 MJ ME / kg, whereas in the second fattening period (from 60 kg until the end of fattening) they were fed forage mixture containing 10% crude protein and 13.23 MJ ME / kg. Throughout the fattening period, pigs in both groups consumed green plant material, alfalfa, (ad libitum). During the fattening, pigs were kept in a semi-open system. Both groups had the same sex ratio. After the slaughter of pigs, the chilled (+ 4 ° C) right pig carcasses were dissected according to the modified method of Weniger et al. (1963). Indicators of meat quality were investigated on the long back muscle. Meat was processed into *kulen* and this product was later subjected to chemical analysis. According to the research results, a conclusion was made that the pigs with lower final body weight (100 kg) had a statistically highly significant ($p < 0.01$) higher share of muscle (46.29% : 38.76%) and bone tissue (9.82% : 8.99%), and a lower share of fat tissue (34.69% : 43.64%) in carcasses. The carcasses of pigs weighing 100 kg had a significantly ($p < 0.05$) higher share of meat from shoulder (7.68% : 6.87%) and leg (15.19% : 13.62%), but a lower share of meat from neck (6.31% : 7.79%), compared to carcasses of pigs weighing 130 kg. Meat (MLD) of pigs from both groups was of very good quality, considering the analyzed indicators (pH1, pH2, water holding capacity, colour). Meat of pigs from lower weight categories (100 kg) had a statistically highly significant ($p < 0.01$) higher crude protein content (23.76% : 20.07%), water (67.51% : 62.04%) and ash (1.03% : 0.91%) content and a lower level of crude fat (7.70% : 16.98%). *Kulen* produced from the meat of pigs weighing 100 kg had a statistically highly significant ($p < 0.01$) higher crude protein content (45.74% : 43.00%), whereas no statistically significant differences ($p > 0.05$) were detected in other physical and chemical parameters of *kulen* with respect to the final weight of pigs. Considering the research results, a conclusion can be made that the final body weight affects the quality of carcasses, meat and *kulen* produced from Black Slavonian pigs.

Key words: Black Slavonian pigs, carcass quality, meat quality, kulen quality

Tovna i klaonička svojstva crnih slavonskih svinja hranjenih obrocima sa i bez zelene mase (lucerne)

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SAŽETAK

Važnost dodavanja voluminoznih krmiva, osobito zelene mase, zbog nižeg sadržaja energije, je višestruka za svinje masnijih genotipova poput crne slavonske svinje. Crne slavonske svinje, hranjene s obrokom od krmne smjese i zelene mase (lucerne) u odnosu na svinje hranjene samo s krmnom smjesom, u tovu od 30 do 130 kg tjelesne mase, imaju nešto manje dnevne priraste (520 g : 645 g), manju dnevnu konzumaciju krmne smjese (2,47 kg : 2,90), veći utrošak krmne smjese za kg prirasta (4,75 kg : 4,50 kg) i veću mesnatost svinjskih polovica (45,92% : 39,24%). Crne slavonske svinje hranjene obrokom bez zelene mase imaju, pak, višu pH1 i pH2 vrijednost mesa (6,53 : 6,00 i 5,86 : 5,60), te veći stupanj svjetloće L* (50,78 : 47,87), manje vode (67,70% : 71,52%) i sirovih proteina (20,40% : 21,58), a više sirove masti (10,36% : 6,88%) u odnosu na meso svinja hranjenih obrokom s krmnom smjesom i zelenom masom. Crne slavonske svinje, zbog sklonosti taloženja masnog tkiva u trupu, treba u poluotvorenom sustavu obavezno hraniti obrocima sa zelenom masom (lucernom).

Ključne riječi: crne slavonske svinje, tovna svojstva, klaonička svojstva, zelena masa

Fattening and slaughtering traits of Black Slavonian pigs fed diets with and without green feed (alfalfa)

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SUMMARY

The importance of the addition of forage, especially green mass, due to the lower energy content, is a multiple of pigs masnijih genotypes like Black Slavonian pigs. Slavonske of pigs fed with the feed of the feed and the green feed (alfalfa) compared to pigs fed with a feed mixture, fattening from 30 to 130 kg body weight, have less daily gain (520 g: 645 g), less daily feed consumption (2.47 kg: 2.90), a higher consumption of compound feed per kg gain (4.75 kg: 4.50 kg) and greater leanness of pig carcasses (45.92%: 39.24%). Black Slavonian pigs fed meal without green mass have, in turn, higher pH1 and pH2 value of meat (6.53: 6.00 and 5.86: 5.60), and a higher level of brightness L * (50.78: 47.87), less water (67.70%: 71.52%) and protein (20.40%: 21.58), a more crude fat (10.36%: 6.88%) compared to pigs fed the meat a meal with a feed mixture and green mass. Black Slavonian pig, given the tendency of deposition of fat in the trunk, should be in the semi-open system required to feed rations with green mass (alfalfa).

Key words: Black Slavonian pigs, fattening traits, carcass traits, green mass

Chemical composition of fodder legumes species: *Vicia* (*articulata*, *ervilia*, *sativa*) and *Lathyrus* (*clymenum*, *cicera*, *sativus*, *tingitanus*), for feed to rumimants

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SUMMARY

An interesting challenge for scientists in the field of animal nutrition for ruminant is the introduction of alternative feedstuffs that could overcome the problems of environmental harshness of forage and pasture in tropical, subtropical and arid areas, where pasture is available only for short periods or is not available at all. Moreover, normally in these countries as in Canary Islands (Spain), the culture and use of local forage is scare and has to be imported for animal diets, is expensive, increasing production costs. The objective of this study was to contribute to the characterization of nutritional potential, of some local and wild fodder legumes species for ruminant feeding. The species selected for this study were: seven species:*Vicia* (*articulata*, *ervilia*, *sativa*) and *Lathyrus* (*clymenum*, *cicera*, *sativus*, *tingitanus*), used to feed animals for farmers from native seeds populations which it was traditionally cultivated but nowadays it have been progressively abandoned the crop of them and the use as feedstuff .We hypothesized that this fodder legumes has a interesting nutrient content which is different between species and the results could contribute to select and recover the local species for including in animal diets.

The species were planted in eight plots of 6m^2, with aisles of a meter, 5 rows of 3 meters long and 40cm apart each other. The seeding density was 83 seeds / m2 with 100 seeds per row. To determine a first approach to nutritional value, the chemical composition of the seven species of the genera *Vicia (articulata, ervilia, sativa) and Lathyrus (clymenum, cicera, sativus, tingitanus) was* analyzed, with dry samples of plants at maturity stage (90% of plants without flowers).Fresh samples were weighed, cut and dried at 60ºC to about 90 kg dry matter (DM). They were then ground to pass a 1mm screen prior to duplicate chemical analysis. Dry matter (DM), ash (ASH) and Crude protein (CP) were determined in duplicated samples according to standard methods as described in AOAC (2000) (methods 930.15, 942.05 and 976.05 respectively). Ash-free neutral detergent fibre (NDFom) was determined using sodium sulfite according to Van Soest et al. (1991). Acid detergent fibre (ADFom) and lignin (sa) content (ADL) were determined following the procedure of Van Soest et al. (1991). Crude protein (CP) was lower on *Vicia sativa (*13.4%), medium on *Lathyrus tingitanus*(16.5%) and *Lathyrus sativa (*17.6%), and CP was higher on *Vicia ervilia (*19.1%), *Lathyrus cicera (*19.6%), *Vicia articulata* (20%), and *Lathyrus clymenum* (20.8%). Neutral detergent fiber (NDF) ranged between 37.4% on *Lathyrus cicera*, to 50.5% on *Lathyrus*

tingitanus, whereas acid detergent fiber (ADF) ranged between 20.0% on *Lathyrus tingitanus* to 36, 06% on *Vicia sativa*. Lignin (sa) content (ADL) was lower on *Lathyrus cicera* (4.5%) and higher on *Lathyrus tingitanus* 8.2%.Finally the ash was lower on *Vicia articulata (*3.0%) and was higher on *Vicia ervilia (*7.1%), *Vicia sativa (*7.4%), *Lathyrus sativa* (6.7%), *Lathyrus clymenum (*7.6%) and *Lathyrus tingitanus (*9.9%). The legumes analyzed contain sufficient CP content to meet the demands of small ruminants for maintenance and low lactation as NRC (1988). Additionally the CP was similar even higher in some of the species analyzed, comparing with a medium quality alfalfa hay estimated by INRA (1988), however there are high differences on Chemical composition between all the species analyzed.Current preliminary results support the thesis that, it seems interesting recover local legumes species which have potential to be used in ruminant feeding systems strategies and also contributing to the fertility of soil. Nevertheless, deeper characterization and in vivo evaluation studies of the species covered in this study are required at different seasons and vegetative stages of the plant, and feeding trial with animal are required to know the nutritive value,(e.g. digestibility in vivo, palatability, voluntary intake, productive response).

Key words: Vicia (articulata, ervilia, sativa) Lathyrus (clymenum, cicera, sativus, tingitanus)

The influence of milk standardisation on the sensory properties of Škripavac cheese

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SUMMARY

The modern cheesemaking includes standardisation of milk which means adjusting the content of protein and milk fat to the optimal ratio of 0.9 : 1 by addition of skimmed milk powder (SMP) or skimming the part of milk fat. In contrast, milk standardisation is not carried out in small scale dairy plant cheese production, which could lead to the lesser financial profit for the farm. Due to the fact that any treating of milk for cheese production can influence the sensory characteristics of cheese, the aim of this study was to determine the influence of milk standardisation on the sensory properties of Škripavac cheese. For the needs of the experiments, in the small scale dairy, 10 batches of Škripavac cheese were produced. The milk of each batch was divided into three categories: milk for cheese production without standardisation (1); milk for cheese production with standardised ratio protein : fat = 0.9 : 1 by the addition of SMP (2), and by skimming the part of milk fat (3). The sensory evaluation of cheeses was performed as a blind sensory test done by consumers (17) familiar with Škripavac cheese properties, whereby they filled questionnaire. The results showed that 81% of evaluators recognised differences between cheeses. Cheese 2 was assessed with the highest score (4.05), while cheeses 1 and 3 were scored with 3.87 and 3.93, respectively ($p<0.15$). The difference in the taste of cheeses was determined, while there were no differences in the colour and odour between cheeses. It could be concluded that milk standardisation could have positive effect on the sensory properties of cheese.

Key words: milk standardisation, milk powder, fat separation, sensory properties, Škripavac cheese

Voćarstvo /
Vinogradarstvo i
vinarstvo

08

Pomology /
Viticulture and Enology

Seasonal variations in abundance and flight activity of the hairy rose beetle, *Tropinota squalida* (scopoli) in apple and cherry orchards and its relation to flowering in Southern Jordan

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SUMMARY

The hairy rose beetle, *Tropinota squalida* (Scopoli) is one of the important insect pests that attacks pome and stone fruits in the southern part of Jordan. This destructive pest attacks the flowers of the crop where it feeds on the reproductive parts of the flowers. The study was initiated to monitor the phenology and flight activity of the hairy rose beetle in an attempt to provide basic information for the development of safe and effective control measures for this economically important insect pest. The study was conducted during 2009-2010 on two apple cultivars, Grany Smith and Royal Gala, and cherry. Capture of the beetles was performed via locally constructed traps that were improved by incorporation of the floral chemical attractants. Adults of the beetle were captured in apple orchards earlier than cherry orchards. In addition, adults disappeared earlier in the cherry orchard than that in the apple orchards. The flight activity of beetle started in the last week of January to the end of May in the apple orchards, but it was during mid-February to mid of May in cherry orchard. Positive relationships were obtained between the beetle flight activity the flowering pattern of the studied fruit crops.

