Croatian 51
2016 sa 11
International Symposium on Agriculture

Book of Abstracts

51
Hrvatski
11
Međunarodni Sympozij Agronoma

Zbornik sažetaka

Impressum

Izdavač Published by	Sveučilište u Zagrebu, Agronomski fakultet, Zagreb, Hrvatska University of Zagreb, Faculty of Agriculture, Zagreb, Croatia
Glavni urednici – Editors in Chief	Milan Pospišil Ivan Vnučec
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Tehnički urednici – Technical Editors	Martina Skendrović Babojelić Ana Pospišil
Oblikovanje i tisak Designed and printed by	MOTIV d.o.o., Zagreb
Naklada – Edition	40

ISBN 978-953-7878-52-8 (tiskana verzija - knjiga)
ISBN 978-953-7878-54-2 (snimljeno na USB stik)
ISBN 978-953-7878-53-5 (web stranica simpozija - u pdf formatu)

Web page **http://sa.agr.hr**

Sveučilište u Zagrebu . Agronomski fakultet . Zagreb . Hrvatska

i

Sveučilište Josipa Jurja Strossmayera u Osijeku, Poljoprivredni fakultet, Osijek, Hrvatska
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The ICA Regional Network for Central and South Eastern Europe (CASEE)
European Society of Agricultural Engineers (EurAgEng)
Sveučilište u Mostaru, Agronomski i prehrambeno-tehnološki fakultet, Mostar, Bosna i Hercegovina
Univerza v Ljubljani, Biotehniška fakulteta, Ljubljana, Slovenija
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University of Agricultural Science and Veterinary Medicine of Cluj-Napoca, Romania

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organiziraju

51. hrvatski i 11. međunarodni simpozij agronoma

15. – 18. veljače 2016. godine
Opatija, Hrvatska
Grand hotel Adriatic

University of Zagreb . Faculty of Agriculture . Zagreb . Croatia

and

University "Josip Juraj Strossmayer" in Osijek, Faculty of Agriculture, Osijek, Croatia
Balkan Environmental Association (B.EN.A)
The ICA Regional Network for Central and South Eastern Europe (CASEE)
European Society of Agricultural Engineers (EurAgEng)
University of Mostar, Faculty of Agriculture and Food Technology, Bosnia and Herzegovina
University of Ljubljana, Biotechnical Faculty, Ljubljana, Slovenia
University of Zagreb, Faculty of Food Technology and Biotechnology, Zagreb, Croatia
University of Agricultural Science and Veterinary Medicine of Cluj-Napoca, Romania

under the auspices of the

Ministry of Science, Education and Sport of the Republic of Croatia
Ministry of Agriculture of the Republic of Croatia

in collaboration with

Agricultural Land Agency, Zagreb, Croatia
Bc Institute for Breeding and Production of Field Crops, Rugvica, Croatia
Department of Agriculture and Forestry of the city of Zagreb, Croatia
Croatian Society of Agronomy, Zagreb, Croatia
Croatian Food Agency, Osijek, Croatia
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organize

51st Croatian and 11th International Symposium on Agriculture

February 15 – 18, 2016
Opatija, Croatia
Grand Hotel Adriatic

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Section **1**

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Agroecology, Ecological Agriculture and Environment Protection

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Agronoma

Zbornik sažetaka

Agroekologija, ekološka poljoprivreda i zaštita okoliša

Innovative management tool for sustainable Marine Protected Areas (MPAs) conservation: Danube Delta study case

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Abstract

Natural resources provide a variety of ecosystems possibilities. In fact, the marine natural resources are the best example for such possibilities offering many ecosystem services. The study case focused on the stakeholder analysis in the Black Sea region, the Danube Delta provides some interesting insights that in which we base the following work on the region. The consultation gathered stakeholder's perceptions on the different activities that can be developed in the future, and responses vary between Ukraine and Romania.

In the frame of specific study it has been proposed a serious research tools for the sustainable management of Marine Protected Areas (MPAs). In particular, four instruments have been proposed EI1: Fishing Rights, EI2: Subsidies, EI3: Entrance Fee and EI4: Product Taxes, in the target region with the goal of implementing conservation and protection of the living resources in MPAs.

The stakeholders of this area included mainly MPA managers, MPA staff, scientific researchers, local authorities, NGO members, fishermen, workers in aquaculture facilities, workers in tourism and other recreational activities. The concrete target of this study was to updating the knowledge of the stakeholders on new innovative scientific tools for any MPAs, in order to be applied in Danube Delta region.

The economical parameter regarding fishery, tourism etc. versus MPAs ecosystem' conservation has been also examined as a significant target MPAs sustainable management. The data gathered on stakeholder's interviews about their priorities for sustainable management of economic activities in the marine and coastal zone , together with the development of a Marine Economic Instrument Index is combined to understand how we can improve management in MPAs in order to meet environmental, economic and social outcomes.

Key words: innovative management tool, Marine Protected Areas, sustainability, Danube Delta

sa2016_a0101

Landslide hazard mapping in Voinesti catchment

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Abstract

There are several methodological approaches to model the landslide hazard or/and susceptibility. The selection of the appropriate methodology is a matter of the required results and is very dependent on data availability. The goal of this paper is to evaluate methodologies used for landslide modelling in a small watershed situated in the western part of Sub Carpathian Mountains, Romania. An overview of the principal models used for landslide hazard/susceptibility modelling is presented and compared each other in terms of their relative advantages. The paper provides the results obtained and concludes with recommendations and solutions on landslide hazard modeling methodology.

The methodological approaches adopted include: a) HazUS methodology proposed by FEMA uses the geologic group, the slope angle and "hydraulic" condition (wet or dry); b) the infinite slope model (factor of safety Fs) uses: geological maps (lithology per geologic group) and topographic maps to define slope angle. Some geotechnical parameters must be estimated or calculated (effective angle of friction, effective cohesion).

Study area is located in the Dambovita watershed, Romania. The Voinesti catchment area is 0.76 km^2 and it is cross by the Muret River Valley. The slopes vary between 2-15% which are affected by major processes of erosion and landslides. An impermeable layer of clay marl exists at a small depth. The vegetation land cover of the basin is composed from: grassland - 59,10%; forest - 33,10 %; natural meadow - 3,79%; other land - 4,01%.

The methodological approaches adopted in this paper were integrated with GIS techniques. The maps obtained in this way were compared with the existing maps. Some general conclusions could be expressed: landslide susceptibility maps could be great tools used in the creation of failure probability maps; infinite slope model seems to work fine for "shallow" landslides, but needs some improvement (regarding assessment of sliding slab thickness).

Key words: landslide mapping, infinite slope model, HazUS model, GIS

sa2016_a0102

Ekologija i upravljanje drenažnim vodama s poljoprivrednih zemljišta

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Sažetak

Glavni cilj ovog rada bio je utvrditi utjecaj umjetnih močvarnih staništa u pročišćavanju drenažnih voda. Makrofiti imaju važnu ulogu u poboljšanju kvalitete vode. U semi-aridnim područjima male količine vode zahtijevaju racionalno korištenje i ponovnu upotrebu. U skladu s održivim razvojem i zaštitom okoliša, zahtijeva se pročišćavanje drenažnih voda zbog visokih koncentracija onečišćivača i njihovih negativnih učinaka na usjeve i/ili recipijente. Ovo istraživanje provedeno je u sjeverozapadnom Uzbekistanu (Karakalpakstan), primjenom umjetne močvare, odnosno protočnog bioplatoa (22000 m^2) sa sljedećim makrofitima: *Phragmites communis*, *Typha angustifolia*, *T. latifolia*, *Scirpus lacustris*. Rezultati ovog rada ukazuju na značajno smanjenje koncentracija (50 do 100%) organskih tvari, hranjivih tvari, halogeniranih derivata ugljikovodika i nafte te teških metala nakon protoka vode kroz bioplato s makrofitima. Najviša akumulacija teških metala zabilježena je u stalno uronjenom dijelu, u odnosu na dio stabljike iznad vode, gdje su željezo i mangan postigli znatno veće kooncentracije u odnosu na bakar, krom i cink. Također, važna funkcija umjetnih močvara očituje u zaštiti obale od erozije. Rezultati ovog istraživanja ukazuju da su alternativni pročišćivaći otpadnih voda vrlo učinkoviti u uklanjanju širokog spektra onečišćivača, a također su jeftini, energetski nisu zahtjevni I jednostavni su za upravljanje.

Ključne riječi: ponovna upotreba drenažnih voda, umjetne močvare, onečišćivsči, semi-aridno područje

sa2016_a0103

Ecology and management of agricultural drainage waters

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Abstract

The main goal of this study was to determine influence of artificial wetlands, in the purification of drainage waters. Macrophytes are well known intermediates in the water quality improvement. In semi-arid regions water deficit requests its rational use and reuse. In the view of sustainable development and environmental protection drainage water should be treated because of high concentrations of pollutants and their negative effects on crops and/or recipient waters. This study was conducted in northwest Uzbekistan (Karakalpakstan), applying artificial wetlands i.e. riverbed bioplato (22000 m^2) with emergent macrophytes: *Phragmites communis, Typha angustifolia, T. latifolia, Scirpus lacustris.* Results indicated significant decreasing in concentrations (50 to 100%) of organic matters, nutrients, halogenated cyclic hydrocarbons, oils, and heavy metals in drainage channels after water flowed through the artificial wetland. The highest accumulation of heavy metals was observed in submerged in comparison to the emergent part of stems, where iron and manganese achieved significantly higher concentrations opposite to the copper, chrome and zinc. Also, important function of that bioplato is recognized in biological coastal protection to prevent soil erosion. Results of this study suggest that alternative wastewater treatment plant are efficient in the removal of wide range of pollutants with advantages as cheap, not energy demanding and easy to manage.

Key words: drainage water reuse, artificial wetlands, pollutants, semi-arid region

sa2016_a0103

The requirements for the management of data on the implementation of integrated pest management in Slovenia

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Abstract

The requirements for the implementation of the integrated pest management (controlling of diseases, pests, weeds) and the records on methods used in controlling harmful organisms are defined in the Rules on integrated pest management (Official Gazette of RS, no. 43/2014). The responsible person (the user of plant protection products (PPPs)) should periodically review the crops or cultivated areas, monitor the occurrence of harmful organisms, and at PPP-user's own discretion and from his/her own experience, a most appropriate measure or plant protection method shall be selected. Primarily, the responsible person shall apply an optimum combination of preventive measures as well as low risk plant protection methods. Plant protection products (chemical protection of plants) are used only when it is considered that the aforementioned measures are not sufficiently effective to control the pest. The responsible person is obliged to keep records on the integrated plant protection. Preventive measures should be recorded in a record on the cultivation technologies. Records on low risk plant protection methods and the use of plant protection products should be kept on the specified form. Records on the use of PPPs and invoices on PPP-purchasing, which are ensuring the traceability of PPPs from the point of purchasing to the point of application, should be made available for three years. We will present an example of a record on integrated pest management.

Key words: data management, integrated pest management, harmful organisms, preventive measures, plant protection products (PPPs)

sa2016_a0104

Usporedba različitih tehnika poprečne validacije u svrhu izrade najpreciznijih karata plodnosti tla

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Sažetak

Danas je precizna poljoprivreda prisutna kod svakog većeg ratara diljem Zemlje. Nažalost, poznavanje prednosti koja ona pruža još nije dovoljno proširena među poljoprivrednicima u Hrvatskoj. Stoga, poznavanje GIS-a i korištenje geostatistike među proizvođačima može promijeniti način poslovanja i smanjiti troškove dok istovremeno plodnost tala i njihova heterogenost može biti više ujednačena. Istraživanja su provedena u istočnoj Hrvatskoj gdje je prikupljeno 647 uzoraka tla iz oraničnog sloja u svrhu opisivanja prostorne varijabilnosti reakcije tla i biljci pristupačnog fosfora. Cilj istraživanja je istražiti geostatističke metode radi opisivanja prostorne varijabilnosti reakcije tla i sadržaja fosfora, te usporediti razne interpolacijske tehnike u svrhu izrade najtočnijih karata plodnosti tla. Rezultati pokazuju da istraživani čimbenici bilježe umjerenu varijabilnost s CV 32,3% za fosfor i 19,2% za pH. Reakcija tla se kretala u rasponu od 3,64 do 7,58 dok se sadržaj fosfora kretao od 2,9 do 50,4 mg/100 tla. Semivariogramska analiza pokazuje umjerenu prostornu zavisnost pH i fosfora s omjerom pogreška/prag od 27,3% i 31,8%. Ordinary kriging se pokazao najtočnijom interpolacijskom metodom za grafički prikaz reakcije tla, dok je Thin Plate Spline najmanje točna metoda. Za prostorni prikaz varijabilnosti fosfora najtočnija metoda je Spline With Tension dok je najmanje točna Thin Plate Spline. Izrađene karte istraživanih svojstava tla pružaju mogućnost varijabilne gnojidbe i kalcifikacije što utječe na smanjenje troškova proizvodnje.

Ključne riječi: GIS, geostatistika, interpolacijske tehnike, semivariogram, fosfor

sa2016_a0105

Comparison of different cross validation techniques in order to provide most accurate fertility maps

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Abstract

Nowadays precision agriculture took part at every bigger crop producer around the Earth. Unfortunately, knowledge about benefits of precision farming practices is still not sufficiently spread among agricultural producers in Croatia. Therefore, knowledge of GIS and geostatistics among producers could change a way of operating and could make expenses lower while soil fertility and heterogeneity could be more uniform. Investigation was performed in eastern Croatia where 647 soil samples (0-30 cm) were collected in order to describe spatial variability of soil pH and plant available phosphorus. Objective of this study is to investigate geostatistical methods to describe spatial variability of pH and phosphorus and to test different interpolation methods to produce most accurate fertility maps. Result showed that investigated parameters showed moderate variability with CV 32,3 % for phosphorus and 19,2 % for pH. Soil pH record values from 3,64 to 7,58 while phosphorus ranging from 2,9 to 50,4 mg per 100 g of soil. Semivariogram analysis showed that pH and P had moderate spatial dependence with nugget/sill ratio of 27,3 % and 31,8 %, respectively. Ordinary kriging was the most precise interpolation method for pH, while the Thin Plate Spline was the least one. Regarding the phosphorus the most precise method was Spline With Tension and the least accurate was Thin Plate Spline. Produced maps of investigated parameters provide possibility for variable rate liming and fertilization which avoid economic cost.

Key words: GIS, geostatistics, interpolation techniques, semivariogram, phosphorus

sa2016_a0105

Optimizacija gnojidbe bilanciranjem fosfora i kalija u uzgoju ratarskih usjeva

Zdenko LONČARIĆ[1], Ljiljana MALIĆ[2], Zoran SEMIALJAC[1], Meri ENGLER[1], Vladimir IVEZIĆ[1], Krunoslav KARALIĆ[1], Brigita POPOVIĆ[1], Marija VUČKOVIĆ[2], Darko KEROVEC[1], Domagoj RASTIJA[1]

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Sažetak

Bilanciranje ukupnog unošenja i iznošenja značajan je činitelj optimalne raspoloživosti fosfora i kalija u tlima. Pokusi gnojidbe pšenice, kukuruza i šećerne repe s fosforom (0, 60, 120, 180 i 240 kg/ha) i kalijem (0, 80, 160, 240, 320 i 400 kg/ha) provedeni su na 4 lokaliteta u Baranji. Cilj je istraživanja kalibracija gnojidbe fosforom i kalijem na temelju iznošenja nadzemnom masom, odnošenja zrnom, unošenja gnojidbom, raspoloživosti AL metodom i bilance. Početne kiselosti tala su u rasponu 4,4-7,7 (pH_{KCl}) i 5,9-8,4 (pH_{H2O}), sadržaj humusa 1,45-4,01%, AL-raspoloživi fosfor 10,2-31,5 i kalij 9,5-29,8 mg/100 g. Dvogodišnja istraživanja obuhvatila su 4 vegetacije kukuruza, 2 pšenice i 1 šećerne repe.

Gnojidba fosforom utjecala je na prinos zrna kukuruza samo u 1 vegetaciji na tlu siromašnom fosforom, a gnojidba kalijem na prirod kukruzovine na praškasto-ilovastom tlu siromašnom kalijem. Prosječna odnošenja zrnom pšenice bila su 50-66 kg/ha P_2O_5 i 29-40 kg/ha K_2O, zrnom kukuruza 44-122 i 21-72, dok su ukupna iznošenja nadzemnom masom pšenice bila 66-100 i 96-140, kukuruzom 74-139 i 83-196 te šećernom repom 105-125 kg/ha P_2O_5 i 235-310 kg/ha K_2O. U tlo je žetvenim ostacima zaorano 4-6 i 14-22 kg/ha nakon pšenice, 17-86 i 46-156 nakon kukuruza te 45-59 kg/ha P_2O_5 i 99-152 kg/ha K_2O nakon šećerne repe.

Prema bilanci gnojidbe i iznošenja kontrolni tretman je nakon 2 godine trebao rezultirati smanjenjem raspoloživog fosfora 108-141 i kalija 115-182 kg/ha. Međutim, AL metodom je u tlima utvrđeno stvarno smanjenje raspoloživog fosfora 3-34 i kalija 19-151 kg/ha. Maksimalna gnojidba (240 kg/ha P_2O_5 i 400 kg/ha K_2O) trebala je prema bilanci nakon 2 godine povećati raspoloživost fosfora za 329-344 kg/ha i kalija 560-651 kg/ha, ali je AL metodom utvrđeno povećanje raspoloživosti fosfora 239-411 i kalija 74-232 kg/ha. Zaključno, bilanciranje fosfora AL metodom točnije je nakon intenzivnije gnojidbe u odnosu na kontrolu, a kalija nakon kontrole u odnosu na veće gnojidbene doze.

Ključne riječi: gnojidba, fosfor, kalij, pšenica, kukuruz

sa2016_a0106

Optimizing fertilization by balancing phosphorus and potassium in crop production

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Abstract

Balancing the total input and uptake of nutrients is an important factor for optimum availability of phosphorus and potassium in the soil. Field experiments with phosphorus (0, 60, 120, 180 and 240 kg/ha) and potassium (0, 80, 160, 240, 320 and 400 kg/ha) fertilization of wheat, corn and sugar beet were carried out at four locations in Baranja region. The aim of our research was calibration of phosphorus and potassium fertilization on the basis of the uptake by above ground biomass, removal by grain, input by fertilization, availability in soil determined by AL method and P and K balance. The initial acidity of soils ranged from 4.4 - 7.7 (pH_{KCl}) and 5,9 - 8,4 (pH_{H2O}), organic matter content ranged from 1.45 - 4.01%, AL-available phosphorus from 10.2 - 31.5 and potassium from 9.5 - 29.8 mg/100g. A two-year experiment included four fields of corn, two of wheat and one of sugar beet.

Phosphorus fertilization affected the corn grain yield only in one year on soil poor with phosphorus while potassium fertilization affected corn stalks on silty loam soils poor in potassium. The average uptake of P and K by wheat grain was 50-66 kg/ha P_2O_5 and 29-40 kg/ha K_2O, by corn grain 44-122 and 21-72, while total removal by above ground wheat mass was 66-100 and 96-140, by corn mass 74-39 and 83-196 and by sugar beet 105-125 kg/ha P_2O_5 and 235-310 kg/ha K_2O. By ploughing crop residues in the soil it was returned 4-6 kg/ha of P_2O_5 and 14-22 kg/ha of K_2O after wheat, 17-86 kg/ha P_2O_5 and 46-156 kg/ha K_2O after corn and 45-59 kg/ha P_2O_5 and 99-152 kg/ha K_2O after sugar beet.

According to the balance of fertilization and uptake, the control treatment should have after two years resulted in a reduction of available phosphorus and potassium 108-141 and 115-182 kg/ha. However, the AL method has determined the reduction of available phosphorus 3-34 kg/ha and potassium 19-151 kg/ha. The highest fertilization treatment (240 kg/ha P_2O_5 and 400 kg/ha K_2O) according to balance after 2 years should increase the availability of phosphorus 329-344 kg/ha and potassium 560-651 kg/ha, but the AL method determined the increase of the phosphorus availability 239-411 and potassium 74-232 kg/ha. In conclusion, balancing phosphorous according to AL method is more precise after intensive fertilization compared to the control, while balancing potassium is more precise after the control in comparison to the higher doses of fertilizer.

Key words: fertilization, phosphorus, potassium, wheat, maize

sa2016_a0106

Učinak gnojidbe fosforom i kalijem na prinos soje

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Sažetak

Cilj istraživanja bio je utvrditi učinak gnojidbe fosforom i kalijem na promjene u tlu i prinos soje u 2013. godini. U tu svrhu postavljen je pokraj Vinkovaca stacionarni poljski pokus (tabla S-T1, Arkod ID: 1404818) s ukupno 10 gnojidbenih varijanata. Pokus je postavljen na površini od 24000 m^2, sastoji se od 10 tretmana u slučajnom bloknom rasporedu u 4 ponavljanja. Veličina svake parcele je 24 x 25 m, a ukupno je pokusom obuhvaćeno 40 parcela. Tretmane čine različiti režimi gnojidbe pojedinačnim fosfornim i kalijevim gnojivima (triplex – 45% P_2O_5, kalijeva sol 60% K_2O) 1. NP_0K_0, 2. NP_0K_{150}, 3. $NP_{50}K_{150}$, 4. $NP_{100}K_{150}$, 5. $NP_{150}K_{150}$, 6. $NP_{200}K_{150}$, 7. $NP_{150}K_0$, 8. $NP_{150}K_{50}$, 9. $NP_{150}K_{100}$ i 10. $NP_{150}K_{200}$. Na svim je tretmanima primijenjeno 180 kg N/ha, kao redovna gnojidba i ona se ne smatra zasebnim tretmanom pokusa. Prosječan sadržaj fosfora (P_2O_5) prije gnojidbe iznosio je 27,5 mg/100 g tla, a kalija (K_2O) 25,4 mg/100 g tla. Sam prinos varirao je u vrlo uskom rasponu od 5,3 do 5,7 t/ha sjemena soje, ovisno o varijanti gnojidbe. Pokus nije bio statistički opravdan. Najniži prinos odnosi se na kontrolnu varijantu, a najviši na varijantu s 150 kg P_2O_5 i 150 kg K_2O. Sadržaj dušika u suhoj tvari zrna varirao je od 6,54 do 6,75%, sadržaj fosfora (P) od 6,67 do 7,34 g/kg, kalija (K) od 17,4 do 18,5 g/kg. Osim sjemena utvrđen je i prinos mase stabljike. Iznosio je od 3,18 do 3,93 t suhe tvari po ha. Sadržaj dušika u suhoj tvari stabljike soje bio je u rasponu od 1,21 do 1,48%, fosfora od 3,89 do 5,02 g/kg, a kalija od 12,3 do 14,3 g/kg.

Ključne riječi: soja, gnojidba fosforom i kalijem, prinos, promjene u tlu

sa2016_a0107

Influence of phosphorus and potassium fertilization on soybean yield

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Abstract

The aim of this study was to determine the effect of phosphorus and potassium fertilization on changes in soil and on the soybean yield in 2013. For this purpose, in the vicinity of Vinkovci a stationary field trial was established (parcel C-T1, ARKOD ID: 1404818) with a total of 10 fertilization treatments. The experiment was set up on an area of 24,000 m^2, and it consisted of 10 treatments in a randomized block design, with four replications. The size of each plot was 24 x 25 m and a total experiment included 40 experimental parcels. Treatments are different doses of fertilization with single phosphorus and potassium fertilizers (triplex - 45% P_2O_5, potassium salt 60% K_2O); 1. NP_0K_0, 2. NP_0K_{150}, 3. $NP_{50}K_{150}$, 4. $NP_{100}K_{150}$, 5. $NP_{150}K_{150}$, 6. $NP_{200}K_{150}$, 7. $NP_{150}K_0$, 8. $NP_{150}K_{50}$, 9. $NP_{150}K_{100}$ i 10. $NP_{150}K_{200}$. For all the treatments 180 kg N/ha was applied, as a regular fertilization and it is not considered a separate treatment. The average content of phosphorus (P_2O_5) in soil before fertilization was 27.5 mg/100 g soil, and potassium (K_2O) 25.4 mg/100 g soil. Yields fluctuated in a very narrow range of 5.3 to 5.7 t/ha soybean, depending on fertilization treatment. The experiment was not statistically significant. The lowest yield refers to the control, and the highest in the variant with 150 kg P_2O_5 and 150 kg K_2O. The nitrogen content in the dry matter of the grain varied from 6.54 to 6.75%, the content of phosphorus (P) from 6.67 to 7.34 g/kg, and potassium (K) from 17.4 to 18.5 g/kg . Apart from the seeds we determined also the weight of the soybean stubble. It ranged from 3.18 to 3.93 t of dry matter per hectare. The nitrogen content in the dry matter of soybean stubble was in the range from 1.21 to 1.48%, phosphorus from 3.89 to 5.02 g/kg, and potassium from 12.3 to 14.3 g/kg.

Key words: soybean, phosphorus and potassium fertilization, yield, changes in the soil

sa2016_a0107

Utjecaj vremena primjene dušika na prinos kukuruza

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Sažetak

Cilj istraživanja bio je utvrditi učinak vremena primjene mineralnog dušika u uzgoju kukuruza. Poljski pokus proveden je u dvije godine, 2014. i 2015. na površini od 10.000 m^2, a sastojao se od 4 tretmana u slučajnom bloknom rasporedu u 4 ponavljanja. Veličina svake parcele bila je 25 x 25 m, a ukupno je pokusom obuhvaćeno 16 parcela. Tretmane čine različiti režimi gnojidbe dušičnim gnojivima (KAN – 17% N, Urea 46% N), odnosno različito vrijeme primjene dušičnih gnojiva: 1. U jesen 180 kg N (Urea), 2. Predsjetveno, 180 kg N (Urea), 3. U jesen 70 kg dušika (Urea), predsjetveno 110 kg N (Urea) i 4. U jesen 70 kg dušika (Urea), predsjetveno 70 kg N (Urea), u prihranjivanju 40 kg N (150 kg KAN). Pokus, prema visini prinosa kukuruza nije bio statistički opravdan niti u jednoj od dvije istraživane godine. Prve godine istraživanja, 2014. prinos zrna varirao je u vrlo uskom rasponu od 16,2 do 16,9 t/ha. Najniži prinos ostvaren je u tretmanu br. 4., s gnojidbom od 70 kg dušika u jesen + predsjetveno 70 kg N + prihranjivanje 40 kg N, a najviši u varijanti 1 s gnojidbom u jesen 180 kg N. Druge godine istraživanja, 2015., najviši prinos od 8,6 t/ha ostvaren je u varijanti 3. - u jesen 70 kg dušika (Urea), predsjetveno 110 kg N (Urea), dok je kod svih ostalih varijanti zabilježen isti prinos – 8,1 t/ha.

Ključne riječi: kukuruz, dušik, prinos, vrijeme primjene dušika

sa2016_a0108

The effect of time of application of nitrogen on maize yield

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Abstract

The aim of this study was to determine the different time of mineral nitrogen application on maize yields. A field experiment was carried out in two years, 2014 and 2015 on an area of 10,000 m^2. Experiment consisted of four treatments in four repetitions in randomize block design scheme. The size of each plot was 25 x 25 m and experiment included sixteen plots in total. Treatments differ in type of nitrogen fertilizers (KAN – 17% N, Urea 46% N) or different times of application: 1) all 180 kg N (urea) in autumn; 2) pre-sowing 180 kg N (urea); 3. in autumn 70 kg nitrogen (urea), pre-sowing 110 kg N (urea); and 4) in the autumn 70 kg N (urea), pre-sowing 70 kg N (urea) and 40 kg N (150 kg KAN) as a sidedress. According to the maize yields experiment was not statistically justified in any of the two years of investigation. The first years of research, in 2014 maize yield varied in a narrow range from 16.2 to 16.9 t/ha. The lowest yield was obtained in the treatment 4 (70 kg N in fall followed with pre-sowing 70 kg N (urea) and with 40 kg N (150 kg KAN) as a sidedress) while the highest maize yield was noted in treatment 1 (fertilization in the fall with 180 kg N). In the second year of research, 2015, the highest yield (8.6 t/ha) was achieved in the treatment 3 (in autumn 70 kg nitrogen (urea) followed with pre-sowing 110 kg N (urea), whereas all the other treatments recorded similar

Key words: maize, nitrogen, yield, time of nitrogen application

sa2016_a0108

Utjecaj gnojidbe rasolom i mineralnim gnojivima na kemijska svojstva tla

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Sažetak

Provedena istraživanja imala su za cilj utvrditi utjecaj gnojidbe kupusa rasolom i mineralnim gnojivima na promjenu kemijskih svojstava tla. Gnojidbeni pokus postavljen je po slučajnom bloknom rasporedu (7 varijanti u 3 repeticije) 2013. godine, na distričnom kambisolu, na području Josipdola. Uz kontrolnu varijantu (bez gnojidbe) u istraživanja je bila uključena varijanta s mineralnom gnojidbom (1000 kg/ha NPK 7:20:30), varijanta s koncentriranim rasolom (2,5 %-tna otopina) te varijante s razrijeđenim rasolom (koncentrirani rasol razrijeđen 2, 5, 10 i 20 puta) u kombinaciji s mineralnom gnojidbom. Uzorci tla za praćenje dinamike i promjena kemijskih svojstava uzeti su u tri navrata. Prvo uzorkovanje provedeno je prije tretmana i sadnje kupusa (srpanj), drugo u kolovozu, a treće u listopadu nakon berbe kupusa. Temeljem dobivenih rezultata nije utvrđen negativni utjecaj gnojidbe rasolom na sniženje pH tla. Utjecaj rasola na povećanje električne vodljivosti tla i ukupne vodotopive soli nisu se značajnije razlikovale u odnosu na kontrolnu varijantu i gnojidbu NPK gnojivima. U odnosu na kontrolnu varijantu i varijantu gnojenu s 1000 kg/ha NPK 7:20:30 značajno veće koncentracije klorida, natrija i ukupnog mineralnog dušika utvrđene su u drugom uzorkovanju u varijantama tretiranim koncentriranim rasolom i rasolom razrijeđenim vodom u odnosu 1:2 i 1:5, što se može dovesti u svezu s klimatskim prilikama koje su vladale u tom razdoblju.

Ključne riječi: gnojidba, rasol, električna vodljivost, vodotopive soli

sa2016_a0109

Influence of fertilization of cabbage with brine and mineral fertilizers on the chemical properties of the soil

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Abstract

The research were aimed to determine the effect of fertilization of cabbage with brine and mineral fertilizers and it's influence on the chemical properties of the soil. The trial was conducted according to random block design (7 variant in 3 repetitions) 2013, on distric cambisol. A field trial was set in Josipdol, with seven types of fertilization: control (without fertilization), mineral fertilizer (1000 kg/ha of NPK 7:20:30), concentrated brine (2.5% solution) and variants with diluted brine (concentrated brine diluted 2, 5, 10 and 20 times) in combination with a mineral fertilizer. Soil samples for observing dynamics and alteration of chemical properties were took three times. First sampling is conducted before treatments and planting of cabbage (July), second was in August and third was in October, after harvest. Based on the results, negative impact of fertilizing with brine is not proven, considering decreasing soil pH. Brine impact on increasing electrical conductivity and total water soluble salts were not significantly different regards to control variant and fertilizing with NPK fertilizers. Regarding control variant and variant fertilized with 1000 kg/ha NPK 7:20:30, significantly higher concentrations of chloride, sodium and total mineral nitrogen were determined in second sampling in variants treated with concentrated brine and brine diluted with water on 1:2 and 1:5 ratio, which can be correlated with climate changes which occurred at that time.

Key words: fertilization, brine, electrical conductivity, water soluble salts

sa2016_a0109

Utvrđivanje potrebe u kalcizaciji na površinama tvrtke Osilovac d.o.o.

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Sažetak

Općina Feričanci se prostire na površini od 46 km^2 i smještena je na krajnjem zapadnom dijelu Osječko-baranjske županije. Kisela tla u Osječko-baranjskoj županiji čine 35,4% svih poljoprivrednih tala na području županije. Stoga je u sklopu provedbe VIP projekta „Utvrđivanje učinkovitosti novih karbonatnih i silikatnih materijala za kalcizaciju u vegetacijskim pokusima“ provedeno preliminarno istraživanje utvrđivanja potrebe u kalcizaciji na površinama tvrtke Osilovac d.o.o. iz Feričanaca. Za proračun potrebe u kalcizaciji prikupljeno je 84 uzorka tla s dubine 0-30 cm s ukupno 16 parcela. Provedene su osnove agrokemijske analize tla, te je utvrđen izračun gnojidbe i potrebne kalcizacije. Neophodnost provedbe kalcizacije je utvrđena na svih 16 analiziranih proizvodnih površina. Pri tome, prosječne vrijednosti reakcije tla su se kretale u rasponu od pH(H_2O) 5,08 do pH(H_2O) 6,29 odnosno od pH(KCl) 3,81 do pH(KCl) 5,02. Raspon prosječnih vrijednosti hidrolitičke kiselosti tla (Hy) iznosio je od 4,02 cmol/kg do 9,81 cmol/kg. Preporučene doze saturacijskog mulja koji se kao materijal za kalcizaciju najviše koristi iznosile su u prosjeku od 9,19 t/ha do 27,33 t/ha. Učinkovitost saturacijskog mulja će u sklopu provedbe VIP projekta biti uspoređena s tri nova i alternativna materijala za kalcizaciju: filterska prašina sa oko 75% $CaCO_3$, bazična troska sa do 50% kalcijevog silikata i drveni pepeo sa do 40% CaO.

Ključne riječi: kiselost tla, kalcizacija, saturacijski mulj, alternativni materijali za kalcizaciju

sa2016_a0110

Determining the liming requirement on the production area of the Osilovac Ltd. Company

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Abstract

Feričanci Municipality covers an area of 46 km^2 and is located at the extreme west of the Osijek-Baranja County. Acidic soils in Osijek-Baranja County covers 35.4% of all agricultural soils in the county. Therefore, in the context of implementing the VIP Project "Determining the effectiveness of new carbonate and silicate materials for liming in vegetation experiments" preliminary research was conducted in order to determine liming requirement on the production area of Osilovac Ltd. company from Feričanci. For lime requirement calculations, 84 soil samples from a depth of 0-30 cm and 16 sites were collected. Basic agrochemical soil analysis were carried out and calculations of fertilization and liming recommendations were conducted. The necessity of liming implementation was found for all 16 analyzed production sites. Therfore, the average values of the soil reaction ranged from pH (H_2O) 5.08 to pH (H_2O) 6.29 or pH (KCl) 3.81 to pH (KCl) 5.02. The range of the average values of hydrolytic acidity (Hy) ranged from 4.02 cmol/kg to 9.81 cmol/kg. The recommended dose of sugar factory lime as the most used material for liming amounted in average from 9.19 t/ha to 27.33 t/ha. The effectiveness of sugar factory lime will within the implementation of the VIP project be compared with three new and alternative materials for liming: filter dust with about 75% $CaCO_3$, acidic slag with 50% calcium silicate and wood ashe with up to 40% CaO.

Key words: soil acidity, liming, sugar factory lime, alternative liming materials

sa2016_a0110

Rezultati monitoringa invazivne strane vrste pajasen (*Ailanthus altissima* (Mill.) Swingle) u Republici Hrvatskoj

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Sažetak

Pajasen je brzorastuće listopadno stablo podrijetlom iz Kine, visine do 35 m. Proširen je na svim kontinentima osim na Antartici te se smatra jednom od najinvazivnijih biljnih vrsta. Cilj provedenog monitoringa bio je utvrditi rasprostranjenost pajasena u Hrvatskoj, detektirati najčešća staništa i uvjeta rasta, veličinu i vigor populacija, visinu i gustoću biljaka te utjecaj na autohtone vrste. Godišnje su obiđene 2-3 županije, a svaka je tijekom vegetacijske sezone obiđena 2-3 puta. Provedenim monitoringom u periodu 2007. - 2014. pajasen je zabilježen u gradu Zagrebu i svih 20 županija. U gradu Zagrebu i 14 županija kontinentalnog dijela Hrvatske proširen je na ograničenim područjima i ne predstavlja izravnu opasnost, iako u nekim područjima preuzima prostor na račun ostalog bilja te pokazuje tendenciju intenzivnog širenja i potiskivanja autohtonog bilja. Duž cijelog obalnog područja, uz jadransku magistralu, u turističkim mjestima i gradovima te na otocima, pajasen je zabilježen kao vrlo agresivna vrsta u stalnoj, gotovo vidljivoj ekspanziji u kojoj vrlo često agresivno potiskuje autohtono bilje i formira monokulture čime smanjuje bioraznolikost. Utvrđeno je da mu odgovaraju devastirana staništa na kojima prostor osvaja puno brže od ostalih vrsta te da je čovjekov vjerni pratilac. Zbog izoliranosti ekosustava, posebnu opasnost predstavlja na otocima te u zaštićenim područjima u kojima egzistira kao što su Park prirode Biokovo i Nacionalni park Krka.

Ključne riječi: pajasen, invazivna vrsta, rasprostranjenost po županijama, bioraznolikost

sa2016_a0111

Results of monitoring of invasive alien weed species tree of heaven (*Ailanthus altissima* (Mill.) Swingle) in the Republic of Croatia

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Abstract

Tree of heaven is a fast-growing deciduous tree originating from China, which can reach up to 35 m in height. It is present on every continent except Antarctica, and is considered one of the most invasive plant species. The objective of this monitoring was to determine the distribution of tree of heaven in Croatia, the most common habitats and growing conditions, the size and vigor of the populations, height and density of the plants and impact on native species. 2-3 counties were visited per year, and each is being visited 2-3 times during the growing season. Monitoring was carried out in the period 2007. – 2014. and tree of heaven was recorded in Zagreb and all 20 counties in Croatia. In Zagreb and 14 counties of the continental part of Croatia, tree of heaven was extended to limited areas and do not represent a direct threat, although in some areas it suppress other plants, and shows a tendency to intensive expansion and suppression of indigenous plants. Along the coastal area, along the main costal road, at tourist resorts and cities, and on the islands tree of heaven was recorded as a very aggressive species in constant, almost visible expansion which often suppresses native species and form monocultures thus reducing biodiversity. It was found that tree of heaven prefers devastated habitats, it occupies areas a lot faster than other species, and it is man's faithful companion. Three of heaven presents a special danger on islands because of the isolated ecosystems and in protected areas in which it is recorded, such as Nature Park Biokovo and National Park Krka.