Key words: *Tropinota squalida,* hairy rose beetle, flowering, flight activity

Upotreba protugradnih mreža u zaštiti od važnih štetnika breskve

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SAŽETAK

Breskvin savijač i breskvin moljac značajni su štetnici breskve u Hrvatskoj. Protugradne mreže u širokoj su primjeni u voćarskoj proizvodnji kako bi se smanjile štete prouzročene tučom. Nedavna istraživanja pokazala su da protugradne mreže ometaju razmnožavanje štetnika iz reda Lepidoptera, čime se sprečavaju štete u proizvodnji voća. Tijekom vegetacijske sezone 2015. godine u integriranom voćnjaku breskve u Hrvatskoj (Čakovec) postavljen je pokus na sorti breskve 'Suncrest' na tri susjedna stabla breskve potpuno pokrivena s protugradnim fotoselektivnim mrežama. Tri mreže imale su istu veličinu okaca (2.4 x 4.8 mm) i bile su različitih boja (bijela, crvena i žuta), dok je četvrta imala manju veličinu okaca (0.9 x 1 mm) i bila je bijele boje (Stop Drosophila Normal). U voćnjaku breskve postavljene su tri repeticije svih četiriju tipova mreža i nepokrivena kontrola, te je svaka repeticija sadržavala jednu feromonsku lovku (Csalomon®). Kako bi se utvrdila prisutnost štetnika, feromonske lovke pregledavane su na tjednoj bazi. Tijekom razdoblja praćenja štetnika zabilježene su statistički značajne razlike u ulovu ispod različitih mreža u odnosu na nepokrivenu kontrolu. S obzirom da su ustanovljeni ulovi štetnika ispod mreža bili ispod kritičnih brojeva, tijekom berbe nisu utvrđene ekonomske štete u uzorkovanim plodovima breskve.

Ključne riječi: *Grapholita (Aspila) molesta* (Busck 1916), *Anarsia lineatella* Zeller 1839, mehaničke prepreke, ulovi štetnika, štete na plodovima

The use of anti-hail nets against peach key pests

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SUMMARY

The oriental fruit moth and the peach twig borer are significant pests of peaches in Croatia. The anti-hail nets are widely used to protect orchards against hailstorms and hail damage. Recent studies have shown that the use of anti-hail nets have a disruptive effect on the reproductive behavior of Lepidoptera pest, thus preventing the damages in fruit production. During the vegetation season of 2015 in IPM peach orchard in Croatia (Čakovec) trial was conducted on the peach cultivar Suncrest on three neighboring peach trees completely covered with anti-hail photo selective nets. Three nets were the same in mesh size (2.4 x 4.8 mm) but in different colors (white, red and yellow), while the fourth net had smaller mesh size (0.9 x 1 mm) and was white (Stop Drosophila Normal). Three repetitions of each color of nets and uncovered control were set up and each repetition contained one pheromone trap (Csalomon®). To assess the presence of pests, weekly sampling of moths on pheromone traps in protected and unprotected (control) net rows was conducted. During the monitoring period a highly significant reduction of moth catches on pheromone traps under different types of nets in comparison to the unprotected control was observed. Since the catches of pests under the nets were below threshold during the whole monitoring period, in the harvest time, the economic damages of sampled fruit were not observed.

Key words: *Grapholita (Aspila) molesta* (Busck 1916), *Anarsia lineatella* Zeller 1839, mechanical barriers, pest catches, fruit damages

Off-flavors in the North American Species *Vitis riparia*, *Vitis cinerea* and *Vitis labrusca*

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SUMMARY

For introgression of resistances, wild *Vitis* (*V.*) species are crossed with the European *V. vinifera*. Grapevine breeding is hampered tremendously by the long generation time and the timely and costly evaluation of quality traits. Besides numerous undesired traits, wild species often feature "off-flavors". The "foxiness" is mainly reported for *V. labrusca*. Furaneol ("strawberry") and methyl anthranilate ("mothball") are the key aroma compounds. Selected hybrids and two cross progenies of the North American species *V. riparia*, *V. cinerea* and *V. labrusca* were investigated with the focus on "off-flavors". "Foxiness" was not typical for the investigated descendants of *V. riparia* and *V. cinerea*. To identify other "off-flavors", olfactory-coupled gas chromatography (GC-O) was performed. The analysis revealed intense vegetative flavors, mainly caused by methoxypyrazines. The interspecific hybrid `Catawba´ is of particular historical interest and turned out to be a direct descendant of *V. vinifera* `Sémillon´. A population originating from a cross of `Blaufraenkisch´ (*V. vinifera*) x `Catawba´ segregated for "foxiness". The offspring was screened for the presence of furaneol (liquid chromatography) and methyl anthranilate (GC). Based on a linkage map built from simple sequence repeat markers, main QTL (quantitative trait loci) on linkage groups 11 and 4 were identified, respectively. The results enhance the evaluation of genetic resources and marker assisted selection in breeding programs.

Key words: Grapevine, QTL, LC-MS, GC-O, organoleptics.

Gospodarska svojstva klonskih kandidata cv. Graševina (*Vitis vinifera* L.) izdvojenih u kutjevačkom vinogorju

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SAŽETAK

Graševina je najvažnija sorta vinove loze u Hrvatskoj koja zauzima 23% ukupnih površina pod vinogradima. Zbog značaja Graševine i uočene visoke razine unutarsortne varijabilnosti u proizvodnim nasadima ove sorte, 2004. godine započelo se sa masovnom pozitivnom selekcijom. U postupku masovne pozitivne selekcije u Kutjevačkom vinogorju izdvojeno je 85 klonskih kandidata (KK) slobodnih od gospodarski štetnih viroza. Isti su razmnoženi 2006. godine i posađeni u pokusni nasad na položaju "Vidim" gdje je proveden postupak predklonske selekcije. Na temelju dobivenih rezultata odabrano je 12 KK koji su 2012. godine posađeni u pokusni nasad na položaju "Radovanci" (Kutjevačko vinogorje). U ovom istraživanju biti će prikazani rezultati analize značajnih gospodarskih svojstava klonskih kandidata u dvije promatrane godine 2015. i 2016. Gospodarske svojstva analizirana u ovo radu su: prinos po trsu te sadržaj šećera i kiselina u moštu. Rezultati ovog istraživanja pokazuju razlike u promatranim svojstvima između izdvojenih klonskih kandidata i postojanje unutarsortne varijabilnosti. Ovo istraživanje je dio postupka individualne klonske selekcije Graševine čiji je cilj izdvajanje klonova kojima će se unaprijediti proizvodnja vina ove sorte i naposlijetku rezultirati priznavanju hrvatskog klona Graševine.

Ključne riječi: vinova loza, Graševina, gospodarska svojstva, klonska selekcija

Economically important characteristics of cv. Graševina (*Vitis vinifera* L.) clonal candidates selected in Kutjevo wine region

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SUMMARY

Graševina is the most important grapevine cultivar in Croatia with 23% of total areas under vineyards. Because of the importance of 'Graševina' and observed high levels of variability within the productive plantations of this variety, in 2004 mass positive selection process was started. In the process of the mass positive selection in Kutjevo wine region allocated 85 clonal candidates (CC) were selected that were free of economically important viruses. They were propagated and planted in experimental vineyard „Vidim" where pre-selection was performed. Based on the obtained results 12 CC was chosen and planted in experimental vineyard „Radovanci" (Kutjevo wine region). In this study, results of the production characteristics of clonal candidates in the two observed years 2015 and 2016 will be presented. Economically important traits analyzed in this paper were: yield per vine, sugar content and total acid content in the must. Results of this study show differences in observed characteristics between the selected clonal candidates and a certain level of intracultivar variability. This study is a fundamental part of the individual clonal selection of cv. Graševina with the aim of improvement of winemaking and production and ultimately results in the Croatian clone of 'Graševina'.

Key words: *V. vinifera* L., Graševina, economically important characteristics, clonal selection

Promet i kakvoća pjenušavih vina u Republici Hrvatskoj od 2011. do 2015. godine

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SAŽETAK

Potrošnja vina u RH tradicionalno je vezana uz konzumaciju mirnih vina, dok su se pjenušava vina vezala uz luksuz i posebne prilike. Ulaskom RH u Europsku Uniju, na domaće tržište dospijevaju pjenušava vina nižih cjenovnih razreda koja omogućuju potrošačima dašak „luksuza" na stolu. Rast i razvoj turizma te dolazak inozemnih gostiju naviknutih na konzumaciju pjenušavih vina, koji žele kušati domaće proizvode, otvara novi segment potražnje „domaće pjenušavo vino". Hrvatski proizvođači odgovaraju na zahtjeve tržišta te se mnogi odlučuju i na specifičnu proizvodnju pjenušavih vina autohtonih sorata.

U Republici Hrvatskoj broj proizvođača (poslovnih subjekata) koji sudjeluju u prometu pjenušavih vina povećao se sa 17 u 2011., na 42 proizvođača u 2015. godini. U skupinu pjenušavih vina svrstavaju se gazirana, biser, pjenušava vina, i u razdoblju od 2011. do 2015. čine prosječni udio od 0,6% u ukupnoj količini prometa vina domaće proizvodnje. Količina pjenušavih vina u prometu prati uzlaznu putanju rasta, te se promet u 2015. u odnosu na 2011. godinu povećao za 103%, s 2.092 hl na 4.251 hl. U ukupnoj količini više od 50% čine pjenušava vina (52,4%), slijede ih gazirana (44,7%) i biser vina (2,9%). Iako pjenušava vina čine relativno mali udio u prometu vina domaće proizvodnje, svi pokazatelji (količina, broj proizvođača, kategorija kakvoće) pokazuju strelovitu stopu rasta, te je za pretpostaviti da će proizvodnja pjenušavih vina imati sve važnije mjesto u ukupnoj proizvodnji i prometu vina.

Ključne riječi: pjenušac, promet, kakvoća, Republika Hrvatska

Trading and quality of sparkling wines in Republic of Croatia for the period 2011 to 2015

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SUMMARY

Traditionally, wine trading in Republic of Croatia is related to consumption of still wines while sparkling wines are tied with luxury and special occasions. Accession of Republic of Croatia to EU, import of lower price categories of sparkling wine have enabled consumers a whiff of "luxury" on the table. Growth and development of tourism, arrival of foreign guest accustomed to sparkling wine consumption but also willing to taste domestic products, opened a new segment of demand, "domestic sparkling wine". Croatian producers responded to market demand and decided also to produce specific sparkling wine made of autochthonous varieties. In the Republic of Croatia number of producers (business entities) had increased from 17 in 2011 to 42 producers in 2015. Average share of sparkling wine group (carbonated, perl and sparkling wines), in wine trading of domestic production, for period from 2011 to 2015, was 0.6%. Total volume of carbonated, perl and sparkling wine trade has the upward trajectory of growth, trade has increased in 2015 in relation to 2011 for 103%, from 2,092 hl to 4,251 hl. Average share of sparkling wine in total volume was more than 50% (52.4%), followed by carbonated (44.7%) and perl wine (2.9%). Even sparkling wines have relatively small share in wine trading of domestic production, all indicators (volume, number of producers, quality category) show growth rate, so it can be assumed that production of sparkling wine will have more important place in segment of total wine production and trading.

Key words: sparkling wine, trading, quality, Republic of Croatia

Preliminary results of ampelographic characterization of the main autochthonous grapes (*Vitis vinifera* L.) from Albania

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SUMMARY

The aim of this study is to describe some important Albanian autochthonous grapevine cultivars based on ampelographic characteristics and to evaluate these characteristics as regards to their usefulness in cultivar identification. Twelve grape cultivars used mainly for wine production were collected in the Southern part of Albania, and were characterized by using OIV (Office International de la Vigne et du Vin) descriptors. The ampelographic evaluation and measurements were performed for a total of twenty-two traits in mature leaves (6), young shoots (5), fluorescence (4), bunch (1) and berry (6). The relationships among grape cultivars were assessed based on UPGMA cluster analysis. Hierarchical cluster analysis divided grapevine cultivars in two main clusters with a mean similarity of 45.5 %. No grouping of cultivars was observed based on grape skin color or fruit use. Considerable variations resulted among grape cultivars on traits as shoot length (351), color of ventral side of node in shoots (010) and berry skin color (225). Certain characteristics as opening of the shoot tip (001), petiole length (092) and bunch length (202), were discriminative for some grape cultivars and can be used for their identification among grapevine cultivars. This study provided preliminary data on potential traits for cultivar identification and an ampelographic characterization of some important native Albanian grape cultivars.

Key words: *Vitis vinifera*, descriptors, ampelography, UPGMA, Albania

The quality of the archival wines of the Riesling variety

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SUMMARY

According to the data of the Ministry of Agriculture, Forestry and Food there were 19.129 hectares of vineyards actually cultivated in Slovenia in year 2015. However, there was a significant diversity in representation of grape varieties on this relatively small area, which represents only 2.8 per cent of agricultural land. Such diversity in combination with various technological approaches in the care of wine enables us to obtain a wide variety of different wines. We have a good experience with the grape variety Riesling, which is in Slovenia especially present in the Podravje wine region. Riesling variety gives in good harvests a base for the best wines, for prolonged maturation of wine, especially in cases of special high-quality wines. This article presents the results of the evaluation of sensory quality of archival wines from Riesling varieties. We established that the wines are still of an excellent quality, despite the age. In our opinion an excellent quality is associated with the fact that more than a half of the estimated sample wines were of a special quality. Archival wines were chemically analyzed for the presence of free and bound sulphur in the wine. We established fairly unequal values, especially regarding the total sulphur content. Nevertheless, the sulphur content was in most of the analyzed samples adequate.

Keywords: Riesling grape variety, quality, archival wine, chemical analysis

Kvaliteta ploda tradicionalnih sorti jabuke u intenzivnom sustavu proizvodnje

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SAŽETAK

Cilj istraživanja bio je utvrditi kako intenzivan sustav proizvodnje djeluje na kvalitetu ploda tradicionalnih sorti jabuke. Pokus je proveden 2016. godine u pokusnom voćnjaku Zavoda za voćarstvo, Hrvatski centar za poljoprivredu, hranu i selo u Donjoj Zelini. Analizirane su sorte jabuke: tradicionalne (Ovčji nos, Mašanka, Zlatna zimska parmenka); otporne (Topaz®, Pinova®, Querina-Florina) i komercijalne (Gala Schnitzer Schniga®, Golden Delicious, Idared). Mjerena su svojstva: topljiva suha tvar refraktometrijski, ukupne kiseline i pH vrijednost, sadržaj vitamina C i sadržaj ukupnih fenola. Rezultati su statistički obrađeni analizom varijance i LSD testom. Topljiva suha tvar iznosila je od 13,96 (Golden Delicious) do 16,91 °Brix - a (Mašanka). Ukupna kiselost kretala se od 10,61 (Gala Schnitzer Schniga) do 43,12 g/l (Topaz), dok je pH iznosio od 3,4 (Topaz) do 4,7 (Pinova). Vitamn C iznosio je od 0,98 (Pinova) do 5,92 mg/l (Ovčji nos). Ukupni fenoli kretali su se od 20,43 (Idared) do 139,74 mg/100g svježeg ploda (Ovčji nos). Tradicionalne sorte su imale najviše topljive suhe tvari (15,71 °Brix – a), vitamina C (3,14 mg/l) i ukupnih fenola (97,67 mg/100 g). Otporne sorte su imale najviše ukupnih kiselina (24,55 g/l), a najmanje vitamina C (1,81 mg/l). Komercijalne sorte imale su najmanje topljive suhe tvari (14,68 °Brix – a), ukupnih kiselina (16,30 g/l) i ukupnih fenola (37,59 mg/100 g).

Ključne riječi: jabuka, intenzivan uzgoj, kvaliteta ploda

Fruit quality parameters of traditional apple varieties in intensive production system

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SUMMARY

The aim of this study was to estimate effect of intensive production system on fruit quality parameters in traditional apples varieties. Trial was conducted in 2016 in experimental orchard of the Institute of Pomology, Croatian Centre for Agriculture, Food and Rural Affairs in Donja Zelina. Traditional (Ovčji nos, Mašanka, Zlatna zimska parmenka), resistant (Topaz®, Pinova®, Querina-Florina) and commercial (Gala Schnitzer Schniga®, Golden Delicious, Idared) apple varieties were analysed. Following characteristics were measured: soluble solids content, total acidity, pH, vitamin C and total phenols content. Data were statistically analysed by variance analysis and LSD test. Soluble solids content ranged from 13,96 (Golden Delicious) to 16,91 °Brix (Mašanka), total acidity 10,61 (Gala Schnitzer Schniga) to 43,12 g/l (Topaz), pH from 3,4 (Topaz) to 4,7 (Pinova), vitamin C from 0,98 (Pinova) to 5,92 mg/l (Ovčji nos) and total phenols from 20,43 (Idared) to 139,74 mg/100g FW (Ovčji nos). Traditional varieties had highest soluble solids content (15,71 °Brix), vitamin C (3,14 mg/l) and total phenols content (97,67 mg/100 g FW). Resistant varieties had highest total acidity (24,55 g/l) while least vitamin C content (1,81 mg/l). Commercial varieties had the least soluble solids (14,68 °Brix), total acidity (16,30 g/l) and total phenols content (37,59 mg/100 g FW).

Key words: apple, intensive production system, fruit quality

Dodavanje bentonita u mošt Malvazije istarske u fermentaciji smanjuje potrebnu dozu i ograničava hidrolizu estera hidroksicimetnih kiselina

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SAŽETAK

Bentonit je i dalje najučinkovitije i najisplativije enološko sredstvo za postizanje proteinske stabilnosti bijelih vina. Međutim, uporaba prevelikih količina bentonita može imati negativan utjecaj na svojstva vina, pa je u interesu proizvođača smanjenje doze. U ovom radu procijenjena je učinkovitost dodavanja bentonita u različitim fazama fermentacije mošta Malvazije istarske (*Vitis vinifera* L.) u odnosu na uobičajeno bistrenje. Dodano je 100 g/hL bentonita u bistri mošt, na početku fermentacije, na sredini i pri kraju fermentacije. U kontrolu nije dodavan bentonit. Procijenjena je proteinska stabilnost proizvedenog vina te su određene i primijenjene dodatne doze za dobivanje stabilnih vina. Fenolni spojevi određeni su HPLC-DAD analizom u vinu nakon fermentacije i u proteinski stabilnom vinu. U odnosu na kontrolu, dodavanje bentonita tijekom fermentacije značajno je smanjilo ukupnu potrebnu dozu, te je bilo najučinkovitije na sredini i pri kraju fermentacije s postignutim smanjenjem doze od 19%, odnosno 21%, što je određeno testom zagrijavanja s taninom. Vina kod kojih se fermentacija odvijala uz prisustvo bentonita, u odnosu na kontrolu, imala su značajno veće koncentracije glavnih estera hidroksicimetnih kiselina, poput *trans*-kaftarne, *trans*-kutarne i *trans*-fertarne kiseline. Kontrolno vino imalo je veću koncentraciju slobodne kavene kiseline, *p*-kumarinske i ferulinske kiseline. Osim što je postignuto smanjenje ukupne potrebne količine bentonita, dodavanje bentonita tijekom fermentacije vjerojatno je i ograničilo aktivnost enzima odgovornih za hidrolizu estera hidroksicimetnih kiselina.

Ovaj je rad sufinanicirala Hrvatska zaklada za znanost projektom UIP-2014-09-1194.

Ključne riječi: bentonit, fermentacija, Malvazija istarska, proteinska stabilnost, fenoli

Bentonite in fermentation of Malvazija istarska must reduces the dose required and limits the hydrolysis of hydroxycinnamoyltartaric acids

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SUMMARY

Bentonite is still the most efficient and cost-effective agent in achieving the protein stability of white wines. However, its excessive use may have a negative effect on the properties of final wine, so the reduction of its dose is of great interest for producers. In this work, the effectiveness of bentonite addition at various stages of fermentation of Malvazija istarska (*Vitis vinifera* L.) must with respect to standard wine fining was evaluated. Doses of 100 g/hL were added in clear must (MU), at the beginning (B), in the middle (MI), and at the end of fermentation (E), while control received no bentonite. In the produced wines, protein stability was evaluated, and additional doses required were determined. The additional doses were applied and protein-stable wines were obtained. Phenolic compounds were determined by HPLC-DAD analysis after fermentation and in protein-stable wines. Bentonite added during fermentation significantly reduced the total amount required in relation to control. The most effective were the treatments MI and E, which reduced its amount for 19 % and 21 %, respectively, as determined by the heating with tannins test. All wines fermented with bentonite contained significantly higher amounts of the major hydroxycinnamoyltartaric acids, such as *trans*-caftaric, *trans*-coutaric, and *trans*-fertaric acid, in relation to control. The control wine had higher amounts of free caffeic, *p*-coumaric and ferulic acid. It was concluded that bentonite added during fermentation, besides reducing its total amount, probably limits the activity of enzymes responsible for the hydrolysis of hydroxycinnamoyltartaric acids.

This work has been supported in part by Croatian Science Foundation under the project UIP-2014-09-1194.

Key words: bentonite, fermentation, Malvazija istarska, protein stability, phenols

Biološke i gospodarske karakteristike novih klonova Graševine

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SAŽETAK

Kao rezultat rada na klonskoj selekciji vinove loze na Poljoprivrednom fakultetu u Novom Sadu pre više desetljeća su selekcionirana i priznata tri klona sorte Graševina (SK 13, SK 54 i SK 61). Ovi klonovi su prihvaćeni od strane proizvođača, a najviše se proširio klon pod oznakom SK 54. Nakon priznavanja navedenih klonova, rad na subklonskoj selekciji je nastavljen u cilju održavanja sorte i izdvajanja klonova sa još boljim proizvodnim i biološkim obilježjima. Tijekom 2015. godine priznata su i stavljena na sortnu listu Republike Srbije četiri subklona Graševine pod oznakama SK 13-13, SK 13-14, SK 54-4 i SK 54-10. Subklonovi SK 54-4 i SK 54-10 se odlikuju izuzetnom kvalitetom i u većini godina grožđe ovih subklonova se može koristiti za proizvodnju visoko kvalitetnih vina. Subklonovi SK 13-13 i SK 13-14 se odlikuju visokim prinosima i kvalitetom na razini populacije sorte. Na matičnim trsovima ovih subklonova nije utvrđeno prisustvo niti jednog gospodarski važnog virusa, te se oni mogu iskoristiti za osnivanje matičnih nasada predosnovne i osnovne kategorije i proizvodnju certificiranog sadnog materijala.

Ključne riječi: klonska selekcija, Graševina, vinogradarstvo, subklonovi, kvaliteta

Biological and productive characteristics of new Riesling italico clones

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SUMMARY

A few decades ago, as a result of the clonal selection of *Vitis vinifera* cultivars at the University of Novi Sad, Faculty of Agriculture, three clones of Riesling italico (SK 13, SK 54 and SK 61) were released. Among these clones, SK 54 has been marked by the producers as the best due to its wine quality and a better sugar accumulating ability than the basic variety. After the recognition of the clones, the work on subclonal selection was initiated because of the variety maintenance and the idea of obtaining new clones with better productive and biological characteristics. In 2015, four Riesling italico subclones SK 13-13, SK 13-14, SK 54-4 and SK 54-10 were released. Subclones SK 54-4 and SK 54-10 have enhanced quality and these clones are suitable for the production of high quality white wines in most of the years. The subclones SK 13-13 and SK 13-14 characterised by high yield have the same quality as the variety population. In the vineyard of these subclones, there was no virus detection so these vines can be used for a succesfull production of prebase and base propagation material and successive certified grapevine planting material.

Key words: clonal selection, Riesling italico, viticulture, subclones, quality

Utjecaj pred tretmana u procesu sušenja šljiva

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SAŽETAK

Plodovi šljive podvrgavaju se različitim tretmanima prije procesa sušenja kako bi se uklonila voštana prevlaka - mašak te time potaknula dehidracija i ubrzalo vrijeme sušenja. Cilj istraživanja bio je utvrditi utjecaj pred tretmana na vrijeme sušenja i organoleptičku kvalitetu ploda tri sorte šljive: Bistrica, President i Topend. Sortirani i odkoštićeni plodovi sorti šljiva tretirani su slijedećim pred tretmanima: mehanički abrazijom na 5, 10 i 15 min; potapanjem u vodu na temperaturama 22 °C i 60 °C te kemijskim potapanjem u otopinu KOH s tri razrjeđenja (0,5%, 1,0% i 1,5%) na dvije temperature (22 °C i 60 °C). Plodovi su sušeni do 35% sadržaja vlage u M. Buchner AG Typ 16B sušari kapaciteta do 30 kg. Posušeni plodovi šljive su ocjenjeni kvantitativnom deskriptivnom organoleptičkom analizom na skali od 1 do 7. Vrijeme sušenja plodova sorti šljive u istraživanju kod mehaničkih pred tretmana bio je najkraći za abraziju 15 min i kretao se od 28 (Bistrica, President) – 35 sati (Topend). Od kemijskih pred tretmana najkraće vrijeme sušenja imali su plodovi potapani u KOH 1,5% na 60 °C i kretali su se od 26 (President) – 29 sati (Topend). Sorte su se statistički razlikovale u organoleptičkoj analizi s obzirom na parametre boje, okusa i arome ($P \leq 0,05$). Predtretmani s KOH na 60C° pokazali su se agresivni u degradaciji kožice kao i u neujednačenom sušenju ploda te su lošije ocijenjeni za parametar plave boje (2,61) u odnosu na ostale tretmane (4,24 5,00). Sorte Bistrica i Topend podvrgnute predtretmanima abrazije u prosjeku su najbolje ocjenjene s obzirom na parametre okusa (4,12 – 4,24) i arome (4,27 – 4,33) na šljivu.