Key words: tree of heaven, invasive species, distribution by county, biodiversity

sa2016_a0111

Alelopatski utjecaj invazivnih vrsta *Ambrosia artemisiifolia* L. i *Solidago gigantea* Aiton na rast test - biljaka

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Sažetak

Invazivne korovne vrste posjeduju brojna svojstva koja im omogućuju uspješan opstanak i širenja na nova područja. Pretpostavka je da je jedno od tih svojstava visok alelopatski potencijal kojim potiskuju konkurentske vrste. Cilj ovog rada bio je utvrditi alelopatski potencijal dviju invazivnih korovnih pridošlica u Republiku Hrvatsku, ambrozije (*Ambrosia atremisiifolia* L.) i velike zlatnice (*Solidago gigantea* Ait.). U tu svrhu napravljeni su vodeni ekstrakti ovih korova kojima je tretirano sjeme test-biljaka. Kao test-biljke poslužile su 3 vrste iz 3 različite biljne porodice: suncokret (*Helianthus annuus* L.) iz porodice glavočika (Asteraceae), uljana repica (*Brassica napus* L.) iz porodice kupusnjača (Brassicaceae) i zob (*Avena sativa* L.) iz porodice trava (Poaceae). Alelopatsko djelovanje utvrđeno je mjerenjem postotka klijavosti, duljine korjenčića i duljine klice test-biljaka.

Istraživanjima je dokazan izrazit inhibirajući učinak korovnih vrsta na test-biljke. Sve izmjerene reakcije bile su negativne. Ekstrakt vrste *Solidago gigantea* Ait. smanjio je duljinu klice zobi za 92,83% što je najveća izmjerena reakcija. Najosjetljivija test-biljka je uljana repica. Nije izmjerena statistički značajna razlika u postotku klijavosti. Istraživanjem su dokazane inhibirajuće alelopatske interakcije između invazivnih vrsta i test-biljaka.

Alelopatski potencijal biljaka može se iskoristiti u pronalaženju prirodnog herbicida u cilju smanjenja primjene kemijskih sredstava za zaštitu bilja.

Ključne riječi: alelopatija, *Ambrosia atremisiifolia* L., *Solidago gigantea* Ait., test-biljke, prirodni herbicid

sa2016_a0112

Allelopathic effect of invasive weed species of ragweed (*Ambrosia artemisiifolia* L.) and giant goldenrod (*Solidago gigantea* Aiton) on the initial development of some crops

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Abstract

Invasive weed species have many properties that enable them to successful survival and spreading to new areas. It is assumed that one of these properties is high allelopathic potential for suppressing species in their environment. The aim of this study was to determine the allelopathic potential of two invasive alien species in Croatia, ragweed (*Ambrosia atremisiifolia* L.) and giant goldenrod (*Solidago gigantea* Ait.). For this purpose, seeds of test-plants were treated with the aqueous extracts of these two weeds. As test-species were used three species of three different plant families: sunflower (*Helianthus annuus* L.) from the daisy family (Asteraceae), rapeseed (*Brassica napus* L.) from the cabbage family (Brassicaceae) and oats (*Avena sativa* L.) from the grass family (Poaceae). Allelopathic effect was determined by measuring the percentage of germination, length of roots and length of sprouts of test-species.

Studies have demonstrated a strong inhibitory effect of weeds on the test-species. All the measured reactions were negative. Aqueous extract of the species *Solidago gigantea* Ait. reduced the length of oats sprout for 92.83% which was the highest measured reaction in this research. The most sensitive test-species was rapeseed. Statistically significant difference in the percentage of germination was not measured. The research demonstrated inhibitory allelopathic interactions between invasive species and test-species.

Allelopathic potential of plants can be used to find natural herbicides to reduce the use of chemical plant protection products.

Key words: allelopathy, *Ambrosia atremisiifolia* L., *Solidago gigantea* Ait., test-species, natural herbicide

sa2016_a0112

Old and emerging causal agents of mushroom green mould disease

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Abstract

The most severe problems in the world-wide production of cultivated white button mushroom (*Agaricus bisporus*) and oyster mushroom (*Pleurotus ostreatus*) are attributed to green mould. Pathogenic moulds compete efficiently for space and nutrients, produce extracellular enzymes, toxic secondary metabolites and volatile organic compounds, leading to drastic crop losses. The causal agent of the disease of *A. bisporus* is known as *Trichoderma aggressivum*, while the pathogens of *P. ostreatus* have been described as *T. pleuroti* and *T. pleuroticola*. However, according to our findings in Croatia the green mould disease of *A. bisporus* is caused exclusively by *T. harzianum* and it also results in severe losses in the cultivation of *P. ostreatus,* together with *T. pleuroticola*. *T. pleurotum* is specialized to *P. ostreatus* mostly, it can rarely be isolated from environmental samples, while *T. aggressivum* appears in associacion with *A. bisporus* only. In contrast, *T. pleuroticola* seems to be a cosmopolitan species, which can be found at various natural habitats, and as a mushroom pathogen it is a generalist appearing also in the cultivation of *A. bisporus* and *Lentinula edodes* (shiitake). Furthermore, as *T. harzianum* is a wide-spread soil inhabiting fungus our finding suggests that it might represent a serious threat to mushroom production.

Key words: Agaricus bisporus, Pleurotus ostreatus, green mould

Acknowledgement

The work was supported by grants K-116475 (National Research, Development and innovation Office) and 90ou3 (Austria-Hungary Action Fund).

sa2016_a0113

Kompost biljnog porijekla opatijskog kraja

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Sažetak

Provedeno je istraživanje kompostiranja (biorazgradnje biljnog materijala) opatijskog kraja u 2014 i 2015 godini. Kompostiranje je rađeno na principu fomiranja kompostne hrpe (sjeckanog bijnog materijala) širine 3 m, visine 2 m te dužine uvjetovane ukupnom količinom biljne mase. Kompostna hrpa je rađena u slojevima od 25 cm inokulirana i slagana u visinu do 8 slojeva. Biorazgradnja je pračena u periodu od ruja 2014. do svibnja 2015. Nakon devet mjeseci dobivena je kompostna masa tamno smeđe boje fine granulirane strukture.

Rezultati analiziranih uzoraka komposta ispunjavaju uvjete propisane Pravilnikom o zaštiti poljoprivrednog zemljišta od onečišćenja štetnim tvarima. Prosječni rezultati kemijskih analiza pokazali su povoljan udio vlage 55,5% i suhe tvari 44,5%, Uzorci komposta imaju idealan C/N odnos što ukazuje na stabilnost komposta kao i povoljan sadržaj suhe tvari. Isto tako, povoljan sadržaj fosfora i kalija, te blago alkalni pH (7,8) uvrštava kompost u sredstva za kondicioniranje dobre fertilizacijske vrijednosti.

Utvrđene koncentracije teških metala su ispod maksimalno dopuštenih koncentracija, što potvrđuje dobru fertilizacijsku i ekološku vrijednost komposta za široku uporabu.

Ključne riječi: biljni matrijal, fertilizacija, kompost, kondicioniranje, suha tvar

sa2016_a0114

Plant originated compost in Opatija area

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Abstract

The research has been conducted about composting (bio-decomposition of plant material) in Opatija area in 2014 and 2015. The composting has been made on the principle of forming of composting pile (minced plant material) of 3 m height and 2 m width and the length depending on the overall mass of plant material. The compost pile has been made in layers of 25 cm inoculated and piled up in the height up to the 8 layers. Bio-decomposition was observed in period from September 2014 untill May 2015. After 9 months it was gained the compost mass of dark brown colour and fine granulated structure.

The results of analysed samples of compost fulfil the conditions regulated by the "Ordinance about protection of agricultural land from pollution of harmful substances". The average results of chemical analysis showed sufficient share of moisture of 55,5% and dry matter 44,5%. The samples of compost have ideal C/N ratio, which points out on stability of compost as well as favourable content of dry matter. Also the favourable content of phosphorus (P) and potassium (K) and the slightly alkaline pH (7,8) classifies compost in the range of products for soil conditioning with good fertilization value.

The established concentrations of heavy metals are below maximum allowed concentrations, which confirm good fertilization value and good ecological value of compost for broad practical application.

Key words: plant material, fertilization, compost, conditioning, dry matter

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Agroekonomika i agrosociologija

Promet vina u Republici Hrvatskoj prije i nakon pristupanja EU

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Sažetak

Promet vina u Republici Hrvatskoj reguliran je zakonskim propisima. Cilj ovoga rada je bio prikazati kretanje registriranog prometa vina na tržištu kako bi se svim zainteresiranim stranama u sektoru vina pomoglo u kreiranju i donošenju strategija. Analizirani su podaci o količinama vina domaće proizvodnje u prometu za razdoblje od 2005. do 2014. i količinama vina u uvozu i izvozu za razdoblje od 2005. do 2012. godine (izvor: baza podataka Hrvatskog centra za poljoprivredu, hranu i selo, Zavoda za vinogradarstvo i vinarstvo), te za razdoblje od 2012. do 2014. godine (izvor: baza podataka Državnog zavoda za statistiku). Rezultati ukazuju na smanjenje ukupne količine vina domaće proizvodnje u prometu u razdoblju od 2005. do 2012. godine. Godine 2014. u odnosu na 2013., došlo je do povećanja količine vina domaće proizvodnje u prometu od 13,5%. Količine vina u uvozu u razdoblju 2005.-2012. pokazuju trend blagog porasta, dok količine vina u izvozu pokazuju trend značajnog porasta. U razdoblju 2013. do 2014. količine vina u uvozu povećane su gotovo za 70%, dok količine vina u izvozu za samo 21%. Temeljem analiziranih podataka može se zaključiti da je pristupanje Republike Hrvatske EU uvelike utjecalo na dinamičnost hrvatskog tržišta vina. Izazov za daljnja istraživanja treba usmjeriti na iznalaženje odgovora na pitanje: koliko su hrvatski proizvođači vina zaista uspješno odgovorili na priliku koju pruža tržište vina Europske unije, te na izazove konkurentnosti s uvoznim vinima.

Ključne riječi: količine vina, promet, uvoz, izvoz

sa2016_a0201

Wine trading in the Republic of Croatia before and after EU accession

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Abstract

Wine trading in Republic of Croatia is regulated by legislations. The aim of this paper was to present trends of registered wine trading on market in order to help all interested parties in wine sector to create and implement strategies. Quantity of wine trading from domestic production for the period from year 2005 to 2014, along with wine quantities from export and import for the period from year 2005 to 2012 (source: data base of Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Viticulture and Enology) and for period from year 2012 to 2014 (source: data base Croatian Bureau of Statistics) were analysed. Results show a decrease of total quantities of wine trading from domestic production in the period from year 2005 to 2012. In the year 2014, in comparison to 2013, there was an increase of 13.5% of quantities of wine trading from domestic production. The quantities of wine from import show trend of slight increase while the quantities of wine from export show trend of significant increase, in the period from year 2005 to 2012. For the period from year 2013 to 2014, quantities of wine from import had an increase for almost 70% while quantities of wine from export had an increase of 21% only. Based on the analysed data it can be concluded that accession of Republic of Croatia to EU, significantly influenced dynamics of Croatian wine market. The challenge for further study is necessary to direct to answer the question: how Croatian wine producers actually successfully responded to the opportunity offered by EU wine market, and to competitiveness with imported wines.

Key words: wine quantities, trading, import, export

sa2016_a0201

Standardni ekonomski rezultati poljoprivredne proizvodnje Republike Hrvatske

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Sažetak

Sustav poljoprivrednih knjigovodstvenih podataka (FADN) kojeg provode države članice EU, ustrojen je 1965. godinu, a temelji se na prikupljanju proizvodnih, ekonomskih i financijskih podataka s uzorka poljoprivrednih gospodarstava, svrstanih u skupine s obzirom na ekonomsku veličinu, tip poljoprivredne proizvodnje te regionalnu pripadnost.

Prema EU metodologiji temeljem podataka prikupljenih FADN istraživanjem, računa se određen broj indikatora ili tzv. Standardni rezultati, koji se periodički prikupljaju i objavljuju.

Ovaj rad donosi pregled općih strukturnih, ekonomskih i financijskih pokazatelja izrađenih na temelju podataka prikupljenih za računovodstvenu 2014. godinu te usporedba s 2012. i 2013. godinom. Za analizu su korišteni ponderirani podaci prikupljeni s uzorka poljoprivrednih gospodarstava koji predstavlja populaciju komercijalnih gospodarstava u Republici Hrvatskoj. Prema anketi o strukturi poljoprivrednih gospodarstava (FSS) korišteni podaci pokrivaju 85% korištenih poljoprivrednih površina, 89% vrijednosti poljoprivredne proizvodnje i 86% broja uvjetnih grla stoke RH.

Standardni rezultati biti će prikazani kroz osam tematskih cjelina: uzorak i populaciju, strukturu i prinos, proizvodnju, troškove, prihode, potpore, bilancu stanja i financijske indikatore. Također, rezultati će biti grupirani prema regiji, glavnim tipovima i razredima ekonomske veličine poljoprivrednika, organizacijskom obliku i dobi poljoprivrednika, te veličini korištenih poljoprivrednih površina.

Ključne riječi: FADN, metodologija, standardni rezultati, poljoprivreda

sa2016_a0202

Standard economic results of the agricultural production of the Republic of Croatia

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Abstract

The Farm Accountancy Data Network (FADN) carried out by the Member states of European Union, was launched in 1965 and is based on the collection of economic and financial data from a sample of the agricultural holdings. Agricultural holdings are divided into groups according to their economic size, type of farming and region.

According to the EU methodology, based on the information gathered by annual FADN survey, a number of indicators or standard results are calculated, which are also periodically collected and published.

This thesis gives an overview of the general structural, economic and financial indicators made on data collected by FADN survey for the accounting year 2014 and the comparison with the accounting years 2012 and 2013. The analysis is based on weighted data collected from a sample of the agricultural holdings representing a population of commercial agricultural holdings in the Republic of Croatia. According to Farm Structure Survey (FSS), used data covers approximately 85% of the total utilised agricultural area (UAA), 89% of the total standard output and 86% of the number of livestock units.

The standard results will provide the information about sample and population, structure and yields, production, costs, income, subsidies, balance sheet and financial indicatorsof the farms, and will be presented aggregated by region, general type of farming, size class, form of organisation, age of the farmer, and utilised agricultural area.

Key words: FADN, methodology, standard results, agriculture

sa2016_a0202

Analiza stavova poljoprivrednih proizvođača o stanju u poljoprivredi Republike Hrvatske

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Sažetak

Analiza stavova hrvatskih poljoprivrednih proizvođača o stanju u poljoprivredi dobivena je putem ankete provedene u okviru IPA projekta Doprinos poljoprivrede čistom okolišu i zdravoj hrani. Cilj rada bio je istražiti pojedine stavove poljoprivrednih proizvođača o osnovnim problemima i stanju u hrvatskoj poljoprivredi. Opsežna anketa pored ekonomskih pitanja uključivala je i pitanja vezana za gnojidbu i zaštitu poljoprivredne proizvodnje. U istraživanju je sudjelovalo 61 poljoprivredni proizvođač s područja Osječko-baranjske i Vukovarsko-srijemske županije. Anketirani poljoprivredni proizvođači prvenstveno su registrirani kao obiteljska poljoprivredna gospodarstva (70%) i obrti (18%). 81% proizvođača upisano je u Upisnik poljoprivrednih proizvođača, 65% ih je u sustavu PDV-a, a 70% prima poljoprivredne poticaje i to u obliku izravnih plaćanja. Kao najznačajniji probleme hrvatske poljoprivrede navode previsoku cijenu inputa u proizvodnju, niske cijene poljoprivrednih proizvoda, presporu državnu administraciju te problem naplate potraživanja. Za takvo stanje u najvećoj mjeri krive Vladu, Ministarstvo poljoprivrede, lokalnu upravu i županije. Proizvođači su na ocjeni od 1 do 5 jako visoko ocijenili efekte poljoprivrednog udruživanja: bolja povezanost s tržištem (4,47), mogućnost usvajanja novih znanja i edukacije članova (4,31), kvalitetnije informacije i pomoć (4,29) i lakši pristup novčanim naknadama i poticajima (4,22). Najznačajnije prepreke u razvoju poljoprivrednog udruživanja vide u međusobnom nepovjerenju, neodgovarajućoj zakonskoj regulativi i problemima ulaganja i raspodjele dobiti (svi 4,11). Stavovi poljoprivrednih proizvođača pokazali su nepovjerenje prema vladinim institucijama, neorganizirano tržište te pozitivne, ali i kritičke predodžbe prema poljoprivrednom udruživanju.

Ključne riječi: poljoprivredni proizvođači, stavovi, stanje u poljoprivredi, udruživanje

sa2016_a0203

Analysis of producers' attitudes about the situation in Croatian agriculture

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Abstract

Analysis of the attitudes of the Croatian agricultural producers on the situation in agriculture was obtained through a survey carried out in the framework of IPA project "Contribution of agriculture to a clean environment and healthy food". The aim of the study was to investigate the individual attitudes of agricultural producers about the basic problems and the situation in the agriculture of Croatia. Other than the economic issues, this extensive survey also involved issues related to fertilization and protection of agricultural production. The study involved around 61 agricultural manufacturers from the area of Osijek-Baranja and Vukovar-Srijem County. Respondents are primarily registered as family farms (70%) and crafts (18%). 81% of producers are inscribed in the Register of agricultural producers, 65% are in the VAT system, and 70% receive agricultural subsidies in the form of direct payments. As the most significant problems of Croatian agriculture, the respondents specify an excessively high price of inputs into production, low prices of agricultural products, a very slow State administration and the problem of receivables collection. For such situation the respondents largely blame the Government, the Ministry of Agriculture, the counties and the local government. On the scale from 1 to 5, the manufacturers evaluated the effects of the agricultural association very highly: a better connection with the market (4.47), the possibility of adopting new knowledge and education (4:31), higher quality information and help (4.29) and easier access to financial compensations and subsidies (4.22). The most significant obstacles in development of agricultural association are the mutual lack of trust, an inadequate legislative regulations and problems of investment and profit distribution (all 4:11). The views of agricultural producers have shown distrust towards government institutions, disorganized market and positive, but also critical viewpoints towards the agricultural associations.

Key words: agricultural producers, attitudes, situation in agriculture, cooperation

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Genetika, oplemenjivanje bilja i sjemenarstvo

Analiza svojstava korijena povezanih sa stresom u populaciji kukuruza

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Sažetak

Kukuruzna zlatica (*Diabrotica virgifera virgifera* LeConte) značajan je štetnik kukuruza u Hrvatskoj. Istraživanje biotskog stresa uzrokovanog napadom kukuruzne zlatice uključuje analizu svojstava korijena povezanih s otpornošću genotipova na kukuruznu zlaticu (oštećenje, sekundarni porast i veličina korijena). Cilj rada bio je procijeniti genotipsku varijabilnost svojstava korijena 220 genotipova kukuruza (od čega su 209 genotipova međukrižane rekombinantne inbred linije IBM populacije), korelacije među svojstvima, te utvrditi potencijalnu vrijednost za oplemenjivačke programe koji se bave otpornošću na kukuruznu zlaticu. Rezultati su pokazali varijabilnost ispitivanih genotipova, te statistički visoko značajne vrijednosti genotipova, ponavljanja i blokova kod svih svojstava, osim kod oštećenja korijena, gdje je vrijednost F-testa za genotipove bila značajna na razini vjerojatnosti 0.05, a za ponavljanja na razini vjerojatnosti 0.1. Srednje vrijednosti oštećenja korijena varirale su od minimalnih 0.08 do maksimalnih 1.88, dok su kod sekundarnog porasta i veličine korijena srednje vrijednosti varirale od 1 do 6, što je ujedno i najveći mogući raspon ocjena ova dva svojstva. Svojstvo oštećenja korijena imalo je najviši koeficijent varijacije (51.4), a najmanju ponovljivost (15.0). Koeficijent varijacije za sekundarni porast i veličinu korijena bio je jednak (24.6), ponovljivost za sekundarni porast iznosila je 32.8, a za veličinu korijena 29.4. Niže vrijednosti ponovljivosti ukazuju na veću okolinsku varijancu, što zahtijeva veći broj ponavljanja/okolina kako bi se dobila preciznija procjena. Koeficijenti korelacije između sva tri svojstva bili su pozitivni i statistički značajni. Pokus će se ponoviti i iduće sezone kako bi procjena genotipova bila potpunija.

Ključne riječi: kukuruzna zlatica, svojstva korijena, biotski stres, populacija kukuruza

sa2016_a0301

Analysis of stress-related root traits in a maize population

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Abstract

Western corn rootworm (*Diabrotica virgifera virgifera* LeConte) (WCR) is a very important maize pest in Croatia. Research on biotic stress caused by WCR includes analysis of root traits related to resistance of maize genotypes to WCR (root injury, root regrowth and root size). Goal of this research was to assess genotypic variability of root traits in 220 maize genotypes (209 genotypes were intermated recombinant inred lines), correlations among traits, as well as to determine the potential of using assessed germplasm in WCR resistance breeding programs. Results showed variability of assessed genotypes. Values of genotypes, replications and blocks were statistically significant for all traits except for root injury (F-value of genotypes was significant at probability level of 0.05, and for replications at probability level of 0.1). Mean values varied from 0.08 to 1.88 for root injury, and from 1 to 6 for root regrowth and root size, which is the total scale range for these two traits. Root injury had the highest variation coefficient (51.4) and the lowest repeatability (15.0) of all traits. Root regrowth and root size had the same variation coefficient (24.6), and the repeatabilities were lower (32.8 for root regrowth and 29.4 for root size). Lower repeatability values indicate higher environmental variance, which requires more replications/environments for more precise assessment. Correlation coefficients among all three traits were positive and statistically significant. Trial will be set next season in order to obtain more complete genotype assessment.

Key words: western corn rootworm, root traits, biotic stress, maize population

sa2016_a0301

Vrlo visoki prinosi hibrida kukuruza u Turskoj kao rezultat specifične interakcije genotip × okolina × upravljanje (G×O×U)

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Sažetak

Uobičajeni pristup u oplemenjivanju bilja je prvo pronaći genotip koji je prilagođen za standardni režim upravljanja (prije svega agrotehnike) na što većem uzgojnom području uzimajući u obzir interakciju genotip × okolina (G×O), pa se zatim regionalno agrotehnika mijenja u odnosu na lokalne okolinske uvjete podrazumijevajući poglavito interakciju okolina × upravljanje (O×U). Ovo neistovremeno razmatranje oplemenjivačke interakcije G×O i agronomske interakcije O×U dovodi do nepoznavanja trofaktorijalne interakcije G×O×U. Zbog toga, kod kukuruza nije poznat, niti dostignut, maksimum prinosa za pojedino uzgojno područje. Oplemenjivači kukuruza u Turskoj su međutim, u poziciji da istražuju G×O×U zbog niza specifičnosti okolina i upravljanja koje mogu maksimalizirati prinos zrna preko 20 t/ha. Tako je u službenim sortnim pokusima u Turskoj na najboljoj lokaciji u 2015. godini, prosječni prinos pokusa bio 19.34 t/ha, a najbolji pokusni hibridi Poljoprivrednog instituta Osijek imali su prinos od 22.46, odnosno 22.07 t/ha. Ukupna srednja vrijednost turskog službenog sortnog pokusa bila je 17.24 t/ha. Odlično upravljanje koje uključuje obvezno navodnjavanje, ali i male vremenske i klimatske oscilacije povećavaju prinos zrna i njegovu predvidivost što pozitivno utječe na valjanu interpretaciju interakcije G×O×U. Međutim, za raspraviti je koliko će utjecati recentne klimatske promjene i održivost sadašnjeg upravljačkog sustava na interakciju G×O×U za prinos kukuruza u Turskoj.

Ključne riječi: kukuruz, prinos zrna, oplemenjivanje, Turska, interakcija genotip × okolina × upravljanje

sa2016_a0302

High yield in maize hybrids grown in Turkey as outcome of a specific genotype × environment × management (G×E×M) interaction

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Abstract

Traditional crop breeding approach seeks firstly genotypes adapted broadly under a standard management regime considering genotype by environment (G×E) interaction, and then manipulation of management regionally in response to average local environmental conditions taking into account the environment by management (E×M) interaction. Due to non-simultaneous consideration of the plant breeding G×E interaction and the agronomic E×M interaction, the three –factor G×E×M interaction is left unknown. Consequently, a yield ceiling in maize is not known and not achieved. Maize breeders in Turkey, however, are in position to investigate G×E×M due to specific environment and management policies what can maximize grain yield surpassing 20 t/ha. Thus, average grain yield at the best location of the official yield trial in Turkey was 19.34 t/ha in 2015, whereas the highest yielding hybrids developed by the Agricultural Institute Osijek were 22.46 and 22.07 t/ha. Total mean of grain yield across all Turkish official trials was 17.24 t/ha in 2015. Excellent management including irrigation and small weather and climate fluctuations increase grain yield and its predictability positively effecting valid interpretation of the G×E×M interaction. It is debatable; however, what are the impacts of recent climate change and sustainability of current managing system on grain yield of maize in Turkey.

Key words: maize, grain yield, breeding, Turkey, genotype × environment × management interaction

sa2016_a0302

Prinos test križanaca IBM populacije u upravljanim uvjetima suše u Turskoj

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Sažetak

U Hrvatskoj se zbog gotovo nepredvidljivih količina oborina tijekom vegetacije ne mogu osigurati upravljani uvjeti suše u poljskim pokusima ratarskih kultura u svrhu istraživanja vodnog stresa. Ovo se odnosi i na kukuruz koji je tijekom srpnja u fazi cvatnje i kada je najosjetljiviji na nedostatak vode što posljedično utječe na pad prinosa zrna. Poljski pokus je postavljen u oplemenjivačkoj stanici u egejskoj Turskoj na pješčanom tlu gdje je količina oborine tijekom srpnja 0 mm kako bi se izuzimanjem navodnjavanja 14 dana prije cvatnje kukuruza inducirao vodni stres kod 212 test križanaca međukrižanih linija IBM populacije kukuruza. Također je postavljen istovjetni pokus na kojem je tijekom srpnja nastavljeno uobičajeno navodnjavanje. Tijekom cvatnje u oba pokusa izmjereni su parametri fluorescence klorofila Fv/Fm i PI kao pokazatelji stresa. Oba pokusa su bila uzgajana u jednom ponavljanju zbog pomanjkanja prostora, te je statistička obrada slijedila metodu za neponavljane pokuse s korekcijom pomičnoga prosjeka. U zasušenom pokusu ukupne srednje vrijednosti za Fv/Fm, PI, bile su 0.77±0.02 i 3.16±0.70 ukazujući na stres, dok su sadržaj vode i prinos zrna u berbi bili 12.57±1.04%, odnosno 9.38±1.14 t/ha. U nezasušenom kontrolnom pokusu ukupne srednje vrijednosti za Fv/Fm i PI bile su statistički značajno veće: 0.81±0.02 odnosno 4.93±0.73 što ukazuje da ovdje biljke nisu bile pod stresom za vrijeme cvatnje. Sadržaj vode i prinos zrna su bili nešto viši: 13.10±1.07%, odnosno 10.35±1.16 t/ha. Naši rezultati pokazuju da su upravljani uvjeti suše tijekom cvatnje doista inducirali stres kod biljaka kukuruza, no to se nije značajno reflektiralo na pad prinosa zrna u testkrižancima IBM populacije. Daljnja analiza će pokazati koliko su svrhovita ovakva istraživanja za oplemenjivanje kukuruza.

Ključne riječi: kukuruz, test križanci, IBM populacija, fluoroscenca klorofila, suša

sa2016_a0303

Yield of testcrosses of IBM maize population under managed levels of drought stress in Turkey

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Abstract

Drought management of field trials for water stress research is not feasible in Croatia due to nearly unpredictable precipitation patterns during crop growing season. This is also true for maize which is particularly water susceptible during flowering in July having an impact on grain yield. A field trial was set at a breeding station located in Aegean Turkey in sandy soil with 0 mm precipitation in July to induce water stress by irrigation withdrawing 14 days before flowering in testcrosses of 212 intermated lines of IBM maize population. At the same time, identical adjacent trial was planted where usual irrigation scheme was applied in July (control). During flowering, in both trials two parameters of chlorophyll fluorescence (Fv/Fm and PI) were measured as indicators of stress. The trials were not replicated due to lack of space, and statistical analysis followed a method of unreplicated trials using moving average adjustment. Mean values in the water-limited trial were 0.77±0.02 and 3.16±0.70 for Fv/Fm and PI, respectively suggesting stress, while in harvest, moisture content was 12.57±1.04%, and grain yield was 9.38±1.14 t/ha. In the well-watered trial, mean values for Fv/Fm and PI were significantly higher (0.81±0.02 and 4.93±0.73, respectively) indicating no stress, whereas means for grain moisture content and yield were somewhat higher (13.10±1.07%, and 10.35±1.16 t/ha, respectively). Our results indicate that the managed level of drought did induce stress during flowering in maize plants, but it had no significant impact on grain yield. Further analyses should confirm whether such research is worthwhile for maize breeding.

Key words: maize, testcrosses, IBM population, chlorophyll fluorescence, drought

sa2016_a0303

Prinosi zrna testkrižanaca kukuruza u godinama s velikim sumama toplinskih jedinica

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Sažetak

Uslijed klimatskih promjena u našoj zemlji sve su češće iznadprosječno tople godine-vegetacijske sezone koje se odlikuju velikim sumama toplinskih jedinica (TJ). Zajedno s porastom suma TJ tijekom vegetacijske sezone sve češće rastu i maksimalne dnevne temperature zraka preko 30 °C u srpnju i kolovozu, kada je kukuruz u fazi cvatnje i nalijevanja zrna. Cilj ovoga rada je bio: 1) Identificirati godine s najvećim sumama TJ (od 1. travnja do 30. rujna) za Zagreb-Maksimir i Osijek za razdoblje 1961.-2015. godina i 2) Usporediti prosječne prinose zrna testkrižanaca kukuruza po FAO grupama (200-400) na lokaciji Rugvica (Zagreb) za nekoliko godina s najvećim sumama TJ s prosječnim prinosom zrna za razdoblje 1996.-2015. godina.

Sedam godina s najvećim sumama TJ za Zagreb-Maksimir i Osijek bile su: 2000., 2003., 2007., 2009., 2011., 2012. i 2015. Najveća suma TJ za Zagreb-Maksimir za razdoblje 1961.-2015. godina zabilježena je 2003. godine (1842.6), dok je za Osijek za isto razdoblje najveća suma TJ zabilježena 2012. godine (1836.2).

Prosječni prinosi zrna kukuruza (1996.-2015.) na lokaciji Rugvica su se kretali od 9.49 t/ha (FAO 200) do 9.90 t/ha (FAO 400). Najmanji prosječni prinos u FAO 200 zabilježen je 2011. godine (6.41 t/ha). U FAO 300 i FAO 400 najmanji prosječni prinos zabilježen je u 2003. godini (6.70 t/ha odnosno 7.71 t/ha), kada je zabilježena i najveća suma TJ.

Ključne riječi: kukuruz, toplinske jedinice, prosječni prinos zrna

sa2016_a0304

Grain yields of maize testcrosses in years with large sums of heat units

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Abstract

Due to climate changes in our country there are more often above average warm years-growing seasons characterized by large amounts of heat units (HU). Together with the increase in sum of HU during the growing season, there is also more often present an increase in maximum daily air temperature above 30 °C in July and August, when maize is in the flowering and grain filling stage. The aim of this study was: 1) To identify years with the largest sums of HU (from April 1 to September 30) for Zagreb-Maksimir and Osijek for the period from 1961 to 2015 and 2) To compare the average grain yield of maize testcrosses per FAO groups (200-400) at the location Rugvica (Zagreb) for several years with the largest sums of HU with the average grain yield for the period 1996-2015.

Seven years with the largest sums of HU for Zagreb-Maksimir and Osijek were: 2000, 2003, 2007, 2009, 2011, 2012 and 2015. The largest sum of HU for Zagreb-Maksimir in the period from 1961 to 2015 was recorded in 2003 (1842.6), while in Osijek for the same period the largest sum of HU was recorded in 2012 (1836.2).

Average grain yields of maize (1996-2015) in Rugvica ranged from 9.49 t/ha (FAO 200) to 9.90 t/ha (FAO 400). The lowest average grain yield in the FAO 200 was recorded in 2011 (6.41 t/ha). In the FAO 300 and FAO 400 groups the lowest average yields were recorded in 2003 (6.70 t/ha and 7.71 t/ha, respectively), when the largest sum of HU was recorded.

Key words: maize, heat units, average grain yield

sa2016_a0304

Utjecaj kadmija na mitotski indeks tri genotipa kukuruza

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Sažetak

Kadmij je neesencijalni metal toksičan za biljke i životinje. U tlu je prisutan u različitim koncentracijama, a povišena koncentracija kadmija u tlu negativno utječe na biljke. Da bi istražili utjecaj povišene koncentracije kadmija na mitotsku aktivnost korijena posijano je sjeme tri genotipa kukuruza koja različito usvajaju kadmij (B84, Os6-2 i njihov hibrid). Za kontrolni tretman je korišteno nekontaminirano tlo (sadrži oko 0.2 mg Cd/ kg tla), a tlo za tretman sa povišenom koncentracijom kadmija je kontaminirano kadmijevim kloridom ($CdCl_2$) do koncentracije 5 mg Cd/ kg tla. Mitotski indeks je izražen kao broj stanica u mitozi/ukupan broj stanica×100%. Izmjerena je koncentracija kadmija u listu (ICP-OES) da bi se vidjelo koliko se kadmija iz tla usvaja u nadzemni dio biljke. Rezultati analize koncentracije kadmija u listu pokazali su da u kontaminiranom tlu linija B84 kadmij gotovo ne usvaja u list (1.321 ± 0.37 mg Cd/kg suhe tvari), linija Os6-2 usvaja velike količine kadmija (10.321 ± 1.35 mg Cd/kg suhe tvari), a hibrid je po usvajanju kadmija između dvije linije (5.137 ± 0.30 mg Cd/kg suhe tvari). Mitotski indeksi linije B84 i hibrida nisu se smanjili u kontaminiranom tlu (kontrola - 13.64%, kontaminirano tlo 12.4% i kontrola - 27.17%, kontaminirano tlo 26.89%) dok se kod linije Os6-2 mitotski indeks bitno smanjio u kontaminiranom tlu (kontrola - 38.8%, kontaminirano tlo - 6.11%) što ukazuje na inhibiciju rasta korijena linije Os6-2, te određeni stupanj tolerantnosti kod linije B84 i hibrida.

Ključne riječi: kukuruz, kadmij, teški metali, stres, mitotski indeks

sa2016_a0305

The effect of cadmium on mitotic index in three maize genotypes

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Abstract

Cadmium is a non-essential metal toxic to plants and animals. It is present in varying concentrations in soil and increased levels of cadmium negatively affect plants. In order to investigate the effects of increased levels of cadmium on mitotic index of the root, seeds of three maize genotypes with different cadmium accumulation were planted (B84, Os6-2 and their hybrid). Uncontaminated soil was used for the control treatment (approximately 0.2 mg Cd/ kg soil) and for the increased cadmium level treatment soil was contaminated with cadmium chloride ($CdCl_2$) up to 5 mg Cd/ kg soil. Mitotic index was calculated as number of cells undergoing mitosis/total number of cells*100%. To determine cadmium uptake in the above ground parts of the plants cadmium concentration in ear-leaves was measured (by ICP-OES). Results of ICP analysis for cadmium have shown that in contaminated soil B84 line has a very low cadmium accumulation in leaves (1.321 mg Cd/kg dry weight), Os6-2 line has high cadmium accumulation in leaves (10.321 mg Cd/kg dry weight) and hybrid is in-between the two maize lines in cadmium accumulation in leaves (5.137 mg Cd/kg dry weight). Mitotic indices of B84 line and hybrid did not show reduction in contaminated soil (control - 13.64%, contaminated soil 12.4%, control - 27.17%, contaminated soil 26.89%) while Os6-2 line showed a large reduction in mitotic index in contaminated soil (control - 38.8%, contaminated soil - 6.11%) which suggests inhibition of root growth in Os6-2 line and a certain degree of tolerance in hybrid and B84 line.

Key words: maize, cadmium, heavy metals, stress, mitotic index

sa2016_a0305

Utjecaj kontrolirane hidratacije sjemena hibrida kukuruza na antioksidacijski status klijanaca

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Sažetak

Cilj rada bio je utvrditi utjecaj različitih varijanti kontrolirane hidratacije sjemena na sadržaj ukupnih fenola (TPC) i aktivnost hvatanja slobodnih 1,1 difenil-2-pikrilhidrazil (DPPH) radikala u korijenu i nadzemnom dijelu klijanaca četiri domaća hibrida kukuruza (FAO grupa 300, 400, 500, 600) sa svrhom procjene kontrolirane hidratacije kao mjere za poboljšanje antioksidacijskog statusa mlade biljke i rasta kukuruza. Sjeme hibrida namakano je 12, 24 i 36 sati u osmotskim otopinama različitog vodnog potencijala (-0,295 i -0,735 MPa) dobivenih primjenom polietilen glikola (PEG 6000), te potom naklijavano u laboratorijskim uvjetima. Prosječni TPC i aktivnost DPPH bili su za 1,45 do 6,69 puta viši u nadzemnom dijelu klijanaca nego u korijenu. Učinci hibrida i varijante kontrolirane hidratacije na oba istraživana parametra bili su značajni (p=0,01). TPC je varirao od 0,462 do 2,273 mg GAE/g svježe tvari korijena i od 0,689 do 2,965 mg GAE/g svježe mase nadzemnog dijela klijanca. Aktivnost DPPH kretala se od 0,116 do 1,676 mg AAE/g svježe tvari korijena i od 0,340 do 2,145 mgAAE/g svježe mase nadzemnog dijela klijanca. Najviše vrijednosti TPC i aktivnosti DPPH u nadzemnom dijelu klijanca za sve varijante kontrolirane hidratacije sjemena utvrđene su kod hibrida FAO grupe 600. Prosječni TPC korijena i nadzemnog dijela bio je za obje razine kontrolirane hidratacije najviši pri 24 satnom namakanju. Aktivnost hvatanja DPPH radikala u korijenu i nadzemnom dijelu bila je u otopini -0,295 MPa najviša pri 12 satnom namakanju, dok je u otopini -0,735 MPa bila najviša pri 24 satnom namakanju. Utvrđena je značajna pozitivna korelacija TPC i DPPH (r=0,862). Rezultati ukazuju da kontrolirana hidratacija sjemena može poboljšati antioksidacijski status mlade biljke i rast hibrida kukuruza.