Ključne riječi: šljiva, pred tretman, sušara, organoleptička analiza

Influence of pre-treatments in plum drying process

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SUMMARY

Plum fruits are submitted to different pre-treatments prior to drying in order to remove waxy layer from fruit skin with aim to foster dehydration and expedite drying time. The aim of the research was to determine the influence of pre-treatments on drying period and organoleptic fruit quality of three plum cultivars: Hauszwetschge 'Schüfer', President and Topend. Sorted and pitted plum fruits were treated by following pre-treatments: mechanically by abrasion on 5, 10 and 15 min; submerging in water on 22 °C and 60 °C and chemically by submerging fruits in KOH solution diluted to 0,5%, 1,0% and 1,5% on temperatures (22 °C, 60 °C) in 90 sec interval, along with untreated fruits as control sample. Pre-treated fruits were dried to 35% moisture content in M. Buchner AG Typ 16B drier up to 30 kg capacity. Dried fruits were evaluated with quantitative descriptive organoleptic analysis on 1 to 7 scale by trained panellist. Drying time of plum fruits in this research in mechanical pre-treatments was the shortest for abrasion in duration of 15 min and ranged from 28 (Bistrica, President) – 35 hours (Topend). Fruits submerged in KOH 1,5% solution on 60 °C had the shortest drying time of chemical pre-treatments and ranged from 26 (President) – 29 hours (Topend). Drying time of control sample was 74 hours. Cultivars significantly differed in organoleptic analysis with regards to colour, taste and aroma parameters ($P \leq 0,05$). KOH pre-treatments on 60 C° were aggressive to fruit skin degradation and exhibited ununiformed drying of fruits. Correspondingly, they obtained lower scores for blue colour intensity parameter (2,61) in relation to other pre-treatments (4,24; 5,00). Cultivars Hauszwetschge 'Schüfer' and Topend pre-treated by abrasion in average scored the highest with regards to plum taste (4,12 – 4,24) and plum aroma (4,27 – 4,33) parameters.

Key words: plum, pre-treatments, dried, organoleptic analysis

Utjecaj rane defolijacije na neke kvalitativne karakteristike grožđa i mošta kultivara Merlot

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SAŽETAK

Utjecaj rane defolijacije na neke kvalitativne pokazatelje grožđa i mošta kultivara Merlot (*Vitis vinifera* L.) istraživan je tijekom 2013. godine na području vinogradarske regije Istočna kontinentalna Hrvatska, podregija Podunavlje, vinogorje Baranja (Karanac) i Srijem (Ilok). Uzgojni oblik je Guyot. Vremenske prilike pogodovale su uzgoju vinove loze i proizvodnji grožđa na obje lokacije. Pokusi su postavljeni po slučajnom bloknom rasporedu s tri tretmana u tri repeticije (kontrolni tretman – bez defolijacije, defolijacija tri lista i defolijacija šest listova od osnove mladice neposredno pred početak cvatnje - E-L faze 16-17). Dobiveni rezultati statistički su obrađeni analizom varijance. Temeljem dobivenih rezultata utvrđena je statistički značajna razlika za pokazatelj sadržaj šećera u moštu između lokacija. Za druge istraživane pokazatelje nisu utvrđene statistički značajne razlike niti između lokacija niti između ispitivanih tretmana. Najveći sadržaj šećera izmjeren je u Iloku kod kontrolnog tretmana i tretmana s tri uklonjena lista (96,7 °Oe). Sadržaj ukupnih polifenola varirao je od 1487 mg/kg kod kontrolnog tretmana u Iloku do 2159 mg/kg kod tretmana s šest uklonjenih listova na istoj lokaciji. Kod tretmana s šest uklonjenih listova u Karancu utvrđen je najveći sadržaj ukupnih antocijana (1134 mg/kg). Tretman s tri uklonjena lista na lokaciji u Karancu odlikovao se najsnažnijom antioksidativnom aktivnošću (343 mg/kg GAE).

Ključne riječi: Merlot, rana defolijacija, mošt, fenolni spojevi

The influence of early leaf removal on some quality parameters of must and grapes varieties Merlot

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SUMMARY

The influence of early leaf removal on some quality parameters of grapes and must of Merlot varieties (*Vitis vinifera* L.) was researched during 2013. on the field of wine-growing region of East continental Croatia, subregion Podunavlje, wine-growing district Baranja (Karanac) and Srijem (Ilok). Training system was Guyot. Weather conditions were favorable for the winegrowing and grapes production on both locations. The experiment was set up according to random block design with three treatments in three repetitions (control treatment - without leaf removal, three leaf removal and six leaf removal from the base of cane, nearly before the beginning of flowering - E-L stages 16-17). The results were statistically analyzed by analysis of variance. Based on the results, a statistically significant difference for parameter of sugar content in the must between locations was determined. In the other carried parameters there weren't any statistically significant differences. The highest sugar content was measured in Ilok at the control treatment and treatment with three leaf removal (96,7 °Oe). The content of total polyphenols ranged from 1487 mg/kg in the control treatment in Ilok up to 2159 mg/kg in the treatment of the six leaf removal at the same location. Treatment with six leaf removal in Karanac had the highest content of total anthocyanins (1134 mg/kg). Treatment with three leaf removal on location in Karanac had the most powerful antioxidant activity (343 mg/kg GAE).

Key words: Merlot, early leaf removal, must, phenolic compounds

Klasifikacija odabranih hrvatskih bijelih vina različitih zaštićenih oznaka izvornosti prema sastavu makro i mikroelemenata

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SAŽETAK

Utvrđivanje geografskog podrijetla vina od velike je važnosti za potrošače i proizvođače vina, budući da se smatra jednim od kriterija za definiranje kvalitete i cijene vina. Primijećeno je da sastav elemenata vina ovisi o više čimbenika, kao što su: karakteristike tla, sorta vinove loze, vinogradarska regija i okolišni uvjeti. Cilj ovoga rada bio je proučiti odnos analiziranih makro i mikroelemenata u odabranim hrvatskim bijelim vinima, s obzirom na njihovo geografsko podrijetlo. Uzorci potječu iz četiri zaštićene oznake izvornosti (ZOI): Slavonija (istočna kontinentalna Hrvatska), Plešivica (zapadna kontinentalna Hrvatska), Hrvatska Istra i Srednja i Južna Dalmacija (primorska Hrvatska). Mjerenja koncentracija odabranih elemenata (Al, B, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Pb, Rb, Sn, Sr i Zn) provedena su spektrometrijom optičke emisije induktivno spregnute plazme (ICP-OES). Analizom varijance utvrđene su statistički opravdane razlike u koncentracijama pet elemenata (Cd, Pb, Zn, Ca i B). Analizom glavnih komponenata (engl. Principal Component Analysis, PCA) željelo se utvrditi da li različiti ZOI utječu na elementarni sastav vina. Rezultati PCA analize potvrdili su različitosti između pojedinih ZOI-a kao i važnost pojedinih elemenata u sastavu vina određenih ZOI-a u RH.

Ključne riječi: zaštićena oznaka izvornosti, vino, makro i mikro elementi

Classification of selected Croatian white wines from different Protected Designations of Origin by macro- and microelements composition

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SUMMARY

The identification of the geographical origin of wines is of great interest for wine consumers and producers, since it is one of the main factors for wine quality and price determination. It has been observed that the elemental composition of wines depend on several factors, including soil characteristics, grape variety, area of production and environmental conditions. The objective of this work was to study the relationship of macro and micro elements in selected Croatian white wines with different geographic origin. The samples originated from four of the Protected Designations of Origin (PDO): Slavonija and Plešivica from continental part of Croatia; Hrvatska Istra and Srednja and Južna Dalmacija from the coastal part. The measurements of selected elements concentration (Al, B, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Pb, Rb, Sn, Sr and Zn) were performed by ICP-OES technique. Analysis of variance showed that there are statistically significant differences in concentrations of five elements (Cd, Pb, Zn, Ca and B). Principal component analysis was performed in order to determine whether the origin of wine has an influence on the micro and macroelement composition of the wine. Results of PCA confirmed existence of differences among PDOs and the importance of specific elements in the wines from particular PDO.

Key words: protected designation of origin, wine, macro and microelements

Effect of Istarska bjelica and Oblica cvs. fruit maturity on virgin olive oil phenolic composition and related typical sensory properties

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SUMMARY

To investigate the effect of olive fruit maturity on virgin olive oil phenolic composition and related sensory properties, Istarska bjelica (IB) and Oblica (OB) olives were harvested at three dates covering the whole customary harvest period in the Croatian regions of Istria and Dalmatia, respectively. During maturation, IB olives did not change skin color significantly (which is a cultivar characteristic), while OB olives were picked as green, semi-ripe, and ripe. Olives were processed using a laboratory scale Abencor system, and the obtained oils were subjected to HPLC-DAD analysis of phenols. Sensory analysis of oils was performed by an accredited authorized panel using the official IOC method. Hydroxytyrosol, tyrosol, and hydroxytyrosol acetate increased with ripening in IB oils. In OB oils the same was observed for hydroxytyrosol acetate, while other simple phenols exhibited irregular fluctuations. Vanillic acid decreased proportionally with the maturation of IB olives, while in OB oils the same was observed also for vanillin and *p*-coumaric acid. Flavonoids and lignans increased with harvest date in IB, while during OB maturation acetoxypineoresinol decreased. Secoiridoids exhibited similar variation for both cultivars: the majority of oleuropein and ligstroside aglycons decreased with maturation, except for 3,4-DHPEA-EDA and *p*-HPEA-EDA which surprisingly increased in OB. However, the decrease of other aglycons was much sharper in OB than in IB oils. Sensory analysis generally revealed a positive correlation between phenols amount and *bitter* and *pungent* sensory attributes of the oils, as well as their overall quality and cultivar typicity.

This work has been supported in part by Croatian Science Foundation under the project UIP-2014-09-1194.

Key words: olive fruit maturity, olive oil, phenols, sensory properties

Primjena referentnog materijala i pouzdanost rezultata senzornog ocjenjivanja vina

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SAŽETAK

Senzornom analizom utvrđuje se kakvoća vina, sortna svojstva i sklad pojedinih sastojaka te je sastavni dio postupka za izdavanje Rješenja za stavljanje vina u promet u RH. Budući da kod senzornog ispitivanja čovjek predstavlja mjerni instrument, ova je metoda ispitivanja subjektivna te parametri senzorne procjene moraju biti standardizirani i kontrolirani. Ako je uzorak kod senzornog ocjenjivanja za bilo koje od svojstava (npr. bistroća, intenzitet i kvaliteta mirisa, itd.) ocijenjen negativno uz obrazloženje, automatski se odbacuje bez obzira na ostale ocjene. Poznati su kemijski spojevi, npr. etil acetat, acetaldehid i dr. koji u određenim koncentracijama vinu daju negativna svojstva i prepoznaju se kao mane ili bolesti vina. U području senzornog ocjenjivanja vina nije postojao certificirani referentni materijal primjenjiv u radu Komisije za organoleptičko ocjenjivanje vina, te je sukladno zahtjevima norme HRN ISO IC/EN17025 pripremljen interni referentni materijal (IRM). Cilj je rada bio prikazati postupak razvoja IRM-a. Ukoliko se u vino doda odgovarajuća koncentracija spoja, ono će biti prepoznato kao vino s manom. U ovome je radu prikazana primjena IRM-a tijekom 2016. godine, te potvrđivanje pouzdanosti metode senzornog ocjenjivanja vina. Na ovaj se način osigurava kontrola kvalitete rezultata senzornog ispitivanja, a prilikom rada Komisije za organoleptičko ocjenjivanje vina povećava pouzdanost rezultata.