Ključne riječi: kukuruz, kontrolirana hidratacija sjemena, ukupni fenoli, DPPH

sa2016_a0306

Effect of controlled seed hydration on antioxidant status of hybrid maize seedlings

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Abstract

The aim of this study was to estimate the effect of varying controlled seed hydration treatments on total phenolic content (TPC) and 1,1 diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging activity in radicle and above ground mass of four domestic maize hybrid seedlings (FAO groups 300, 400, 500, 600) in order to evaluate controlled seed hydration as a measure to enhance antioxidant status of young plants and maize growth. Seed of hybrids was soaked for 12, 24 and 36 hours in osmotic solutions with different water potential (-0.295 and -0.735 MPa) made by using polyethylene glycol (PEG 6000), and then left to germinate in laboratory conditions. Average TPC and activity of DPPH were for 1.45 to 6.69 times higher in above ground part of seedlings than in radicle. The effects of hybrid and controlled seed hydration treatment were significant (p=0.01) for both investigated parameters. TPC varied from 0.462 to 2.273 mg GAE/g of fresh radicle weight, and from 0.689 to 2.965 mg GAE/g of fresh above ground seedling mass. DPPH activity was from 0.116 to 1.676 mg AAE/g of fresh radicle weight, and from 0.340 to 2.145 mg AAE/g of fresh above ground seedling mass. Hybrid of FAO group 600 obtained the highest values of TPC and DPPH activity in above ground mass of seedlings for all tested controlled seed hydration treatments. Average TPC of radicle and above ground mass was highest at 24 hours of soaking for both levels of controlled hydration. DPPH activity in radicle and above ground mass was for -0.295 MPa water solution highest at 12 hours of soaking, and for -0.735 MPa solution at 24 hours of soaking. Significant positive correlation between TPC and DPPH was found (r=0.862). Results suggest that controlled hydration of seed may enhance antioxidant status of young plants and growth of maize hybrids.

Key words: maize, controlled seed hydration, total phenols, DPPH

sa2016_a0306

Izbor ranijih hibrida kukuruza za biofortifikacijska svojstva pod kombiniranim abiotskim uvjetima

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Sažetak

U Hrvatskoj su hibridi ranije vegetacije često zastupljeniji od kasnijih hibrida. Hibridi kraće vegetacije imaju nižu vlažnost zrna te nisu nužno i manje prinosni. Međutim, nije poznato kakve su koncentracije mikroelemenata u zrnu kod ovih hibrida u kombinaciji s abiotskim stresom. Cilj ovoga istraživanja je utvrditi učinak kiselog tla i suše na prinos zrna, vlažnost zrna i koncentracije Fe, Zn, Mn i Cu te ispitati specifične odnose između njih u uvjetima abiotskog stresa kod deset hibrida kukuruza različite dužine vegetacije. Prosječne vrijednosti za svih šest svojstava između okolina i hibrida su značajno varirale (5.5-11.3 t ha^{-1}, 17-28 %, 17-24, 13-19, 4-5, 1.6-2.0 mg kg^{-1} za prinos zrna, vlagu, koncentracije Fe, Zn, Mn i Cu). Ovo je povezano sa specifičnim abiotskim stresom, odnosno sušom, kiselošću tla ili njihovom kombinacijom. Rezultati su pokazali da bi izbor genotipova kraće vegetacije mogao biti značajan za koncentraciju Fe, dok je abiotski stres značajan za ostale mikroelemente. Korelacije između prinosa zrna i koncentracija mikroelemenata su bile proturječne, osim za koncentraciju Mn. Bila bi korisna istraživanja interakcije genotipa, okoline i agrotehnike (G x E x M) kako bi se povezala agronomska i oplemenjivačka uloga u biofortifikacijskim programima.

Ključne riječi: hibridi kukuruza, prinos, biofortifikacijska svojstva, abiotski stres

sa2016_a0307

Choosing earlier maize hybrids for biofortification traits under combined abiotic stress conditions

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Abstract

There is a trend in large-scale maize production in Croatia that the earlier maturing hybrids are even more frequently chosen than the later ones. Earlier hybrids have lower grain moisture and they are not necessarily lower-yielding. It is not clear, though, what are possible changes in grain micronutrient concentrations following this choice particularly when abiotic stresses occur. Objectives of this study were to determine the effects of acid soil and drought on grain yield, moisture, Fe, Zn, Mn and Cu concentrations, and to examine the specific relations between the traits in the presence of particular abiotic stress in ten maize hybrids differing in maturity. Mean values for all six grain traits across environments and hybrids differed significantly (5.5-11.3 t ha^{-1}, 17-28%, 17-24, 13-19, 4-5, 1.6-2.0 mg kg^{-1} for grain yield, moisture, Fe, Zn, Mn and Cu, respectively). This was associated with specific abiotic stress, either drought or soil acidity or combined. The choice of genotypes of earlier maturity might be more important for Fe, whereas managing of abiotic stress environments appears to be of interest for Zn, Mn and Cu. There were inconsistent correlations between grain yield and micronutrient status across the field environments with the exception of Mn. We might recommend investigating simultaneous genotype × environment × management (G×E×M) interactions in order to integrate agronomic and breeding efforts for a successful biofortification program.

Key words: maize hybrids, yield, biofortification traits, abiotic stress

sa2016_a0307

Gospodarska vrijednost novih Bc hibrida kukuruza FAO grupe 300 i 400 u sušnoj 2015. godini

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Sažetak

Uz prinos zrna i otpuštanje vode iz zrna, jedno od najvažnijih poželjnih svojstava u oplemenjivanju kukuruza je i tolerantnost na stresne uvjete proizvodnje kao što je suša koja je u različitim intenzitetima bila prisutna u četiri od zadnjih pet godina u RH. S obzirom da je kukuruz najosjetljiviji na sušu u fazi cvatnje, javlja se potreba za sjetvom nešto ranijih hibrida, kao što su hibridi FAO grupe 300 i rane grupe 400, koji su dovoljno rani da izbjegnu period visokih temperatura u kombinaciji s nedostatkom vode u cvatnji, a s druge strane imaju visok potencijal rodnosti koji će osigurati zadovoljavajuće prinose. Cilj ovog istraživanja je bio ispitati gospodarske vrijednosti 13 novih hibrida FAO grupe 300 i 400 u sušnoj 2015. godini u odnosu na standardni hibrid BC344. Pokusi su bili postavljeni na pet lokacija od kojih su dvije u Hrvatskoj (Rugvica i Šašinovec), te tri u Mađarskoj (Boly, Dalmand i Bekescaba) po slučajnom blok sustavu u 3 repeticije. Na tri lokacije u Mađarskoj najrodniji su bili hibridi BC478 s prosječnim prinosom od 11,87 t/ha, BC323 s prosječnim prinosom od 11,54 t/ha, te Thriller s prinosom od 11,51 t/ha. U Hrvatskoj na dvije lokacije kao najbolji su se pokazali hibridi BC424, BC406 i BC478 s prosječnim prinosima u iznosu od 9,43 t/ha, 9,41 t/ha, te 9,08 t/ha. Iz dobivenih rezultata možemo zaključiti da smo uspjeli razviti nove hibride visokog potencijala rodnosti s vrlo visokim stupnjem tolerantnosti prema sušnim uvjetima proizvodnje.

Ključne riječi: kukuruz, hibrid, stres, prinos zrna

sa2016_a0308

Economic value of new BC maize hybrids from FAO 300 and 400 group in dry 2015

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Abstract

Beside grain yield and fast dry down one of the most favorable traits in maize breeding is tolerance to different stress conditions such as drought, which is present in different intensity in Croatia in four of last five years. Maize is the most sensitive to drought in flowering time, so it is needed to plant earlier hybrids such as hybrids from FAO 300 and 400 group, which are early enough to avoid high temperatures in combinations with lack of rain, but on the other side they have high yield potential which can ensure good yield. The aim of this study was to examine 13 new hybrids FAO 300 and 400 in dry 2015 and compared to standard hybrid BC344. Trials were planted on five locations, two in Croatia (Rugvica and Sasinovec) and three in Hungary (Boly, Dalmand and Bekescaba) in randomized block design in three repetitions. On three locations in Hungary the best yielding hybrids were BC478 (11.87 t/ha), BC323 (11.54 t/ha) and Thriller (11,51 t/ha), while in Croatia the best hybrids were BC424, BC406 and BC478 with 9.43 t/ha, 9,41 t/ha and 9.08 t/ha, respectively. From these results we can conclude that we developed new hybrids with high grain yield potential and with the high degree of tolerance to drought.

Key words: maize, hybrid, stress, grain yield

sa2016_a0308

Utjecaj defolijacije inbred linija kukuruza na prinos

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Sažetak

Prinos zrna kukuruza jako je vezan za LAI (Leaf Area Index) i učinkovitost lisne mase u fotosintezi. Defolijacijski tretmani mogu utjecati na pristupačnost asimilata u fazi nalijevanja zrna i u konačnici na proizvodnju sjemena. Kako bi se osigurala genetska čistoća proizvedenog sjemena, u sjemenskoj proizvodnji hibridnog sjemena potrebno je ukloniti sve metlice na majčinskim biljkama. Prilikom čupanja metlica uvijek se iščupaju i gornji listovi biljke zajedno s metlicom. Broj iščupanih listova ovisi o morfologiji biljke, vremenu čupanja metlice u odnosu na vrijeme pojave metlice, polinaciji i izlasku svile. Pokus proveden na Poljoprivrednom institutu Osijek 2013. godine postavljen je s ciljem dobivanja informacija o gubicima u proizvodnji sjemena prilikom čupanja prevelikog broja listova tijekom emaskulacije biljaka. Pokus je postavljen po slučajnom blok rasporedu u tri ponavljanja. U pokusu je ispitano devet inbred linija Poljoprivrednog instituta Osijek iz različitih FAO grupa. Defolijacija je izvedena u pet tretmana: T_1- uklonjena samo metlica, T_2- uklonjena metlica i dva lista, T_3- kontrola, T_4- uklonjena metlica i četiri lista, T_5- uklonjena metlica i šest listova. Defolijacija je obavljena ručno. Rezultati su ovisno o genotipu pokazali da se prinos zrna smanjio za 8,6-15,1% u T_1, 3,7-17% u T_2, 12,3-41% u T_4 i 12,1-69,9% u T_5 u odnosu na kontrolu (T_3). Rezultati pokusa pokazuju da se uklanjanjem velikog broja gornjih listova prilikom čupanja metlica značajno smanjuje fotosintetski aparat koji je od velike važnosti u sjemenskoj proizvodnji.

Ključne riječi: defolijacija, inbred linije, prinos, sjemenska proizvodnja.

sa2016_a0309

The impact of defoliation of maize inbred lines on yield

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Abstract

Maize yield is strongly connected with LAI (Leaf Area Index) and photosynthetic efficiency of the leaf mass. Defoliation treatments reduce the accessibility of assimilates in grain filling stage and ultimately affects seed production. In seed production of hybrid maize seed all tassels must be removed to ensure the genetic purity of the produced seeds. When tassels are jerked out some of the upper leaves are pulled out while removing tassels. The number of leaves removed with the tassel depends on plant morphology, the time of detasseling relative to time of tassel emergence, pollen shed and silk emergence. An experiment was conducted at Agricultural Institute Osijek in 2013 to obtain information concerning the loss in grain yield resulting from careless detasseling. The experiment was set in a random block design with three repetitions. Experiment consisted of nine inbred lines which belong to different FAO groups. Defoliation was performed in five treatments: T_1-pulling only tassels, T_2-pulling tassels and two leaves, T_3-control, T_4- pulling tassels and four leaves, T_5- pulling tassels and six leaves. Defoliation was carried out manually. The results showed that, depending on the genotype, detasseling reduced the yield 8.6-15.1% in T_1, 3.7-17% in T_2, 12.3-41% in T_4 and 12.1-69.9% in T_5 compared to control (T_3). Results show that the removal of a large number of upper leaves of plants, while pulling the tassels, significantly reduces the photosynthetic apparatus which is of great importance in seed production.

Key words: defoliation, inbred lines, yield, seed production.

sa2016_a0309

Kvantitativno genetička analiza svojstava povezanih s abiotičkim i biotičkim stresom kod kukuruza

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Sažetak

Utjecaj povećane gustoće sklopa kod kukuruza ogleda se u pojačavanju štetnog utjecaja različitih abiotskih i biotskih stresova. U našem istraživanju provedena je kvantitativna genetska analiza visine klipa (VK), visine biljke (VB), intervala prašenje-svilanje (ASI), dva parametra fluorescencije klorofila (Fv/Fm I PI), te postotka fuzarijske truleži klipa (%Fus) kao sekundarnih svojstava povezanih sa stresom, te prinosa zrna u populaciji kukuruza pri uzgoju na dvije gustoće. Uzgajano je 212 test križanaca IBM (međukrižane B73 x Mo17) populacije križanih s Iodent inbred linijom i četiri standarda u dvije gustoće sklopa – umjerena (55.000 biljaka/ha) i visoka (89.000 biljaka/ha) u dva ponavljanja pravokutnog lattice plana. VK se značajno razlikovala između gustoća (121.7 pri umjerenoj i 129.4 pri visokoj) s heritabilnosti (h^2) od 66.1%. VB nije se značajno razlikovala između gustoća (300.7 i 301.1 u dvije gustoće) s h^2 od 86.16 %. ASI se značajno razlikovao između gustoća (2.6 dana pri umjerenoj i 3.7 dana pri visokoj) s vrijednosti h^2 od 55.9%. %Fus bio je značajno viši pri visokoj (6.8%) u odnosu na umjerenu gustoću sklopa (4.4%) s h^2 od 65.7%. Fv/Fm i PI parametri se nisu značajno razlikovali između dva sklopa i imali su vrlo male genetske komponente varijance. Prinos zrna bio je značajno viši pri visokoj (13.5 t/ha) u odnosu na umjerenu gustoću sklopa (12.2 t/ha) s h^2 od 65.7%. Dvogodišnji podatci biti će predstavljeni i raspravljeni s ciljem preporuke relevantnih sekundarnih svojstava povezanih sa stresom u gustom sklopu.

Ključne riječi: kukuruz, gustoća sklopa, IBM populacija, svojstva povezana sa stresom, kvantitativna genetska analiza

sa2016_a0310

Quantitative genetic analysis for secondary traits related to abiotic and biotic stress in maize

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Abstract

Adverse effects of various abiotic and biotic stresses are known to be enhanced by high planting density in maize. We made quantitative genetic analysis for ear height (EH), plant height (PH), anthesis - silking interval (ASI), two chlorophyll fluorescence parameters (Fv/Fm and PI) and Fusarium ear rot percentage (%Fus) used as secondary stress-related traits measured along with grain yield in a maize population in two plant densities. 212 testcrosses of IBM (Intermated B73 x Mo17) population with an Iodent inbred line and four checks were grown in two planting densities – moderate (55.000 plants/ha) and high (89.000 plants/ha) and were set as incomplete rectangular lattice in two replications. EH differed significantly between the densities (121.7 cm in moderate and 129.4 cm in high) with heritability (h^2) of 66.1 %. PH showed no significant differences between the densities (300.7 and 301.1 cm grown in two respective densities) with h^2 being 86.16 %. ASI differed significantly between the densities (2.6 days in moderate and 3.7 days in high) with h^2 value of 55.9 %. %Fus was significantly higher in high (6.8 %) compared to moderate planting density (4.4 %) with h^2 of 60.6 %. Fv/Fm and PI did not differ significantly having very small genetic variance component. Grain yield was significantly higher in high (13.5 t/ha) compared to moderate planting density (12.2 t/ha) with h^2 of 65.7 %. Two-year data will be presented and discussed in order to recommend, which secondary traits seem to be relevant for plant density evaluation in maize breeding.

Key words: maize, plant density, IBM population, stress related traits, quantitative genetic analysis

sa2016_a0310

Interakcija genotip × okolina za prinos zrna i ulja novih OS hibrida suncokreta

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Sažetak

Oplemenjivanje suncokreta u Poljoprivrednom institutu Osijek traje u kontinuitetu gotovo četrdeset godina. Primarni cilj je stvoriti hibride visokog prinosa zrna i ulja, koji će ta svojstva zadržati na što višem nivou u različitim okolinama. Stoga se provode testiranja novostvorenih hibrida suncokreta u odnosu na standarde (domaće i introducirane hibride). U ovom radu prikazani su rezultati testiranja 6 novostvorenih hibrida suncokreta kreiranih u okviru oplemenjivačkog programa Poljoprivrednog instituta Osijek (H-1 do H-6) i jednog standarda (H-7). Standard je introducirani hibrid koji u dugom nizu godina zauzima značajne površine u Republici Hrvatskoj. Pokusi su postavljeni prema slučajnom bloknom rasporedu na lokalitetu Osijek, a obuhvaćali su četiri agroklimatski vrlo različite godine (2012.-2015.). Analizirana su najvažnija kvantitativna svojstva: prinos zrna, sadržaj ulja i prinos ulja. Najviši prinosi zrna i ulja ostvareni su 2013. godini, a sadržaj ulja u 2012. godini. Pojedinačno, najviše prinose zrna i ulja ostvario je hibrid H-3, te se smatra potencijalnim kandidatom za priznavanje u Republici Hrvatskoj i inozemstvu. Rezultati istraživanja ukazuju kako je u Poljoprivrednom institutu Osijek ostvaren značajan napredak u oplemenjivačkom procesu, te kako novostvoreni hibridi postižu više vrijednosti najvažnijih agronomskih svojstava, ali i veću stabilnost u odnosu na standarde.

Ključne riječi: suncokret, hibrid, okolina, prinos zrna, prinos ulja

sa2016_a0311

Genotype by environment interaction for grain and oil yield of new OS sunflower hybrids

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Abstract

Sunflower breeding at the Agricultural Institute Osijek lasts almost 40 years in continuity. Main target is to create hybrids with high grain and oil yield, which will keep these traits on as much as possible high level in different environments. Due to this task, researchers conduct testing of newly created sunflower hybrids in comparison with standards (domestic and foreign hybrids). In this study, we present test results of six new sunflower hybrids created in the frame of the Agricultural Institute Osijek breeding program (H-1 to H-6) and one standard (H-7). Standard is an introduced hybrid, which for a number of years takes significant areas under sunflower in the Republic of Croatia. Trials were set up under RCBD at location Osijek and included four very different years (2012-2015) in terms of agroclimatology. The most important quantitative traits were analyzed: grain yield, oil content and oil yield. The highest grain and oil yield were achieved in 2013, and oil content in year 2012. Individually, the highest grain and oil yields achieved hybrid H-3, and should be considered as candidate for recognition in the Republic of Croatia and abroad. Results of research indicate that the significant improvement in sunflower breeding process at the Agricultural Institute Osijek is accomplish, and newly created hybrids achieves higher values of the most important agronomic traits, as well as the higher stability in comparison with standards.

Key words: sunflower, hybrid, environment, grain yield, oil yield

sa2016_a0311

Veza visine biljaka uljane repice i prinosa zrna u VCU ispitivanjima u 2014. i 2015. godini

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Sažetak

U Republici Hrvatskoj nova sorta priznaje se prema Zakonu o sjemenu, sadnom materijalu i priznavanju sorti poljoprivrednog bilja (NN 140/05, 35/08, 25/09, 124/10, 55/11, 14/14) ako je različita, ujednačena i postojana, ako ima odgovarajuću gospodarsku vrijednost te ako u skladu sa Zakonom ima odgovarajuću denominaciju odnosno ime sorte. Utvrđivanje gospodarske vrijednosti (VCU) provodi se prema Pravilniku o priznavanju sorti poljoprivrednog bilja (NN 99/2008) te njegovim izmjenama i dopunama (NN 100/09,109/10,77/13). VCU ispitivanja u pokusnom polju i laboratoriju organizira i izvodi Zavod za sjemenarstvo i rasadničarstvo u Osijeku. Cilj istraživanja bio je analizirati međusobne odnose visine biljke i prinosa uljane repice putem koeficijenata korelacije. Istraživanje je rađeno u sklopu službenih VCU pokusa na lokaciji Osijek i Tovarnik te je obuhvatilo 18 hibrida u 2014. godini, te 17 hibrida u 2015. godini. Pokus je postavljen po slučajnom blok sustavu u četiri ponavljanja. Na lokaciji Osijek u 2014. godini prosječna visina iznosila je 164,6 cm, a prosječan prinos 6,626 t/ha te nije postojala statistički značajna korelacija (r=0.125; p=0,6210), dok je na lokaciji Tovarnik prosječna visina iznosila 166 cm, a prosječan prinos 6,412 t/ha te je korelacija statistički značajna (r=0.575; p=0,0126). Na lokaciji Osijek u 2015. godini prosječna visina biljaka bila je 158,8 cm, a prosječni prinos 6,515 t/ha te je utvrđena značajna korelacija pozitivnog smjera (r=0.877; p=0,0000), jednako kao i na lokaciji Tovarnik(r=0.720; p=0,0011) gdje je prosječna visina iznosila 171,8 cm, a prosječni prinos 6,435 t/ha.

Ključne riječi: uljana repica (*Brassica napus* L.), korelacije, visina biljke, prinos

sa2016_a0312

The relationship between oil rape plant height and grain yield in 2014 and 2015 VCU testing

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Abstract

In Republic of Croatia, cultivar registration is under the jurisdiction of Law on seeds, planting material and Registration of varieties of agricultural plants (NN 140/05, 35/08, 25/09, 124/10, 55/11, 14/14). A cultivar is approved if it is distinct, uniform and stabile, if it has relevant economic value (cultivation and use value) and appropriate denomination, i.e. a new cultivar name. Value for cultivation and use testing of plant varieties (VCU) carried out according to the Regulations on varietes of agricultural plants (OG 99/2008) and its amedments (OG 100/09, 109/10, 77/13). VCU field and laboratory testing is carried out by the Institute for Seeds and Seedlings in Osijek. The aim of the research was to investigate possible correlations between oil rape plant height and its grain yield. The research was conducted in two consecutive years during official VCU testings at locations in Osijek and Tovarnik. In 2014, there were 18 hybrids tested and in 2015, the sample consisted of 17 hybrids. The experiment was set on random bloc system in four repetitions. For location in Osijek in 2014, the average height value was 164.6 cm and the average grain yield 6.626 t. There was no statistically significant correlation between the two (r=0.125; p=0.6210). For location in Tovarnik in 2014 the average height value was 158.8 cm and the average grain yield 6.412 t. The correlatiom between the two was statistically significant (r=0.575; p=0.0126). In 2015, statistically significant positive correlation was found on both locations. The average height value in Osijek for that year was 158.8 cm and the average grain yield 6.515 t (r=0.877; p=0.0000). In Tovarnik, the average height value was 171.8 cm and the average grain yield 6.435 t (r=0.720; p=0.0011).

Key words: oil rape (*Brassica napus* L.), correlation, plant height, grain yield

sa2016_a0312

Kvantitativno genetička analiza hrvatskih službenih sortnih pokusa tijekom desetogodišnjeg razdoblja

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Sažetak

U zapadnoj Europi i Kanadi, genetički aspekt službenih sortnih pokusa (VCU) je nedavno analiziran primjenom metodologije mješovitog modela s obzirom na vrlo nebalansirane setove podataka s velikom udjelom nedostajućih vrijednosti podataka kombinacije godina × lokacija × genotip. Cilj ovog istraživanja bio je opisati strukturu komponenti varijance prinosa za pojedine usjeve na temelju rezultata hrvatskih VCU pokusa u razdoblju od 2001. do 2010. godine koristeći metodu rezidualne ili ograničene najveće vjerodostojnosti (REML). Rezultati naše studije su pokazali da je relativna veličina komponenti varijance slična vrijednostima dobivenim u Velikoj Britaniji i Njemačkoj. Tako je genotipska komponenta varijance bila relativno mala kod ozimog ječma i ozime uljane repice objašnjavajući samo 2.2% ukupne varijacije za prinos, dok je kod suncokreta i kasnog kukuruza njezin udio u ukupnoj varijanci bio 11.6% odnosno 13.5%. Štoviše, koeficijenti genotipske varijacije su bili veći od onih dobivenih u Njemačkoj kod svih sedam ispitivanih kultura: 170% (ozime pšenice), 117% (ozimog ječma), 150% (kukuruza srednje grupe zrenja), 154% (kukuruza kasne grupe zrenja), 118 % (ozime uljane repice), 127% (suncokreta) i 112% (šećerne repe), slično kao i u Velikoj Britaniji. Naši rezultati pokazuju da kombinacije godina i lokacija u hrvatskim VCU pokusima, kada su lokacije dovoljno rasprostranjene, omogućuju ekstremne reakcije sorata kao i u geografski raširenijim setovima VCU pokusa u zapadnoj Europi.

Ključne riječi: VCU pokusi, komponente varijance

sa2016_a0313

Quantitative genetic analysis of Croatian official variety trials during a 10-year period

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Abstract

In Western Europe and Canada, the genetic aspects of official variety (VCU) trials have been recently analyzed using the mixed model methodology due to highly unbalanced datasets with a large fraction of empty cells in the year × location × genotype three-way table. Objective of this study was to describe the structure of crop-specific variance components for yield based on Croatian VCU results over the period from 2001 to 2010 utilizing restricted maximum likelihood method (REML). The results of our study demonstrated that the relative magnitude of the variance components were similar to those obtained in Great Britain and Germany. Specifically, genotypic variance component was relatively small in winter barley and winter oil seed rape explained only 2.2% of the total yield variation, whereas in sunflower and late maize it explained 11.6% and 13.5% of the total yield variation, respectively. Moreover, coefficients of genotypic variation were greater than those obtained Germany in all seven investigated crops: 170% (winter wheat), 117% (winter barley), 150% (maize medium), 154% (maize late), 118% (winter oil seed rape), 127% (sunflower) and 112% (sugar beet), and hence in the UK. Our results indicate that the combinations of years and locations within Croatia, when sufficiently widely sampled, can provide as extreme variety responses as a geographically more dispersed set of VCU trials in Western Europe.

Key words: VCU testing, variance components

sa2016_a0313

Usporedbe morfometrijskih karakteristika mahuna i sjemenki populacija rogača (*Ceratonia siliqua* L.) sakupljenih na dvije udaljene lokacije, Drveniku Malom i Malom Lošinju

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Sažetak

Poznato je da rogač (*Ceratonia siliqua* L.) nije raširen na otocima i obali sjevernog Jadrana. Štoviše, teško je uopće pronaći spontana (ne zasađena) stabla rogača sjevernije od Dugog Otoka i obale okolice Zadra. Bilo kako bilo, tijekom terenskog rada u prvoj istraživačkoj godini u okviru projekta TEUCLIC (akronim za: Taxonomy, Ecology and Utilization of Carob tree and Bay Laurel in Croatia) financiranog od strane Hrvatske zaklade za znanost, na Malom Lošinju (osnovne koordinate: 44.32°N i 14.28°E) pronađen je najsjeverniji habitat rogača. U ovom radu iznijeti su rezultati morfometrijskih analiza mahuna i sjemenki populacije rogača na Malom Lošinju u usporedbi s rezultatima istih analiza populacije rogača na otoku Drveniku Malom, smještenom u srednje jadranskom arhipelagu (44.45°N i 16.08°E), s ciljem da se utvrde moguće razlike između najvažnijih morfoloških osobina između tih dviju relativno udaljenih populacija. Nakon provedenih morfometrijskih istraživanja, pronađena je manja duljina i debljina mahuna u populaciji rogača Malog Lošinja u usporedbi s populacijom rogača Drvenika Malog. Međutim, razlike nisu bile signifikantne (D=2.67 i 2.28; F-test ns, p=0.272 i 0.877). S druge strane, širina mahuna u populaciji rogača Malog Lošinja je signifikantno manja u usporedbi s populacijom Drvenika Malog (D= 8.66, p<0.001), podjednako kao i težina i broj sjemenki po mahuni (D=15.4 i 2.26, p<0.001). Također, utvrđeno je da su sjemenke populacije rogača Drvenika Malog dulje, šire (D=1.08 i 0.68, p<0.001) i teže u usporedbi sa sjemenkama populacije rogača na Malom Lošinju (D=0.05, p<0.05). No bez obzira na tu činjenicu sjemenke rogača populacije Malog Lošinja su signifikantno deblje u usporedbi sa sjemenkama rogača populacije Drvenika Malog (D=0.24, p<0.001). Razlike glede tih morfometrijskih osobina ne mogu se objasniti okolišnim čimbenicima, posebno edafskim. Primarno zato jer nema signifikantnih razlika u količini fosfora u tlu i aciditetu tla (pH određen i u dest. vodi i 1M KCl) između ta dva habitata, s izuzetkom signifikantno veće količine kalija u uzorcima tla habitata s Drvenika Malog u usporedbi s tlom habitata Malog Lošinja (D=39.48 mg/100 g tla). Na osnovi iznijetog može se pretpostaviti da su razlike u morfometrijskim osobinama mahuna i sjemenki rogača tih dviju populacija primarno uvjetovani genetskim čimbenicima, što bi trebalo biti potvrđeno analizama DNA izolirane iz listova.

Ključne riječi: rogač, *Ceratonia siliqua*, morfometrijske osobine, okolišni uvjeti, genetski čimbenici

sa2016_a0314

Comparison of morphological characteristics of carob tree (*Ceratonia siliqua* L.) pods and seeds of populations collected from two different habitats, islands Drvenik Mali and Mali Lošinj

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Abstract

It is well-known that carob tree (*Ceratonia siliqua* L.) is not overspread in Croatian north Adriatic islands and coast. Moreover, it is hardly possible to find spontaneous (not planted) trees of *Ceratonia siliqua* northern from the island of Dugi Otok and Zadar coast. However, during the first research year of research project TEUCLIC (acronym for: Taxonomy, Ecology and Utilization of Carob tree and Bay Laurel in Croatia) financed by Croatian Foundation for Science, we found the northernmost habitat of carob tree on the island of Mali Lošinj (basic coordinates: 44.32°N and 14.28°E). This paper deal with the results of morphometric analyses of carob tree pods and seeds of Mali Lošinj population, compared with the same analyses of carob tree population of island of Drvenik Mali placed in middle-Dalmatian archipelago (basic coordinates: 44.45°N and 16.08°E), in order to find the possible differences of most important morphological traits between these two relatively distant populations. After provided morphometric research we found smaller length and thickness of carob pods of population of Mali Lošinj in the comparison with population of Drvenik Mali, but the differences were not significant (D=2.67 and 2.28; F-test not significant, p=0.272 and 0.877, respectively). On the other hand width of carob pods of population of Mali Lošinj were significantly smaller in the comparison with population of Drvenik Mali (D=8.66, p<0.001), as well as weight and average number of seeds per pod (D=15.4 and 2.26, p<0.001, respectively). Also, we found that carob seeds of population of Drvenik Mali are significantly longer, wider (D=1.08 and 0.68, p<0.001, respectively) and also heavier in the comparison with the population of Mali Lošinj and (D=0.05, p<0.05), in spite of the fact that the seeds of population of Mali Lošinj were significantly thicker in the comparison with seeds of Drvenik Mali population (D=0.24, p<0.001). The differences between these morphometric traits cannot be explained by environmental conditions, particularly soil conditions. Primarily, because there isn't significant differences in content of phosphorous and level of soil acidity (pH determined both in distilled water as well as in 1M KCl solution) between these two habitats, with exception of significantly higher potash content in soil samples of Drvenik Mali in the comparison with soil of Mali Lošinj (D=39.48 mg/100 grams of soil). We assume that the differences in morphometric traits of carob pods and seeds between these two populations are primarily caused by genetic factors, which have to be confirmed by the analysis of genomic DNA isolated from the leaves.

Key words: carob tree, *Ceratonia siliqua*, morphometric traits, environmental conditions, genetic factors

sa2016_a0314

Udio ukupnih fenola i antioksidativna aktivnost u zrnu različitih sorti ječma i njihovom sladu

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Sažetak

Ječam je jedna od najznačajnijih žitarica na svijetu koja se uglavnom koristi u ishrani stoke i kao sirovina u proizvodnji slada. Promatrano kroz povijest, ječam je bio jedan od najranije kultiviranih usjeva i jedna od prvih žitarica koja se koristila u ljudskoj prehrani diljem svijeta. U današnje vrijeme oko dvije trećine usjeva ječma se koristi kao hrana za stoku, jedna trećina za slađenje i oko 2% za ljudsku prehranu. Uključivanjem ječma u prehranu osiguravaju se neophodna vlakna, vitamini, minerali, antioksidansi i drugi biološki aktivni spojevi koji povoljno djeluju na zdravlje ljudi. U ovom radu analizirano je devet sorti ozimog pljevičastog ječma i šest linija golozrnog ječma. Istraživanje je uključilo određivanje svojstava zrna ječma, udio β-glukana, udio ukupnih fenola i antioksidativnu aktivnost određenu DPPH (2, 2-diphenyl-1-picrylhydrazyl) metodom. Uzorci zrna ječma su oslađeni kako bi se usporedila svojstva kvalitete slada između pljevičastog i golozrnog ječma. Drugi cilj je bio procijeniti utjecaj procesa mikroslađenja na ukupne fenole u zrnu. Rezultati dobiveni u ovom istraživanju su pokazali da golozrni ječam u prosjeku ima veći udio ukupnih fenola i veću antioksidativnu aktivnost određenu DPPH metodom u usporedbi s pljevičastim ječmom. Postupak mikroslađenja je utjecao na povećanje udjela ukupnih fenola i antioksidativne aktivnosti u zrnu slada u odnosu na zrno ječma, ali je to povećanje variralo između uzoraka. Linije golozrnog ječma su u prosjeku imale veći udio proteina, škroba, β-glukana, ekstrakta slada i veće vrijednosti viskoznosti sladovine, ali i niži Kolbach-ov indeks i friabilnost slada u usporedbi s pljevičastim sortama ječma.

Ključne riječi: ječam, slađenje, udio ukupnih fenola, antioksidativna aktivnost, β-glukan

sa2016_a0315

Total phenolic content and antioxidant activity of different barley varieties and their malts

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Abstract

Barley is one of the world's most important cereal crops, used mostly as feed for animals and raw material in the production of malt. Historically, it was one of the first cultivated grains and one of the earliest cereals to feature in the human diet in many parts of the world. In recent times, about two-thirds of the barley crop has been used as feed for animals, one-third for malting and about 2% for human food directly. Food barley provides dietary fibres, vitamins, minerals, antioxidants and other phytochemicals having valuable health benefits. In this study nine hulled and six hull-less barley varieties were evaluated for their grain characteristics, β-glucans, total phenolic contents (TPC) and corresponding antioxidant activities determined by 2, 2-diphenyl-1-picrylhydrazyl radical (DPPH) scavenging method. Samples were malted to compare malt quality properties between hulled and hull-less types of barley and to estimate the influence of malting process on total phenolics. The results showed that hull-less barley varieties had in average higher total phenolic content and DPPH radical scavenging activity when compared to hulled malting varieties. Malts were found to have higher total phenolics and antioxidant activity than their corresponding barleys, but the increase varied. Hull-less barley lines had in average higher protein, starch, β-glucan, malt extract content and wort viscosity, but lower Kolbach Index and malt friability when compared to hulled varieties.

Key words: barley, malting, total phenolic content, antioxidant activity, β-glucan

sa2016_a0315

Inovativno oplemenjivanje pšenice – brza fenotipizacija i selekcija potpomognuta DNA biljezima

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Sažetak

Kisela tla (pH < 5.5) su uslijed toksičnosti aluminija i nepristupačnosti hranjiva, ponajviše fosfora, jedan od najvažnijih ograničavajućih faktora u poljoprivrednoj proizvodnji, pogotovo u proizvodnji žitarica. Najučinkovitije rješenje problema uzgoja kultura na kiselim tlima je oplemenjivanje sorata s ciljem povećanja tolerantnosti na toksičnost aluminija i efikasnijeg usvajanja i iskorištenja fosfora. Cilj projekta "Inovativno oplemenjivanje pšenice – brza fenotipizacija i selekcija potpomognuta DNA biljezima" je stvoriti brzu i inovativnu platformu za oplemenjivanje pšenice korištenjem suvremenih metoda fenotipske analize uz pridruživajuće kartiranje upotrebom različitih sustava biljega DNA. Fenotipska analiza obuhvaća digitalnu analizu fotografija korijena 100 sorata i oplemenjivačkih linija pšenice uzgojenih na kontinuirano vlaženom filter papiru, sa simuliranim uvjetima u kiselom tlu, pri čemu su tretmani povećana koncentracija aluminija i smanjena koncentracija fosfora primijenjeni u obliku hranjivih otopina. Za genotipizaciju će biti korišteno 40 biljega SSR kao i čip biljega SNP veličine 15k, te će se pridruživajućim kartiranjem pokušati identificirati genomske regije povezane sa odgovorom korijena na uvjete u kiselim tlima. Ovdje će biti predstavljeni rezultati SSR analize 100 sorata i oplemenjivačkih linija pšenice, koji će u pridružujućem kartiranju biti korišteni za procjenu matrice populacijske strukture i srodnosti (QK model).

Ključne riječi: pšenica, struktura populacija, kisela tla, DNA biljezi, kartiranje pridruživanjem

sa2016_a0316

Innovative wheat breeding – fast phenotyping and DNA marker assisted selection

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Abstract

Acid soils (pH < 5.5) are, due to aluminium toxicity and inaccessibility of nutrients, namely phosphorus, one of the most important limiting factors in agricultural production, especially for cereals. The most efficient way out for agricultural production on acid soils is breeding of cultivars with increased tolerance to Al toxicity as well as better P uptake and use efficiency. The aim of the project "Innovative wheat breeding – fast phenotyping and DNA marker assisted selection" is to create a fast and innovative wheat breeding pipeline through the use of the state of the art phenotyping methods coupled with an association mapping approach. For phenotyping, digital image analysis of root photographs of 100 seedlings of wheat cultivars and breeding lines grown on filter paper in hydroponics simulating acid soil conditions with increasing Al and decreasing P contents as treatments will be conducted. Genotyping will be conducted using 40 SSR markers and a 15K SNP array. Association mapping approach will be used for the detection of the genome regions associated with root traits. We will present here the results of SSR genotyping of 100 wheat cultivars and breeding lines. These results will be used for the estimation of population structure and familial relatedness in the QK mixed-model association-mapping approach.

Key words: wheat, root traits, hydroponics, DNA markers, association mapping

sa2016_a0316

Vrn geni u hrvatskom sortimentu pšenice

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Sažetak

Niske temperature, u određenim fazama razvoja žitarica, potrebne su kako bi došlo do klasanja i formiranja zrna i u konačnici ostvarivanja visokih prinosa. Na molekularnoj razini, duljina razdoblja vernalizacije heksaploidnih kultivara pšenice regulirana je *Vrn* lokusima (*Vrn-1*, *Vrn-2* i *Vrn-3*). Cilj ovoga istraživanja bio je ispitati genetsku varijabilnost *Vrn-A1*, *Vrn-B1*, *Vrn-B3* te *Vrn-D1* lokusa u 23 hrvatska i 17 stranih kultivara ozime pšenice korištenjem molekularnih markera. Gen *Vrn-A1* identificiran je kao četiri različite alelne varijante. *Vrn-A1a* alel pronađen je u jednom hrvatskom kultivaru (~4%) te u dva strana kultivara pšenice (~12%). U šest hrvatskih kultivara pšenice (~26%) pronađen je *Vrn-A1b*/*Vrn-A1c* alel, dok u stranim kultivarima navedeni alel nije bio prisutan. Recesivni *vrn-A1* alel pronađen je u 16 hrvatskih kultivara (~70%) te u svim stranim kultivarima pšenice. Na *Vrn-B1* lokusu pronađen je recesivni *vrn-B1* alel u 20 hrvatskih (~87%) i 16 stranih (~94%) kultivara pšenice, dok je recesivni *vrn-B3* alel pronađen u 22 hrvatska kultivara (~96%) i svih stranih kultivara pšenice. Dominantni *Vrn-D1* alel nije pronađen u hrvatskim kultivarima pšenice, dok je kod stranih pronađen u samo jednom kultivaru (~6%). Recesivni *vrn-D1* alel pronađen je u svim hrvatskim kultivarima pšenice te u 14 stranih kultivara (~82%).

Ključne riječi: pšenica, vernalizacija, *Vrn* lokusi, molekularni markeri

sa2016_a0317

Identification of *Vrn* genes in Croatian wheat varieties

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Abstract

Low temperatures, during different developmental stages of cereals, are necessary for them in order to emerge and form kernel and finally perform high yield. At molecular level, vernalization duration in hexaploid wheat varieties is regulated by *Vrn* loci (*Vrn-1*, *Vrn-2* and *Vrn-3*). The aim of this study was to examine genetic variability of *Vrn-A1*, *Vrn-B1*, *Vrn-B3* and *Vrn-D1* loci in 23 Croatian and 17 foreign winter wheat varieties using molecular markers. The *Vrn-A1* gene was identified as four different allelic variants. The *Vrn-A1a* allele was found in one Croatian variety (~4%) and in two foreign wheat varieties (~12%). In six Croatian wheat varieties (~26%) *Vrn-A1b*/*Vrn-A1c* allele was identified, while in foreign wheat varieties mentioned allele was not present. The recessive *vrn-A1* allele was found in 16 Croatian varieties (~70%) and in all foreign wheat varieties. At *Vrn-B1* locus, a recessive *vrn-B1* allele was found in 20 Croatian (~87%) and 16 foreign (~94%) wheat varieties, while a recessive *vrn-B3* allele was found in 22 Croatian varieties (~96%) and in all foreign wheat varieties. The dominant *Vrn-D1* allele was not found in any of Croatian wheat varieties, while it was found in one foreign variety (~6%). The recessive *vrn-D1* allele was identified in all Croatian varieties and in 14 foreign wheat varieties (~82%).

Key words: wheat, vernalisation, *Vrn* loci, molecular markers

sa2016_a0317

Pregled sortimenta pšenice i zahtjevi tržišta u pogledu uspostave post-registracijskih sortnih pokusa

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Sažetak

Nestabilnost poljoprivredne proizvodnje uzrokovana proizvodnim uvjetima u smislu variranja kvalitete poljoprivrednih proizvoda dovodi do situacije u kojima niti poljoprivredni proizvođači niti prateća industrija ne mogu u potpunosti zadovoljiti svoja očekivanja i potrebe. U tržišnom poslovanju sa postavljenim okvirima vrijednosti proizvedenih roba poljoprivredni proizvođači u određenim situacijama nađu se u podređenom položaju bez obzira na uložena sredstva u proizvodnom ciklusu. U takvim situacijama, proizvođaču je prilikom planiranja proizvodnje potrebno osigurati što više relevantnih informacija kako bi upravljajući njima donio najbolje poslovne odluke prije pokretanja proizvodnje. Na Sortnoj listi Republike Hrvatske trenutno je upisano 140 sorti pšenice, te na Zajedničkom katalogu sorata poljoprivrednih biljnih vrsta Europske unije je 2169 sorti pšenice. Post-registracijski sortni pokusi pšenice i drugih za Hrvatsku važnih biljnih vrsta, regionalnog karaktera, uvelike bi poljoprivrednim proizvođačima olakšali izbor sortimenta prilikom pokretanja proizvodnje na određenom području s obzirom na zahtjeve i potrebe industrije koja bi taj proizvod koristila.

Ključne riječi**:** pšenica, sortiment, tržište, industrija, pokusi

sa2016_a0318

Overview of wheat assortment and market requirements in terms of establishing a post-registration variety trials

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Abstract

The unstable agricultural production caused by production conditions in terms of the variation of quality of agricultural products leads to a situation in which neither farmers nor related industry cannot fully meet their expectations and needs. In a market business with value requirements of produced goods, agricultural producers in certain situations may find themselves in a subordinate position, regardless of the funds invested in the production cycle. In such situations, it is necessary to provide as much relevant information to the producer while planning production for bringing the best business decisions before starting production. On the Variety List of the Republic of Croatia, there are currently 140 varieties of wheat, and on the European Union Common Catalogue of Varieties of Agricultural Plant Species there are 2169 wheat varieties. Post-registration variety trials of wheat and other important crops of Croatia with regional character, would largely help to agricultural producers to select varieties when starting production in a particular production area with regard to the requirements and needs of the industry which would use that product.

Key words: wheat, assortment, market, industry, trials

sa2016_a0318

Ekonomski aspekti proizvodnje merkantilne pšenice zasnovane farmerovim i certificiranim sjemenom

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Sažetak

Tijekom 2014./2015. godine obavljeno je istraživanje o visini prinosa i ekonomskoj isplativosti proizvodnje merkantilne pšenice sorte Kraljica sjetvom dvije varijante certificirano i farmerovo sjeme u tri repeticije. Pokus je postavljen po split-plot shemi u HCPHS - Zavodu za sjemenarstvo i rasadničarstvo u Osijeku (N 45°31´, E 18°40´) uz primjenu standardne agrotehnike za pšenicu. Uzimajući u obzir agrotehničke mjere koje se koriste, uz pomoć tablica i grafikona dana je analiza čimbenika i usporedba isplativosti proizvodnje merkantilne pšenice sjetvom certificiranog i farmerovog sjemena u Hrvatskoj po hektaru, kako bi se odredila najpogodnija odnosno najisplativija varijanta za proizvodnju merkantilne pšenice.

Ključne riječi: pšenica, certificirano sjeme, farmerovo sjeme, isplativost i prinos

sa2016_a0319

Economic aspects on wheat production with farmer and certified seed

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Abstract

During 2014/2015 the research was conducted on the amount of yield and economic viability of the production of commercial wheat varieties Kraljica sowing two varieties certified and farmers seed in three repetitions. The experiment was set in a split-plot design in HCPHS – Institute for seed and seedlings in Osijek (N 45°31´, E 18°40´) using standard practies for wheat. Taking into account the agrotechnical measures are usedwith the help of tables and charts on the analysis of the factors of production and the comparision of profitability of commercial wheat sowing certified and farmer seeds per hectare in Croatia, in order to determine the most appropriate and most cost-effective option for the production of wheat production.

Key words: wheat, certified seed, farmers seed, profitability and yield

sa2016_a0319

Desetogodišnje klimatske varijacije i kvaliteta pšenice: utjecaji i reakcije

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Sažetak

U radu je ispitana varijabilnost kvalitete 24 kultivara pšenice uzgojenih na Poljoprivrednom institutu Osijek u periodu 2005.-2014. Za isti period su uspoređeni klimatski uvjeti. Parametri kvalitete pšenice su značajno pod utjecajem genotipa i okoline. Između agronomskih svojstava najveći koeficijent varijacije je imao urod zrna (24,8 %), dok je hektolitarska masa varirala najmanje (5,4 %). Udio proteina je varirao 13,5 %, dok su omjer vlažni gluten/protein i izbrašnjavanje imali koeficijen varijacije ≤ 10.0 %. Sedimentacijska vrijednost je kao indirektni pokazatelj kvalitete varirala najviše (33,3 %). Reološka svojstva tijesta, osim upijanja vode i rastezljivosti (5,2 and 15,6 %), su u prosjeku najviše varirali (iznad 40,0 %). U zadnjem desetljeću je najniža temperature zraka zabilježena 2005. (10,4 °C), dok je 2014. bila najtoplija (12,8 °C). 2005. i 2010. su bile ekstremno kišne godine (973,7 i 1038,2 mm) dok su 2009., 2011. i 2012. bile sušnije (544,6, 422,2 i 595,3 mm). Analiza glavnih komponenti je korištene za obradu kompleksne matrice podataka. Prema dobivenim rezultatima kišne godine su se grupirale zajedno kao i sušne, što znači da su kultivari u ekstremnim godinama slično reagirali. Što se tiče grupiranja kultivara prema analiziranim svojstvima kvalitete u zadnjih 10 godina, stari kultivari U1 and Sirban Prolific, koje karakterizira kontinuirana lošija pekarska kvaliteta u odnosu na modernije sorte, su grupirane zajedno dok je Divana kao hrvatski poboljšivač također jasno odvojena od drugih kultivara.

Ključne riječi: pšenica, kvalitet, klimatski uvjeti, varijabilnost

sa2016_a0320

Ten-year climate variation and wheat quality: impacts and responses

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Abstract

Variability of quality for 24 wheat cultivars grown at the Agricultural Osijek in period 2005-2014 was evaluated. For the last decade the climatic conditions were compared. Wheat quality properties are strongly influenced by genetic and environments. Among agronomic properties yield had the highest coefficient of variation (24.8 %), while hectolitre weight varied the least (5.4 %). Protein content varied 13.5 %, while wet gluten/protein ratio and flour yield had coefficient of variation ≤ 10.0 %. Sedimentation value as indirect quality parameter varied the most (33.3 %). Dough rheological properties, except water absorption and extensibility (5.2 and 15.6 %, respectively), were the most variable (above 40.0 % in average). In the last decade, the lowest average temperature was noticed in 2005 (10.4 °C), while 2014 was the warmest (12.8 °C). In the last decade 2005 and 2010 were extremely rainy (973.7 and 1038.2 mm, respectively) while 2009, 2011 and 2012 were dry years (544.6, 422.2 and 595.3 mm, respectively). Principal component analysis and classification statistical analysis were used for processing complex data matrix and obtained results showed those rainy years are grouped together as well as dry years, meaning that cultivars very similar reacted to unfavourable weather conditions during extreme years. Several cultivars clusters regarding their quality properties obtained in the last decade were noticed. Old cultivars U1 and Sirban Prolific, with continuous poorer quality properties during last decade compared to modern cultivars, were grouped together, while cultivars Divana as Croatian bread improver was also clearly separated from others.

Key words: wheat, quality, climatic conditions, variability

sa2016_a0320

Učinak genotipa, okoline, razine dušika i njihovih interakcija na agronomska svojstva i svojstva kvalitete ozime pšenice

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Sažetak

Cilj istraživanja bio je utvrditi učinak genotipa (G), okoline (E), razine dušika (N) i njihovih interakcija na agronomska svojstva i svojstva kvalitete ozime pšenice. Provedeno je trogodišnje ispitivanje sa 19 genotipova ozime pšenice (*Triticum aestivum* L.) širokog raspona prinosa i kvalitete zrna, posijanih u osam okolina uz dvije primjenjene razine dušika: 80 kgN/ha i 180 kgN/ha. Analiza varijance provedena je kombinirano kroz gnojidbe i okoline. Za sva agronomska svojstva, izvori varijabilnosti G, E i N (osim N za masu 1000 zrna), bili su značajni. Signifikantnost interakcija G×E, G×N, N×E i G×N×E, a time i razina njihovog učinka na ekspresiju nekog svojstva, varirala je od svojstva do svojstva. Za prinos zrna, udio okoline u ukupnoj sumi kvadrata bio je za 3.5 puta veći od udjela genotipa (43.6% vs. 12.3%) i tri puta veći u odnosu na interakciju GxE. Kod svih indirektnih pokazatelja kvalitete, udio genotipa u ukupnoj sumi kvadrata bio je veći od udjela okoline i kretao se u rasponu od 25.2% (sadržaj proteina) do 67.8% (gluten indeks), osim za padajući broj na koji je najveći utjecaj imala okolina (37.7%). Kod svih farinografskih svojstva (osim za grupu kvalitete i razvoj tijesta), kao i za sva ekstenzografska svojstva, udio genotipa u ukupnoj sumi kvadrata bio je veći od udjela okoline, dušika i interakcije GxE. Rezultati provedenog istraživanja omogućuju nam bolji uvid u stabilnost agronomskih svojstava i pokazatelja kvalitete ozime pšenice.

Ključne riječi: ozima pšenica, dušik, prinos, kvaliteta, reologija

sa2016_a0321

Effect of genotype, environment, nitrogen and their interaction on agronomic and quality traits of winter wheat

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Abstract

The aim of the study was to determined effect of genotype (G), environment (E), nitrogen levels (N) and their interaction on agronomic and quality traits of winter wheat. A tree-year trails included 19 genotypes of winter wheat (*Triticum aestivum* L.) a wide range of grain yield and grain quality, planted in eight environments with two nitrogen levels: 80 kgN/ha and 180 kg N/ha. Analysis of variance was conducted over fertilization levels and environments. For agronomic traits, source of variability G, E and N, except N for 1000 kernel weight, were significant. The significance of interactions (G×E, G×N, N×E i G×N×E) and their effect on the expression of some properties, varied from properties to properties. For grain yield, the proportion of the E in the total sum of squares was 3.5 times higher than the proportion of G (43.6% vs. 12.3%) and three times higher compared to G×E. For all indirect parameters of quality, the proportion of G in the total sum of squares was higher than the proportion of E and ranged from 25.2% (grain protein content) to 67.8% (gluten index), except for the falling number on which the greatest influence had E (37.7%). For farinograph indicators (except for quality group and dough development time) and also for all extensograph indicators, the proportion G in the total sum of squares was higher than proportion E, N and G×E. The results of this study allow us better insight into the stability of the agronomic and quality traits of winter wheat.

Key words: winter wheat, nitrogen, yield, quality, rheology

sa2016_a0321

Procjena heritabilnosti za otpornost na fuzarijsku palež klasa ozime pšenice

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Sažetak

U oplemenjivačkom programu ozime pšenice Bc Instituta d.d. svake godine provodi se ispitivanje elitnih oplemenjivačkih linija na otpornost na fuzarijsku palež klasa (FHB). Najboljih 18 linija zajedno sa standardima (Lucija, Poncheau, Renan, Roazon i Žitarka), posije se u poljskom pokusu postavljenom po RCBD shemi sa četiri ponavljanja. Primjenjuju se tri metode infekcije: spray metoda, metoda infekcije sa zaraženom stabljikom kukuruza i prirodna metoda infekcije. Otpornost materijala ocjenjuje se pomoću dvije standardne ocjene, vizualnim indeksom (VRI) i % zrna zaraženog fuzarijumom (FDK). Statistička analiza napravljena je svake godine zasebno, dok je za pet standardnih kultivara napravljena kombinirana analiza preko godina. Genotpovi, metode infekcije i godine modelirane su pomoću procedure PROC GLM u SAS/STAT statističkom programu. Komponente varijance procijenjene su pomoću procedure PROC VARCOMP. Svake godine je za tri metode infekcije i dvije ocjene otpornosti izračunata ponovljivost pokusa, dok je za standardne kultivare izračunata heritabilnost za otpornost na FHB (h^2). Rezultati upućuju na to da je spray metoda infekcije najpouzdanija za izazivanje umjetne infekcije. Najveća h^2 za obje ocjene otpornosti (0.84 za VRI i 0.78 za FDK) izračunata je za spray metodu infekcije, dok je najmanja (0.24 i za VRI i za FDK) izračunata u uvjetima prirodne infekcije, sto upućuje na nužnost provodenja umjetne infekcije u selekcijskim pokusima na otpornost prema FHB.

Ključne riječi: ozima pšenica, fuzarijska palež klasa, otpornost, umjetna infekcija, heritabilnost

sa2016_a0322

Heritability estimates for resistance to Fusarium head blight in winter wheat

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Abstract

Each year Bc Institute d.d. performs screening of it's most improved winter wheat breeding lines for Fusarium head blight (FHB). The 18 best breeding lines and five standards (Lucija, Poncheau, Renan, Roazon, Žitarka) are planted in field trials under three FHB infection methods (spray method, deployment of Fusarium infected corn stalks and natural infection). Disease severity ratings are scored as visual rating index (VRI) and % of Fusarium damaged kernels (FDK). In the present study, results obtained from 2011 to 2014 were presented. Genotypes, methods of infection and years were modelled using the PROC GLM in SAS/STAT. Components of variance were estimated using the PROC VARCOMP. Each year, for all methods of infection and both disease ratings, repeatebility of trials was calculated, while for the five standard cultivars a broad sense heritability (h^2) for disease resistance was calculated. Among the cultivars significant differences for FHB resistance were found for all methods of infection and both disease ratings except for FDK under conditions of natural infection. The highest FHB severity scored both as VRI and FDK was observed using the spray method of infection. The highest h^2 for both disease ratings (0.84 for VRI and 0.78 for FDK) was observed using the spray method of infection, while the smallest (0.24 for both VRI and FDK) was observed under conditions of natural infection, confirming the necessity for performing artificial infection in FHB selection trials.

Key words: winter wheat, Fusarium head blight, resistance, artificial infection, heritability

sa2016_a0322

Agronomske karakteristike sortimenta ozimog i jarog ječma (*Hordeum vulgare* L.) kroz oplemenjivačke cikluse

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Sažetak

Oplemenjivanje ječma (*Hordeum vulgare* L) *pedigree* metodom, koja dominira u programu Poljoprivrednog instituta Osijek (PIO) i dalje daje dobre rezultate, gdje su isti slabo vidljivi radi relativno dugog perioda selekcije. Promatranjem agronomskih svojstava PIO sortimenta priznatog od 1970.-ih godina do danas, moguće je zorno prikazati napredak cjelokupnog oplemenjivačkog programa ozimog i jarog ječma. U tu je svrhu izdvojeno po četiri grupe ozimih i jarih sorata ječma, što ukupno iznosi 72 priznate sorte uključene u ovo istraživanje tijekom dvije godine (2011. i 2012.). Poljski pokus je postavljen na lokaciji PIO (45°31'54 N, 18°45'18 E) u tri ponavljanja, prema dizajnu *α-lattice*. Istraživani parametri su: urod zrna (t/ha), hektolitarska masa zrna (kg), visina stabljike (cm) i polijeganje (%). Analiza varijance (ANOVA) za spomenuta svojstva upućuje na statistički opravdanu razliku (P<0,01) što se ozimih ječmova tiče i to po svim izvorima varijabilnosti, osim kod svojstva polijeganja u interakciji s genotip×godina (G×Y) gdje je prag značajnosti na razini P<0,05. ANOVA kod jarih ječmova pokazuje značajnost na razini P<0,01 za sve izvore varijabilnosti, osim kod svojstva uroda zrna u interakciji s G×Y koja nije signifikantna i svojstva hektolitarske mase zrna u istoj interakciji (P<0,05). Analiza oplemenjivačkih ciklusa oba sezonalna tipa ječma pokazuje napredak svih promatranih svojstava, što je u manjoj mjeri vidljivo kod hektolitarske mase zrna, dok je cjelokupni napredak kroz cikluse nešto jače izražen kod ozimog sezonalnog tipa.

Ključne riječi: ječam, sezonalni tip, oplemenjivanje, sorta, svojstva

sa2016_a0323

Agronomic characteristics of winter and spring barley (*Hordeum vulgare* L.) varieties through breeding cycles

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Abstract

Breeding barley (*Hordeum vulgare* L) with *pedigree* method which is predominantly used in Agricultural Institute Osijek (AIO) programme, still allows for good results. However, these results can be vague due to relatively long selection period. Through observation of agronomic traits of AIO varieties recognized from 1970 till today it is possible to show the advancement of the winter and spring barley breeding programme in its entirety. With said purpose four groups of winter and spring barley varieties were set which makes a total of 72 released varieties included in this research. Field trials were set up during two years (2011 and 2012) at AIO location (45°31'54 N, 18°45'18 E) in three repetitions embedded within the *α-lattice* design. Research parameters are: grain yield (t/ha), hectolitre weight (kg/hl), stem height (cm) and lodging (%). Analysis of variance (ANOVA) for said traits shows statistically significant difference ($P<0.01$) considering winter barley throughout all sources of variability, except with lodging trait interacting with genotype×year (G×Y) where we had $P<0.05$ significance. ANOVA within spring barley varieties also shows significant difference among all sources of variability, except for grain yield interacting with G×Y (not significant) and hectolitre weight trait within the same interaction had $P<0.05$. Breeding cycle analysis of both seasonal types of barley showed a significant increase among all traits but less with the hectolitre weight trait. Cumulative progress through breeding cycles is also more expressive with winter barley varieties.

Key words: barley, seasonal type, breeding, variety, traits

sa2016_a0323

Promjena kemijskog sastava zrna i antioksidacijske aktivnosti *shrunken* genotipova kukuruza šećerca tijekom dozrijevanja

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Sažetak

Tijekom dozrijevanja kukuruza šećerca dolazi do brze promjene kvalitete zrna. Kvalitetu pretežito određuje sadržaj vode i šećera u zrnu, međutim, u novije se vrijeme sve veća pozrnost daje antioksidacijskim spojevima. Ciljevi ovoga rada bili su analizirati kemijski sastav zrna genotipova kukuruza šećerca tijekom dozrijevanja i utvrditi korelacije između ispitivanih parametara. Devet *shrunken* hibrida kukuruza šećerca ispitivano je u 2013. i 2014. godini. Kemijski sastav zrna analiziran je pet puta (20, 23, 26, 29 i 32 dana nakon oplodnje) a određeni su sadržaj vode, ukupni šećeri, karotenoidi i polifenoli te antioksidacijska aktivnost redukcijom DPPH radikala. Dobiven je visoko opravdan učinak godine, genotipa, dana berbe i interakcije genotip x dan berbe na sadržaj vode, šećera, karotenoida i polifenola. Na antioksidacijsku aktivnost visoko opravdan učinak imali su godina i dan berbe. Od prvog do zadnjeg dana berbe, prosječno kroz godine i hibride, smanjio se sadržaj vode (od 76,17% na 70,29%) i šećera (od 30,27% na 17.98%) a povećali su se sadržaj karotenoida (od 130,02 mg/g na 220,16 mg/100g), fenola (od 267,05 na 305,15 mg GEA/100g) i antioksidacijska aktivnost (od 318,45 na 365,25 mg GEA/100g). Utvrđena je opravdana pozitivna korelacija između antioksidacijske aktivnosti i karotenoida (r=0,51), te između antioksidacijske aktivnosti i polifenola (r=0,39). Karotenoidi u zrnu bili su u opravdanoj negativnoj korelaciji s vodom (r=- 0,73) i šećerima (r=-0,83). Izdvojeni su hibridi kukuruza šećerca s visokim sadržajem šećera, karotenoida i polifenola u zrnu.

Ključne riječi: kukuruz šećerac, hibridi, kemijski sastav zrna, antioksidacijska aktivnost

sa2016_a0324

Changes in phytochemical composition and antioxidant activity in *shrunken* sweet corn genotypes during maturation

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Abstract

Sweet corn kernel quality changes rapidly during maturation. The quality is usually associated most with the kernel water and sugar content. Nowadays there is more importance of antioxidant compounds, such as polyphenolics and carotenoids, which may have health benefits. The objectives of this study were to evaluate the phytochemical composition in sweet corn genotypes at five subsequent harvest dates and to determine the correlations among evaluated traits. Nine *shrunken* sweet corn hybrids were evaluated in 2013 and 2014. Data were recorded 20, 23, 26, 29 and 32 days after pollination (DAP) for kernel water (W), total sugars (TS), total carotenoids (TC), total phenolic (TP), and antioxidant activity (AA) by DPPH free-radical-scavenging assays. Significant effects ($P \leq 0.01$) of environment, genotype, harvest date and genotype x harvest date interaction were obtained for kernel W, TS, TC and TP. For AA significant ($P \leq 0.01$) were effects of environment and harvest date. In average, accros years and hybrids, from first to last harvest date W decreased from 76.17% to 70.29%, TS decreased from 30.27% to 17.98%, TC increased from 130.02 mg/g to 220.16 mg/100g, TP increased from 267.05 to 305.15 mg GEA/100g and AA increased from 318.45 to 365.25 mg GEA/100g. Significant correlations between AA and TC and between AA and TP were obtained for 29 DAP ($r=0.51$ and $r=0.39$, respectively). A significant negative correlation was observed between kernel W and TC and between TS and TC ($r=-0.73$ and $r=-0.83$, respectively). Hybrids with the highest TS, TC and TP were identified.

Key words: sweet corn, hybrids, phytochemical composition

sa2016_a0324

Correlation between seed width and seed mass of the common bean (*Phaseolus vulgaris* L.)

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Abstract

Determination of a correlation between quantitative and qualitative traits in cultivated plants is very useful in selective genetics for data gathering and potential new sorts breeding. In our research we studied such as co-relation in seeds of common bean (*Phaseolus vulgaris* L.).

For this purpose, seeds of four new hybrids of the common bean (*Phaseolus vulgaris* L.), which were domestically bred in Kazakhstan, were subjected to morphometric analysis for following parameters: seed length, seed width, and 100-, 200-, 300-seed weights. Besides this, all received data were subjected to statistical analysis and inscribed in a table as mean values ± standard deviation. Then, obtained values were inscribed in bar charts. Each bar chart corresponded to each studied parameter and each bar corresponded to each hybrid. All hybrids were positioned in the same order in all bar charts. Eventually, all bar charts were compared to each other and analyzed.

The results revealed that seed width- and seed weight- bar charts were almost ident, while seed length- and seed weight- bar charts had significant differences. Especially as Hybrid No.2 had bigger rates for seed mass and seed width than Hybrid No.1, whereas Hybrid No.2 had lower rate for seed length than Hybrid No.1. However, Hybrid No. 3 had bigger rates for all parameters than Hybrid No.2, and Hybrid No.4 had bigger rates for all parameters than Hybrid No. 3.

According to obtained results, there were an obvious positive co-relation between seed width and seed mass. Significant difference between seed weight- and seed length- bar charts can be explained by the assumption, that there is still a positive co-relation between seed weight and seed length, but it is weaker than co-relation between seed weight and seed width, or this co-relation is not always expressible.

Key words: common bean (*Phaseolus vulgaris* L.), correlation, hybrid, bar chart, bar

sa2016_a0325

New hybrids of the common bean (*Phaseolus vulgaris* L.) are bred and statistically analyzed.

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Abstract

Four new unique hybrids of the common bean (*Phaseolus vulgaris* L.) namely; "Dzhungarskaya", "Aktatti", "Nazym (southern plot)" and "Nazym (northern plot)", which have been domestically bred, as foreign accessions received from EU countries, Asia, Russia and USA, under the sharply continental conditions of Kazakhstan in high-mountain zone of Almaty region, were studied in our research to reveal a potential of using these new hybrids in food or in further breeding.

For this reason, some seed quantitative and qualitative traits (seed length, seed width and 100-, 200-, 300-seed weights) were measured 3 times for each hybrid. Results were subjected to statistical analysis and then inscribed in a table as mean values ± standard deviation.

Obtained results revealed, that all studied hybrids possess high proximate mass rate (50.03±0.22g/ 100 seeds ("Dzungars-kaya"), 55.31±0.77g/ 100 seeds ("Aktatti"), 78.19±1.85g/ 100 seeds ("Nazym" south.) and 73.49±1.29g/ 100 seeds ("Nazym" north.)). Especially hybrid "Nazym" (south.), which surpasses other studied hybrids for all measured parameters. Hybrid "Nazym" (south.) also had bigger variation and higher deviation of mean values than other hybrids.

Summing up the results, we came to the conclusion, that all four studied new hybrids have high potential to be used in food due to their high proximate mass rate, especially hybrids "Nazym" (south.) and "Nazym" (north.). The high variation and deviation of mean values in hybrid "Nazym" (south.) means that this hybrid has high variability inside its hybrid population, and all seeds can be divided into bigger- and smaller- seed populations. This can be used for obtaining of new hybrids, smaller- and bigger- seeds cross-breeding.

Key words: common bean (*Phaseolus vulgaris* L.), hybrid, breeding, quantitative traits, qualitative traits

sa2016_a0326

Croatian 51 Sa 11 International Symposium on Agriculture
2016

Section 4

Book of Abstracts

Vegetable Growing, Ornamental, Aromatic and Medicinal Plants

51 Hrvatski
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Zbornik sažetaka

Povrćarstvo, ukrasno, aromatično i ljekovito bilje

Valorizacija Alepskog bora (*Pinus halapensis*) na zelenim površinama grada Šibenika

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Sažetak

Alepski bor (*Pinus halapensis* L.) se koristio u pošumljavanju krša šibenske regije od sredine 19. stoljeća, zbog čega se često javlja u ranije zasnovanim parkovima. U zadnja dva desetljeća Alepski bor se znatno manje koristi u krajobraznom oblikovanju. U novije vrijeme u sustavu gradskog zelenila uglavnom ga je zamijenio bor pinija (*Pinus pinea* L.) koji uzgojno i kulturološki nije vezan za ovo područje. Alepski bor je simbol mediteranskog krajobraza, te ga je potrebno sustavno i pažljivo koristiti i u budućem oblikovanju parkova, vrtova i zelenih površina. Ima dekorativno deblo, listove i češere te interesantni oblik krošnje. Cijena odraslih sadnica nije velika, pa predstavlja važan čimbenik za odabir alepskog bora za primjenu u parkovnom uređenju. Upravo zbog poznatih dekorativnih karakteristika i kulturološke vrijednosti, istraživanje je imalo za cilj krajobraznu valorizaciju, inventarizaciju i predočenje estetske ocjene zelenih površina s alepskim borom. U tu svrhu provedena je taksonomska analiza zelenih površina s alepskim borom. Floristično i anketno istraživanje je provedeno tijekom 2013. godine na području grada Šibenika. Obzirom na tip habitusa, po Erhardtu i sur. (2002) dominiraju grmolike forme i alohtone dendrološke svojte. Prema geografskom podrijetlu najviše su zastupljene vrste azijskog podrijetla. Temeljem rezultata istraživanja vizualnog geštalta, putem anketnog ispitivanja, zaključuje se da ispitanici ugodno doživljavaju parkovne prostore s alepskim borom.

Ključne riječi: alepski bor, Šibenik. valorizacija, estetska vrijednost, zelene površine

sa2016_a0401

Valorisation of Aleppo pine (*Pinus halapensis*) on green spaces of the city of Šibenik

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Abstract

Aleppo pine (*Pinus halapensis* L.) has been used for the afforestation of karst throughout the Šibenik region since the mid-19th century, hence this species can be frequently found in the previously established parks. In the last two decades, Aleppo pine was much less used in landscape design. In recent years, in the system of urban greenery, Aleppo pine is mostly replaced with the Stone pine (*Pinus pinea* L.) whose breeding and culture is not tied to this region. Aleppo pine is a symbol of the Mediterranean landscape, and it is necessary to use it systematically and carefully in shaping the future of parks, gardens and green spaces. Aleppo pine has a decorative tree trunk, leaves, cones and interesting foliage shape. Price of adult plant is not high, so it is an important factor in choosing a pine for use in park planning. Primarily due to well-known decorative features and the cultural value of Aleppo pine, this paper is aiming to conduct landscape valorisation, inventorisation aesthetic evaluation of green spaces covered in Aleppo pine. Floristic and survey study was conducted during 2013 in the city of Šibenik. Consequently a taxonomic analysis of green spaces covered in Aleppo pine has been conducted. Concerning the habitus type according to Erhardt et al. (2002), shrub-like growth forms and allochthonous dendrological species are predominant. According to geographical origin, the most common species are those of Asian origin. Based on the results of research on the visual gestalt, as well as following a survey conducted, the conclusion has been reached that the respondents' experience of park areas covered in Aleppo pine has been extremely pleasant.

Key words: Aleppo pine, Šibenik, valorisation, aesthetic value, green spaces

sa2016_a0401

Fiziološki učinak folijarne primjene apscizinske kiseline (ABA) na presadnice paprike

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Sažetak

Biljke su često izvrgnute stresu uzrokovanom uvjetima okoliša i te informacije koriste kako bi modulirale obrasce rasta i razvoja. Promjene u rastu i razvoju uzrokovane abiotičkim stresovima nazivamo kaljenje, a proces se potencijalno može izazvati i primjenom abscisinske kiseline (ABA). Kako bi testirali učinkovitost duge, u odnosu na kratku, primjenu ABA na fiziološke procese presadnica paprike (*Capsicum annuum* L.), folijarno je primijenjena ABA u koncentraciji 0, 0,1 ili 1,0 mM kroz 5, 10 ili 15 uzastopnih dana. Reducirajući učinak ABA na A_{CO2} u usporedbi s kontrolom utvrđen je nakon 5 dana izlaganja ABA-i pri 1,0 mM te nakon 15-dnevnog izlaganja ABA-i pri 0,1 mM i 1,0 mM ABA. Potvrđena je sposobnost biljaka da brzo povrati fotosintetsku aktivnost, jer nakon perioda oporavka nije bilo učinka ABA-e bez obzira na tretman. Slično kao kod A_{CO2}, g_s (provodljivost puči) je naglo opala s vremenom te je zabilježena značajna interakcija između koncentracije i broja dana primjene ABA. Koncentracija međustaničnog CO_2 također se smanjila s vremenom, ali u manjoj mjeri nego A_{CO2} i g_s. Veći vodni potencijal lista opažen je kod presadnica paprike tretiranih s ABA u odnosu na kontrolu. Sedamnaest dana nakon početka eksperimenta, broj puči na gornjoj i donjoj strani lista bio je manji pri 1,0 mM u odnosu na 0,1 mM ABA, bez obzira na broj dana primjene. Naši rezultati pokazuju kako bi primjena ABA u kaljenju presadnica mogla imati praktične primjenu u hortikulturi.

Ključne riječi: fotosinteza, broj puči, *Capsicum annuum*, provodljivost puči, vodni potencijal

sa2016_a0402

Physiological response of bell pepper seedlings to foliarly applied abscisic acid (ABA)

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Abstract

Plants perceive environmental stress and use the information to modulate their regular pattern of development. Altered responses to abiotic stresses are referred to as acclimation or hardening and these responses can potentially be enhanced by application of ABA. To investigate the efficiency of long- versus short-term ABA treatment on physiological responses of the bell pepper (*Capsicum annuum* L.) the seedlings were imposed to foliarly applied ABA at 0, 0.1 or 1.0 mM for 5, 10 or 15 consecutive days. A depressive effect of ABA on A_{CO2} compared to control was found after 5-day ABA-exposure at 1.0 mM, and after 15-day ABA-exposure at both 0.1 mM and 1.0 mM ABA. The ability of plants to quickly resume photosynthetic activity was confirmed here since no effect of ABA application was found after period of recovery regardless of treatment. Similar to A_{CO2}, g_s decreased sharply with time, and a significant interaction of ABA-rate and ABA-days of exposure was observed. The intercellular CO_2 concentration also decreased with time but to a lesser extent than A_{CO2} and g_s. Higher leaf water potential was observed in pepper seedlings treated with ABA when compared to control seedlings. At 17 days after the beginning of the experiment, the number of stomata at both adaxial and abaxial sides was reduced at 1.0 mM ABA-rate compared to 0.1 mM ABA for each ABA-day of exposure. Our results demonstrate that the use of ABA to condition transplants could have practical horticultural applications.