Ključne riječi: senzorno ocjenjivanje, vino, referentni materijal

The use of reference material in the wine sensory evaluation

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SUMMARY

Sensory analysis determines the quality of wine in regard to the varietal characteristics and harmony of individual wine characteristics and is a prerequisite for obtaining the Permit to market the wine in Republic of Croatia. Since, human is a measuring instrument in sensory analysis, this method is subjective and as many as possible parameters of sensory analysis must be standardized and controlled. If the analyzed wine has a defect in any of the tested characteristics (e.g. clarity, quality of odour, etc.) it is rated negative with an explanation and cannot be placed on the market. Furthermore, chemical compounds like ethyl acetate, acetaldehyde, etc. that in certain concentrations cause wine faults and defects are known. Certified reference material (RM) for sensory evaluation of wines applicable to the work of the Commission for sensory evaluation does not exist, so in-house RM was developed in compliance with ISO/IEC 17025:2007. Wines with added compound, in proper concentration will be recognized as negative property in wine and can be identified as wine faults. The aim of this paper was to present the development and use of reference material. Internal reference material enables quality control and its use in the work of Commission for sensory evaluation increases reliability of the results. In this work use of the reference material on the results and confirmation of objectivity of sensory evaluation of wine during the year 2016 will be presented.

Key words: sensory evaluation, wine, reference material

Sadržaj ukupnih polifenola i antioksidativna aktivnost nekih armenskih i hrvatskih vina autohtonih sorti grožđa

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SAŽETAK

Fenolni spojevi u crnim vinima su spojevi koji igraju važnu ulogu u nekoliko osjetilnih osobina kao što su boja, okus, oporost i jakost. Imaju velik opseg blagotvornih učinaka i djeluju anti-karcinogeno, antiupalno i antivirusno. Ovi preventivni učinci koji proizlaze iz konzumiranja vina rezultat su antioksidativnog djelovanja fenola. Polifenolna kompozicija u vinima ovisi o sorti, klimatskim uvjetima, vinogradarskoj praksi i tehnikama vinifikacije. Cilj istraživanja bila je komparativna analiza vina armenskih i hrvatskih autohtonih kultivara vinove loze kako bi se utvrdio sadržaj i razlike u fenolima i ukupna antioksidativna aktivnost. Ukupna antioksidativna aktivnost je određena s 1,1- difenil-2- picrylhydrazyl (DPPH) deionizacijom radikala i 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) ($ABTS^{\cdot+}$) kation dekolorizacijom radikala. Utvrđena je snažna pozitivna korelacija ($p < 0.01$) s ukupnim saržajem fenola koji su izmjereni reakcijom s Folin-Ciocalteu reagensom, pomoću galne kiseline kao standarda. Dobiveni rezultati su potvrdili varijacije u sadržaju fenola u armenskim i hrvatskim crnim vinima kao i u vinima dobivenim iz grožđa različitog geografskog porijekla. Ovo preliminarno istraživanje doprinosi novim saznanjima o kompoziciji vina proizvedenog od različith kultivara vinove loze i geografskog porijekla. Potrebne su daljnje studije kako bi se potvrdile promatrane razlike.

Ključne riječi: crno vino, fenolni spojevi, antioksidativna aktivnost, Armenija, Hrvatska

Total phenolic content and total antioxidant activity of Armenian and Croatian local red wines

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SUMMARY

The phenolic compounds of red wines are substances which play an crucial role in several sensory properties such as colour, flavour, astringency and hardness. They manifest a wide range of beneficial effects including anti-carcinogenic, anti-inflammatory and antiviral activities. These protective effects derived from the consumption of wines have been attributed to the antioxidant character of phenolics. Polyphenolic composition in wine depends on grape variety, climatic conditions, viticulture practice and vinification techniques. The main objective of the presented study was comparative analysis of wines from Armenian and Croatian local grape cultivars in order to determine their total phenolic content and total antioxidant activity. Total antioxidant activity was determined by 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging assay and 2,2'-azino-bis-(3-ethylbenzothiazoline-6-sulfonic acid) ($ABTS^{\cdot+}$) radical cation decolourisation. They were correlated and exhibited a strong correlation ($p < 0.01$) with the total phenolic content determined by Folin-Ciocalteu's reagent using gallic acid as a standard. The obtained results have confirmed a variation in the phenolic content amongst Armenian and Croatian red wines and also amongst wines made from grapes of different geographical origin. This preliminary study contributes new knowledge of the composition of the wines of different grapes and origin. Further studies are necessary to confirm the observed differences.

Key words: red wine, total phenolic content, antioxidant activity, Armenia, Croatia

Fluorescencija klorofila *a* kao indikator toplinskog stresa pet kultivara jabuka

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SAŽETAK

Jabuka (*Malus domestica* L) je najrasprostranjenija voćna vrsta u kontinentalnom djelu Hrvatske. U prirodnim uvjetima, u voćnjacima, stabla jabuka su izložena mnogim negativnim stresnim okolišnim čimbenicima. Jedan od važnih abiotskih stresnih čimbenika je toplinski stres koji može poremetiti fotosintetski aparat, uzrokujući smanjenje kvalitete, produktivnosti i ukupan urod jabuke. Fotosinteza je proces izrazito osjetljiv na različite abiotske stresove te se smatra dobrim indikatorom vitalnosti biljke. Stoga, istraživanja fotosinteze i fotosintetskog aparata imaju važnu ulogu u proučavanju biljaka i njihovog odgovara na stresne okolišne čimbenike. Fluorescencija klorofila predstavlja mali dio disipacijske energije iz fotosintetskog mehanizma koji nam daje informacije o fotosintetskom mehanizmu biljaka i koristi se za utvrđivanje promjena u PS II koje se javljaju uslijed stresnih uvjeta. OJIP test, koji istražuje promjene u PS II, korišten je za proučavanje negativnog utjecaja visokih temperatura na fotosintetski aparat 5 različitih kultivara jabuke: Jonagold Novajo, Golden Delicous Clone B, Red Chief Camspur, Gala Galaxy and Gold Rush. Parametar fluorescencije klorofila (F_v/F_m) predstavlja maksimalni kvantni prinos PS II i koristi se za ranu detekciju stresa kod biljaka. Pet kultivara jabuke je ispitivano na otpornost na toplinski stres u ekološkim uvjetima istočne Hrvatske na Poljoprivrednom institutu Osijek, tijekom tri vegetacijske sezone. Iz zabilježenih vrijednosti parametra (F_v/F_m) tijekom istraživanja može se zaključiti da je kultivar Gold Rush najtolerantniji. Kultivari Golden Delicous Klon B i Jonagold Novajo se smatraju tolerantnima, dok se kultivari Red Chief Camspur i Gala Galaxy smatraju manje tolerantnim kultivarima. Naši rezultati potvrđuju da je OJIP test pouzdani indikator tolerancije na toplinski stres izabranih kultivara. Rezultati također upućuju na važnost poznavanja interakcije između kultivara i okolišnih čimbenika kako bi se pravilnim odabirom kultivara smanjio utjecaj stresa i kako bi se postigli najbolji rezultati u odgovarajućim agroekološkim uvjetima.

Ključne riječi: jabuka, toplinski stres, fotosinteza, fluorecencija klorofila

Chlorophyll *a* fluorescence as an indicator of heat stress in five apple cultivars

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SUMMARY

Apple (*Malus domestica* L) is one of the most widely cultivated fruits in the continental part of Croatia. Under natural conditions, in the orchards, apple trees are exposed to many adverse environmental stress factors. One of the major abiotic stress is heat stress which can disrupt the photosynthetic apparatus, causing a decrease of apple quality, productivity and overall yield. Photosynthesis is highly sensitive to different abiotic stresses especially to heat stress and it has been considered as a good indicator of plant vitality. Therefore, the study of photosynthesis and the photosynthetic apparatus have a important role in the study of plants and their response to stress environmental factors. The chlorophyll fluorescence represents a very small fraction of the energy that is dissipated from the photosynthetic machanism and it is widely used to provide information about the photosynthetic mechanism of plants and it has been used to detect changes in photosystem II (PSII) that ocure under stress conditions. OJIP test, which explores changes in photosystem II (PSII), has been used for studying the negative effects of high temperatures on photosynthetic apparatus in leaves of 5 different apple cultivars: Jonagold Novajo, Golden Delicous Clone B, Red Chief Camspur, Gala Galaxy and Gold Rush. The chlorophyll fluorescence parameter (F_v/F_m) represents the maximum quantum efficiency of photosystem II (PSII) photochemistry and has been widely used for early stress detection in plants. Five apple cultivars were evaluated for heat stress tolerance in ecological condition of eastern Croatia at Agricultural institute Osijek, during three growing season. From recorded vallues of parameter F_v/F_m during research, it can be concluded that the most tolerant cultivar was Gold Rush. Cultivars Golden Delicous Clone B and Jonagold Novajo can be considered as tolerant, while cultivars Red Chief Camspur and Gala Galaxy as less tolerant cultivars. Our results confirm that the OJIP test is a reliable indicator of heat tolerance of selected apple cultivars. The results also indicate the importance of knowing the interaction between cultivar and environmental factors, because the proper selection of varieties can reduce the impact of stress and contribute to the best results in appropriate environmental conditions.

Key words: apple, heat stress, photosynthesis, chlorophyll fluorescence, maximum quantum efficiency of PS II (F_v/F_m)

Sušene jabuke kao proizvod s dodanom vrijednošću dobiven u sustavu održive voćarske proizvodnje

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SAŽETAK

Posljednjih godina jačanjem svijesti o održivoj poljoprivredi i očuvanju bioraznolikosti raste i zanimanje za uzgojem tradicionalnih i autohtonih sorti, čija je proizvodnja trenutno uglavnom ekstenzivna. Bez primjene suvremenih tehnologija ove sorte uglavnom daju niže prirode. Stoga su u istraživanju uspoređene tradicionalne (Ovčji nos, Mašanka i Zlatna zimska parmenka) s otpornim (Topaz®, Pinova® i Querina-Florina) i komercijalnim sortama (Gala, Golden Delicious, Idared) u sustavu intenzivne proizvodnje s ciljem bolje procjene potencijala sorti za stvaranje dodatne vrijednosti kroz preradu. Pokus je proveden u pokusnom voćnjaku Zavoda za voćarstvo Hrvatskog centra za poljoprivredu, hranu i selo. Nakon provedenih pomoloških te fizikalno-kemijskih analiza u vrijeme berbe, plodovi sorti jabuka u istraživanju su posušeni u sušari M.Bucher AG Typ 20 te je provedena kvantitativna deskriptivna organoleptička analiza sušenih plodova sorti. Sušene jabuke su ocjenjivane na skali od 1 do 7, pri čemu je ocjena 1 predstavljala najslabiji a 7 najjači intenzitet određenog svojstva. Sorte u istraživanju su se međusobno razlikovale s obzirom na pojavu žute i smeđe boje posušenog ploda pri čemu je žuta boja najviše došla do izražaja u sorti Golden Delicious (ocjena 4,33), a smeđa kod sorte Ovčji nos (4,83), i te razlike su statistički značajne ($P \leq 0,05$). Strani miris posušenog ploda uočen je kod sorti Topaz (ocjena 2,16) i Mašanka (2,25). Okus na jabuku najmanje je bio izražen kod sorte Golden Delicious (3,41), a najviše kod sorte Querina-Florina (5,25). Sorte Querina-Florina te Gala dobile su najviše ocjene za slatki okus (4,08; 4,41), a za kiseli sorta Topaz (5,33). Kod ove sorte također je uočen je i izražen strani okus (1,75). Otporne sorte Querina-Florina i Pinova pokazale su se pogodnijima za sušenje od ostalih sorti u istraživanju.