Key words: photosynthesis, stomata number, *Capsicum annuum*, stomatal conductance, water potential

sa2016_a0402

Minerali i sirovi proteini u hrvatskim tradicijskim kultivarima graha

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Sažetak

Sve se više polaže pažnja na nutritivnu vrijednost hrane koja se konzumira, pa tako i na nutritivnu vrijednost povrća. Grah je zanimljiva strateška povrćarska namirnica jer nije kvarljiva, a ima visoku količinu minerala i proteina, za razliku od ostalog povrća, osobito lisnatog. Stoga, grah, uz ostale mahunarke, u Hrvatskoj i svijetu postaje sve atraktivnija namirnica. Minerali su jednako važni za biljku i čovjeka zbog svoje fiziološke uloge u metabolizmu kao aktivatori i kofaktori mnogih enzima, ali i kao sastavni dijelovi staničnih struktura. Diljem Hrvatske sakupljeno je 300 primki tradicijskih kultivara graha u svrhu utvrđivanja količine minerala i sirovih proteina kao temelj za oplemenjivanje graha s ciljem dobivanja kultivara sa što većom nutritivnom vrijednošću. Utvrđeno je da je grah, pored minerala, značajan izvor sirovih bjelančevina. Fosfor se kretao u rasponu 490-570 mg P 100 g^{-1}, kalij 1380-1550 mg K 100 g^{-1}, kalcij 320-440 mg Ca 100 g^{-1}, magnezij 170-200 mg Mg 100 g^{-1}, željezo 641,2-753,4 mg Fe 100 g^{-1}, mangan 140,9-193,1 mg Mn 100 g^{-1} te cink u rasponu 250,7-288,3 mg Zn 100 g^{-1}. Količina sirovih proteina kretala se od 19,64 do 23,2 %. Prema količini istraživanih minerala osobito su se istakli tradicijski kultivari: 'Biser' (P, Ca, Mg, Mn i Zn), 'Dan i noć' (Ca i Mg), 'Puter' (K) te 'Trešnjevac' (Fe), a prema količini sirovih proteina 'Dan i noć' te 'Kukuruzar'. Ovaj rad je financirala Hrvatska zaklada za znanost projektom UIP-11-2013-3290.

Ključne riječi: *Phaseolus vulgaris*, kultivar, minerali, povrće

sa2016_a0403

Minerals and crude proteins in Croatian traditional bean landraces

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Abstract

More attention is given to the nutritional value of food we consume, including vegetables nutritive value. Beans are an interesting strategic vegetable because they are not perishable and have a high mineral and protein content, unlike other vegetables, especially leafy. Thus, beans, among other legumes, in Croatia and the world, become increasingly attractive foods. Minerals are equally important for the plant and humans because of their physiological roles in the metabolism as activators and cofactors of many enzymes, but also as components of cell structures. Across Croatia 300 accessions of traditional bean varieties were collected in order to determine the content of minerals and crude proteins as a basis for breeding of beans in order to obtain cultivars with a greater nutritional value. It was found that beans, apart from minerals, are a significant source of crude protein. Phosphorus ranged 490-570 mg P 100 g^{-1}, potassium 1380-1550 mg K 100 g^{-1}, calcium 320-440 mg Ca 100 g^{-1}, magnesium 170-200 mg Mg 100 g^{-1}, iron 641.2-753.4 mg Fe 100 g^{-1}, manganese 140.9-193.1 mg Mn 100 g^{-1} and zinc 250.7-288.3 mg Zn 100 g^{-1}. The content of crude protein ranged from 19.64 to 23.2 %. The highest content of the studied minerals have following traditional cultivars: 'Biser' (P, Ca, Mg, Mn and Zn), 'Dan i noć' (Ca and Mg), 'Puter' (K) and 'Trešnjevac' (Fe) from the amount of crude protein 'Dan i noć' and 'Kukuruzar'. This work was funded by the Croatian Science Foundation project UIP-11-2013-3290.

Key words: bean, cultivar, minerals, vegetable

sa2016_a0403

Dinamika fosfora u travnjacima različite namjene

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Sažetak

Biogeni element fosfor ulazi u sastav fosfolipida, fosfoproteida, nukleinskih kiselina te molekula koje pohranjuju energiju. Fosfor povećava prinos i učinkovitost korištenja vode i hraniva. Fosfor se u travama (ukrasnih travnjaka) kreće u rasponu od 0,30 do 0,55 %P suhe tvari i bitan je za razvoj korijena, a indirektno i usvajanje svih hraniva. Osim na podzemni dio, fosfor utječe i na lijep i zdrav nadzemni dio trava jer je travnjak sastavni dio svake zelene površine. Tako kvaliteta travnjaka utječe i na kvalitetu i ljepotu življenja kroz sport i rekreaciju. Cilj ovog istraživanja bio je utvrditi dinamiku fosfora u tlu i listovima trava na dva rekreativna (Bundek i Jarun) i dva sportska (Hipodrom i Mladost) travnjaka grada Zagreba te odrediti adekvatnu gnojidbu. Uzorkovanje tla i biljnog materijala provedeno je 3 puta tijekom vegetacije na svakom od 4 istraživana travnjaka. Fosfor je određen spektrofotometrijski, u tlu nakon ekstrakcije amon laktat octenom kiselinom, a u biljci nakon digestije s HNO_3. Rezultati pokazuju da je stanje ishranjenosti tla fosforom vrlo slabo, a status fosfora u listovima na donjoj granici opskrbljenosti. Vrijednosti fosfora u tlu kretale su se od 1,78 do 6,78 mg P_2O_5 100 g^{-1} tla, a u biljci od 0,15 do 0,45 % P. Zbog osobito niskog statusa fosfora u tlu i biljci posebnu pažnju pri dizajniranju gnojidbe treba posvetiti prihrani fosforom te aplicirati cca. 1 g P_2O_5 m^{-2} rano u proljeće, kao i po potrebi tijekom vegetacije.

Ključne riječi: gnojidba, fosfor, hranivo, makroelement, travnjak

sa2016_a0404

Phosphorus dynamics in lawns of different purposes

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Abstract

Phosphorus increases both yield and use efficiency of water and nutrients. Phosphorus in grass (of decorative lawns) ranges from 0.30 to 0.55 %P in dry matter and is essential for the root development and indirectly the adoption of all nutrients. Except under-ground, phosphorus affects both beautiful and healthy above-ground part of the grass as the lawn is integral part of any green space. So the quality of the lawn affects the quality and beauty of life through sports and recreation. The aim of this study was to determine the dynamics of phosphorus in the soil and the grass leaves of two recreational (Bundek and Jarun) and two sports (Hipodrom and Mladost) lawns of Zagreb and determine adequate fertilization. Sampling of soil and plant material was conducted three times during the growing season in each of the 4 researched lawns. Phosphorus was determined spectrophotometrically, in the soil after extraction with ammonium lactate acetic acid, and in the plant after digestion with HNO_3. The results show that the soil phosphorus nutritional status is low, and the leaves phosphorus status is on the low limit of the supply. The values of phosphorus in the soil ranged from 1.78 to 6.78 mg P_2O_5 $100g^{-1}$ soil, and in plant from 0.15 to 0.45 % P. Due to the particularly low status of the phosphorus in the soil and plant, special attention when designing fertilization should be given to phosphorus fertilization and apply approx. 1 g of P_2O_5 m^{-2} in the early spring, and if necessary during the growing season.

Key words: fertilization, lawn, macroelement, nutrient, phosphorus

sa2016_a0404

Study on the variation of cowslip (*Primula veris*) under the two regions of the Kosovo (Dukagjini and Kosovo plane)

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Abstract

Cowslip is very important medicinal plant, because its parts, especially flowers, are widely used in the pharmaceutical industry. This study is focused on five sites of Dukagjini plane (Northern Mountains of Istog, Western Mountains of Istog, Northern Mountains of Rugova, Western Mountains of Rugova, Deçani Mountains) spread at altitudes from 1300 to 1700 m over the sea level, and five sites of Rrafshi i Kosoves plane (Radisheve, Shale e Bajgores, Kaçanik, Gollak and Artana) spread at altitudes from 500 to 999 m over the sea level. In both regions 10 cowslip plant populations were studied. About 15 bio-morphological features (indicators), such as plant height, leaf length and shape, number of leaves, flowers, flowering stalks and seeds per plant etc. were described for each population. Observed bio-morphological features show a very large variation between plant populations, depending on their habitat and altitude over the sea level. To make groups of genotypes according to their characteristics, Principal Components Analyses (PCA) method was used. This study is very important because it creates a good basis for cultivation of the best cowslip plant populations, identified by their bio-morphological and chemical features.

Key words: diversity, plant population, bio-morphological traits, PCA

sa2016_a0405

Croatian 51
2016 sa 11
International Symposium on Agriculture

Section 5

Book of Abstracts

Field Crop Production

51 Hrvatski
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Zbornik sažetaka

Ratarstvo

Land use impacts on agri-environment

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Abstract

Production of field crops has always been a main issue in the history of mankind. Agriculture and food industry are related to crop production activities. Traditionally animal husbandry and human alimentation are both based on plant products. Nowadays crop production is much more diverse concerning its fields of economic and social utility.

Agricultural production may have several targets however none of them can be independent from environmental aspects. Food produced by agricultural activities is essential for mankind, but this sustenance should never risk our sustainability. A possible definition of sustainability is that the world conservation strategy should include management of the use of a resource in a way, that it can meet human demands of the present generation without decreasing opportunities for future generations.

Sustainable agriculture should involve the successful management of agricultural resources to satisfy human needs while maintaining or enhancing the quality of the environment and conserving natural resources. Agriculture requires many resources - land, water, energy, chemicals and minerals, machinery and human resources. Many of these are finite, yet are subject to increasing pressure. The question of world food adequacy and the interrelationships between population, high-yield farming and preservation of natural resources represent a real endeavour in crop science.

The paper is intended to give an overview on the main issues of land use – the coexistence of agricultural production and natural environment in the framework of a Hungarian case study.

Key words: land use, sustainability, field crop production, agri-environment

sa2016_a0501

Vrijeme tijekom sjetve i cvatnje kukuruza u ekstremno toploj 2015. godini

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Sažetak

Kao rezultat sve češćih klimatskih promjena nakon vlažne lanjske godine uslijedila je godina s ekstremno toplim ljetom. 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 sjetve i cvatnje kukuruza 2015. 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.-2015. za Zagreb-Maksimir (Zg) i Osijek (Os).

Tlo na 5 cm dubine tijekom sjetve i nicanja kukuruza u istočnoj i zapadnoj Hrvatskoj bilo je „toplo“ , a ponegdje i „vrlo toplo“. Neadekvatna obrada tla zbog prekomjerne vlažnosti uvjetovala je na određenim površinama probleme s nicanjem kukuruza. Krajem svibnja dodatne probleme uvjetovale su velike količine oborine. Prema raspodjeli percentila ljeto je u cijeloj Hrvatskoj bilo „ekstremno toplo“. U dijelu istočne i zapadne Hrvatske bilo je ne samo „sušno“, nego i „vrlo sušno“.

Dobiveni rezultati otkrivaju kako je u vremenskom nizu 1961.-2015. ova godina po TS u Os na 4. a u Zg na 5. mjestu. Najviše SDD bilo je u godinama i s najviše TS. U Os je ova godina po SS na 8. a u Zg na 14. mjestu. Po RR 2015. godina u Os je na 14. a u Zg na 36. mjestu. Kao posljedica ovakvih vremenskih prilika u 2015. godini očekuju se niži prinosi kukuruza nego lani.

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

sa2016_a0502

Weather conditions during planting and flowering of maize in extremely warm 2015

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Abstract

As a result of increasingly frequent climatic changes, after the wet last year this year had an extremely hot summer. The aim of this study was: 1) to show weather conditions during planting and flowering of maize in 2015 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 2015 for Zagreb-Maksimir (Zg) and Osijek (Os).

During planting and germination of maize, soil at 5 cm below ground in eastern and western Croatia was "warm", and somewhere "very warm". Inadequate soil preparation due to excessive moisture in certain areas has caused the problems with the germination of maize. In late May, additional problems were caused by large amounts of precipitation. Summer in all of Croatia was "extremely warm" by the percentile distribution. In the part of eastern and western Croatia was not only "dry", but also "very dry."

The results reveal that in the period from 1961 to 2015, this year by HU in Os was at the 4th place and in Zg at 5th place. The most SDD were in years with the most HU. In Os this year by the SH was at the 8th and in Zg at the14th place. According to P 2015 in Os was at the 14th and in Zg at the 36th place. As a result of such weather conditions in 2015 lower maize yields than last year are expected.

Key words: maize, accumulated heat, heat stress, precipitation, sunshine

sa2016_a0502

Bc hibridi kukuruza u proizvodnim pokusima u 2015. godini

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Sažetak

Pokusi Bc hibrida kukuruza u 2015. godini postavljeni su na velikom broju lokacija u različitim agroekološkim uvjetima na području cijele Hrvatske. Sjetva kukuruza odvijala se od početka travnja i trajala je sve do konca mjeseca. Tlo se u tom periodu moglo dobro pripremiti, pa su uvjeti za nicanje bili povoljni što je rezultiralo ostvarenjem planiranog broja biljaka po pojedinom hibridu. Do cvatnje je kukuruz imao izrazito povoljne uvjete za rast i razvoj, a cvatnju kukuruza je pratio dugi period s visokim temperaturama i izostankom oborina. U kolovozu se nastavlja izrazito sušno razdoblje praćeno toplinskim udarima u više navrata, a posebno su nepovoljni uvjeti za kukuruz bili u istočnim dijelovima Hrvatske. U rujnu dolaze povoljniji uvjeti uslijed pada temperatura i prestanka nedostatka oborina.

Unatoč nepovoljnim uvjetima za kukuruz, rezultatima uroda Bc hibrida u proizvodnim pokusima moramo biti više nego zadovoljni.

Navodimo primjer rezultata pokusa u Lovasu gdje je sa 26 Bc hibrida FAO 200 – 600 ostvaren prosječan urod od 8,7 t /ha sa 14 % vode uz prosječan sadržaj vode u vršidbi od 14,6 %. Najbolji urod imao je hibrid Bc344 s rezultatom od 10,4 t/ha sa 11,7 % sadržajem vode.

Sagledavajući ostvareni urod u odnosu na brzinu otpuštanja vode iz zrna novi Bc hibridi (Alibi, Thriller, Bc306, Bc344, Riđan i Dugi) pokazali su se izuzetno prilagodljivim uvjetima kakvi su bili u 2015. godini.

Ključne riječi: kukuruz, proizvodni pokusi, hibridi, urod

sa2016_a0503

Bc maize hybrids in production trials in 2015

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Abstract

Trials with Bc maize hybrids in 2015 were laid out at a large number of locations in different agro ecological conditions in the entire Croatia. Maize sowing took place from the beginning of April and lasted until the end of the April. In this period the soil was well prepared, and the conditions for the germination were favorable, which resulted by planned number of plants per individual hybrids.

Until flowering, hybrid maize had very favorable conditions for growth and development, and flowering of maize followed a long period with high temperatures and lack of rainfall. In August continued very dry period followed by heat waves repeatedly. Especially unfavorable conditions for maize were in the eastern parts of Croatia. In September were favorable conditions due to falling temperatures and frequent rainfalls.

Despite the unfavorable conditions for maize, we have to be more than satisfied with the yield results of Bc hybrids in the production trials.

An example is a trial in Lovas where with 26 Bc hybrids FAO 200-600 average grain yield was 8.7 t/ha with 14% of water with an average water content in harvest of 14.6%. Best yield had hybrid Bc344 with a result of 10.4 t/ha with 11.7% water content.

Considering the achieved yield in relation to the speed of dry down, new Bc hybrids (Alibi, Thriller, BC306, BC344, Riđan and Dugi) proved to be extremely adaptable under the conditions as they were in 2015.

Key words: maize, production experiments, hybrids, yields

sa2016_a0503

Dvogodišnji rezultati primjene navodnjavanja kap po kap u proizvodnji šećerne repe na Belju d.d.

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Sažetak

Cilj ovih istraživanja bio je ispitati utjecaj navodnjavanja metodom kap po kap uz primjenu mineralnih hranjiva otopljenih u vodi za navodnjavanje koja su sadržavala sve mikroelemente uz odgovarajuću količinu bora koji je uz navodnjavanje bio ključni element u ovim istraživanjima (fertirigacija).

Istraživanja su provedena na dvije farme (Topolik, Mirkovac) na Belju d.d. u 2014. i 2015. godini u tri ponavljanja. Rezultati su obrađeni statistički analizom varijance.

Tla na kojima su provedena istraživanja su ritske crnice (humogley), neutralne reakcije, dobro opskrbljena humusom i osrednje do dobro fosforom i kalijem, ali slabije borom, vrlo važnim mikroelementom u ishrani šećerne repe. Po mehaničkom sastavu, tla su praškaste ilovače podložne zbijanju, što otežava dublje zakorijenjavanje korijenovog sustava šećerne repe i korištenje vode i u njoj otopljenih hranjiva iz većeg volumena tla, što opravdava primjenu povremenog dubljeg rahljenja tla nakon žetve žitarica.

U dvije klimatski različite godine istraživanja, primjena fertirigacije statistički je opravdano povećala prirod i sadržaj šećera u korijenu šećerne repe. To je posebno bilo naglašeno u drugoj godini istraživanja kada su bile zabilježene vrlo male ukupne sume oborina i njihov raspored tijekom vegetacijskog razdoblja. Od sjetve do vađenja šećerne repe (ožujak-listopad) palo je 342 mm kiše, a tijekom ljetnih mjeseci (lipanj-rujan) samo 145 mm, što je djelovalo i na propadanje većeg dijela lisne površine i smanjenu asimilaciju CO_2, slabiji razvoj korijena i niži sadržaj šećera u korijenu uz jaku retrovegetaciju na nenavodnjavanoj varijanti.

Primjena fertirigacije u 2014. godini povećala je prirod korijena za 30,6% a sadržaj šećera za 8,4%. U vrlo sušnoj 2015. godini ista agrotehnička mjera povećala je prirod za 42,7% a sadržaj šećera za 8,9%. Primjena otopljenih hranjiva u vodi za navodnjavanje (posebno bora) povećala je digestiju šećerne repe za 1,4% i značajno utjecala na ukupni ekonomski rezultat proizvodnje u dvije godine istraživanja.

Ključne riječi: šećerna repa, navodnjavanje kap po kap, fertirigacija, bor, prirod korijena, digestija

sa2016_a0504

Two-year results of the application of drip irrigation in the production of sugar beet at Belje d.d.

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Abstract

The aim of this research was to investigate the impact of the drip irrigation method with the application of mineral nutrients dissolved in water for irrigation which contained all the macroelements with the appropriate amount of boron which was a key element in these studies (fertirrigation) along with irrigaton.

Studies were performed on two farms (Topolnik, Mirkovac) at Belje d.d. in 2014 with three repetitions in 2015. The results were analysed statistically by analysis of variance.

The soils on which the studies were conducted are humogley, soils of neutral reaction, well supplied in humus and mediocre to well in phosphorus and potassium, but weaker in boron, which is a very important microelement in sugar beet nutrition. Regarding the mechanical composition, those are filty loam soils susceptible to compaction, which hinders deeper rooting of sugar beet root system and the use of water and dissolved nutrients from a larger volume of soil, which justifies the application of the occasional deeper soil loosening after grain harvest.

In two climatically different years of research, the application of fertirrigation statistically justified increase of yield and sugar content in sugar beet root. It has especially been emphasised in the second year of studies which recorded very little rainfall and their schedule during the vegetation period. From sowing to extraction of sugar beet (March-October) it fell 342 mm of rain, and during the summer months (June-September) only 145 mm, which caused deterioration of the larger part of the leaf surface and reduced assimilation of CO_2, weaker root development and the lower sugar content with a strong retro-vegetation on non-irrigated variance.

Application of the fertirrigation in 2014 has increased the root yield by 30.6% and sugar content by 8.4%. In a very dry 2015 the same agrotechnical measure increased the yield by 42.7% and sugar content by 8.9%. Application of dissolved nutrients in the water used for irrigation (especially boron) has increased digestion of sugar beet by 1.4% and significantly influenced the overall economic result of production in two years of research.

Key words: sugar beet, drip irrigation, fertirrigation, boron, root yield, digestion

sa2016_a0504

Morfološka svojstva domaćih populacija predivog i uljanog lana prema UPOV-u

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Sažetak

Predivi i uljani lan se tradicionalno uzgajao u mnogim područjima Hrvatske. Međutim, ne postoje selekcionirani domaći kultivari predivog i uljanog lana. Nekada su se uzgajale samo domaće populacije, koje su praktički nestale. Cilj ovog istraživanja bio je opisati morfološka svojstva stabljike, cvijeta, ploda i sjemena dvije populacije predivog i tri populacije uljanog lana uzgojenih na području kontinentalne Hrvatske u cilju očuvanja starih genetskih materijala. Uzorci predivog lan prikupljeni su sa lokacija Ivanić Grad i Zagreb, a uljanog sa lokacija Glina, Čakovec i Zagreba. Istraživanje je provedeno tijekom 2015. godine na pokušalištu Sveučilišta u Zagrebu Agronomskog fakulteta na eutrično smeđem antropogeniziranom tlu. Primijenjena je standardna agrotehnika u uzgoju predivog i uljanog lana. Istraživana morfološka svojstva opisana su prema UPOV-im deskriptorima u fazama početka cvatnje, pune cvatnje i pune zriobe. Na osnovi dobivenih rezultata jednogodišnjih istraživanja utvrđeno je da postoje razlike u morfološkim svojstvima i udjelima pojedinih svojstava unutar istraživanih populacija predivog i uljanog lana.

Ključne riječi: predivi i uljani lan, domaće populacije, morfološka svojstva, UPOV-i deskriptori

sa2016_a0505

Morphological traits of domestic population of fibre flax and linseed according to UPOV guidelines

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Abstract

The fibre flax and linseed has traditionally been cultivated in most parts of Croatia but there are no Croatian fibre flax and linseed cultivars. In the past, only the domestic populations were grown, which are practically disappeared. The aim of this paper was to describe the morphological traits of steam, flower, boll and seed of the two populations of fibre flax and the three populations of linseed which were growing on the continental part of Croatia with the aim to preserve the old genetic materials. The samples of fibre flax were collected from locations Ivanić Grad and Zagreb, and linseed from locations Glina, Čakovec and Zagreb. The investigation was conducted during the 2015 at the experimental field of the University of Zagreb, Faculty of Agriculture on the anthropogenized eutric cambisol. The standard agrotechnics were used for growing of fibre flax and linseed. The investigated morphological traits were described according to UPOV guidelines in growth stages of the beginning of flowering, full flowering and fully ripe. According to the results of the one-year research the differences were obtained between investigated morphological traits and between the shares of individual traits within the population of fibre flax and linseed under study.

Key words: fibre flax and linseed, domestic populations, morphological traits, UPOV guidelines

sa2016_a0505

Agronomska svojstva inozemnih sorata i domaćih populacija uljanog maka

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Sažetak

Uzgoj uljanog maka u nas je praktički napušten, a potrebe za sjemenom za izradu kolača podmiruju se uvozom. Za te svrhe osobito se cijeni sjeme tamnoplave i sive boje. Posljednjih nekoliko godina u Republici Hrvatskoj povećava se interes za uzgoj uljanog maka.

Stoga je cilj ovih istraživanja bio utvrditi prinos sjemena i druga agronomska svojstva inozemnih sorata i izvornih domaćih populacija uljanog maka u agroekološkim uvjetima sjeverozapadne Hrvatske te na temelju dobivenih rezultata odabrati najbolje sorte za ovo područje. Istraživanja su provedena kroz sortne mikropokuse postavljene na pokušalištu Sveučilišta u Zagrebu Agronomskog fakulteta tijekom 2013. i 2015. godine. U istraživanje su bile uključene četiri inozemne sorte (Opal, Lazur, Major i Matis) i dvije domaće populacije maka nazvane prema lokaciji gdje su prikupljene (Gornji Bogićevci - IND00042 i Beli Manastir - IND00043). Pokus je bio postavljen prema metodi slučajnog bloknog rasporeda u pet ponavljanja. Na pokusnim površinama provedena je uobičajena tehnologija proizvodnje za uljani mak.

Na temelju dobivenih rezultata može se zaključiti kako su se istraživane sorte i domaće populacije maka značajno međusobno razlikovale po prinosu sjemena, broju tobolaca po biljci, masi sjemena po tobolcu, masi sjemena po biljci i masi 1000 sjemenki samo u 2013. godini. U prosjeku istraživanja najrodnije sorte/populacija bile su Opal (847 kg/ha), Beli Manastir (834 kg/ha) i Major (816 kg/ha).

Ključne riječi: uljani mak, sorte, populacije, prinos sjemena

sa2016_a0506

The agronomic traits of foreign cultivars and domestic populations of oilseed poppy

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Abstract

Cultivation of oilseed poppy in the Croatia is practically abandoned, and the needs for seed for making cakes are settled by imports. For these purposes especially are esteemed poppy varieties with dark blue and gray seed color. There has been increased interest for oilseed poppy cultivation in Croatia for last years.

Therefore, the aim of this study was to determine the seed yield and other agronomic traits of foreign cultivars and domestic populations of oilseed poppy in the environmental conditions of northwestern Croatia and according to the results select the best varieties for this area. The investigations were carried out through the varietal micro-trial conducted during 2013 and 2015 at the experimental field of the University of Zagreb, Faculty of Agriculture. The investigations involved four foreign cultivars (Opal, Lazur, Major and Matis) and two domestic populations of oilseed poppy named according the site where they have been collected (Gornji Bogićevci - IND00042 and Beli Manastir - IND00043). The trials were carried out according to the RCBD in five replications. The standard crop management was used for oilseed poppy cultivation.

According to obtained results it can be concluded that the investigated cultivars and domestic populations of oilseed poppy significantly differed in seed yield, number of capsules per plant, seed weight per capsule, the weight of seeds per plant and 1000 seeds weight only in 2013. In average of research the best yielding cultivars/populations were Opal (847 kg/ha), Beli Manastir (834 kg/ha) and Major (816 kg/ha).

Key words: oilseed poppy, cultivars, populations, seed yield

sa2016_a0506

Prinos sjemena konoplje (*Cannabis sativa* L.) u ovisnosti o sorti i gustoći sklopa

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Sažetak

Posljednjih nekoliko godina u Republici Hrvatskoj primjetan je povećani interes za uzgoj industrijske konoplje za sjeme. Budući da se u prošlosti gotovo isključivo uzgajala konoplja za vlakno, nedovoljno je poznata tehnologija uzgoja konoplje za sjeme. Nadalje, Hrvatska ne raspolaže vlastitim selekcijskim materijalom te je upućena na introdukciju stranih sorata koje je potrebno istražiti s gledišta njihovih agronomskih i morfoloških svojstava. Paralelno s time potrebno je istražiti aklimatizacijske sposobnosti na agroekološke uvjete Hrvatske uz primjenu adekvatne agrotehnike. Stoga je cilj ovih istraživanja bio utvrditi koja sorta i pri kojoj gustoći sklopa daje najveće prinose sjemena u našim agroekološkim uvjetima.

Istraživanja su provedena kroz poljske pokuse na pokušalištu Visokoga gospodarskog učilišta u Križevcima i na OPG-u Trglačnik u Vidovcu u 2015. U istraživanje je bilo uključeno šest sorata industrijske konoplje (Fedora 17, Uso 31, Felina 32, Santhica 27, Futura 75 i Ferimon) koje su sijane u dvije gustoće sklopa. Planirane gustoće sklopa bile su 100 i 200 biljaka/m^2 (20 i 40 kg sjemena/ha). Ostvareni broj biljaka u žetvi bio je 91 - 102 biljke/m^2 kod sjetve 20 kg sjemena/ha, odnosno 157 - 197 biljaka/m^2 kod sjetve 40 kg sjemena/ha. Pokus je postavljen prema shemi slučajnog bloknog rasporeda u četiri ponavljanja. Na pokusnim površinama provedna je uobičajena agrotehnika za konoplju.

Na oba lokaliteta i kod svih sorata statistički značajno veći prinos sjemena ostvaren je sjetvom u gušćem sklopu (200 biljaka/m^2).

Sorta Futura 75 sijana u većoj gustoći sklopa (200 biljaka/m^2) ostvarila je statistički značajno najveći prinos sjemena na oba lokaliteta (1904,0 kg/ha na lokalitetu Križevci; 1319,2 kg/ha na lokalitetu Vidovec).

Ključne riječi: konoplja, *Cannabis sativa* L., sorte, gustoća sklopa, prinos sjemena

sa2016_a0507

Seed yield of hemp (*Cannabis sativa* L.) depending on cultivar and plant density

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Abstract

During the last few years in Croatia there has been an increased interest for cultivation of industrial hemp for seed. In our region hemp has always been cultivated almost exclusively cultivated for fiber. As a result technology for hemp grain cultivation is not developed very well. Furthermore, Croatia doesn't have its own selective material so it is initiated for an introduction of foreign cultivars which need to be investigated based on their agronomical and morphological properties. In parallel with that, it is necessary to investigate adaption abilities on agro-ecological Croatian conditions as well as the use of appropriate agricultural technology. Therefore, the aim of this study was to determine which cultivar and in which plant density gives the highest seed yields in our environmental conditions.

The investigations were carried out by means of field experiments on the College of Agriculture at Križevci and at the family farm Trglačnik in Vidovec in 2015. The investigations included six cultivars of industrial hemp (Fedora 17, Uso 31, Felina 32, Santhica 27, Futura 75 and Ferimon) that have been sown in two plant densities. Planned densities were 100 and 200 plants/m^2 (20 and 40 kg seeds/ha). Actual number of plants at harvest was 91 - 102 plants/m^2 for sowing 20 kg seeds/ha, or 167 to 197 plants/m^2 for sowing 40 kg/ha of seed. The experiment was set up according to the randomized complete block design with four replications. On the experimental fields was conducted common agricultural practice for hemp.

At both sites and for all cultivars there was significantly higher seed yield when sown in higher density (200 plants/m^2).

The cultivar Futura 75 sown in higher plant density (200 plants/m^2) achieved a statistically significantly highest average seed yield at both sites (1904.0 kg/ha at the site Križevci, 1319.2 kg/ha at the site Vidovec).

Key words: hemp, *Cannabis sativa* L., cultivars, plant density, seed yield

sa2016_a0507

Utjecaj agrotehničkih mjera u proizvodnji ratarskih usjeva na populaciju trčaka

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Sažetak

Trčci (Coleoptera: *Carabidae*) su najveća porodica iz podreda *Adephaga*. Dobro su poznati kao pokazatelji ekoloških promjena u okolini. Imaju važnu ulogu u biološkom suzbijanju brojnih vrsta štetnika zbog polifagnog predatorskog načina ishrane. Osjetljivi su na promjene uzrokovane ljudskim utjecajem pa se smatra da imaju bioindikativnu vrijednost. Također, ličinke trčaka su posebno osjetljive na način obrade tla zbog relativno mekog tijela. Cilj istraživanja je bio utvrditi utjecaj agrotehničkih mjera (obrade tla, plodoreda, pokrovnosti i primjene insekticida) na brojnost trčaka u različitim usjevima obzirom na vremenske uvjete koji su prevladavali u istraživanom području. Istraživanje je provedeno u sjeveroistočnom dijelu Hrvatske. Uzorci su prikupljani tjedno, od svibnja do rujna, pomoću epigejskih (pitfall) i endogejskih mamaca. Ukupno je prikupljeno 2.730 trčaka. Broj prikupljenih trčaka razlikuje se između istraživanih polja. Vrsta usjeva i plodored značajno utječu na brojnost vrsta koje se kreću po površini i ispod površine tla. Najviši ulovi zabilježeni su u usjevu uljane repice, a najniži u šećernoj repi što se može povezati sa pokrovnosti tla i tretiranjem sjemena insekticidima. Folijarna primjena insekticida nije imala učinka na brojnost trčaka.

Ključne riječi: trčci, agrotehničke mjere, obrada, vremenski uvjeti, Hrvatska

sa2016_a0508

Impact of agro-technical measures in arable crop production on ground beetle population

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Abstract

Ground beetles (Coleoptera: *Carabidae*) are the largest family of adephagan beetles who are well known as good ecological indicators of environmental change. They have important role in natural pest-control due to their predatory polyphagous nutrition. Because of sensitivity to anthropogenic changes it is considered that they have bioindicative value. Also larvae are especially susceptible to tillage practices since their bodies are relatively soft. The aim of the study was to determine the effect of agro-technical measures (tillage, cropping history, soil cover and insecticide treatments) on the ground beetle abundance in different types of arable crops with respect to the prevailing weather conditions. The study was conducted in the north - eastern part of the Croatia. Samples were collected weekly, from May to September 2015, by using epigeic (pitfall traps) and endogenic traps. In total, 2,730 ground beetles were collected. The number of collected ground beetles differs among investigated fields. The crop and cropping history strongly influence the abundance of both, soil surface and soil dwelling species. The highest captures were recorded on oilseed rape field, while the lowest on sugar beet field. This could be correlated with soil cover and insecticide seed treatment. Foliar application of insecticides did not influence the abundance of ground beetles.

Key words: ground beetles, agro-technical measures, cultivation, weather conditions, Croatia

sa2016_a0508

Changes in stomata parameters of maize leaf (*Zea mays* L.) under different foliar fertilizing conditions

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Abstract

In this research, the effects of foliar fertilizer Megegreen on stomata parameters of maize leaf (*ZP 677*) were studied. The experiment was performed on the experimental fields of the Institute of Agriculture in Skopje, Republic of Macedonia, during the 2008 and 2009. The foliar fertilizer was applied four times during the growing period in different concentrations of 0.3, 0.6 and 0.9% solution. Stomata density and size were measured on the adaxial and abaxial leaf surface from randomly selected plants from each replication in stage of silking. Stomata counts were made on the impressions from microscopic fields using the colodium method. Analyses of variance indicated that the application of foliar fertilizer has significant influence on stomata features on corn leaves.

Results from research show higher stomata density on adaxial (176.19-182.32 stomata/mm^2) and abaxial surface (289.12-293.12 stomata/mm^2) at variants 3 and 4. Variant 3 has the highest stomata length on adaxial surface (59.75 μm), without significant difference and the highest average length on the abaxial surface (63.00 μm), which is significantly different from the control variant. With the highest average width on adaxial leaf surface was variant 4 with 11.56 μm and on the abaxial surface was variant 2, with 13.49 μm. A positive significant correlation was observed between stomata number on the adaxial and abaxial surface of leaf (R^2= 0.856**).

Key words: fertilizer, maize, density, adaxial, abaxial

sa2016_a0509

Utjecaj klimatskih uvjeta na prinos kukuruzne silaže

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Sažetak

Cilj istraživanja je bio procjeniti visinu i stabilnost prinosa silažnog kukuruza u različitim proizvodnim okolinama i različitim agroekološkim uvjetima. Istraživanje je provedeno na pet lokaliteta (Ciglana Beli Manastir, Grabovac, Karanac, Popovac, Topolje) u dvije klimatski različite godine (2014. i 2015.). Na svim lokalitetima primijenjena je standardna agrotehnika za kukuruz (predkultura: ozima pšenica; obrada tla: duboko jesensko oranje s gnojidbom od 190 kg ha^{-1} N + 120 kg ha^{-1} P_2O_5 + 140 kg ha^{-1} K_2O). Pokus je postavljen po slučajnom blok sistemu u četiri ponavljanja.

U 2015. godini u vegetacijskom razdoblju (travanj-kolovoz) palo je 127,6 mm manje oborina u odnosu na isto razdoblje u 2014. godine, a temperatura je bila viša u prosjeku za 1,042°C. Najveći prosječni prinos ostvaren je na lokalitetu Topolje u klimatski povoljnijoj 2014. godini. Utvrđene su statističi opravdane razlike u visini prinosa na pet prozvodnih lokacija i dvije klimatski različite godine. Rezultati istraživanja pokazuju značajan utjecaj godine kao i lokacije na prinos kukuruzne silaže hibrida FAO grupe 600. Proizvodni rezultati pokazuju da silažni kukuruz posjeduje visoku adaptabilnost i stabilnost prinosa.

Ključne riječi: agroekološki uvjeti, silažni kukuruz, stabilnost, okolina, prinos

sa2016_a0510

Climatic conditions influence on corn silage yield

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Abstract

The aim of the study was to determine silage corn yield and yield stability in various environments and agro-ecological conditions. The research was conducted on five locations (Ciglana Beli Manastir, Grabovac, Karanac, Popovac, Topolje) and two years (2014 and 2015).

On all locations standard corn crop management was applied (pre-crop: winter wheat, soil preparation: deep ploughing, fertilization 190 kg ha^{-1} N + 120 kg ha^{-1} P_2O_5 + 140 kg ha^{-1} K_2O). Trial design was randomized complete block layout with four repetition.

In the year 2015 during vegetation (April-September) was less rainfall comparing with same period in 2014 and temperature was in average higher for 1,0421°C. Highest average yield was on Topolje location in climatic favourable season 2014. Analysis showed statistical differences on five different locations and two years. The results of the study showed significant influence of climatic conditions on corn silage yield in MG6. Results show that silage corn has high adaptability and yield stability.

Key words: agro-ecological conditions, silage corn, stability, environment, yield

sa2016_a0510

Rasprostranjenost vrste *Heterodera schachtii* na području Tovarnika i mjere suzbijanja

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Sažetak

Repina nematoda *Heterodera schachtii* Schmidt 1871 značajan je štetnik šećerne repe. Preventivni pregled površina na kojima se planira sijati šećerna repa, predstavlja garanciju dugoročnog uzgoja šećerne repe na jednom području. Cilj istraživanja bio je utvrditi rasprostranjenost vrste *H. schachtii* na značajnom uzgojnom području šećerne repe, lokalitetu Tovarnik te prema utvrđenoj visini populacije dati preporuke za prikladne mjere suzbijanja. U periodu 2012. - 2014. godine provedeno je uzorkovanje 1159,49 ha repišta na lokalitetu Tovarnik, a prikupljen je 691 uzorak tla. Uzorci su analizirani korištenjem Spearsovog flotacionog uređaja kojim su izdvajane ciste iz suhih uzoraka tla te potom identificirane prema morfološkim obilježjima. Vitalnost cista određivana je drobljenjem cista pomoću Huijsmanovog homogenizatora te brojanjem vitalnih jaja i ličinki u suspenziji. Visina populacije izražena je po 1 g tla. Zaraza repinom nematodom utvrđena je na oko 867 ha repišta. Prema visini populacije repine nematode na zaraženim površinama, za očekivati je vrlo velike štete. Na zaraženim površinama proizvođačima se preporuča integrirana zaštita šećerne repe od toga štetnika kroz prakticiranje višegodišnjeg plodoreda, suzbijanje korova domaćina te sjetvu lovnih nasada kao što su uljana rotkva i gorušica. Sjetva sorata tolerantnih na repinu nematodu pruža djelomično rješenje problema, omogućava održavanje proizvodnje na zaraženim površinama, no ponekada uz upitnost zadovoljavajućih prinosa.