Ključne riječi: otporne sorte jabuka, sušenje, organoleptika, dodana vrijednost

Dried apples as a value added product obtained from sustainable fruit production

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SUMMARY

Recently, with accepting the importance of sustainable agriculture and preservation of biodiversity, interest in traditional and autochthonous fruit cultivars is increasing, which production is rather extensive. Productivity of these cultivars is mainly low without the usage of modern technologies. Hence, this research aimed to compare traditional Ovčji nos, Mašanka and Zlatna zimska parmenka) with resistant (Topaz®, Pinova® and Querina-Florina) and commercial cultivars (Gala, Golden Delicious and Idared) within the intensive production system in order to better evaluate cultivar potential for creation of value added products through processing. Trial was implemented in the research orchard of the Institute of Pomology of the Croatian Centre for Agriculture, Food and Rural Affairs. After pomological, physical and chemical fruit analysis at harvest, fruits of apple cultivars in research were dried in M.Bucher AG Type 20 dryer. Dried apples were evaluated by quantitative descriptive organoleptic analysis on a 1 to 7 scale, whereas mark 1 represented the weakest and mark 7 the strongest intensity of certain characteristic. Cultivars in research differed with regards to yellow and brown colour presence of dried apple discs. Yellow colour was the most prominent in cv Golden Delicious (mark 4,33), and brown at cv Ovčji nos (4,83), and these differences are statistically significant (P≤0,05). Off fragrance of dried apples was noted in cvs Topaz (mark 2,16) and Mašanka (2,25). Apple taste was the least intense at cv Golden Delicious (3,41), and most prominent at cv Querina-Florina (5,25). Cvs Querina-Florina and Gala scored highest marks for sweet taste (4,08; 4,41 respectively), and cv Topaz (5,33) for sour taste. This cultivar as well prompted off taste as well (1,75). Traditional cultivars displayed good suitability for drying.

Key words: apple cultivars, drying, organoleptic analysis, added value

Morphological characteristics of fruits and structural analysis of yields of some plum cultivars

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SUMMARY

Morphological characteristics of fruit of some plum cultivars was conducted: 'Čačanska lepotica', 'Čačanska najbolja', 'Čačanska rodna', 'Katinka', 'Top first', 'Tegera', 'Hanita', 'Jojo', 'Elena' and 'Stanley' for the control cultivar. Studies were conducted in the region of Troyan in the climate conditions of the Fore-Balkan. The weight of fruits varied from 20.4 g for 'Katinka' cultivar to 47.4 g for 'Čačanska najbolja'. Fruits of 'Čačanska lepotica', 'Čačanska najbolja', 'Top first', and 'Jojo', exceeded in their size, the control cultivar of 'Stanley'. For all of them the main colour of fruit skin was blue in purple nuances. The content of total sugars in fruits was from 9.40 % for 'Čačanska Najbolja' to 11.95 % for 'Čačanska lepotica'. According to this indicator, all the cultivars yielded to the control where the total sugars were 11.95 %. Structural analysis was conducted of the following cultivars: 'Čačanska lepotica', 'Čačanska rodna', 'Hanita', 'Jojo' and 'Katinka'. The yield was divided in fractions, according to a scale for each cultivar separately – large-sized, average-sized, small-sized and poor quality fruits. For all cultivars, the average-sized fruit fraction had the highest share, as for 'Čačanska rodna' it was 53.6 %. The large-sized fruits had the highest percentage of the yield from 'Čačanska lepotica' and 'Katinka' – respectively 25.0 % and 32.0 %. The studied cultivars covered a harvesting period in the second decade of July till the second half of September. Fruits of 'Katinka' became ripen first, and fruits of 'Elena' were the latest. For the control cultivar of 'Stanley', in most cases fruits reach ripening stage in the end of August.

Key words: plum, cultivars, morphological characteristics, yield, structural analysis

Polifenolni profil grožđa sorte 'Plavac mali' (*Vitis vinifera* L.) tijekom zrenja

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SAŽETAK

Karakterom crnih vina sorte Plavac mali dominiraju polifenoli, fitokemijski sastojci koji definiraju boju, okus i senzaciju vina. Pravilan izbor datuma berbe, u zadanim agroekološkim okvirima, pomaže nam optimizirati tehnologiju vinifikacije te osigurati željeni stila vina. Kožica je ishodište antocijana i flavonola te se uz sjemenke smatra najvažnijim izvorom monomera i dimera (B1, B2, B3 i B4) flavan-3-ola. Cilj ovoga rada je bio identificirati i kvantificirati različite grupe polifenolnih sastojaka kožice Plavca malog tijekom zrenja u uvjetima Mediteranske klimatske regije Republike Hrvatske. Fenolni sastojci proizašli iz flavonoidnog puta biosinteze određeni su tekućinskom kromatografijom visoke djelotvornosti uz detektor s nizom fotodioda (HPLC-DAD). Razlike u sastavu i koncentraciji fenolnih sastojaka između četiri roka berbe testirane su analizom varijance (ANOVA) uz Bonferronijevu korekciju pogreške. Rezultati su pokazali da flavonoidnim profilom kožice Plavca malog dominiraju antocijani proizašli iz delfinidin 'starter' grupe bez obzira na rok berbe. Tijekom zrenja determiniran je pozitivan trend u akumulaciji glukozida antocijana i flavonola, kao i epikatehina i galokatehina te dimera B2 ((-)epikatehin-4β-8-(-)epikatehin) u kožici. Najzastupljenija prodelfinidin jedinica flavan-3-ola, epigalokatehin ima negativan trend ponašanja tijekom zrenja. Zadnji rokovi berbe ističu se značajno visokim koncentracijama (-) epikatehina naspram koncentracija izomera (+) katehina.

Ključne riječi: datum berbe, flavonoidi kožice, antocijani, flavonoli, proantocijanidini

Polyphenolic profile of the grapes of 'Plavac Mali' (*Vitis vinifera* L.) during ripening

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SUMMARY

Polyphenols, phytochemical components that define the color, taste, and sensation dominate the character of the wines of the red grape variety Plavac Mali. Proper selection of the date of harvest, in the given agroecological frameworks, helps us to optimize the technology of the vinification, and to ensure the production of the desired wine style. The skin is the origin of the anthocyanins and flavonols, and, together with seeds, is one of the most important sources of the monomers and dimers (B1, B2, B3 and B4) of the flavan-3-ols. The aim of this study was to identify and quantify different classes of polyphenolic components of the skins of Plavac Mali during ripening under the Mediterranean climatic conditions in Croatia. Phenolic components derived from the flavonoid biosynthetic pathway were determined by the high performance liquid chromatography with a diode array detector (HPLC-DAD). Differences in the composition and concentration of phenolic components between four harvest dates were tested using analysis of variance (ANOVA) with the Bonferroni correction. The results showed that flavonoid profile of the skins of Plavac Mali is dominated by anthocyanins derived from delphinidin 'starter' group, regardless of the harvest. A positive trend in the accumulation of anthocyanin and flavonol glycosides, epicatechin and gallocatechin and the B2 dimer ((-) epicatechin-4β-8-(-) epicatechin) in the skin was determined during ripening. The most abundant prodelphinidin unit of the flavan-3-ols was epigallocatechin, and it exhibited a negative trend during the ripening. The last ripening dates stand out by the significantly high concentrations of (-) epicatechin isomers against the concentration of (+) catechin.

Key words: harvest date, flavonoids of the skin, anthocyanins, flavonols, *proanthocyanidins*

Improved water productivity by deficit irrigation: implications for water saving in orange, olive and vineyard orchards in arid conditions of Tunisia

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SUMMARY

Field experiments on deficit irrigation (DI) were performed in a drip-irrigated olive, orange and grapevine orchards during 2013 and 2014 in farm field situated in Médenine, Tunisia. Four irrigation treatments were applied: Full irrigation (FI), which was irrigated at 100% of ETc for the whole season; DI75 and DI50 deficit irrigation treatments, which received 25 and 50% less water than FI. These treatments were compared with a traditional farming (FM). The findings were that irrigation amounts applied in olive, orange and grapevine orchards where irrigation is scheduled according to traditional farming (FM) was much less than actually needed. While the recommended irrigation water requirement is 100% of ETc, the traditional farming (FM) applied 11, 18, 30 and 33% less than the FI treatment, respectively, in orange, grapevine and table and oil olive orchards, indicating that farmers practice a form of unintended deficit irrigation. When DI was applied using 25% less water than FI, yields were reduced. There were significant differences between DI75, DI50 and FM treatments. Significant differences were not observed between DI50 and FM treatments even though numerically smaller yield was observed in the former (DI50) as compared to the latter (FM). The irrigation water productivity (IWP) was significantly affected by irrigation treatments. The smallest IWP was recorded under the FI treatment, while the largest IWP was obtained under the deficit irrigation treatment (DI50). The DI50 and FM treatments reduced the economic return compared to the full treatment (FI), while the DI75 treatment resulted in a better economic return than did DI50 and FM. Full irrigation (FI) could be recommended for olive, orange and grapevine irrigation under the arid climate of Tunisia. Nevertheless, the treatment DI75 can be applied as a strategy under water scarcity conditions in commercial olive, orange and grapevine orchards allowing water savings up to 25% but with some reduction in yield and net return. The results would be helpful in adopting deficit irrigation in ways that enhance net financial returns.

Key words: orchards, irrigation, water, yield, arid

Morphological and Pomological Traits of Some Fig Cultivars and Genotypes in Mediterranean Region of Turkey

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SUMMARY

Fruit quality characteristics of some cultivars and types of fig were determined in Dörtyol, Hatay, Turkey. The fig accessions included in the study were Sarilop, Bursa Siyahi, Göklop, Yediveren, Yesilguz, Morguz, Sari Zeybek, and Akça and 22 selections. Several pomological characteristics of these accessions were determined during five growing season. Averaged over the 5 years, fruit weight ranged between 22.31 and 48.62 g, total souble solids (TSS) ranged between 19.87 and 24.05 %. Goklop, Bursa Siyahi, Sarılop, 31-IN-17 and 31-IN-11 produced the largest fruits determined by fruit weight and dimensions. Bursa Siyahi, Yediveren cultivars, 31-IN-16 and 31-IN-17 types scored the highest in overall quality according to the weighted ranked method. Based on the results obtained Yediveren cultivar, 31-IN-16 and 31-IN-17 types could be use with Bursa Siyahi, currently the most favored fresh table fig cultivar.

Key words: *Ficus carica* L., fruit quality, fresh fig, morphology

Correlations between Important Fruit Quality and Plant Characteristics of Some Fig Genotypes

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SUMMARY

Experiments were carried to determine correlations of important fruit and plant characteristics using 30 fig genotypes. In the study, fruit weight, fruit diameter, fruit length, neck length, ostiolium width, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, thickness of the fruit skin, texture of skin, fruit ribs, fruit internal cavity, TSS, pH, acidity, TSS/acidity, trunk diameter, shoot length, yield per tree were traits examined. The correlation coefficients between these traits were calculated using SAS program. According to five year data, fruit weight was found to positively correlation by fruit diameter (r= 0.92; $P < 0.01$), fruit length (r= 0.81; $P < 0.01$), neck length (r= 0.35; $P < 0.01$), ostiolium width (r= 0.23; $P < 0.01$), trunk diameter (r= 0.26; $P < 0.01$), fruit skin cracks (r= 0.26; $P < 0.01$) and negatively correlation by TSS (r= -0.26; $P < 0.01$) and fruit ribs (r= -0.21; $P < 0.01$). Relations between some traits such as ostiolium width, abscission of the stalk from the twig, ease of peeling, fruit skin cracks, texture of skin and fruit ribs deviated based on the years. Some relationships between fig fruit characteristics exist, which may help researchers to solve some problems such as ostiolium width and fruit skin cracking. These studies may contribute to producing fruit with a good quality and help to evaluate new cultivars.