Ključne riječi: *Heterodera schachtii*, mjere suzbijanja, rasprostranjenost, repina cistolika nematoda, šećerna repa

sa2016_a0511

The distribution of *Heterodera schachtii* at the area of Tovarnik and control measures

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Abstract

Beet cyst nematode *Heterodera schachtii* Schmidt 1871 is a significant pest of sugar beet. Preventive inspection of the area, in which it is planned to sow sugar beet, is a guarantee of long-term cultivation of sugar beet. The aim of this study was to determine the distribution of *H. schachtii* in the important growing area of sugar beet, locality Tovarnik and according to the determined population of the nematode to recommend appropriate control measures. Soil sampling was carried out on 1159.49 ha of sugar beet fields at the area of Tovarnik in the period 2012 - 2014. A total of 691 samples were analyzed using Spears flotation devices which extracts cysts from dry soil samples. Cysts were identified following the morphological features. Vitality of cysts was determined by crushing the cysts using Huijsman's homogenizer and counting viable eggs and juveniles in a suspension. Population height was converted to 1 g of soil. Infection by sugar beet nematode was found at 867 ha of sugar beet fields. According to the population height of beet cyst nematode on infected fields, great damages are expected. On infected fields it is recommended to conduct integrated control of sugar beet from this pest through the crop rotation, weed control and sowing of trap crop plants like oil radish and mustard. In order to maintain production in the infected areas, sowing sugar beet varieties tolerant to nematodes provides partial solution of the problem, sometimes with no satisfactory yields.

Key words: beet cyst nematode, control measures, distribution, *Heterodera schachtii*, sugar beet

sa2016_a0511

Utjecaj dodatka kakao ljuske na svojstva kukuruznih ekstrudata

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Sažetak

Ekstruzija je jedan od najznačajnijih procesa u prehrambenoj industriji gdje se vrlo često kao osnovna sirovina koristi kukuruzna krupica. Zbog poboljšanja fizikalno-kemijskih svojstava i nutritivne vrijednosti proizvoda, u kukuruznu krupicu se mogu dodavati brašna različitih žitarica, osušeno voće i povrće i dr. Kakao ljuska kao nusproizvod prerade kakao zrna predstavlja značajan problem u prehrambenoj industriji. Budući da je dobar izvor prehrambenih vlakna i polifenola, mogla bi se koristiti kao sirovina za razvoj novih proizvoda. Stoga je cilj ovoga rada bio ispitati utjecaj ekstruzije i dodatka kakao ljuske (u udjelima 5 %, 10 % i 15 %) na svojstva ekstrudata na bazi kukuruzne krupice. Dobivenim ekstrudatima ispitana su osnovna fizikalna svojstva: ekspanzijski omjer, nasipna masa, tekstura, boja te indeks apsorpcije i indeks topljivosti u vodi.

Utvrđeno je da je dodatkom kakao ljuske došlo do smanjenja ekspanzijskog omjera i lomljivosti, a povećanja nasipne mase i tvrdoće ekstrudata. Ekstruzija je uzrokovala posvjetljenje kontrolnog uzorka kukuruzne krupice, a potamnjenje ekstrudata s dodatkom kakao ljuske. Indeks apsorpcije vode i indeks topljivosti u vodi povećali su se značajnije nakon ekstruzije. Iz svega navedenog može se zaključiti da se kakao ljuska može uspješno dodavati u kukuruznu krupicu s ciljem proizvodnje novih ekstrudiranih proizvoda.

Ključne riječi: ekstruzija, kukuruzna krupica, kakao ljuska, fizikalna svojstva

sa2016_a0512

Influence of cocoa shell addition on properties of corn extrudates

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Abstract

Extrusion is one of the most significant processes in food industry, where corn grits is often used as main raw material. In order to increase nutritive value and improve physical and chemical properties, in corn grits can be added flours of different grains, dehydrated fruits and vegetables, etc. Cocoa shell as a by-product of cocoa beans processing is a significant problem in the food industry. Since it is a good source of dietary fiber and polyphenols, it could be used as raw material for development of new products. Therefore, the aim of this study was to investigate the influence of extrusion process and cocoa shell addition (in proportions of 5%, 10% and 15%) on properties of extrudates based on corn grits. On obtained extrudates physical properties were determined, which included: expansion ratio, bulk density, texture, color, water absorption index and water solubility index.

It was established that addition of cocoa shell resulted in decrease of expansion ratio and fracturability, but in increase of bulk density and hardness of extrudates. Extrusion caused lightening of control sample of corn grits, but darkening of extrudates with added cocoa shell. Water absorption index and water solubility index increased significantly after extrusion. From all above it can be concluded that cocoa shell can be successfully added to corn grits in order to produce new extruded products.

Key words: extrusion, corn grits, cocoa shell, physical properties

sa2016_a0512

Croatian 51
2016 sa 11
International Symposium on Agriculture

Section 6

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Zbornik sažetaka

Ribarstvo, lovstvo i pčelarstvo

Osnovni kriteriji dizajna recirkulacijskih akvakulturnih sustava

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Sažetak

Poznavanjem recirkulacijske tehnologije i osnova dizajna zatvorenih akvakulturnih sustava (RAS) moguće je osigurati kontrolu kvalitete vode pod intenzivnim uvjetima hranjenja. Organizacija proizvodnog sustava zahtijeva integraciju dizajna, opreme i tehnologije sa specifičnim metodama menadžmenta. Osnovni kriteriji dizajna koji su prikazani u radu pokazuju različite opcije inženjeringa koje omogućuju ekonomski učinkovitu kontrolu kvalitete vode potrebnu u zatvorenim intenzivnim sustavima. Dizajn uzgojnih tankova treba da omogućiti brzo uklanjanje ostataka nepojedene hrane, izmeta i drugih mehaničkih čestica iz uzgojnog volumena te dozvoliti prirodno kretanje i ponašanje riba. Mehaničke čestice se mogu ukloniti pomoću tri osnovne metode: gravitacije, filtracije kroz medij za filtriranje (mrežica, pijesak ili plastične čestice) ili plutanja (čestice se podižu na površinu, a zatim uklanjaju). Biofilteri se koriste prvenstveno za aerobnu nitrifikaciju ili pretvorbu/oksidaciju amonijaka kao toksičnog proizvoda metabolizma vodenih životinja u nitrate i sekundarno za anaerobnu denitrifikaciju nitrata. Kisik potrošen disanjem i bakterijskom aktivnošću, kompenzira se ubrizgavanjem zraka ili čistog kisika u vodu. Visoka količina ugljičnog dioksida proizvedenog zbog visoke nasadne gustoće uzgajanih organizama i bakterijske aktivnosti na biofiltrima, smanjuje pH vode u uzgojnim tankovima pa komponenta koja mjeri i prilagođava pH na optimalnu vrijednost mora biti uključena u dizajn. Suvišak ugljičnog dioksida se uklanja povećanjem kontaktne površine između zraka i vode što se postiže prokapavanjem vode preko različitih medija. UV reaktor ili ozon generator su komponente koje obično koriste za sterilizaciju vode u uzgojnim tankovima.

Ključne riječi: recirkulacijski sustavi, RAS, dizajn, komponente sustava, kvaliteta vode

sa2016_a0601

Design criteria for closed recirculation systems in aquaculture

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Abstract

By using various unit processes to recycle and reuse culture water, recirculating aquaculture systems (RAS) can provide for the control of water quality under intensive feeding conditions. This requires the integration of equipment and technologies with specifically co-developed management techniques. The present design criteria demonstrate process engineering options which effectively and economically achieve the water quality control capabilities necessary for closed systems. Water quality control is provided by effectively co-engineered systems for clarification, biofiltration, de-gassing, oxygen/ozone injection, and water movement technologies. Cultured tanks should be designed to allow for the quick removal of uneaten food, feces, and other mechanical particles from rearing areas and to allow for the natural movement and behavior of the fish. Mechanical particles can be separated using three basic methods: gravity, filtration through a filtration medium (mesh, sand, or plastic particles), or flotation (particles are lifted to the surface and then removed). Biofilters are used primarily for aerobic nitrification or conversion/oxidation of ammonia as a toxic product of the metabolism of aquatic animals into nitrates, and secondarily for anaerobic denitrification of nitrates. The oxygen consumed by breathing and bacterial activity is compensated by injecting air or pure oxygen into the water. High quantity of carbon dioxide that lowers the pH of the water in breeding tanks is produced due to high stocking density and bacterial activity on the biofilter. The control component that measures and adjusts the pH to the optimal value has to be included in the design. The excess carbon dioxide is removed by increasing the contact surface between air and water. This is achieved by dripping water through the various media. UV-reactor or ozone generators are components typically used for the sterilization of culture water in closed systems.

Key words: recirculation systems, RAS, design, system components, water quality

sa2016_a0601

Analiza efikasnosti purifikacijskih sustava za školjkaše

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Sažetak

Otpremno-purifikacijski centri standardna su i neizostavna komponenta suvremenih sustava kontrole i tržišnog plasmana školjakša, čiji je osnovni cilj maksimalno podizanje sigurnosti potrošača vezano uz zdravstvenu ispravnost proizvoda. To je u slučaju školjkaša koji se konzumiraju sirovi ili nedovoljno termički obrađeni izuzetno važna i osjetljiva tema. U uzgojnom području razreda B more je svojom kakvoćom pogodno za uzgoj, ali školjkaši prije pakiranja i označavanja u otpremnom centru te slanja na tržište, moraju biti podvrgnuti procesu pročišćavanja u sustavu za purifikaciju. Primjenom ovog, zakonom propisanog postupka, eliminiraju se do sada najčešći uzročnici oboljenja ljudi izazvanih konzumacijom. Proces depuracije traje najmanje 42 sata, odnosno do dobivanja zdravstveno ispravnog proizvoda. Na efikasnost procesa utječu brojni čimbenici: dizajn i efikasnost komponenti sustava, postupanje sa školjkašima od izlova do depuracije, fizikalno kemijska svojstva vode u sustavu i ambijentalnom moru, čistoća ljušture školjkaša, vrsta i početna količina štetnih mikroorganizama u školjkašima, vrsta i fizička kondicija školjkaša. Tijekom ovog istraživanja obavljena je usporedba tri purifikacijska centra u Hrvatskoj te je na osnovu rezultata napravljena analiza rizika. Pored neadekvatnog postupanja sa školjkašima nakon izlova, sukladno analizi, najznačajniji rizični čibenik predstavlja neadekvatan dizajn, odnosno odabir komponenti purifikacijskih sustava što značajno umanjuje njihov kapacitet i efikasnost.

Ključne riječi: školjkaši, purifikacija, depuracija, dizajn sustava

sa2016_a0602

Analysis of the bivalve purification systems efficiency

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Abstract

Dispatch-purification centers are standard and indispensable components of modern control systems and marketability of bivalves, whose main goal is to maximize consumer safety as it relates to product safety. This is an extremely important and sensitive issue with bivalve molluscs, that are eaten raw or inadequately cooked. Class B breeding areas are more suitable for its breeding quality, but bivalves prior to packaging, labeling, and delivery to market, must be subjected to the purification process. The most common causes of food borne illness are a direct result of consumption and are eliminated by following the procedures prescribed by law. The depuration process takes at least 42 hours, or until a healthy and safe product is obtained. The efficiency of the process is affected by many factors: design and efficiency of system components, handling of bivalves from harvesting to depuration, ambient water, physical and chemical properties of the water in the system, cleanliness of the shell, the initial amount of harmful microorganisms in the soft tissue, species, and the physical condition of the bivalves. During this study a comparison of three purification centers in Croatia was performed based on the results of a risk analysis. The analysis demonstrated that in addition to the inadequate treatment of bivalve molluscs after harvesting, the most significant risk factor is inadequate design or the selection of components of the purification system, which decrease capacity and efficiency.

Key words: bivalve, purification, depuration, system design

sa2016_a0602

Genska obilježja invazivnih ponto-kaspijskih glavoča (Gobiidae) savskog slijeva u Hrvatskoj

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Sažetak

U novije vrijeme invazivni ponto-kaspijski glavoči uzrokuju dramatične promjene u populacijama riba dunavskog slijeva. Iako je njihova prisutnost u hrvatskom dijelu slijeva primjećena i distribucija izučena, njihovo porijeklo i zastupljenost haplotipova do sada su bili nepoznati. Sekvenciran je citokrom b gen mitohondrijske DNK za 15 uzoraka invazivnih ponto-kaspijskih glavoča: riječnog glavočića (*Neogobius fluviatilis*), glavočića okrugljaka (*Neogobius melanostomus*) i keslerova glavočića (*Ponticola kessleri*) iz savskog slijeva. Za svaku od analiziranih vrsta utvrđen je jedan crnomorski haplotip, a isti su pronađeni i u drugim europskim zemljama. Malen broj haplotipova u savskom slijevu upućuje na relativno malobrojne populacije ponto-kaspijskih glavoča što potencijalno smanjuje njihov invazivni potencijal. Dok su ponto-kaspijski glavoči još uvijek u ekspanzivnom razdoblju, a ekosustav se prilagođava novim okolnostima, potrebno je nastaviti praćenje populacijske dinamike riba u savskom slijevu da se odredi ishod i utjecaj prisutne invazije.

Ključne riječi: Savski slijev, riječni glavočić, glavočić okrugljak, keslerov glavočić, sekvenciranje, haplotip, genska raznolikost

sa2016_a0603

Genotypization of invasive Ponto-Caspian gobies (Gobiidae) from the Sava River Basin in Croatia

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Abstract

Invasive Ponto-Caspian gobies have recently caused dramatic changes in fish assemblage structures throughout the Danube basin. While their presence in the Croatian part of the basin has been noted and distribution studied, their origin and representation of haplotypes, until now, has been unknown. 15 mitochondrial DNA cytochrome b sequences of invasive Ponto-Caspian goby species: monkey goby (*Neogobius fluviatilis*), round goby (*Neogobius melanostomus*) and bighead goby (*Ponticola kessleri*) from the Sava River Basin, were analyzed., Only one haplotype originated from the Black Sea Basin, for each of the analyzed species, was determined. Identified haplotypes have also been found in other European countries. Results reveal presence of low number of Ponto-Caspian goby populations in the Sava River Basin, which may reduce their invasive potential. Ponto-Caspian gobies in Croatia are still in the expansionary period of invasion and the ecosystem still adapting to new circumstances. Thus, continued monitoring of impacts of this invasion on fish population dynamics in the Sava River basin is needed.

Key words: Sava River Basin, monkey goby, round goby, bighead goby, sequencing, haplotype, genetic diversity

sa2016_a0603

Novo nalazište crnke (*Umbra krameri*) u Hrvatskoj

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Sažetak

Crnka (*Umbra krameri*, Walbaum 1792) je jedina predstavnica roda *Umbra* u hrvatskoj ihtiofani. Crnka naseljava vode dunavskog slijeva od Beča do ušća Dunava, te donje tokove Pruta i Dnjestra. Endem je dunavskog slijeva, a vjerojatno i glacijalni relikt. Jedna je od najotpornijih vrsta riba koja podnosi niske koncentracije kisika (<0,5 ml/L), opstaje u ekstremnim ljetnim uvjetima u mulju i prezimljuje pod ledom. Ova vrsta ubraja se u najugroženije i najranjivije vrste riba dunavskog slijeva (Bernska konvencija), prije svega zbog intenzivnog i konstantnog uništavanja njezinih prirodnih staništa. S aspekta akvakulture, ova vrsta nije ekonomski značajna. Postoji vrlo malo podataka o njezinoj rasprostranjenosti u Republici Hrvatskoj. Delić i sur., (1997) ihtiofaunističkim istraživanjem potvrdili su prisutnost crnke u nekoliko manjih vodotokova virovitičke Podravine (u melioracijskim kanalima Gakovac, Šušulić, Županijskom kanalu i kanalu kod Starogradačkog Marofa). Na temelju tog istraživanja postavljena je hipoteza kako crnka možda živi i u donjim dijelovima Županijskog kanala, bliže gradu Slatini. Stoga je pokrenuto istraživanje na kanalima u poplavnom području rijeke Drave radi pronalaženja mogućih novih nalazišta, a u kontekstu zaštite i opstanka ove endemske i reliktne vrste. Istraživanje je provedeno u Požeško – slavonskoj županiji u blizini naselja Vaška na ribolovnoj vodi Mlinski kanal. Mlinski kanal je po svojoj funkciji oborinski kanal koji se ulijeva u Županijski kanal. U kanalu je izražena sedimentacija sitnog kamenja, pijeska i organskog detritusa što pogoduje naseljavanju vodenih makrofita. Na lokaciji Mlinski kanal utvrđenu su zajednica krute voščike, *Ceratophyllum demersum* i klasasti krocanj, *Myriophyllum spicatum*, čije su stabljike svojom duljinom prilagođene ujednačenom strujanju vode. U dubljim dijelovima kanala prisutne su manje sastojine lokvanja, *Nuphar luteum*, a od elemenata močvarne flore zabilježena je močvarna perunika, *Iris pseudacorus*. Inventarsko uzorkovanje ihtiofaune provedeno je 15. svibnja 2013., a obavljeno je korištenjem elektroribolovnog agregata, tip EL 65 II, proizvođača AGK kronawitter, izlazne snage 13 kW, DC, bez pulsatora. Uzorkovalo se 100 m kanala, a područje uzorkovanja bilo je zatvoreno mrežama za uzorkovanje (EIFAAC, 2005). Ukupno je ulovljeno 10 primjeraka crnke. Ulovljene jedinke su bile relativno male mase tijela (3,80 ± 1,89 g), totalne dužine tijela (7,20 ± 1,15 cm) i standardne dužine (6,03 ± 1,01 cm). Prilikom analize u laboratoriju, nije bilo moguće utvrditi spol kod ulovljenih primjeraka crnke. Prosječan Fultonov kondicijski indeks iznosio je 0,96 ± 0,15, a bio je u rasponu od 0,76 do 1,23.

Ključne riječi: crnka, stanište, ugroženost

sa2016_a0604

New site for European mudminnow (*Umbra krameri*) in Croatia

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Abstract

The European mudminnow (*Umbra krameri*, Walbaum 1792) is the only representative of genus *Umbra* in Croatian ichthyofauna. The European mudminnow inhabits the lowlands of the Danube watershed from Vienna to the Danube Delta and the lower reaches of the Rivers Prut and Dniester. The European mudminnow is endemic to the Danube region and probably glacial relict. It is one of the hardest species of fish which can survive at the low oxygen concentrations (<0.5 ml/L), extreme summer conditions survives buried in the mud and it can survive winter under the ice. This species is one of the most vulnerable and endangered fish species in Danube basin (Bern Convention), mostly due to intensive and constant destruction of natural habitats. From the aspect of aquaculture this species doesn't have economic value. Data on the occurrence of the European mudminnow in Croatia is very scarce. Delić et al. (1997) confirmed the presence of the European mudminnow in few small channels in Virovotička Podravina (melioration channel Gakovac, Šušulić, Županijski channel and the channel near Starogradački Marof). Based on that findings it was hypothesized that the European mudminnow may have stable population in the lower parts of the Županijski channel, near the city of Slatina. Therefore, a study was conducted on the channels in the floodplain of the Drava River with the goal of finding new possible sites, in the context of the protection and survival of this endemic and relict fish species. The field study was carried out in Požega-Slavonia County, near the settlement Vaška on channel Mlinski. The channel Mlinski serves as stormwater and melioration channel which flows to Županijski channel. The sediment of channel Mlinski is composed of very small stones, sand and organic detritus which encourages the populating of aquatic macrophytes. On location channel Mlinski, the community of hornwort, *Ceratophyllum demersum* and Eurasian watermilfoil, *Myriophyllum spicatum*, whose stems are adjusted to steady flow of water, were determined. In deeper parts of the channel Yellow Water Lily, *Nuphar luteum,* was detrmined and the presence of Yellow flag, *Iris pseudacorus*., on the banks. Inventory sampling of the ichthyofauna was carried out on May 15, 2013, with the electrofisher, type El 65 II, manufacturer AGK kronawitter, 13kW output, DC without pulse. The sampling area was 100 m long, and the area was closed by survey gill nets (EIFAAC, 2005). A total of 10 specimens of the European mudminnow were caught. Caught individuals had relatively small mass (3.80 ± 1.89 g), total body length (7.20 ± 1.15 cm) and standard length (6.03 ± 1.01 cm). During the analysis in the laboratory, it was not possible to determine the gender of the caught specimens. The average Fulton condition index was 0.96 ± 0.15, and ranged from 0.76 to 1.23.

Key words: European mudminnow, habitat, vulnerability

sa2016_a0604

Histološke promjene crijevnog i jetrenog tkiva smeđeg somića (*Ameiurus nebulosus* L.) pri hranidbi biljnim i jednostaničnim proteinima

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Sažetak

U istraživanju se iznose rezultati učinka zamjene ribljeg brašna sojinim brašnom i inaktivnim pivskim kvascem na morfometrijske promjene jetrenog i crijevnog tkiva smeđeg somića (*Ameiurus nebulosus* L.). Triplikatne skupine riba su hranjene s devet različitih hranidbenih smjesa (28,7% SP). Varijabilne komponente u postocima zamjene ribljeg brašna (RB) u smjesama su bile: sojino brašno 25, 50, 75 i 100 (K1, K2, K3 i K4); te kombinacija sojinog brašna i 8%-tnog dodatka inaktivnog pivskog kvasca: 17+8, 42+8, 67+8 i 92+8 (K5, K6, K7 i K8). Kontrolna skupina (K) sadržavala je 30% ribljeg brašna. U svaki od 27 kvadarnih bazena pojedinačnog volumena 115 l u recirkulacijskom sustavu nasađeno je po 10 riba početne pojedinačne mase od 120g. Ribe su hranjene jednom dnevno obrokom u količini od 1% ukupne mase ribe kroz 70 dana. Kvalitativni histopatološki pregled preparata crijevnog tkiva hranidbenih skupina K0, K1, K2 i K3, K5 ukazuje na normalne karakteristike *lamine epithelialis mucosae* i *lamine proprie*, uredno definiran četkasti epitel i pravilno distribuirane vrčaste stanice. Zamijećene su blage promjene sluznica kod zamjenica s višim postotkom zamjene RB te početne naznake upalnih procesa kod potpune zamjene RB sa SB, neovisno o inkluziji PK (K4, K8). Također, rezultati indiciraju hepatocite nepravilnog oblika s okruglim jezgrama potisnutim uz rub stanice kod riba hranidbenih skupina K4 i K8. Akumulacija masti u jetrenom tkivu nije bila prisutna dok su naglašene iscrpljene rezerve glikogena kod riba hranjenih višim postotcima zamjene RB. Kvantitativnom analizom dokazane su početne naznake kariopiknoze kod svih istraživanih skupina pri usporedbi s kontrolom. Analiza histoloških preparata jetrenog i crijevnog tkiva, zajedno s rezultatima visceralnog i hepatosomatskog indeksa, ukazuje na znakove pothranjenosti i negativnog utjecaja neadekvatnih K4 i K8 hranidbenih smjesa.

Ključne riječi: lamina propria, lamina epithelialis mucosae, hepatociti, Ameiurus nebulosus, riblje brašno, zamjena

sa2016_a0605

Histological alterations in intestinal and hepatic tissue of brown bullhead (*Ameiurus nebulosus* L.) fed with plant and single cell protein based diets

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Abstract

An 10-week feeding trial was carried out to investigate the effects of replacing fishmeal with soybean meal and brewer's yeast on morphometric changes of liver and intestinal tissue of brown bullhead (*Ameiurus nebulosus* L.). Triplicate group of fish was fed with nine isonitrogenous feeds (28.7% CP) in which fish meal was replaced with soybean meal in percentages 25, 50, 75 and 100 (K1, K2, K3, and K4) and with combination of soybean meal and brewer's yeast 17+8, 42+8, 67+8 and 92+8 (K5, K6, K7 and K8). The control feed (K) contained 30% of fish meal. Two-hundred-seventy brown bullhead of about 120 g initial body weight was randomly divided in 27 experimental tanks (115 liters each) in RAS. Fish were fed once a day in an amount of 1% of total body weight for 70 days. Qualitative histology analysis indicated normal characteristics of basal epithelial mucosa and *lamina propria* with properly defined brush epithelium and distribution of goblet cells in fish fed with K0, K1, K2, K3 and K5 diets. Initial inflammatory indications with abnormal vacuolization of the *lamina propria* and basal epithelium were present in diet K4 and K8. Also, the results indicated irregular shaped hepatocytes with circular nucleus placed on the edge of the cell in fish fed with K4 and K8 diets. The accumulations of fat in the liver were not present, while the emphasis was on stored glycogen in the liver, which was the most intense in control group K0. Quantitative histology analysis indicated significantly lower surface of hepatocytes nucleus in all experimental diets when compared with control. The analysis of histological preparations of tissues, together with VSI and HSI results, indicated signs of malnutrition and negative impact of inadequate feeding mixtures of K4 and K8 diets.

Key words: lamina propria, lamina epithelialis mucosae, hepatocites, Ameiurus nebulosus, fishmeal, replacement

sa2016_a0605

Interakcije riba, zooplanktona i makrofita u restauraciji jezera

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Sažetak

Uspostava i održavanje submerznih makrofita i kontrola predacije riba su nezaobilazni čimbenici restauracije jezera. Eutrofikacija, obogaćivanje hranjivim tvarima, je dobro poznati pokretač promjena iz prozirnog u mutno stanje vode. U ovom istraživanju nastojali smo utvrditi sposobnost submerznih makrofita u restauraciji jezera uzimajući u obzir promjene sastava zooplanktona i predacijskog pritiska riba. Stoga je ovo istraživanje provedeno u rukavcu rijeke Sutle (SZ Hrvatska), koji se sastoji od dva međusobno povezana bazena: gornji, proziran, sa submerznim makrofitima (*Ceratophyllum demersum*) i donji bazen, zamućen i bez makrofita. Osim uzorkovanja prirodne zajednice planktona, u mutnom bazenu je bio postavljen mesokozmos pokus, s malo modificiranim prirodnim sastavom planktona i riba, koristeći male (BM, 10 mm, – ribe) i velike (BV, 40 mm , + riba) promjere oka mrežastih bazena. U mesokozmosu izloženom predaciji riba dominirali su detritivorni kolnjaci i mali rašljoticalci, što pokazuje veliku sličnost sa sastavom mutnog bazena. U mesokozmosu bez riba, makrofiti su ostali u velikoj gustoći, a povećala se abundancija velikih rašljoticalca i veslonožaca, koji su pokazivali značajnu sličnost s litoralom prozirnog bazena. Rezultati ovog istraživanja potvrdili su da ponovno uspostavljanje makrofita ima sposobnost brze promjene biocenoza i okolišnih uvjeta.

Ključne riječi: eutrofikacija, predacijski pritisak riba, zooplankton, rašljoticalci

sa2016_a0606

Interactions between fish, zooplankton and macrophytes in the lake restoration

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Abstract

Reestablishment and maintenance of submerged macrophytes and control of fish predation are inevitable factors in the lake restoration. Eutrophication, nutrients enrichment, is well known in shifting of transparent *vs*. turbid states. This study was focused on the capacity of submerged macrophytes in the lake restoration by alteration of biotic interactions. The research was carried out in Sutla River backwater (NW Croatia), consists of two interconnected basins: the upper, transparent and vegetated with submerged macrophytes (*Ceratophyllum demersum*) and the lower, turbid and non-vegetated. Except sampling of natural community, a mesocosmos experiment was set up within turbid basin, with slightly modified natural community, using small (BS, 10 mm, – fish) and large (BL, 40 mm, + fish) mesh sizes in the basins construction. In the mesocosmos under fish top-down control, macrophytes coverage decreased, and in plankton dominated detritovorous rotifers and small cladocerans. This assemblage was similar to the pelagial of turbid and unvegetated basin. In the mesocosmos without fish, macrophytes remained very dense, and large-bodied algivorous cladocerans and copepods increased abundance and exhibited significant similarity to the littoral stands in the transparent basin. Results of this study confirmed that reestablishment of macrophytes has a great capacity in the lake restoration by causing rapid changes in the biotic interactions and environmental conditions.

Key words: eutrophication, top-down control, zooplankton, cladocerans

sa2016_a0606

Utjecaj pročišćenih otpadnih voda na ribe u recipijentima

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Sažetak

Istražen je učinak pročišćenih otpadnih voda na zdravstveni status babuške (*Carassius gibelio*), mikrobiološku kontaminaciju i otpornost prema antimikrobnim lijekovima, strukturu tkiva riba, biokemiju plazme te nuklearne aberacije jezgre eritrocita. Među izoliranim bakterijskim patogenima značajan udjel činile su bakterije iz roda *Aeromonas*, potencijalni uzročnici zoonotskih bolesti. Najveća bakterijska otpornost pokazala se prema sulfametoksazolu i eritromicinu. U riba lovljenih u efluentu najčešći histopatološki nalaz bio je fuzija škržnih lamela uz smanjivanje interlamelarnih prostora. U plazmi istih riba uočeno je značajno povišenje vrijednosti uree, ukupnih bjelančevina, albumina i triglicerida, te značajno smanjenje aktivnosti superoksid dismutaze. Uočena je i učestalost pojave nuklearnih aberacija eritrocita, kao i značajna razlika histoloških i hematoloških parametara riba u efluentu u odnosu na nizvodne vode. Zaključno, pročišćene otpadne vode modificirale su okolišna svojstva recipijenata te su bile ključni čimbenik antimikrobne rezistencije; histološki, hematološki i biokemijski parametri plazme riba ukazuju na značajne promjene koje se mogu korelirati sa okolišnim stresorima.

Ključne riječi: pročistač otpadnih voda, babuška, *Carassius gibelio,* zdravstveni status

sa2016_a0607

Impact of treated wastewater on fish living in recipients

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Abstract

Treated wastewater discharged from the wastewater treatment plant was evaluated by assessing its impact on fish (Prussian carp, *Carassius gibelio*) health status, microbiological contamination and antimicrobial resistance, fish tissue structure, blood biochemistry and erythrocyte nuclear abnormalities. Potential bacterial pathogens from fish and respective waters comprised aeromonads with a zoonotic potential. High resistance profiles were determined towards the tested antimicrobial compounds, mostly sulfamethoxazole and erythromycin. Histopathology primarily revealed gill lamellar fusion and reduction of interlamellar spaces of fish captured from the effluent. A significant increase in plasma values of urea, total proteins, albumins and triglycerides and a significant decrease in the activity of plasma superoxide dismutase were noted in carp from the effluent-receiving canal. A higher frequency of erythrocyte nuclear abnormalities was found in fish sampled from the effluent-receiving canal. Histological and haematological parameters differed significantly in effluent and downstream. Overall, treated wastewater modified the environmental parameters of the receiving surface waters, and played an important role in the antibiotic resistance scheme; the investigated histological, hematological and plasma biochemical parameters of fish indicated to significant changes related to a complexity of environmental stressors.

Key words: wastewater treatment plant, *Carassius gibelio*, health assessment

sa2016_a0607

Izazovi pred rekreacijskim ribolovom

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Sažetak

Rekreacijskim se ribolovom u Europi bavi 25 milijuna ribiča. U tom je sektoru zaposleno 60 000 ljudi, a financijska vrijednost u mnogim zemljama premašuje onu iz akvakulture. U Hrvatskoj je oko 60 000 registriranih ribiča, uz 20 000 onih koji kupuju dozvole do mjesec dana. Pored toga, tu su i posredne koristi od rekreacijskog ribolova, posebno od ribolovnog turizma te socijalizacije i zdravlja ribiča, naročito branitelja. No, suvremeni rekreacijski ribolov suočen je s nizom izazova. Dio je vezan uz ekološke teme kao što su onečišćenja voda, izgradnja brana s nefunkcionalnim ribljim stazama, krivolov i loše gospodarenje. Ribiči se ponekad nalaze u kompeticiji s gospodarskim ribarima, kao i s drugim korisnicima voda. Zadnjih godina su, naročito u razvijenim zemljama, sve više suočeni i s etičkim pitanjima. Sve ovo ukazuje na potrebu suradnje svih zainteresiranih dionika.

Ključne riječi: ribiči, gospodarski ribari, gospodarenje vodama, etika, ekologija voda

Challenges facing recreational fishing

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Abstract

There are 25 millions of anglers in Europe. European sector of recreational fishing employs 60 thousand people. Its financial value in many countries surpasses the aquaculture one. There are 60 thousand of registered anglers in Croatia together with 20 thousand anglers who occasionally buy licences for a day, week or month. The indirect benefits of recreational fishing include angling tourism and social and health benefits, especially for the veterans of war. However, modern recreational fishing faces series of challenges. Some of them relate to the ecology: the water pollution, dams with dysfunctional fish passes, poaching and bad management. Sometimes, anglers compete with professional fishermen and other water users. Recently, the ethical questions are becoming more important, particularly in developed countries. All these issues call for the cooperation of all the stakeholders involved.

Key words: anglers, professional fishermen, water management, ethics, water ecology

sa2016_a0608

Procjena uzorka aktivnosti nezavičajnih papkara u Mediteranskom staništu

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Sažetak

S ciljem da se provede procjena uzorka aktivnost različitih nezavičajnih vrsta papkara, korištenjem osam skrivenih IR kamera provedeno je istraživanje u periodu od travnja do rujna 2015. godine. Područje istraživanja ukupne površine 800 ha nalazilo se na zapadnom dijelu jadranskog otoka Raba koji pripada eumediteranskoj vegetacijskoj zoni. Glavni šumski ekosustavi otoka su šume hrasta crnike sa crnim jasenom te umjetno podignute sastojine alepskog bora, primorskog bora i pinije. Prosječna godišnja temperatura zraka iznosila je 15,3°C, a količina oborina 1,100 mm. Analiziranjem 67 356 JPEG uočene su dvije vrste papkara (europski muflon i jelen aksis), europski jazavac, kuna, europski zec i štakor. Rezultati dnevne aktivnosti vrsta papkara mogu se opisati kao bimodalni što je tipičan uzorak aktivnosti opisan kod većine papkara. Europski muflon je uglavnom aktivan u zoru i sumrak, dok je jelen aksis većinom aktivan navečer, tijekom noći sve do ranog jutra. Između muflona i jelena aksisa nije utvrđeno bihevioralno ili međuvrsno izbjegavanje. Daljnja istraživanja su potrebna kako bi se pojasnilo da li su utvrđeni uzorci aktivnosti uobičajeni ili su odraz vremenskog pomaka niša budući da je moguć utjecaj temperature i/ili turizam na aktivnost životinja.

Ključne riječi: skrivene kamere, europski muflon, jelen aksis, vremensko razdvajanje, ponašanje

sa2016_a0609

Activity pattern of no-native ungulate species in Mediterranean habitat

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Abstract

Aiming to assess the activity pattern between different non-native ungulate species, a study including eight IR camera traps was carried out from April to September 2015. The study area of total 800 ha was located in the western part of the Adriatic Island of Rab which belongs in eu-mediterranean vegetation zone. The major islands forest ecosystems are holm oak forests with black ash and artificially established stands of Aleppo pine, Maritime pine, and Turkish pine. The average annual air temperature is 15.3 °C, and the amount of rainfall is 1,100 mm. Analysing 67.356 JPEG obtained images were observed two ungulate species (European Mouflon and Axis deer), European badger, Marten spp., European hare and Rat spp. Results of daily activity of ungulate species can be described as a bimodal which is typical pattern described in most other ungulates. European mouflon are mostly active during dawn and dusk, while Axis deer are mostly active during the evening, throughout the night until early morning. Between mouflon and axis deer there was no behavioural or interspecific avoidance. Further studies are needed to clarify whether this activity pattern is typical or it reflects a temporal niche shift, because impact such as temperature and/or tourism may also effect on animal activity.

Key words: camera-trapping, European Mouflon, Axis deer, temporal segregation, behaviour

sa2016_a0609

Razvoj rogovlja kod mladih mužjaka jelena običnog (*Cervus elaphus* L.)

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Sažetak

Odabir kod mužjaka se temelji na dva glavna parametra, stupanj tjelesnog razvoja (tjelesna masa) i stupanj razvoja sekundarne spolne osobine – grana rogovlja. Rogovlje se može okarakterizirati kao oružje na kojemu se odražava dob, tjelesna masa i fiziološko stanje. Posebno je stupanj razvoja rogovlja standard odabira kod grla tijekom rasta i razvoja, posebno kod godišnjaka, ali i kod mladih mužjaka. Dobni razred „mladi mužjaci", starosti 3, 4 i 5 godina je presudan prilikom odabira kod muškog dijela populacije jelenske divljači. U tom dobnom razredu mladi mužjaci zahtijevaju dosta energije zbog svog, kako skeletnog, tako i tjelesnog razvoja. Jednako tako se u tom dobnom razredu pojavljuju važni elementi grane rogovlja, parožak srednjak i jednostruko ili višestruko račvanje završetka grane. Istraživanje je vršeno na području Državnog lovišta br.: XIV/9 „PODUNAVLJE – PODRAVLJE" (baranjsko podunavlje), tijekom 2015.g. Obrađene su odbačene grane 13 mužjaka tijekom godina njihovog života iz ograđene jedinice dijela lovišta (individualni pristup). Nakon obrade podataka posebna se pažnja poklonila dobnom razredu „mladi mužjaci". Utvrđeno je kako je u ovom dobnom razredu prisutan trend rasta svih promatranih odlika. No, jednako tako je utvrđena i dob kada dolazi do prvog tzv. „skoka", odnosno značajne razlike u razvoju rogovlja u odnosu na prethodnu godinu života jedinke. Značajan razvoj rogovlja kod mladih mužjaka se događa u petoj godini života kada mladi mužjaci dostignu potreban tjelesni i skeletni razvoj te razvojem rogovlja ne mogu ugroziti usporedo odvijanje ostalih tjelesnih procesa u organizmu.

Ključne riječi: jelen obični, mladi mužjaci, rogovlje, odabir, Baranja

sa2016_a0610

Antler development of young Red Deer (*Cervus elaphus* L.)

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Abstract

Selection of males is based on two main parameters, degree of physical development (body weight) and the stage of development of secondary sexual characteristic – antlers. Antlers can be characterized as a weapon which reflects the age, body weight and physiological condition. In particular, antler development is indicator for selection of yearlings but also in young males. Selection in age class „young males" (age 3, 4 and 5 years) is crucial for managing male side of red deer population. In this age class young males require a lot of energy because they are experiencing, both skeletal and physical development. In this age class it is important to mention that important elements of antlers are appearing – tines and possible royal. The research was conducted in the area of state hunting ground XIV/9 „PODUNAVLJE – PODRAVLJE" (Baranja Danube area) during 2015. Cast antlers of 13 males were measured during their life (individual approach). After the data processing special attention was given to age class „young males". Trend of growth for all the observed parameters appeared. What occurred is the so-called first significant „jump"of antler development. Significant development of antlers in young males is happening in the fifth year of life when the young males reach the required physical and skeletal development so that development of antlers can't jeopardize parallel operations of other body processes.

Key words: Red deer, young males, antlers, selection, Baranja

sa2016_a0610

Kraniometrijska obilježja kune bjelice (*Martes foina* ERX.) na području sjeverozapadne Hrvatske

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Sažetak

Kuna bjelica (*Martes foina*) stanovnik je gotovo svih lovišta u Republici Hrvatskoj sa brojnom i stabilnom populacijom. Ovim istraživanjem bila su obuhvaćena tri lovišta sjeverozapadne Hrvatske. Ukupno je sakupljeno 26 lubanja kune bjelice u razdoblju od pet godina (2010. - 2015.). Svakoj jedinki određen je spol i masa. Na lubanjama je izmjereno 16 kraniometrijskih mjera pomičnom mjerkom koje su zatim statistički obrađene u programu IBM SPSS Statistics. Iz dobivenih rezultata zaključili smo kako je spolni dimorfizam kod kuna slabo izražen te da je vrlo teško odrediti spol kuna samo temeljem lubanje. Lubanje mužjaka nešto su veće od lubanja ženki, a isto je i s masom jedinki. Za točnije razlikovanje spolova temeljem kraniometrijskih izmjera nužno je najprije odrediti dob kune. Statistički značajne razlike između mužjaka i ženki vidljive su iz slijedećih mjera: visina lubanje iza M1, ukupna dužina lubanje, kondilobazalna dužina, dužina moždane duplje i udaljenost između gornjih P4. Kraniometrijske mjere kuna bjelica iz sjeverozapadne Hrvatske su veće od kraniometrijskih mjera kuna u ostatku Europe, izuzev Alpske i Uralske populacije.

Ključne riječi: kuna bjelica, *Martes foina* ERX., kraniometrija, sjeverozapadna Hrvatska

sa2016_a0611

Craniometrical characteristics of Stone marten (*Martes foina* ERX.) in northwest Croatia

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Abstract

Stone marten (*Martes foina*) lives in almost all hunting grounds in Croatia and has a large and stable population. This study covered three hunting grounds in northwest Croatia. Twenty-six skulls of the stone marten were collected during a period of five years (2010-2015). Each stone marten was determined with regard to its sex and weight. Sixteen measures were taken from the skulls using a caliper, which were then statistically processed in IBM SPSS Statistics Program, Version 22. From the received data we concluded that sexual dimorphism is weekly pronounced and it is difficult to determine the sex of a stone marten only by its skull. The skulls of males are a little larger than those of females and they are larger in weight. To get more precise differentiation between sexes using craniometric measurements it is necessary to determine the age of the marten first. Statistically significant differences between males and females can be seen from the following measurements: skull height between M1, total length of the skull, condylobasal length, braincase length and the distance between upper P4. Craniometric measures of the stone martens in northwest Croatia are larger than of those in the rest of Europe, with the exception of the stone marten population in the Alps and the Ural Mountains.

Key words: stone marten, *Martes foina* ERX., craniometry, northwest Croatia

sa2016_a0611

Uzorci aktivnosti ne zavičajnog grivastog skakača *(Ammotragus lervia)* u regiji južnih Dinarida u Hrvatskoj

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Sažetak

Tijekom 2002. godine pet jedinki grivastog skakača (tri ženke i dva mužjaka) ilegalno su ispušteni u južnoj dinaridskoj regiji (planina Mosor: 1339 m nadmorske visine) u Hrvatskoj, a trenutna populacija procjenjuje se na 210 životinja sa tendencijom povećanja. Na dnevni ritam kretanja papkara snažno utječu razni biotički i abiotički faktori. Tijekom toplih perioda planinski papkari koji žive na otvorenim područjima tipično pokazuju bimodalni uzorak ritma aktivnosti, najviše u zoru i sumrak. Ali, do danas, jako malo se zna o uzorcima aktivnosti slobodnih alohtonih grivastih skakača u područjima gdje je prisutan veliki predator (vuk). Koristeći deset senzornih kamera kroz period od dva mjeseca, ispitali smo uzorke kretanja grivastih skakača na raznim lokacijama i nadmorskim visinama, te u tri vrste staništa (šuma, kamenjar i makija). Dnevna dinamika je bila najveća u dva perioda, ujutro između 5:00 i 7:00, te navečer između 19:00 i 21:00 (s prosjekom 1,8 jedinki po snimci). Postotak uspješnosti u snimanju sa senzornim kamerama ukazala je na znatne razlike u uzorku aktivnosti grivastog skakača ovisno u kojem su staništu snimani, najveća aktivnost bila je na nadmorskoj visini od 679 m u kamenjaru, dok aktivnosti nije bilo pri nadmorskoj visini od 357 m u grmovitom staništu. Također, 11 Ožujka 2015. dvije jedinke uhvaćene su mrežom i označene GPS-GSM ogrlicama. Ogrlice su namještene da snimaju lokaciju svakog punog sata, 24 sata na dan. Ženku (4 godine starosti) zaklali su vukovi tijekom noći 22 Ožujka 2015 u 23:45 sati, svega 11 dana nakon što je ogrlica postavljena. Iz tog razloga njene podatke nismo analizirali. Prosječna suma dnevne prijeđene udaljenosti mužjaka (3 godine starosti) iznosila je samo 1,61 km. Mužjakova dnevna razina aktivnosti je tipično najviše izražena u dva intervala, prvi ujutro (oko 6:00), a drugi navečer (20:00 – 22:00). Grivasti skakač tipično iskazuje bimodalni uzorak (sa dva vrha) aktivnosti koji je prethodno već opisan kod divokoze. Iako se naša studija bazira na malom uzorku životinja, jedna je od prvih GPS studija na slobodno živućim grivastim skakačima te zato zahtijeva daljnje istraživanje kako bi se detaljnije razradila ova tema.

Ključne riječi: senzorne kamere, GPS telemetrija, planina, papkari, aktivnost, Hrvatska

sa2016_a0612

Activity patterns in introduced nonnative Barbary sheep (*Ammotragus lervia*) from southern Dinarides, Croatia

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Abstract

During year 2002 five Barbary sheep (three females and two males) of unknown origin have been illegally released in the southern Dinaric region (Mosor Mountain; 1.339 m a.s.l.) of Croatia and the current population size is estimated to be at around 210 animals with an increasing tendency. Daily activity rhythms of ungulates are strongly affected by a range of biotic and abiotic factors. During warm periods, mountain ungulates living in open areas typically show a bimodal pattern of activity rhythms, with peaks at dawn and dusk. To date, however, little is known about the activity patterns of free range nonnative Barbary sheep in areas where large predator (wolves) is present. Using ten camera-traps over a 2-month period between mid-May and mid-July of 2015, we investigated the activity patterns of Barbary sheep in different locations and altitudes, in three types of habitats (forest, rock and bush). Daily dynamics were highest in two periods, in the morning between 5:00 am and 7:00 am and also in the evening between 7:00 pm and 9:00 pm (with an average of 1.8 individuals per photo). The success rates in camera-trapping suggested significant differences in Barbary sheep activity patterns between habitat types, the highest activity was at elevation of 679 m in rock habitat while the no activity was at elevation 357 m in bush habitat. Also, on 11 of March 2015 two individuals (one male and one female) were caught in the net and tagged with GPS-GSM collars. GPS collars were set to record a position every full hour, 24-hours per day. Female (4 years old) was killed by the wolves at night (23:45) on 22 of March 2015, just 11 days after GPS-tagging. Therefore we did not analyze its GPS data. The male (3 years old) average daily sum of traveled distances was only 1,61 km. His circa diurnal locomotion activity typically exhibits two pronounced peaks, first one in the morning (around 6:00 am) and second one in the evening (20:00-20:00 pm). Barbary sheep exhibits typical bimodal pattern (with two peaks) of activity that has been previously also described in chamois. Our study were based on a small number of animals but still is one of the first GPS studies on free range Barbary sheep, though further investigations is necessary to better illuminate this issue.

Key words: camera-traps, GPS telemetry, mountain, ungulate, activity, Croatia

sa2016_a0612

Studies on the fungal pathogens of honeybees in Croatia: molecular species identification

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Abstract

Various fungal pathogens, e.g. *Nosema, Ascosphaera* and *Aspergillus* species cause severe colony losses of European honeybee (*Apis mellifera*) and due to mycotoxin production *Aspergillus* species can impair the quality of honey and risk the health of beekeepers as well. Variation has been observed recently in the species composition of bee pathogenic fungi, which has to be studied to aid pest management strategies.

Bees were collected from managed colonies in Croatia. The high number of *Nosema* spores detected in the midguts (10^6 and 10^7/bee) shows severe diseased status of the colonies.

DNA extraction from the midguts and a species specific primer-based method, suitable for the detection of *Nosema apis*, *N. ceranae* and *N. bombi*, were optimized and the analysis revealed the exclusive presence of *N. ceranae* in all the examined samples. These findings indicate that *N. ceranae*, known before as the pathogen of bees in Asia only, has appeared in Croatia as well, superseding *N. apis* in the Western countries.

This study was the initial step of a large-scale survey, aimed at the examination of *Nosema, Ascosphaera* and *Aspergillus* species in bee colonies in different countries, as well as the development of potential strategies for biological pest management.

Key words: *Apis mellifera*, Croatia, *Nosema ceranae*

This study forms part of the project TÁMOP-4.1.1.C-12/1/KONV-2012-0014, which is supported by the European Union and co-financed by the European Social Fund, and TÁMOP-4.2.1C/"Tudás-Park".

sa2016_a0613

Informacija kao bitan čimbenik razvoja lovstva

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Sažetak

Komunikološki značaj Lovačkog vjesnika u 125. godišnjici neprekinutog izlaska među populacijom lovaca kao i ljubitelja prirode ostao je isti. Kao statusno i službeno glasilo Hrvatskog lovačkog saveza od 1925. godine istinskog sadržaja primjerenog lovkinjama i lovcima te svima čiji je profesionalni život, kao i privatni interes, u planiranju slobodnog vremena povezan s prirodom i time obiteljskom sredinom ostvaruje nezamjenjivo mjesto u literaturnom opusu jedne obitelji.

Među prvim je glasilima u povijesti distribucija informacija putem tiskovina i taj status zadržao je do danas. Pravodobno informiranje u vrijeme kad je jedina mogućnost bila putem tiskovine ostavila je zapažen rezultat koji je ostao prepoznat do današnjih dana. Povijesna vrijednost očituje se prijenosom s koljena na koljeno, a kao drugo po starosti u Europi i treće u svijetu glasilo ove tematike ima iznimni respekt među novovjekim časopisima. Osim pravodobnosti zadržava i status medija kojem se vjeruje, a time je postupak širenja vijesti više nego uspješan i učinkovit. Osim trajne vrijednosti koja je preživjela stoljeće u doznačavanju informacije bitnu ulogu ima u promicanju lovačke kulture i običaja kao i etike te izgradnje odnosa prema prirodi kroz edukativnu i obrazovnu dimenziju.

Njegov doprinos u razvoju svijesti pravilnog gospodarenja i uvođenja suvremenih metoda i postupaka utemeljen je kroz izdavaštvo kojem je okosnica u izdanju stručne literature koja se ubraja među najranije publikacije ove vrste. Bitni je nosioc izdavačkih cjelina poput Male lovačke biblioteke koja prednjači u objavi priručnika praktičnih namjena i Zelenog trokuta čija su domena enciklopedijska izdanja.

Ključne riječi: Lovački vjesnik, Hrvatski lovački savez, lovstvo, komunikacija, informacija, edukacija

sa2016_a0614

Information as an important factor in the development of hunting

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Abstract

Communicational significance of "Lovački vjesnik" magazine on its 125th anniversary of continuous publication among the population of hunters and nature lovers remains unchanged. As important and the official journal of the Croatian Hunting Association since 1925 with true content appropriate for huntress and hunters, and anyone whose professional life, as well as private interests in planning leisure time are associated with nature and family environment, this magazine holds an irreplaceable place in a literary oeuvre of any family.

It was one of the first magazines in the history of distribution of information in the media via publications and it still holds that status today. Timely information at a time when the only option was via printed publications left a remarkable result that remains recognized to this day. The historical value is reflected in the transfer of the magazine from generation to generation, and as the second oldest publication on this subject in Europe and third oldest in the world, it enjoys an extraordinary respect among modern magazines. In addition to timeliness it also maintains the status of the media which is believed to, which makes the process of disseminating news more than a successful and effective. In addition to a permanent value that has survived the centuries in predicting information, it also plays an important role in promoting hunting culture and customs as well as ethics and building a relationship towards nature through educational dimension.

Its contribution to the development of awareness on sustainable management and the introduction of modern methods and procedures was established through publications whose basis is in expert literature which is among the earliest publications of that type. It is an important bearer of publishing units such as "Mala lovačka biblioteka" which is at the vanguard of publishing practical purpose manuals and "Zeleni trokut" whose domain are encyclopaedic publications.

Key words: Lovački vjesnik, Croatian Hunting Association, hunting, communication, information, education

sa2016_a0614

Utjecaj količine legla i broja pčela na higijensko ponašanje radilica tri linije medonosne pčele (*Apis mellifera*)

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Sažetak

Istraživanje je provedeno 2015. godine u Baranji na tri linije medonosne pčele (*Apis mellifera carnica*). Higijensko ponašanje pčela radilica na 57 pčelinjih zajednica ocjenjeno je standardnom pin test metodom. Prilikom provedbe testa nije bilo unosa nektara, zabilježen je broj okvira s leglom i broj okvira zaposjednutih pčelama. Prosječno je 18 sati nakon provedbe testa bilo očišćeno 65,4% stanica legla s dosta širokim rasponom (18-100%). Nakon usporedbe rezultata nije pronađena korelacija između jačine pčelinje zajednice i higijenskog ponašanja, dok je uočena razlika između linija pčela gdje je najlošija prosječno očistila 59,2% stanica, a najbolja 74,8% stanica. Naši rezultati pokazuju kako broj pčela i količina legla u košnici nema utjecaja na izražavanje higijenskog ponašanja kod pčela radilica.

Ključne riječi: higijensko ponašanje, jačina pčelinje zajednice, *Apis mellifera*

Effect of brood and number of bees on expression of hygienic behaviour on three lines of honey bee (*Apis mellifera*)

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Abstract

The study was caried out on three lines of honeybees (*Apis mellifera carnica*) during summer of 2015 in Baranja, Croatia. Hygienic behaviour of bees were measured with standard pin test method on 57 colonies. Numer of combs with bees and brood was counted on day when test was performed, and during test there was no nectar flow. Colonies showed wide range of brood removal (16-100%) 18 hours after conducting pin test. After comparing results no correlation was found between colony strength and success of hygienic behavior. However there was differnce between lines with one line avarage of 59.2% of cleaned cells and one line with 74.8% of cleaned cells. Our result show that number of bees and brood in the hive doesn't affect expression of hygienic behaviour.

Key words: hygienic behaviour, colony strength, *Apis mellifera*

sa2016_a0615

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Stočarstvo

Fenotipske i genetske korelacije između količine mlijeka i svojstava vanjštine za Holstein pasminu goveda u Hrvatskoj

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Sažetak

Povezanost proizvodnje mlijeka i svojstava vanjštine ima veliki ekonomski značaj pri visokoj proizvodnji mlijeka zdravih i plodnih krava. Cilj ovog rada bio je procijeniti fenotipske i genetske parametre za količinu mlijeka (KM) i dva svojstva vanjštine (mliječni karakter - MK i dubina vimena - DV) za populaciju prvotelki Holstein pasmine u Hrvatskoj. Zapisi količine mlijeka i svojstava vanjštine dobiveni su od 14811 Holstein koje su se telile od 2004. do 2015. godine i analizirani su koristeći model s dva svojstva u VCE programskom paketu. Model za KM uključivao je sistematske utjecaje sezonu teljenja, regiju i redni broj laktacije,a dob krava kod prvog teljenja i stadij laktacije su korišteni u modelu kao kovarijable. Dob kod teljenja i ocjene vanjštine krava, sezona ocjene, ocjenjivač i vrijeme proteklo od mužnje su uključeni u model za ML i DV. Direktni aditivni genetski utjecaj, interakcija stado-godina kontrole i permanentni utjecaj okoliša korišteni su kao slučajni utjecaji u modelu za KM, dok je direktni aditivni genetski utjecaj bio jedini slučajni utjecaj u modelu za MK i DV. Fenotipska korelacija između KM i MK je bila 0,09, odnosno -0,18 između KM i DV. Heritabiliteti su bili u rasponu od 0,18 do 0,24 i sukladni s procjenama iz nacionalnog genetskog vrednovanja. Srednje jaka i pozitivna genetska korelacija utvrđena je između KM i MK (0,51), dok je korelacija između KM i DV bila srednje jaka i negativna (-0,41). Ovi rezultati ukazuju da je visoka proizvodnost praćena izraženim mliječnim karakterom, dok je visoko vezano vime genetski povezano s manjim volumenom tj. manjom proizvodnjom u prvoj laktaciji. Dobiveni rezultati pokazuju da treba uvažavati postojanje genetskog antagonizma između KM i DV kako bi se spriječilo narušavanje ovog kao i ostalih koreliranih svojstava kao što su dugovječnost i plodnost.

Ključne riječi: Holstein, količina mlijeka i svojstva vanjštine, heritabilitet, genetska korelacija

sa2016_a0701

Phenotypic and genetic correlations between milk yield and type traits for Holstein cattle in Croatia

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Abstract

Associations between milk production and type traits are of great economic importance in order to obtain high milk production from healthy, fertile cows. The objective of this work was to estimate phenotypic and genetic parameters for milk yield (MY) and two type traits (angularity – AN and udder depth – UD) of first lactating Holstein cows in Croatia. Milk and type records of 14811 Holstein cows calved from 2004 to 2015 were analysed by bivariate animal model implemented in the VCE software. Model for MY included fixed effects of calving season, region, and parity. The age of cow at first calving and days in milk were fitted as a covariate. Age at calving and scoring, season of scoring, classifier, and time after milking were fitted in the model for AN and UD. Direct additive genetic, herd-year of testing, and common permanent environmental effect were included in the random part of the model for MY, while direct additive genetic effect was only random effect for AN and UD. Phenotypic correlation was 0.09 between MY and AN and -0.18 between MY and UD. Heritabilities ranged from 0.18 to 0.24 and were in line with estimates from the national evaluation. Moderate and positive genetic correlation was obtained between MY and AN (0.51), while the correlation between MY and UD was moderate and negative (-0.41). These results indicate that higher yielding cows are more angular, while high udders are genetically associated with small volumes and lower production. Considerable importance should be given to genetic antagonism observed between MY and UD to avoid deterioration of this or other correlated traits such as longevity and fertility traits.

Key words: Holstein, milk yield and type traits, heritability, genetic correlation

sa2016_a0701

Povezanost parametara boje junećeg mesa mjerenim na toplim i hladnim polovicama

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Sažetak

Boja mesa je vrlo bitan parametar kvalitete junećeg mesa. Veće klaonice preferiraju metode mjerenja boje mesa junadi na dostupnim pozicijama trupova, u što kraćem periodu nakon klanja. Cilj istraživanja je utvrditi povezanost vrijednosti boje mesa mjerenih na toplim i hladnim junećim polovicama. Istraživanje je provedeno na 340 trupova junadi zaklanih u dobi od 16 do 19 mjeseci. Boja mesa na toplim polovicama mjerena je neposredno nakon primarne obrade trupova na pozicijama *m. rectus abdominis* i *m. gracilis*. Nakon hlađenja trupova (*24 h post mortem*) i otvaranja mišića (*60 min*) mjerena je boja na pozicijama *m. gracilis* i *m. longissimus dorsi*. Boja mesa mjerena je uređajem Minolta Chroma Meter CR-410. Prosječna vrijednost L* parametara na toplim polovicama na poziciji *m. rectus abdominis* (36,62) značajno ne odstupa od uočene prosječne vrijednosti na hladnim polovicama na *m. gracilis,* no značajno je niža od prosječne vrijednosti na *m. longissimus dorsi* (40,93; P<0,01). Prosječne vrijednosti L* parametra na toplim i hladnim polovicama na *m. gracilis* značajno se razlikuju (P<0,01). Prosječne vrijednost a* parametara na toplim polovicama na *m. rectus abdominis* i *m. gracilis* značajno se razlikuju od vrijednosti uočenih na hladnim polovicama na *m. longissimus dorsi* i *m. gracilis* (P<0,01). Zapažene korelacije parametara boje ukazuju da je na toplim polovicama najpouzdanija izmjera boje mesa na poziciji *m. rectus abdominis* te ista može poslužiti kao pokazatelj kvalitete mesa.

Ključne riječi: juneće meso, boja, tople polovice, hladne polovice, korelacija

sa2016_a0702

Correlation between color parameters measured on hot and cold beef carcasses

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Abstract

Meat color is one of the important parameter of beef quality. Larger slaughterhouses favored methods for measuring the color of meat directly on slaughter line on muscles available in standard processing of beef carcass. The aim of the study is to determine the meat color measured in two positions on hot carcasses and two positions in the cold carcasses, and to determine their correlations. The study was conducted on 340 beef carcasses which were slaughter in the age between 16 and 19 month. Meat color in hot beef carcasses was measured on *m. rectus abdominis* and *m. gracilis*. On cold beef carcasses meat color (*24 h post mortem*) was measured on *m. gracilis* and *m. longissimus dorsi* 60 min after blooming time. Meat color was measured with Minolta Chroma Meter CR-410. The average L* value parameter of 36.62 on hot carcasses of *m. rectus abdominis* was not significantly different from the value observed on the cold carcasses of *m. gracilis* but is significantly lower than the value observed on *m. longissimus dorsi* (40.93; $p<0.01$). The average L* values observed on hot and cold carcasses on *m. gracilis* were significantly different ($p<0.01$). The average value of a* parameter on hot carcasses on *m. rectus abdominis* and *m. gracilis* are significantly different from the value observed on the cold carcasses in *m. longissimus dorsi* and *m. gracilis* ($p<0.01$). Observed correlation of color parameters indicate that measurement of meat color in the hot carcasses on *m. rectus abdominis* is reliable parameter and can be used as primary indicators of meat quality.

Key words: beef, color, hot carcasses, cold carcasses, correlation

sa2016_a0702

Genetska struktura romanovske ovce u Hrvatskoj

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Sažetak

Uzgoj ovaca ima dugu tradiciju i važno mjesto u hrvatskom stočarstvu. Romanovska ovca uvozila se zbog poboljšanja mesnatosti u križanjima i uzgoja u čistoj krvi. Današnja populacija sastoji se od 1364 rasplodne ovce i 67 ovnova. Cilj ovog istraživanja bio je procijeniti genetsku varijabilnost romanovske ovce u Hrvatskoj koristeći podatke iz rodoslovlja (30184 životinja). Referentna populacija sastojala se od 6195 ženskih i 4550 muških životinja rođenih između 2005 i 2010. Genetska varijabilnost u populaciji opisana je sljedećim parametrima: koeficijent srodstva, postotak poznatih predaka, efektivan broj predaka, osnivača i genoma osnivača. Parametri su procijenjeni programskim paketom PEDIG. Broj inbridiranih ovaca je bio 13519 s prosječnim inbridingom od 4%. Prosjek poznatih predaka unatrag 6 generacija je bio 19.07%. Efektivan broj osnivača bio je14.3. Efektivan broj predaka za muške životinje je bio 13.85, a za ženske 13.72. Odnos razlika među efektivnim brojem osnivača i predaka ne upućuje na nedavno usko grlo u populaciji. Efektivan broj genoma osnivača bio je 10.20 za muške i za ženske životinje. Proporcija gena koji su doprinijeli referentnoj populaciji preko najvažnijih predaka bili su 15.91% za muške i 15.34% za ženske životinje. Najvažnijih 5 predaka objasnilo je 50% varijabilnosti u genetskom bazenu. Kako bi se donijele ispravne selekcijske odluke, potreban je dodatan rad na poboljšanju kvalitete rodoslovlja koja utječe na pouzdanost procijenjenih parametara i na genetsku strukturu populacije.

Ključne riječi: analiza rodoslovlja, romanovska ovca, srodstvo, genetska varijabilnost

sa2016_a0703

Genetic structure of Romanov sheep in Croatia

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Abstract

Sheep breeding has a long tradition in Croatia. Romanov sheep is imported mainly for improvement of meat performance and breeding of pure animals. Today's population consist of 1364 ewes and 67 rams. The objective of this study was to estimate the genetic variability in Romanov sheep breed using pedigree (30184 animals). Reference population consisted of 6195 female and 4550 male animals born between 2005 and 2010. Genetic variability in population was described using following parameters: inbreeding coefficient, proportion of known ancestors, effective number of founders, ancestors and founder genomes. Parameters were estimated using PEDIG program package. Number of inbred animals was 13519 with an average inbreeding of4%. Proportion of known ancestors 6 generations back was19.07%. Effective number of founders was 14.3. Effective number of ancestors was, 13.85 for male and 13.72 for female animals. Discrepancy in effective number of ancestors and founders does not indicate any recent bottlenecks in the population. Effective number of founder genomes was 10.20 for males and for females. The proportion of the genes contributed to the reference population of males and females by the most important ancestor was 15.91% and 15.34%. The first 5 ancestors explained around 50% variability in the gene pool. In order to perform proper selection decisions, additional work should be done to increase the quality of pedigree data which affects the reliability of estimated parameters and genetic structure of the population.

Key words: pedigree analysis, Romanov sheep, inbreeding, genetic variability

sa2016_a0703

Effect of different levels of soy isoflavones and sex on oxidative stability of meat and serum lipid parameters of broiler chickens

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Abstract

The study was conducted to investigate the effect of dietary soy isoflavone (ISF) and sex on thigh and breast meat oxidative stability and serum lipid parameters of broiler chickens. A total of 256 day old Ross 308 chicks were randomly allocated to 8 treatments using a factorial arrangement (4×2) with 4 replicates and 8 birds each. ISF in 4 levels of 0, 30, 60 and 90 mg/kg of diet fed to male or female chickens for a period of 42 days. At day 35, blood samples were collected from wing vein of two birds of each replicate. The birds thigh and breast meat samples were also taken at day 42 following the slaughtering. According to the results, a reduction in total cholesterol, triglycerides, low density lipoprotein (LDL)-cholesterol and very low density lipoprotein (VLDL)-cholesterol levels of serum was observed by ISF supplementation ($P<0.001$). Adding ISF increased the level of serum high density lipoprotein (HDL)-cholesterol as well ($P<0.001$). The levels of triglyceride and VLDL-cholesterol were higher ($P<0.05$), while the level of HDL-cholesterol was lower in female than those of male ($P<0.01$). No significant interaction was observed between ISF and sex concerning blood parameters. The concentration of malondialdehyde in breast and thigh meats, in case of refrigerated or frozen, was decreased by ISF inclusion to the birds diet. There were no significant effect of Sex and its interaction with ISF on oxidative status of meat. In conclusion, dietary ISF decreased serum triglyceride and cholesterol levels and improved meat oxidative stability of broiler chickens. Moreover, there were no interactions between ISF and sex of these birds until 42 days of age.

Key words: soy isoflavone, oxidative stability, serum lipids, broiler chickens

sa2016_a0704

Isparljivi sastojci mesa janjadi iz različitih zemljopisnih područja

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Sažetak

Isparljivi sastojci janjećeg mesa iz različitih zemljopisnih područja korišteni su u ovom istraživanju kao eventualni biomarkeri, odnosno poveznica između janjetine i floističkog pokrova određenog uzgojnog područja. U tu svrhu izvršene su analize isparljivih spojeva pečene janjetine porijeklom iz pet različitih područja (dalmatinsko zaleđe, otok Pag, Lika, otok Cres i Kupreško polje u BiH) na GC-MS (SPME metoda). Sva je janjad bila porijeklom od izvornih pasmina ovaca (dalmatinske pramenke, paške ovce, creske ovce, ličke pramenke i kupreške pramenke) iz prethodno navedenih uzgojnih područja. Analizom je utvrđeno 121 različitih isparljivih sastojaka u svih pet vrsta janjetine, od čega 88 u dalmatinske janjetine (DL), 52 u paške janjetina (PL), 70 u ličke janjetine (LL), 76 u creske janjetine (CL) i 66 u kupreške janjetine (KL). Najzastupljenija skupina isparljivih sastojaka bili su aldehidi (oko 50% ukupne površine vršnih područja, ovisno o vrsti janjetine), alkoholi (od 20 do 30% za sve skupine, osim KL koja je sadržavala u prosjeku 7,7%) i ketoni (oko 10% za sve skupine, osim CL koja je sadržavala u prosjeku 5,84%). Rezultati ovog istraživanja su uglavnom u skladu s relevantnim referencama u kojima se 2,3-oktanedion, 3-metilindol (skatol), terpeni kao i dugolančani alkani i C-7 aldehidi navode kao pouzdani markeri pašnjačkog uzgoja ovaca. Naime, DL, LL i KL uzgajana su isključivo na pašnjaku, a CL uzgajana su na paši uz dodatak žitarica (dob klanja u navedene četiri skupine bila je 100 ± 5 dana), a PL othranjena su gotovo isključivo sisanjem vlastitih majki (prosječna dob klanja 33 dana). Prema tome, u usporedbi s drugim skupinama, CL je imala znatno manje aldehida (43.87%, P≤0,001) i ketona (5,84%; P≤0,001, od čega 2,3-oktanediona 4,31%, P≤0,05), kao i aldehida C-7 (7,10%, P≤0,001). Ukupno vršno područje terpena kao i njihov sastav značajno su se razlikovali između svih skupina (P≤0,001). Najviše ukupnih terpena utvrđeno je u CL (4,93%) i DL (4,03%), a najmanje u KL (0,94%). Također je zanimljivo da je više terpena bilo u PL (1,72%) negoli u KL i LL (1,41%). Budući da se u literaturi terpeni smatraju izravnim biljnim biomarkerima, prethodno navedene razlike mogu se objasniti specifičnim floističkim sastavom pašnjaka na otocima Cresu i Pagu kao i u dalmatinskom zaleđu, koji rezultira višim sadržajem terpena u usporedbi s pašnjacima planinskih područja. Međutim, kako bi se došlo do pouzdanijih zaključaka, potrebno je provoditi daljnja istraživanja u ovom smjeru, uključujući istraživanja floističkog sastava pašnjaka i isparljivih spojeva ovčjeg mlijeka.

Ključne riječi: izvorne pasmine, ovce, profil arome, isparljivi spojevi, terpeni

sa2016_a0705

Meat volatiles of lambs reared at different geographical areas

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Abstract

The meat volatiles of lambs reared at different geographical areas were used in this study as potential biomarkers which could be link between lamb meat and floristic composition of certain rearing area. For this purpose, a SPME/GC/MS VOC analysis of heat-treated lamb reared at five different areas (Dalmatian hinterland, Island of Pag, Lika, Island of Cres and Kupres field in BiH) was carried out. All the lambs originated from indigenous sheep breeds (Dalmatian Pramenka, Paška sheep, Creska sheep, Lika Pramenka and Kupreška Pramenka) from previously mentioned geographical areas. The VOC analyses resulted in 121 various meat volatiles in all five types of lamb, out of which 88 in Dalmatian lamb (DL), 52 in Pag lamb (PL), 70 in Lika lamb (LL), 76 in Cres lamb (CL) and 66 in Kupreška lamb (KL). The most represented groups of volatiles were aldehydes (about 50% of the total peak area, depending on the type of lamb meat), alcohols (from 20 to 30% for all groups, except the KL which contained in average of 7.7%) and ketones (about 10% for all groups, except the CL which contained in average of 5.84%). The results of this study are largely consistent with relevant references in which 2,3-octanedione, 3-methylindole (scatole), terpenes as well as long-chain alkanes and aldehydes C-7 are mentioned as reliable markers of pasture rearing of sheep. Namely, DL, LL and KL are reared exclusively on pasture, but CL were grown on pasture and grain feed supplement (slaughter age of these four groups was 100±5 days), and PL were grown almost exclusively by suckling their mothers (average slaughter age of 33 days). Consequently, compared with the other groups, CL had significantly less aldehydes (43.87%; P≤0,001) and ketones (5.84%; P≤0,001; out of which 2,3-octanedione 4.31%; P≤0,05), as well as aldehydes C-7 (7.10%; P≤0,001). Total peak areas of terpenes as well as terpene profiles were significantly different among all groups (P≤0,001). The largest area of total terpenes was established for CL (4.93%) and DL (4.03%) and the lowest for KL (0.94%). Also, it is interesting that area of total terpenes was larger in the PL (1.72%) rather than in KL and LL (1.41%). Since in literature terpenes are considered as direct plant biomarkers, above mentioned differences could be explained by a specific floral composition of pastures on islands of Cres and Pag, as well as in Dalmatian hinterland, which result in higher terpenes content compared to mountain pastures. However, to draw more reliable conclusion, further research in this direction including research of the floristic composition of pastures and volatiles of sheep milk should be carried out.

Key words: indigenous breeds, sheep, aromatic profile, meat volatiles, terpenes

sa2016_a0705

Antibiotička rezistencija G+ i G- bakterija izoliranih iz spontano fermentiranih kobasica divljači

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Sažetak

Tradicionalne kobasice od divljači proizvode se u Hrvatskoj u domaćoj radinosti i prema tradicionalnoj recepturi, bez dodatka starter kultura. Takvi visoko vrijedni proizvodi odlikuju se svojom autentičnošću i senzornim svojstvima. Poznato je da fermentirana hrana predstavlja način prijenosa živih bakterija u ljudskom gastrointestinalnom (GI) traktu. Bakterije unesene hranom mogu imati gene koji kodiraju za antibiotičku rezistenciju, koje potom mogu, najčešće horizontalnim transferom gena, prenijeti na ostale bakterije, uključujući patogene vrste. Zbog toga je od iznimne važnosti detaljno karakterizirati autohtonu mikrobiotu tradicionalnih kobasica proizvedenih od mesa jelena (*Cervus elaphus*) i divlje svinje (*Sus scofa*) kao i utvrditi obrazac njihove antibiotičke rezistencije. Osim nasljedne rezistencije, gram-pozitivne i gram-negativne bakterije posjeduju izuzetnu sposobnost stjecanja rezistencije na antibiotike različitim mehanizmima. Budući da podatci o antibiotičkoj rezistenciji bakterija izoliranih iz tradicionalnih fermentiranih kobasica nedostaju, cilj ovog istraživanja bio je istražiti osjetljivost gram-pozitivnih i gram-negativnih bakterija, izoliranih iz tradicionalnih kobasica od divljači, na različite klinički važne antibiotike. Antibiotička rezistencija gram-negativnih bakterija (*E. coli* i *Enterobacteriaceae*) istražena je prema 9 antibiotika, a gram-pozitivnih bakterija (*Enterococcus* spp.) prema 6, metodom difuzije diska u agaru. Svi izolati bakterije *E. coli* (51 izolat) bili su osjetljivi na sve testirane antibiotike. Bakterije roda *Enterobacteriaceae* (186 izolata), pokazale su rezistentnost na ampicilin (20 %), cefoksitin (7 %) i ampicilin/sulbaktam (1 %). Kod bakterija roda *Enterococcus* (280 izolata), utvrđena je rezistentnost na tetraciklin (4 %), eritromicin (2,5 %) i vankomicin (3 %) te srednja osjetljivost na eritromicin (57 %), kloramfenikol (5 %) i tetraciklin (2 %).

Ključne riječi: tradicionalne kobasice od divljači, antibiotička rezistencija, antibiotici

sa2016_a0706

Antibiotic resistance of G+ and G- bacterial isolates from spontaneously fermented game meat sausages

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Abstract

Traditional game meat sausages are produced in Croatia at small scale by traditional techniques without the addition of starter cultures. Such artisanal products have increased value due to their sensory properties and authenticity. However, fermented foods represent transfer vehicles for live bacteria to human gastrointestinal (GI) tract. These bacteria may carry transferable genes coding for antibiotic resistance which may be transferred to the other commensal or pathogen bacteria in GI tract. Therefore, an in depth analysis and characterization of indigenous microflora and their antibiotic activity in traditional sausages from deer (*Cervus elaphus*) and wild boar (*Sus scrofa*) is essential. It has been reported that commensal bacteria found in such products may possess intrinsic multi-resistance to antibiotics, a trait that has evolved in bacteria before antibiotics were even applied in medicine or husbandry. Furthermore, bacteria possess a remarkable ability to develop new resistances to antibiotics through many different mechanisms. As the data for antibiotic resistances of bacteria from traditional fermented sausages is scarce, the aim of our study was to analyse susceptibility of gram-positive and gram-negative bacteria from the game meat sausages to different clinically important antibiotics. Antimicrobial susceptibility of gram-negative bacteria (*Escherichia coli* and *Enterobacteriaceae*) was tested against 9 antibiotics and gram-positive bacteria (*Enterococcus*) were tested against 6, by agar disc diffusion method. A total of 51 isolates of *E. coli* showed to be sensitive to all drugs tested. *Enterobacteriaceae* (186 isolates), displayed resistance towards ampicillin (20 %), cefoxitin (7 %) and ampicillin/sulbactam (1 %). *Enterococcus* (280 isolates) presented resistance pattern toward tetracycline (4 %), erythromycin (2.5 %) and vancomycin (3 %) with the intermediate resistance observed for erythromycin (57 %), chloramphenicol (5 %) and tetracycline (2 %).