Keywords: Fig genotype**,** fruit quality, plant characteristic, correlation

Effect of foliar fertilization on productivity and quality of table grape, cv. Cardinal

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SUMMARY

During 2012-2014 of field experiments, the influence of the foliar fertilization on yield and quality of table grape, cv. "Cardinal", grown in "Tikvesko" vine area, Republic of Macedonia, has been investigated. Field trials has been organized according the method of random block system with four variants (along with control- Variant I) and three repetitions. The variants included three foliar fertilizers, with different nutrient contents (II – Ca, III – NPK+ME, IV – N) applied in concentration of 0,5 %, four times during the growing period (before and after blooming, buckshot berries and veraison). The influence of foliar fertilization was studied through monitoring of: yield, cluster content, mechanical properties of berry (braking resistance and resistance of pressure) and chemical content of must (content of sugar and total acids). One of the main findings were, that all variants of foliar fertilizers applied, significantly increases the total yield of vine grape in comparison to control variant (13,59 t/ha). Fertilized Variant III had higher average yield with 5,23 kg/vine and 17,01 t/ha. During the tree years of investigations, the largest mass of grape bunch and berry were recorded using the Variant III (428 g and 414,7 g) and the lowest in Variant I – control variant (344 g and 330,92 g). With a reference to the mechanical properties of grains, the highest resistance of pressure (2229,7 g) and breaking resistance (364,52 g) were detected at Variant II. In addition, the highest average content of sugar in the grape must with 164,77 g/l and lowest total acids 4.70 g/ l, were at Variant III. Correlation analyses, showed significant correlation between total yield with grape mass (r=.946**) and sugar content (r=.700**).

Key words: Cardinal, grape, foliar, fertilizing, yield

Agroklimatski indeksi i rasprostranjenost sorata vinove loze u Republici Hrvatskoj

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SAŽETAK

Uzgoj vinove loze i proizvodnja vina u Hrvatskoj imaju dugu tradiciju, te su od velikog gospodarskog i kulturološkog značaja u društvu. Klimatski uvjeti među najvažnijim su čimbenicima za uspješan i ekonomičan uzgoj vinove loze jer uvjetuju izbor sorte, agrotehničke i ampelotehničke mjere gospodarenja u vinogradu, utječu na kvalitetu grožđa, a u konačnici i na kvalitetu vina. Meteorološki elementi poput temperature zraka, vlažnosti zraka, količine oborine, Sunčevog zračenja i dr. imaju veliki utjecaj na biljke. Cilj ovoga rada je na temelju agroklimatskih indeksa odrediti zemljopisna područja s pogodnim uvjetima za rast i razvoj vinove loze u Hrvatskoj. U tu svrhu obrađeni su podaci s 84 meteorološke postaje preuzeti iz baze podataka Državnog hidrometeorološkog zavoda (1961.-2014. g.), te su analizirani trendovi za 30-godišnja razdoblja (1961.-1990., 1985.-2014.). Izračunati su agroklimatski indeksi: suma efektivnih temperatura prema Winkleru (GDD ili WI), heliotermički Huglinov indeks (HI), indeks hladnih noći (CI) i prosječna temperatura zraka u vegetaciji (TGS). Dobivene vrijednosti i pogodnost vinogradarskih regija za uzgoj vinove loze uspoređene su s trenutnom rasprostranjenosti sorata vinove loze u RH.

Ključne riječi: klima, agroklimatski indeksi, vinova loza, sorta

Agroclimatic indices and the distribution of grapevine varieties in Republic of Croatia

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SUMMARY

Viticulture and wine production in Croatia have a long tradition and a great economic and cultural interest in the society. Climatic conditions are among the most important factors for a successful and cost-effective cultivation of grapevine. They give basic thresholds for the selection of the grape variety, viticulture production system and they affect the characteristics of the grapes, and ultimately the quality of the wine. Meteorological elements such as air temperature, wind, humidity, precipitation, solar radiation have a great affect on plants.The aim of this work was to determine the geographical areas with the optimal conditions for the growth and development of the grapevine in Croatia. Data from the 84 meteorological stations were taken from the database of Meteorological and Hydrological service of Agriculture (period from years 1961-2014) and trends for 30 year periods (1961-1990, 1985-2014) were determined. We have calculated agroclimatic indices: Growing degree-days (GDD or WI), Heliothermal index (HI), Cool night index (CI) and Average growing season temperature (Tgs). The results of indices and suitability of wine growing areas for cultivation of grapevine in Croatia are compared with current wine growing regions and distribution of grapevine varieties in Republic of Croatia.

Key words: climate, agroclimatic indices, grapevine, variety

Suvremena klonska reprodukcija biljaka

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SAŽETAK

Moderna rasadničarska praksa razvijenih članica Europske unije u proizvodnji sadnica specijaliziranih kultura (maline, kupine, borovnice, aronije i dr.), ali i strateških kultura kao što su masline, temelji se dijelom ili u potpunosti na uporabi suvremenih biotehnoloških metoda (mikropropagcija *in vitro*). U cilju još veće učinkovitosti i masovnosti posljednih godina veliku ekspanziju ima reprodukcija klonskog materijala u bioreaktorima nove generacije. TIB (eng. „Temporary Immersion Bioreactor“) sustavi, odnosno submerzni bioreaktori. To su visoko modularni biotehnološki sustavi koje karakterizira visoka učinkovitost i skraćeni ciklus proizvodnje usljed bržeg rasta biljnih kultura. Povećana je stopa multiplikacije, stopa preživljavanja u fazi aklimatizacije (*ex vitro*) te je utvrđena odlična adaptibilnost transplatiranih biljka *in vivo*. Dodatne prednosti su smanjenje troškova pripreme medija, ušteda električne energije, potrebne radne snage i laboratorijskog prostora. Zbog poboljšanih konstrukcijskih rješenja olakšana je manipulacija biljnim materijalom čime se lakše i jednostavnije postiže masovna proizvodnja. Visoka razina automatizacije te masovna proizvodnja velikim kompanijama omogućava superiorne uvjete na tržištu, a europskim proizvođačima voća osigurava repromaterijal deklarirane kvalitete po povoljnijim cijenama. Iako je naglašeno smanjenje troškova proizvodnje i povećana učinkovitost, navedeni sustavi zahtjevaju naročitu pozornost u poštovanju protokola i kontroli aseptičnih uvjeta pri manipulaciji biljnim materijalom. Kako je tehnologija nova i podložna brojnim modifikacijama, neprestano se radi na poboljšanju laboratorijskih protokola za komercijalni uzgoj sve većeg broja biljnih kultura.

Ključne riječi: sadnica, *in vitro*, klonski materijal, bioreaktor, TIB

Contemporary clonal reproduction of plants

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SUMMARY

Modern nursery practice of developed EU member states in the production of fruit saplings of specialized culture (raspberry, blackberry, blueberry, chokeberry, etc.), As well as strategic crops such as olives, based partly or entirely on the use of modern biotechnological methods (micro propagation *in vitro*) . In order to even greater efficiency and mass in recent years a large expansion has a reproduction of clonal material in bioreactors new generation. TIB (eng. "Temporary Immersion Bioreactor") systems, or submerged bioreactors are highly modular biotechnological systems characterized by high efficiency and shortened production cycle due to faster growth of crops. The increased rate of multiplication, the survival rate in the acclimatization phase (*ex vitro*) and an excellent adaptability of transplanted plant *in vivo*. Additional benefits are reduced costs of preparing the media, the amount of electricity needed manpower and laboratory space. Due to improved structural solutions facilitated the manipulation of plant material, which is lighter and easier to achieve mass production. The high level of automation and mass production of large companies enables superior market conditions and European producers of fruit provides raw materials (fruit saplings) declared quality at lower prices. Although a reduction in production costs and increased efficiency is emphasized, stated systems require special attention in respect of protocols and control aseptic conditions when handling plant material. As technology is new and is subject to a number of modifications, is constantly working to improve laboratory protocols for commercial cultivation of a growing number of crops.

Key word: fruit sapling, *in vitro*, clonal material, bioreactor, TIB

Primjena referentnog materijala i pouzdanost rezultata senzornog ocjenjivanja vina

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SAŽETAK

Senzornom analizom utvrđuje se kakvoća vina, sortna svojstva i sklad pojedinih sastojaka te je sastavni dio postupka za izdavanje Rješenja za stavljanje vina u promet u RH. Budući da kod senzornog ispitivanja čovjek predstavlja mjerni instrument, ova je metoda ispitivanja subjektivna te parametri senzorne procjene moraju biti standardizirani i kontrolirani. Ako je uzorak kod senzornog ocjenjivanja za bilo koje od svojstava (npr. bistroća, intenzitet i kvaliteta mirisa, itd.) ocijenjen negativno uz obrazloženje, automatski se odbacuje bez obzira na ostale ocjene. Poznati su kemijski spojevi, npr. etil acetat, acetaldehid i dr. koji u određenim koncentracijama vinu daju negativna svojstva i prepoznaju se kao mane ili bolesti vina. U području senzornog ocjenjivanja vina nije postojao certificirani referentni materijal primjenjiv u radu Komisije za organoleptičko ocjenjivanje vina, te je sukladno zahtjevima norme HRN ISO IC/EN17025 pripremljen interni referentni materijal (IRM). Cilj je rada bio prikazati postupak razvoja IRM-a. Ukoliko se u vino doda odgovarajuća koncentracija spoja, ono će biti prepoznato kao vino s manom. U ovome je radu prikazana primjena IRM-a tijekom 2016. godine, te potvrđivanje pouzdanosti metode senzornog ocjenjivanja vina. Na ovaj se način osigurava kontrola kvalitete rezultata senzornog ispitivanja, a prilikom rada Komisije za organoleptičko ocjenjivanje vina povećava pouzdanost rezultata.

Ključne riječi: senzorno ocjenjivanje, vino, referentni materijal

The use of reference material in the wine sensory evaluation

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SUMMARY

Sensory analysis determines the quality of wine in regard to the varietal characteristics and harmony of individual wine characteristics and is a prerequisite for obtaining the Permit to market the wine in Republic of Croatia. Since, human is a measuring instrument in sensory analysis, this method is subjective and as many as possible parameters of sensory analysis must be standardized and controlled. If the analyzed wine has a defect in any of the tested characteristics (e.g. clarity, quality of odour, etc.) it is rated negative with an explanation and cannot be placed on the market. Furthermore, chemical compounds like ethyl acetate, acetaldehyde, etc. that in certain concentrations cause wine faults and defects are known. Certified reference material (RM) for sensory evaluation of wines applicable to the work of the Commission for sensory evaluation does not exist, so in-house RM was developed in compliance with ISO/IEC 17025:2007. Wines with added compound, in proper concentration will be recognized as negative property in wine and can be identified as wine faults. The aim of this paper was to present the development and use of reference material. Internal reference material enables quality control and its use in the work of Commission for sensory evaluation increases reliability of the results. In this work use of the reference material on the results and confirmation of objectivity of sensory evaluation of wine during the year 2016 will be presented.

Key words: sensory evaluation, wine, reference material

Influence of some soil and climate factors of the region of Troyan on the yield and quality of plum fruits of 'Katinka', 'Tegera', 'Elena' cultivars, in natural grass establishment

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SUMMARY

Grey forest soils with heavy sandy clay structure and low nutrient availability are characteristic for the conditions of the region of Troyan. Climate conditions are the following: the average annual temperature is about 10°C and the annual rainfall is about 750 mm. The duration of vegetation period is 245 days. The experiment includes small-sized plum cultivars of 'Tegera' and 'Elena' grafted on Mirobolan seedlings and planted in 2000 and 'Katinka' grafted on 'Fereley' rootstock, planted in 2005, all being grown under non-irrigated conditions. The aim is to determine the influence of soil and climate factors in the region of Troyan on the phenology and reproduction of the introduced German plum cultivars of 'Katinka', 'Tegera' and 'Elena'. The flowering and some vegetative and reproductive indicators were observed and chemical analysis of fruits was conducted for characterization of their taste qualities. It is found that in the foothill region of Troyan plum cultivars find favorable conditions for growth and development, but they require regular agrotechnical measures and increased attention in extreme climate changes. In 2015, which was a favorable year, the plum harvest of 'Katinka' was about 40 kg per tree. Fruits had very small weight (15; 16; 21 g), but the great quantity gave opportunity for high yield. The earlier ripening cultivars of 'Tegera' and 'Katinka' accumulate less dry matter in comparison with the late ripening cultivar of 'Elena'.

Key words*:* Troyan region Bg, agro-ecological conditions, plum, cultivars

Utjecaj bioloških mjera na suzbijanje obične kruškine buhe (*Cacopsylla pyri* L.)

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SAŽETAK

Obična kruškina buha (*Cacopsylla pyri* L.) je štetnik od velikog ekonomskog značaja u plantažnim nasadima kruške. Predstavlja sve veći problem u proizvodnji kruške zbog malog broja registriranih preparata ali i brzog razvoja otpornosti štetnika na iste. Rezultat je povećani broj usmjerenih suzbijanja. Direktne štete od obične kruškine buhe su u zastoju rasta i razvoja voćke kao rezultat deformacije lišća i sušenja napadnutih mladica te smanjena fotosintetske učinkovitosti zbog prisustva gljive čađavice (*Cladosporium* spp.). Indirektne štete se manifestiraju u prenošenju opasnih patogena kruške (*Pear decline*). Crnilo na plodovima izazvano mednom rosom i gljivom čađavicom samanjuje tržišnu vrijednost ploda. U sklopu istraživanja koje financira Vijeće za istraživanje u poljoprivredi pratio se utjecaj integriranog programa suzbijanja ovog štetnika i utjecaj kaolinskog preparata na populaciju korisnih i štetnih kukaca te njihovu učinkovitost u suzbijanju obične kruškine buhe. Integrirani program suzbijanja imao je veći postotak učinkovitosti u odnosu na kaolinski tretman. Zaključak je da samostalna aplikacija kaolinskog preparata nije dovoljna da se izbjegnu štete od obične kruškine buhe. Kaolin se treba uvrstiti u integrirani program suzbijanja kako bi se bolje istakli svi njegovi pozitivni utjecaji djelovanja.

Ključne riječi: Obična kruškina buha, suzbijanje, integrirana zaštita, kaolin

The impact of biological measures on pear psylla (*Cacopsylla pyri* L.) control

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SUMMARY

Pear psylla (*Cacopsylla pyri* L.) is a pest of great economic importance in pear plantation. Small number of registered products as well as the rapid pest resistance development are growing problem in the pear production. The result is an increased number of directional control. Direct damages caused by pear psylla are in stopped growth and stopped development of fruit trees as a result of leaves deformation and drying attacked grafts and reduced photosynthetic efficiency due to the presence of fungi (*Cladosporium* spp.). Indirect damage is manifested in the transfer of dangerous pear pathogens (*Pear decline*). Blackness on fruits caused by honeydew and fungi reduce the market value of the fruit.

In this research, which is funded by the Council for Research in Agriculture, the impact of an integrated program and kaolin efficiency on psylla control was examined, as well as their impact on beneficial insects populations. Integrated control program has given better results in the efficiency of pear psylla. Beneficial insects were determined in both treatments. The conclusion is that kaolin treatments is not enough to avoid the presence of psylla damage on the pear. Kaolin has to be incorporated into an integrated program for better psylla control efficiency.

Key words: pear psylla, control, integrated protection, kaolin

Identitet lokalnih genotipova trešnje: sorte ili klonovi?

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SAŽETAK

Na području Hrvatske, BiH, Makedonije i Slovenije postoje lokalne sorte trešanja za koje još uvijek nije sigurno jesu li zaista autohtone (nastale spontanim križanjima na području u kojem se uzgajaju) ili su sinonimi stranim sortama koje su tijekom vremena neplanski introducirane i koje su se s vremenom udomaćile pod lokalnim nazivom. Neke od njih su fenotipski slične (ali ne i jednake), posebno po obliku i veličini ploda, duljini peteljke kao i prema vremenu dozrijevanja. Međutim, u morfološke i fenološke podatke ne možemo biti sigurni budući da ne postoji kolekcijski nasad u kojem bi svi genotipovi sorata bili uzgajani pod ujednačenim pomotehničkim uvjetima. Za DNA analizu smo prikupili uzorke dostupnih genotipova lokalnih sorata s područja BiH, Slovenije i Hrvatske i usporedili ih s nekim poznatim svjetskim sortama u cilju utvrđivanja njihove moguće istovjetnosti (sinonimi). Za dio sorata utvrđena je konstitucija *S*-alela, ali glavninu usporedbe proveli smo primjenom genetičkih molekularnih SSR markera na 24 mikrosatelitska lokusa od kojih je 16 predloženo kao osnovni lokusi za analizu trešnje. Istovjetnost *S*-alela (S_3S_{12}), kao i jednak ili vrlo sličan genetski profil na 24 SSR lokusa upućuju na postojanje sinonima unutar lokalnih sorata poput 'Kutjevačke', 'Ohridske' i dr., ali i na moguće male razlike u granicama klonskih (razlika u samo jednom alelu). Rezultati također upućuju i na postojanje sinonima između pojedinih stranih i domaćih sorata uključenih u istraživanje.

Ključne riječi: trešnja, identitet, sinonimi, SSR analiza, *S*-aleli

The Identity of Local Sweet Cherry Genotypes: Varieties or Clones?

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SUMMARY

Local sweet cherry varieties existing in Croatia, Bosnia and Herzegovina, Macedonia and Slovenia are still not verified as native varieties, i.e. varieties originated from spontaneous crossings in the area they are locally produced. They also might be synonyms of foreign varieties introduced upon a time, and propagated in traditional and administratively non-controlled way, adopting a new local name. Some of these varieties are similar (but not the same), especially by the shape, petal length and the time of ripening. However, we cannot be sure about their morphology and phenology because there is no collection orchard where all the genotypes might be grown under the same pomotechnical conditions. We collected samples of the all available local genotypes for DNA analyses from Bosnia and Herzegovina, Slovenia and Croatia and compered them with several old world-known varieties, in order to ascertain their possible synonymy. We also analyzed *S*-allele constitution for a part of varieties included in the research, but the major part of the comparison was carried out by molecular SSR markers on 24 loci, out of them 16 proposed as a basic set for cherry analyses. The same *S*-allele constitution (S_3S_{12}), but also the same or very similar genetic profile suggests the synonymy among local varieties like 'Kutjevačka', 'Ohridska' etc. but also possible small differences within the range of clonal variations (the differences in only one allele). The results also indicate the existence of synonyms among several international varieties and local genotypes included in this research.

Key words: sweet cherry, identity, synonymy, SSR analyses, *S*-alleles

Diferencijacija između dvije podvrste *Vitis vinifera* subsp. *sativa* i *sylvestris*: fenotipske varijacije hrvatskih primki

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SAŽETAK

Kultivirana (*Vitis vinifera* L. subsp. *sativa*) i divlja (*Vitis vinifera* subsp. *sylvestris* Gmel Hegi) loza izražavaju vrlo sličan fenotip. Fenotipska varijabilnost između kultivara *V. vinifere* je intrigantna i predmet istraživanja kroz dugi niz godina. Nasuprot tome, fenotipska varijabilnost kod divlje loze je gotovo nepoznata premda ova podvrsta predstavlja divljeg pretka današnjih kultivara. Glavna razlika između ove dvije bliske podvrste je u građi cvijeta. Divlja loza je dvodomna vrsta dok su sorte kultivirane loze jednodomne i većinom hermafroditi. Razumjevanje fenotipskih varijacija unutar kultivirane i divlje forme loze omogućiti će njihovu sigurnu identifikaciju, očuvanje i korištenje u oplemenjivanju. Ovdje pokazujemo fenotipske razlike između ove dvije podvrste i varijabilnost u pogledu osnovnih karakteristika mladice, lista, cvijeta i grozda na osnovu standardnih OIV deskriptora. Antocijanski profili kožice bobica analizirani su putem HPLC metode. 30 različitih kultivara *V. vinifera* analizirani su u *ex situ* kolekcijskom nasadu, dok su individue divlje loze analizirane na prirodnim staništima na četiri različite lokacije. Rezultati upućuju na niz zajedničkih karakteristika, te različite frekvencije razina ekspresije kod određenih svojstava. Primke su grupirane u nekoliko distinktivnih grupa putem klaster analize pri čemu je vidljiva jasna odjeljenost kultiviranih i divljih. Morfološka karakterizacija divljih primki u Hrvatskoj predstavlja nužan korak u očuvanju ove vrijedne biljke.

Ključne riječi: ampelografija, *Vitis vinifera* subsp. *sylvestris*, biljni genetski izvori, morfologija

Differentiation between two subspecies *Vitis vinifera* subsp. *sativa* and *sylvestris*: phenotypic variability among Croatian accessions

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SUMMARY

Cultivated (*Vitis vinifera* L. subsp. *sativa*) and wild (*Vitis vinifera* subsp. *sylvestris* Gmel Hegi) grapevine express very similar phenotype. Phenotypic variability among *V. vinifera* cultivars is intriguing and research issue for years. Unlike, phenotypic variability in wild grapevines is almost unknown though this subspecies is considered to be the wild ancestor of modern cultivars. The main difference between these two close subspecies is in flower phenotype. The wild grapevine is dioecious while cultivated grapevines are monoecious and mainly hermaphrodites. Understanding phenotypic variations within the cultivated and wild grapevine forms will allow their secure identification, conservation and selection for breeding purposes. Here we show phenotypic differences between these two subspecies and variability considering the main characteristics of the shoots, leaves, flowers and fruits based on standard OIV descriptors. Anthocyanin profiles of the grape berry skin were analyzed by High–performance Liquid Chromatography. There were 30 different *V. vinifera* cultivars analyzed in the *ex situ* collection, while wild grapevine individuals were analyzed in their natural habitats at four different locations. The results point to a number of common characteristics and different frequency expression levels in certain traits. Accessions were grouped in several distinctive groups via cluster analysis where clear separation between cultivated and wild accessions was observed. Morphological characterization of wild grape accessions in Croatia is a necessary step in order to preserve this valuable plant.

Key words: ampelography, *Vitis vinifera* subsp. *sylvestris*, plant genetic resources, morphology

Poljoprivredna
tehnika

09

Agricultural
Engineering

Tehničke specifikacije i radni učinci ratarske prskalice neophodni su za preciznu i sigurnu primjenu pesticida

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SAŽETAK

Sukladno propisima održive uporabe pesticida, strojevi za primjenu pesticida trebali bi biti testirani zbog sigurnosti, zdravstvene i standarde zaštite okoliša. Precizna primjena pesticida također je važna u ekološkom kao i u ekonomskom smislu. Da bi postigli optimalnu primjenu pesticida prskalica mora biti tehnički u potpunosti ispravna. Veliki broj prskalica koji se trenutno koristi ne zadovoljava kriterije tehničke ispravnosti. Neispravni strojevi za primjenu pesticida u zemljama u razvoju, uvelike utječu na količinu apliciranog sredstva za zaštitu bilja, na načinu primjene te su povećani rizik za zdravlje ljudi i okoliša. Financijski gubici zbog predoziranja pesticida, istrošenih mlaznica, nepravilnog podešavanja, kao i indirektni troškovi uzrokovani lošom zaštitom usjeva protiv bolesti i štetnika ili korova mogu biti značajni. Cilj dobre zaštite bilja je u sigurnoj, pravovremenoj i učinkovitoj primjeni sredstava za zaštitu bilja na ciljanoj površini. Sredstva za zaštitu bilja koja nisu deponirana na biljku koju tretiramo (primjerice radi neispravnog uređaja) smanjuju učinkovitost pesticida i povećavaju troškove. Tehnologija ne može kompenzirati nestručnog rukovatelja. Neophodan je prijenos znanja, tehnike primjene pesticida i postupaka kroz djelovanje savjetodavne službe.

Ključne riječi: uređaji, precizna poljoprivreda, pesticidi

The technical specifications and performance of a field sprayer are essential for the precise and safe application of pesticides

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SUMMARY

According to the gulations of sustainable use of pesticides, all the equipment for pesticide application is subject to regular testing to ensure safety, ecological and health conditions for the user, animals and enviroment protection. Precize application of pesticides is also important as an ecological and economical issue. In order to achieve better application of pesticide prayers must be accurate and technically sound. It is common for a great number of field crop sprayers to fail routine testing.

There is cause for serious concern in the developing world over the condition of agricultural pesticide sprayers in the field. This situation greatly efects the amount of pesticide used, the way it's applied, and the risk to human health and the environment. The financiall losses incurred from over-application, through worn nozzles or faulty settings and the indirect losses from poor pest, disease and weed control can be considerable.

Most agree that the objective of spraying is the safe and timely delivery of an effective and uniform dose of product to a target area. Any product not deposited on the target area (e.g. spray drift, sprayer leaks, runoffs, etc.) reduces the efficiency and is called wastage. Technology cannot compensate for unnskilled operator to do a good job. It's essential to transfer the knowledge of spraying techniques and procedures through the work of extension services.

Key words: equipment, precise, pesticides