Key words: game meat sausages, antibiotic resistance, antibiotics

sa2016_a0706

Utvrđivanje brojnog stanja i pasminsko identificiranje konja u Sarajevskoj i Bosansko-podrinjskoj županiji

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Sažetak

Cilj rada je da se kroz utvđivanje brojnog stanja i pasminsko identificiranje konja u Sarajevskoj i Bosansko-podrinjskoj županiji uspostavi sustavni uzgojno selekcijski rad u FBiH, te predlože mjere za očuvanje populacije konja u BiH. U periodu od siječnja do rujna 2015. godine su evidentirana sva grla. Ukupan broj konja iznosi 361, a od tog broja je umatičeno 215 grla. Sva umatičena grla su izmjerena, fotografirana i opisana. Broj konja u promatranom području je za 86,5 % manji nego prema popisu iz 1991. godine, a sve procjene govore da je slično stanje i na ostalom području FBiH, što će se saznati u daljem radu FZZP.

Ključne riječi: broj konja, pasminsko identificiranje, FBiH,

sa2016_a0707

Defining number and breed identification of horses in Sarajevo Canton and Bosnian – Podrinje Canton

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Abstract

The objective of this work is to establish systematically breeding and selective work in the Federation by defining number and breed of horses in Sarajevo Canton and Bosnian –Podrinje Canton, and then suggest some appropriate measures to sustain horse population in Bosnia and Herzegovina. All the horses were recorded from January to September 2015. There are 361 horses, 215 horses of them are registered. All the registered horses were measured, photographed and described.

Number of horses in the observed area is 86,5 % less than the number according to 1991 census data, and it is highly estimated that is the same situation in the rest of the Federation, which will be known in the further work of the Federal Institute of Agriculture.

Key words: number of horses, breed identification, the Federation of Bosnia and Herzegovina

sa2016_a0707

Modeli procjene ugroženosti i održivosti uzgoja autohtonih pasmina goveda i konja

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Sažetak

Krajem dvadesetog stoljeća autohtone pasmine prepoznate su kao važan genetski resurs kojeg treba očuvati radi prepoznatljivosti i sigurnosti proizvodnje hrane. Dio autohtonih pasmina gospodarski je zapostavljen što je potaklo njihov biološki nestanak. Problem je prepoznat na svim institucionalnim razinama te su ponuđeni modeli procjene stanja autohtonih pasmina, indikatori rizika ugroženosti koji su podloga mjerama poticanja njihove održivosti. Najčešće korišteni numerički indikatori temelje se na broju jedinki, broju odraslih i mlađih kategorija i omjeru spolova. Propituje se potreba dopune modela procijene statusa ugroženih autohtonih pasmina kojom se uvažavaju svi potencijalni rizici. Indikatori geografske koncentracije i genetskog profila poboljšavaju procjenu rizika, no iziskuju individualni pristup pasmini i uzgojnom području. Cilj istraživanja je simulacijska analiza modela i indikatora procjene ugroženosti autohtonih pasmina goveda i konja. U analizi su korišteni numerički modeli procjene rizika te alternativni modeli koji uključuju indikatore geografske koncentracije, genetske erozije, gospodarske iskoristivosti i uključenosti u društvo. Provedena analiza indikatora ukazuje na slabost korištenja isključivo numeričkog modela te potrebu uključivanja drugih modela i indikatora radi boljeg sagledavanja pasminskog stanja, trendova, rizika i prilika. Interaktivno povezivanje modela i indikatora doprinosi objektivnijem vrednovanju i optimizaciji uzgojnih strategija autohtonih pasmina.

Ključne riječi: autohtone pasmine, indikatori, ugroženost, održivost

sa2016_a0708

Estimation of risk status and sustainable breeding of autochthonous cattle and horses breeds

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Abstract

At the end of the twentieth century, autochthonous breeds have been recognized as an important genetic resource that should be preserved for recognition and security of food production. Part of breeds is economically neglected what foster their biological disappearance. The problem has been recognized at all institutional levels therefore different models for assessment status of autochthonous breeds are offered. These models refer to evaluation of vulnerability risk indicators that underlie measures to encourage their sustainability. The most commonly used numerical indicators are based on the number of individuals, the number of adult and young categories and sex ratio. There is need for supplement the models for assessment the status of endangered autochthonous breeds which take into account all potential sustainability risks. Indicators of geographical concentration and genetic profile improve risk assessment, but require individual approach to the breed and breeding area. The aim of the research is to analyze simulation models and indicators to risk status of autochthonous cattle and horses breeds. In analyses are used numerical models of risk status and alternative models that include indicators of geographical concentration, genetic erosion, economic efficiency and inclusion in society. Results of analysis points to the weakness of using only the numerical model in understanding current breeding status, trends, risks and opportunities of autochthonous breeds, therefore there is a need to include other models and vulnerability indicators. Interactive connectivity of models and indicators contribute to a more objective evaluation and optimization of breeding strategies of autochthonous breeds.

Key words: autochthonous breeds, indicators, vulnerability, sustainability

sa2016_a0708

Mogućnosti standardizacije mlijeka u proizvodnji sira škripavca

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Sažetak

Standardizacija mlijeka u proizvodnji tradicionalnih sireva u pravilu nije uobičajeni postupak. Posljedica toga je manja financijska dobit gospodarstva zbog smanjene: iskoristivosti proteina i masti, čvrstoće gruša i randmana. Cilj ovog preliminarnog istraživanja bio je utvrditi utjecaj postupka standardizacije mlijeka na kemijski sastav sira škripavca i sirutke te randman sira. U pokusnim uvjetima u mini sirani proizvedeno je 8 šarži sira škripavca. Mlijeko svake šarže podijeljeno je u tri grupe: mlijeko za sirenje bez standardizacije (kontrolna grupa); mlijeko za sirenje standardizirano na omjer protein : mast = 0,9 : 1 dodavanjem obranog mlijeka u prahu (OMUP); mlijeko za sirenje standardizirano na omjer protein : mast = 0,9 : 1 obiranjem dijela vrhnja. Dodavanje OMUP odnosno obiranje dijela vrhnja uzrokovalo je značajno smanjenje udjela mliječne masti ($P < 0,01$; $P = 0,01$), te povećanje udjela proteina ($P = 0,09$; $P < 0,01$) u siru u odnosu na kontrolni sir. Dodatak OMUP nije uvjetovalo bolju iskoristivost mliječne masti i proteina kako se očekivalo, no randman sira značajno se povećao ($P < 0,05$) u odnosu na kontrolni sir. Standardizacija obiranjem dijela vrhnja uzrokovala je bolju iskoristivost mliječne masti ($P=0,08$), no iskoristivost proteina bila je manja, a time i niži randman ($P=0,08$). Standardizacija mlijeka dodatkom OMUP može dati ekonomsku korist u proizvodnji tradicionalnih sireva, dok standardizacija obiranjem može imati negativan utjecaj na randman sira zbog mehaničkog tretmana mlijeka za sirenje separacijom koja se u tradicionalnoj proizvodnji sira u pravilu ne koristi.

Ključne riječi: standardizacija mlijeka, mlijeko u prahu, obiranje mlijeka, randman sira, sir škripavac

sa2016_a0709

The possibilities of milk standardisation in the production of Škripavac cheese

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Abstract

In the traditional cheese production standardisation of milk is not a common procedure. The consequence of avoiding this step could be a lesser financial profit for the farm, due to reduced: proteins and fats utilisation, firmness of the curd and cheese yield. The aim of this preliminary study was to determine the effect of the milk standardisation on the chemical composition of Škripavac cheese and whey, as well as on the cheese yield. For the needs of the experiments, in the small scale dairy, 8 batches of Škripavac cheese were produced. The milk of each batch was divided into three categories: milk for cheese production without standardisation (control group); milk for cheese production with standardised ratio protein : fat = 0.9 : 1 by the addition of SMP; milk for cheese production standardised to the ratio of protein : fat = 0.9 : 1, by skimming the part of milk fat. Adding of SMP or skimming the part of a cream had a significant effect on the content of fat ($P < 0.01$; $P = 0.01$) and proteins ($P = 0.09$; $P < 0.01$) in the cheese. The content of milk fat decreased after milk standardisation and the content of proteins increased in comparison to the control batch. Addition of the SMP did not result in a better utilisation of milk fat and proteins as expected, but the cheese yield increased significantly ($P < 0.05$) compared to the control cheese. Milk standardisation by skimming the part of the cream caused better utilisation of milk fat ($P = 0.08$), but the lower cheese yield resulted in the lesser utilisation of proteins and therefore in a lower cheese yield ($P = 0.08$). Milk standardisation by addition of SMP can provide the economic benefits in the production of traditional cheeses. On the contrary, the process of milk skimming can have a negative influence on the cheese yield due to the mechanical treatment of milk (separation), which is not usual in a traditional cheesemaking.

Key words: milk standardisation, milk powder, fat separation, cheese yield, Škripavac cheese

sa2016_a0709

Mikrosatelina i mtDNK analiza hrvatskih autohtonih pasmina svinja

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Sažetak

U ovom istraživanju smo koristili 18 parova mikrosatelitnih markera kako bismo utvrdili genetski odnos između dviju hrvatskih autohtonih pasmina svinja i divlje svinje. Drugi cilj ovog istraživanja bio je utvrditi filogenetske odnose između hrvatskih pasmina svinja i nekih azijskih i europskih svinja koristeći mtDNA D-loop polimorfizam. Između promatranih populacija prisutna je relativno visoka raznolikost lokusa i prosječan broj alela po lokusu je 4,68, što znači da su mikrosateliti koji su se koristili u ovom istraživanju bili pogodni za analizu genetske raznolikosti. Prosječna vrijednost F_{ST} svih lokusa je 0,24 što ukazuje da se oko 24% od ukupnih genetskih varijacija može objasniti razlikama unutar populacije, preostalih 78% razlikama između pojedinih individua unutar populacije. mtDNA analiza pokazala je da se hrvatska populacija svinja po haplotipu razlikuje od drugih europskih i kineskih haplotipova. Crna slavonska svinja pokazala je neke sličnosti s mangalicom i durokom dok se genetska udaljenost turopoljske svinje može objasniti visokim stupnjem inbridinga unutar populacije tijekom prošlog stoljeća.

Ključne riječi: crna slavonska svinja, turopoljska svinja, mikrosateliti, mtDNK

sa2016_a0710

Microsattelite and mtDNA analysis of croatian autochtonous pig breeds

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Abstract

In this study we used 18 pairs of microsatellite primers to detect the genetic relationship between two Croatian autochthonous pig breeds and Croatian wild pigs. The second goal of this study was to determine phylogenetic relationships among Croatian pig breeds and some Asian and European pigs using the mtDNA D-loop sequence polymorphism. Between observed populations are present relatively high variety of loci and the average number of alleles per locus was 4,68 which means that the microsatellites used in this study were suitable for genetic diversity analysis. The average F_{ST} of all loci was 0.24. which indicated that around 24% of the total genetic variation was explained by population differences, with the remaining 78% corresponding to differences among individuals within population. mtDNA analysis showed that Croatian pig populations haplotype are different from other European and Chinese haplotypes. Black Slavonian pigs shown a some similarity with Mangalitza and Duroc and genetic distances of Turopolje pig can be explained with high degree of inbreeding during past century.

Key words: Black Slavonian pig, Turopolje pig, microsatellites, mtDNA

sa2016_a0710

Utjecaj promjene sustava plaćanja mlijeka i sezone na higijensku kvalitetu mlijeka u Bosni i Hercegovini

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Sažetak

Osnovni pokazatelji higijenske kvalitete mlijeka su ukupan broj mikroorganizama te broj somatskih stanica. Cilj rada bio je istražiti promjene u higijenskoj kvaliteti mlijeka uslijed uvođenja novog sustava plaćanja mlijeka u Bosni i Hercegovini u razdoblju od 2010 do 2013 godine te utvrditi utjecaj sezone na higijensku kvalitetu mlijeka. Prikupljeni su skupni uzorci mlijeka pojedinih proizvođača sa cjelokupnog područja Bosne i Hercegovine koji svoje mlijeko predaju za otkup mljekari. Ukupno je prikupljeno 53 363 uzorka skupnog mlijeka u kojima je određen broj somatskih stanica (BSS) i 52 999 uzoraka mlijeka u kojima je utvrđen ukupan broj mikroorganizama (UBMO). Rezultati istraživanja su pokazali da se udio otkupljenog mlijeka unutar razreda do 300.000 somatskih stanica/ml značajno povećao ($P<0,05$) te je utvrđen i značajan porast ($P<0,05$) udjela proizvođača mlijeka koji proizvode mlijeko EU kvalitete u Bosni i Hercegovini. Sezona je značajno ($P<0,05$) utjecala na BSS. Tako je u proljetnom periodu (travanj) udio mlijeka sa BSS do 300 000/mL bio najveći, dok je udio takvog mlijeka u jesenskom periodu bio značajno manji ($P<0,05$). Utvrđen je signifikantan ($P<0,05$) linearan porast udjela otkupljenog mlijeka u Bosni i Hercegovini s UBMO do 200 000/mL. Jednako tako promjena sustava plaćanja mlijeka u Bosni i Hercegovini dovela je do značajnog ($P<0,05$) porasta udjela proizvođača koji predaju takvo mlijeko. Kad govorimo o utjecaju sezone, utvrđen je značajan ($P<0,05$) pad udjela mlijeka s UBMO do 200 000/mL u ljetnom periodu. Može se zaključiti da dosljednom primjenom postojećih pravilnika koji određuju kvalitetu mlijeka temeljenim na EU- standardima dolazi do znatnog poboljšanja higijenske kvalitete mlijeka u otkupu neke zemlje što se pokazalo na primjeru Bosne i Hercegovine.

Ključne riječi: mlijeko, higijenska kvaliteta, sustav plaćanja, sezona

sa2016_a0711

The impact of changes in the system of milk payment and season on hygienic quality of milk in Bosnia and Herzegovina

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Abstract

The main indicators of hygienic quality of milk are the total number of microorganisms and the number of somatic cells. The objective of this paper was to investigate the changes in the hygienic quality of milk due to implementation of the new system of milk payment in Bosnia and Herzegovina in the period of 2010-2013 as well as to determine the impact of season on hygienic quality of milk. The bulk milk samples were collected from milk producers from the whole area of Bosnia and Herzegovina who submit its milk to dairy industry. It was collected 53 363 milk samples which were analysed for the number of somatic cells (NSC) and 52 999 milk samples for the total number of microorganisms (TNMO). The results of research showed that the proportion of redeemed milk with the number of somatic cells lesser than 300 000/mL was significantly increased, as well as the proportion of milk producers who produce milk of EU quality ($P<0.05$). The season had a significant effect ($P<0.05$) on the NSC. Thus, in spring (April) the proportion of milk with the number of SC < 300 000/mL was significantly the highest ($P<0.05$) while the proportion of such milk in the autumn period was significantly lower ($P<0.05$). Significant linear increase ($P<0.05$) of the proportion of redeemed milk with the TNMO < 200 000/mL was perceived. The change in the system of milk payment in Bosnia and Herzegovina resulted with significantly ($P<0.05$) increased proportion of producers who submit that's kind of milk. Significantly lower proportion of milk in summer period with TNMO < 200 000/mL was determined. It can be concluded that consistent appliance of existing regulations which determine the quality of milk, based on EU standards, leads to the improvement of hygienic quality of redeemed milk, as illustrated by the case of Bosnia and Herzegovina.

Key words: milk, hygienic quality, system of payment, season

sa2016_a0711

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Section 8

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Zbornik sažetaka

Vinogradarstvo i vinarstvo

Promet i kakvoća predikatnih vina u Hrvatskoj u razdoblju od 2005. do 2015. godine

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Sažetak

Predikatna vina u Hrvatskoj definirana su Zakonom o vinu kao vrhunska vina koja u dobrim godinama i prikladnim uvjetima dozrijevanja grožđa na trsu, a ovisno o postignutom stupnju prezrelosti grožđa te vremenu berbe i prerade, postižu posebnu kakvoću i moraju biti proizvedena isključivo od grožđa preporučenih sorata za pojedino vinogorje.

Kategorije predikatnih vina u Hrvatskoj su: kasna berba, izborna berba, izborna berba bobica, izborna berba prosušenih bobica te ledeno vino. Pristupanjem Hrvatske Europskoj Uniji i prihvaćanjem novih zakonskih regulativa te prilagodbom nacionalnih propisa, predikatna vina su uvrštena u Zaštićene oznake izvornosti na području kontinentalne Hrvatske.

U ovom radu je prikazan pregled proizvodnje i prometa predikatnih vina u Hrvatskoj kroz desetogodišnje razdoblje od 2005. do 2015. godine (izvor: baza podataka Hrvatskog centra za poljoprivredu, hranu i selo, Zavoda za vinogradarstvo i vinarstvo). Podatci su iskazani s obzirom na proizvedene količine i količine predikatnih vina u prometu, kategorije predikatnih vina, sortnu zastupljenost, regionalnu zastupljenost te specifičnosti vezane uz fizikalno kemijski sastav i senzorno ispitivanje predikatnih vina.

Analizirane su količine i kategorije predikatnih vina stavljene u promet međusobno i unutar promatranih godina kao i klimatski uvjeti u godinama berbe predikata te promjene uvjetovane prilagodbom proizvođača zahtjevima tržišta.

Ključne riječi: predikatna vina, promet, kakvoća, fizikalno kemijski sastav

sa2016_a0801

Trading and quality of predicate wines in Croatia in the period of year 2005 to 2015

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Abstract

Predicate wines in Croatia are defined in the Law on wine as a top quality wines in good years and from appropriate ripening conditions of grapes, depending on the degree of overripeness of grapes and the time of harvest and processing. They achieve a special quality and must be produced exclusively from grapes of recommended varieties from individual vineyards.

Categories of the predicate wines in Croatia are: late harvest, selected harvest, selected harvest of berries, selected harvest of dry berries and the ice wine. After Croatia joined the European Union and after the acceptance of the new legal regulations and adapting of the national regulations, predicate wines are included in the protected designation of origin in the continental Croatia.

This paper will give an overview of the production and trade of the predicate wines in Croatia through the ten-year period from year 2005 to 2015 (source: data base of Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Viticulture and Enology). The data is reported with regard to the quantity of the produced and marketed predicate wines, varietal and regional representation and specifics related to physical and chemical composition and sensory testing of predicate wines.

Results represent an anaylsis of the quantities and categories of predicate wines placed on the market as well as the influence of the climate conditions in the harvest years and producers adjusment to market demands were analysed.

Key words: predicate wines, trading, quality, physical and chemical composition

sa2016_a0801

Fauna cvrčaka (Insecta: Auchenorrhyncha) u vinogradima okolice Zadra (Hrvatska)

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Sažetak

Cvrčci su značajni štetnici vinove loze, a posebno kao vektori fitoplazmi. Cilj ovog istraživanja bio je determinirati faunu cvrčaka u vinogradima okolice Zadra (Hrvatska). Uzorkovanje je obavljeno u periodu svibanj – listopad 2015. godine u različitim vinogradima (konvencionalni i integrirani). U integriranom nasadu površina tla između redova je zatravljena i održava se košnjom, a korovi unutar reda se suzbijaju korištenjem herbicida. Osim upotrebe herbicida u konvencionalnom vinogradu korovi se suzbijaju i oruđima za obradu tla. Za ulov insekata korištene su žute ljepljive ploče. Uzorci su uzimani svakih 15 dana. Ulovljeno je sveukupno 3703 cvrčka koji pripadaju 6 porodica i 12 rodova (Cicadetta, Cixius, Dictyophara, Edwardsiana, Empoasca, Fieberiella, Ledra, Macropsis, Metcalfa, Neoaliturus, Stictocephala i Zygina). U konvencionalnom vinogradu uhvaćeno je sveukupno 3163 jedinke dok je u integriranom nasadu uhvaćeno 540 jedinki. Najbrojnija porodica je Cicadellidae (58,3%). U integriranom vinogradu eudominantni cvrčci su; *Edwardsiana rosae* (72,7%), *Empoasca spp*. (12,2%) i *Neoaliturus fenestratus* (12,2%) dok je u konvencionalnom vinogradu eudominantna *Edwardsiana rosae* (91,1%), a *Empoasca spp*. (8,44%) je dominantna. Svi ostali cvrčci spadaju u subrecentne sa zastupljenošću manjom od 1%. Potencijalni prenosioci fitoplazmi su; *Fieberiella spp*., *Neoaliturus fenestratus* i *Dictyophara europaea*.

Ključne riječi: vinova loza, cvrčci, fitoplazma, vektori

sa2016_a0802

The leafhopper and planthopper fauna (Insecta: Auchenorrhyncha) in vineyards of Zadar Region (Croatia)

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Abstract

Leafhoppers and planthoppers are important pests of grapevine in particular as vectrors of some phytoplasmas. The main aim of this research was to identificate the fauna of leafhoppers and planthoppers in vineyards near Zadar (Croatia). The survey was conducted from May to October in 2015 in different vineyards (integrated and conventional). In integrated vineyard soil surface among rows was covered with grass and mowed several times during vegetational season, while for under vine weed control herbicides were used. Except herbicides, weed control in conventional vineyard was done mostly with tillage tools. Samples were carried out fortnightly using yellow sticky traps. A total of 3703 individuals belonging to 6 families and 12 tribes (Cicadetta, Cixius, Dictyophara, Edwardsiana, Empoasca, Fieberiella, Ledra, Macropsis, Metcalfa, Neoaliturus, Stictocephala and Zygina) were collected during this research. In conventional vineyard 3163 individuals were detected, while in integrated 540. The most numerous family was Cicadellidae (58,3%). In integrated vineyard eudominat leafhoppers were *Edwardsiana rosae* (73%), *Empoasca spp*. (12,2%) and *Neoaliturus fenestratus* (12,2%). In conventional vineyard eudominant leafhopper was *Edwardsiana rosae* (91,2%), while *Empoasca spp*. (8,44%) was found as dominant. Remaining species were defined as subrecent with contribution less than 1%. As potential vectors of phytoplasmas *Fieberiella spp.*, *Neoaliturus fenestratus* and *Dictyophara europaea* were detected.

Key words: grapevine, leafhoppers, planthoppers, phytoplasma, vectors

sa2016_a0802

A simple method to investigate the impact of the maturity level on berry constituents

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Abstract

The musts of ten genotypes with *Vitis labrusca* ancestry were investigated. Each genotype was examined at two different ripening stages. Finally, analytical data was related to organoleptic evaluations. Out of three plants from each genotype, one plant was enwrapped completely with plastic foil before bud burst in springtime. The foil was removed about six weeks later. The wrapping advanced the flowering and the veraison of the grapes for about two weeks. In fall, the grapes of both variants were harvested simultaneously and separately. The content of sugars, titratable acidity and furaneol, the key aroma compound of the *V. labrusca* typical strawberry flavor, was quantified. The intensity of the sweetness, acidity and strawberry flavor was evaluated by a panel of five experienced testers.

As expected, the sugar content of the variants with advanced ripening stage was higher (13% on average) and the acid content was lower (25% on average). This was confirmed by organoleptics perceiving a higher sweetness and lower acidity. On average, the furaneol content was nine times higher and the strawberry flavor was rated as more intense or equal compared to the reference plants.

The wrap method emerged to be useful to investigate the consequences of an earlier flowering time and ripeness. This can be applied also for other issues, such as the analysis of effects on the quality potential by the climate change.

Key words: berry ripeness, flowering time, HPLC, organoleptics, furaneol.

sa2016_a0803

Utjecaj tehnologije vinifikacije na aromatski potencijal vina bijelih kultivara grožđa (*Vitis vinifera* L.) iz Hrvatske

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Sažetak

Cilj ovog istraživanja bio je utvrditi aromatski potencijal nekoliko autohtonih i udomaćenih bijelih kultivara vinove loze. S obzirom da se većina bijelih vina od nearomatičnih kultivara proizvodi brzom preradom, istražen je utjecaj hladne maceracije na njihov aromatski profil. Hladna maceracija se koristi zbog veće ekstrakcije aromatskih spojeva i njihovih prekursora što najčešće rezultira promjenama u senzornim svojstvima vina. Tretmani u istraživanju su bila dva načina vinifikacije grožđa, brza prerada i hladna maceracija masulja pet različitih kultivara vinove loze (Pošip, Malvazija istarska, Maraština, Kraljevina i Škrlet). Određivanje kvalitativnog i kvantitativnog udjela tvari arome u vinima provedeno je primjenom plinske kromatografije (GC). U radu se koristila metoda pripreme uzorka mikroekstrakcijom na čvrstoj fazi (SPME). Sva vina u istraživanju senzorno su ocijenjena metodom 100 pozitivnih bodova. S obzirom na veliki broj ispitivanih kultivara, učinak hladne maceracije nije bio jednako izražen – značajan utjecaj utvrđen je pri povećanju terpena, spojeva primarne arome u vinima svih kultivara, a najviše u vinu Škrleta. Koncentracija fermentacijskih aroma, prvenstveno estera, pod utjecajem maceracije se značajno povećala u svim vinima, a pojedini viši alkoholi samo u vinima Škrleta i Maraštine. Senzorno su najbolje ocijenjena vina Škrleta i Pošipa, dok je najmanja razlika u senzornim svojstvima zabilježena u vinima Kraljevine i Malvazije.

Ključne riječi: aromatski spojevi, bijeli kultivari grožđa, hladna maceracija, bijelo vino, plinska kromatografija

sa2016_a0804

Influence of vinification technology on Croatian white wines aromatic potential (*Vitis vinifera* L.)

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Abstract

The aim of this research was to determine the aromatic potential of some white grape cultivars from Croatia. Regarding the fact that the most of white wines are produced without maceration process, influence of cold maceration on their aromatic profile was analyzed. It is well known that maceration process affects extraction of aromatic compounds and their precursors that often results with changes in sensory characteristics. Two treatments were included in this research- classic vinification and cold maceration of five different white grape cultivars (Pošip, Malvazija istarska, Maraština, Kraljevina and Škrlet). Aromatic compounds in wines were determined by the method of gas chromatography (GC) with previous extraction on solid phase (SPME). Sensory analyses have been carried out using the 100 points method. The effect of cold maceration was not consistent regarding the five different cultivars in research. The primary aroma compounds, i.e. terpenes, were significantly influenced by cold maceration process in all investigated wines, especially in Škrlet wine. Cold maceration treatment also resulted in significant increases in the concentrations of esters in all wines and some individual higher alcohols in Škrlet and Maraština wines. Škrlet and Pošip wines were the best sensory evaluated wines, while the least differences in sensory properties were observed in Kraljevina and Malvazija wines.

Key words: aromatic compounds, white grape cultivars, cold maceration, white wine, gas chromatography

sa2016_a0804

Utjecaj različitih termina defolijacije na neke kvalitativne parametre kultivara Merlot i Frankovka (*Vitis vinifera* L.) u vinogorju Đakovo

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Sažetak

Cilj istraživanja bio je utvrditi utjecaj različitih termina defolijacije na sadržaj šećera, ukupnu kiselost i realnu kiselost mošta te sadržaj ukupnih polifenola i antocijanina u pokožici kultivara Merlot i Frankovka (*Vitis vinifera* L.) cijepljenih na podlogu SO4. Istraživanje je provedeno tijekom 2015. godine na vinogradarsko-vinarskom pokušalištu Poljoprivrednog fakulteta Osijek smještenom u Mandićevcu, vinogradarska regija Istočna kontinentalna Hrvatska, podregija Slavonija, vinogorje Đakovo. Vinograd je posađen 2013. godine uz razmak sadnje 2,2x0,8 m. Pokus je postavljen po slučajnom blok sustavu s tri varijante u četiri ponavljanja (kontrolni tretman – bez defolijacije, defolijacija neposredno pred početak cvatnje - E-L faze 16-17 i defolijacija pred početak faze šare – E-L faza 34). Nisu utvrđene statistički značajne razlike između kontrolnog tretmana i defolijacija za sadržaj šećera za oba istraživana kultivara. Najveći sadržaj šećera zabilježen je u moštu kultivara Merlot kod tretmana s defolijacijom pred početak šare (107 ^{0}Oe), a nešto niži kod kontrolnog i tretmana pred početak cvatnje (105 ^{0}Oe). Najviša ukupna kiselost u moštu kultivara Frankovka izmjerena je kod tretmana s uklanjanjem listova pred početak šare (7,02 g/l) i ona se nije statistički značajno razlikovala u odnosu na druga dva tretmana. Temeljem dobivenih rezultata nisu utvrđene značajne razlike ukupne kiselosti mošta kod kultivara Merlot. Realna kiselost mošta nije značajno varirala kod oba istraživana kultivara.

Ključne riječi: defolijacija, količina šećera, ukupna kiselost, Merlot, Frankovka

sa2016_a0805

Influence of different leaf removal terms on some quality parameters of cv. Merlot and Blaufraenkisch (*Vitis vinifera* L.) in vinegrowing district Djakovo

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Abstract

The aim of this research was to identify the impact of different leaf removal terms on sugar content, total acidity and real acidity in must as well as total phenolics and anthocyanins in skin of Merlot and Blaufraenkisch (*Vitis vinifera* L.) grafted on rootstock SO4. The research was carried out during year 2015, located on Agriculture faculty Osijek experimental field in Mandićevac, east continental vinegrowing region, subregion Slavonia, vinegrowing district Djakovo. Vineyard was planted in 2013 with 2,2x0,8 m plant spacing. The experiment was set up according to random block design with three treatments in four replications (control treatment - without leaf removal, pre-bloom leaf removal - E-L stages 16-17 and pre-veraison leaf removal – E-L stage 34). There were no significant differences in sugar content between control and leaf removal treatments for both research cultivars. The highest sugar content was measured in Merlot in pre-veraison leaf removal treatment (107 ^{0}Oe) and slightly lower in control treatment and pre-bloom leaf removal treatment (105 ^{0}Oe). The highest total acidity was measured in must of Blaufraenkisch in treatment of pre-veraison leaf removal (7,02 g/l) and there were no significant differences between treatments. On grounds of results there were no significant differences for total acidity in must of Merlot. There was no notably variation for real acidity.

Key words: leaf removal, sugar content, total acidity, Merlot, Blaufraenkisch

sa2016_a0805

Promet desertnim vinima u Republici Hrvatskoj u razdoblju od 2004. do 2014.

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Sažetak

Proizvodnja desertnih vina u Republici Hrvatskoj ima svoju dugu i bogatu tradiciju. Dokaz tome je i jedno od najpoznatijih desertnih vina Prošek koje je poznato još iz antičkih vremena. Danas je prometovanje desertnih vina regulirano zakonskim aktima te je slijedom toga proizvodnja desertnih vina jedino moguća u regijama Primorske Hrvatske. Cilj ovoga rada je prikazati promet desertnim vinima u RH u desetogodišnjem periodu od 2004. do 2014. godine. Rezultati analiza pokazuju da je najveća količina u prometu svih kategorija desertnih vina zabilježena 2004. godine dok je najmanja količina zabilježena 2014. godine. U periodu od 2004. do 2008. zabilježen je ujednačen promet ukupne količine desertnih vina, dok je 2009. zabilježen nagli pad. Prema boji vina, dominantan je bio promet bijelih vina. U 2011. godini je osim prometa bijelih i crnih vina zabilježen i promet ružičastim desertnim vinima. Prema kakvoći najzastupljenije je kvalitetno desertno vino s kontroliranim zemljopisnim podrijetlom. Razloge pada trenda prometa desertnim vinima moguće je tražiti u nepovoljnim klimatskim promjenama koje uvjetuju zahtjevniji način proizvodnje, a time i povećavaju cijenu proizvodnje. Drugi razlog je i u smanjenoj potražnji vina visoke cjenovne kategorije kojoj desertna vina pripadaju. Važan utjecaj na potrošnju desertnih vina svakako je imala i educiranost i informiranost samih potrošača odnosno nedostatan marketing desertnih vina.

Ključne riječi: desertno vino, promet, Republika Hrvatska

sa2016_a0806

Dessert wine trade in Croatia in the period from 2004 to 2014

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Abstract

Production of dessert wines in the Republic of Croatia has a long and rich tradition. The proof is one of the most significant dessert wine Prošek which has been known since ancient times. Nowadays the dessert wines trade is regulated by legislation and consequently the production of dessert wines is only possible in regions of the Croatian coast. The aim of this paper is to show trade with dessert wines in Croatia in the ten-year period from 2004 to 2014. The results have shown that the largest amount of traffic with all dessert wines was recorded in 2004 and the lowest amount was recorded in 2014. In the period from 2004 to 2008 there was an egually trade of total amount of dessert wines, while in 2009 a sudden decrease was recorded. The dominant color of dessert wine in trading were white. In 2011, besides the trading of white and red wines also, trade with pink dessert wines were recorded. According to the quality of the most common was a quality dessert wine with a geographical origin. The reasons for the downward trend of traffic with dessert wines can be sought in the climatic changes that affected demanding mode of production, and thus increased the cost of production. Another reason was the drop in demand and high price category wines which belong to the dessert wines. An important influence on the consumption of dessert wine certainly had and education and awareness of consumers and insufficient marketing of dessert wines.

Key words: dessert wine, trading, Republic of Croatia

sa2016_a0806

Usporedba vina od sorti Malvazija istarska i Chardonnay proizvedenih u Istri (Hrvatska) na osnovi HS-SPME-GC/MS profiliranja hlapljivih spojeva arome

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Sažetak

Zbog nedostatka objektivnih znanstvenih spoznaja, znanje o tipičnosti vina od domaćih hrvatskih sorti još uvijek je na kolokvijalnoj razini. Iako je sastav hlapljivih spojeva arome u vinima od najvažnije domaće sorte u Istri (Hrvatska), Malvazije istarske, relativno istražen, do danas nije utvrđeno koji su spojevi pokazatelji sortnog podrijetla i nositelji tipičnosti ovih vina, a na osnovi kojih se ona razlikuju od vina ostalih sorti. S ciljem usporedbe vina Malvazije istarske s onima proizvedenim od najvažnije introducirane međunarodne sorte Chardonnay, uzorci iz berbi 2013. i 2014. podvrgnuti su profiliranju hlapivih spojeva arome pomoću tehnike HS-SPME-GC/MS. Na osnovi izračunatih vrijednosti mirisne aktivnosti, uz β-damascenon, u vinima od obje sorte utvrđena je dominacija spojeva fermentacijske arome, posebno estera nositelja voćno-cvjetnih nijansi. Utvrđene su razlike u sastavu monoterpena, s višim koncentracijama pronađenim u vinu Malvazije istarske, te u vinima iz 2013. godine. Multivarijatnim statističkim modelima postignuta je solidna iako ne i potpuna diferencijacija ispitivanih uzoraka na osnovi sorte i godine berbe.

Ovaj je rad sufinancirala Hrvatska zaklada za znanost projektom „Razjašnjavanje sortne tipičnosti vina i maslinovih ulja od hrvatskih domaćih sorti“ (UIP-2014-09-1194).

Ključne riječi: Malvazija istarska, Chardonnay, hlapljivi spojevi arome, HS-SPME-GC/MS, tipičnost

sa2016_a0807

Comparison of commercial Malvazija istarska and Chardonnay wines produced in Istria (Croatia) based on HS-SPME-GC/MS volatile aroma compounds profiling

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Abstract

Because of the absence of objective scientific information, knowledge on the varietal typicity of wines from native Croatian grape varieties is still on a colloquial level. There is published data on the composition of volatile aroma compounds in wines from Malvazija istarska, the most important native variety in the Istria County (Croatia), but the volatiles indicators of its varietal origin and drivers of its wine typicity, on the basis of which it can be distinguished from other monovarietal white wines, are unknown. With the aim of comparing wines produced from native Malvazija istarska with those from the most important international variety in Istria, Chardonnay, samples from harvests 2013 and 2014 were subjected to volatile aroma compounds profiling by HS-SPME-GC/MS. Based on the calculated odour activity values, besides β-damascenone, in wines of both varieties the dominance of fermentation aroma compounds, especially fruity-floral esters, was determined. The differences were found with respect to monoterpenes, with higher concentrations in Malvazija istarska wines, and in wines from 2013. By multivariate statistical models a solid although not complete differentiation of the samples based on the variety and the harvest year was obtained.

This work has been supported in part by Croatian Science Foundation under the project „Unravelling the varietal typicity of wines and olive oils from Croatian native varieties“ (UIP-2014-09-1194).

Key words: Malvazija istarska, Chardonnay, volatile aroma compounds, HS-SPME-GC/MS, varietal typicity

sa2016_a0807

Osnovni pokazatelji kvalitete vina Merlot iz različitih vinogradarskih zona Hrvatske, berbe 2012.-2014.

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Sažetak

Kvaliteta hrane i pića definirana je kao skup svojstvenih karakteristika proizvoda, sustava ili procesa koji ispunjavaju zahtjeve potrošača i drugih zainteresiranih strana (HR EN ISO 9000:2005). U Hrvatskoj, službena kontrola kvalitete vina obuhvaća fizikalno-kemijsku analizu i senzorno ocjenjivanje proizvoda. Tijekom senzornog ocjenjivanja ocjenjivači su upoznati s osnovnim podacima o proizvodu uključujući i vinorodnu zonu proizvodnje (B, C I ili C II). Merlot je sorta preporučena u svim podregijama Hrvatske i trenutno je iza Plavca malog najzastupljenija crna sorta u RH. U ovom radu su statistički analizirani rezultati fizikalno-kemijskih analiza vina proizvedenih od sorte Merlot koja su senzorno ocjenjivana metodom 100 pozitivnih bodova (izvor: OIV) te su korišteni službeni podaci Hrvatskog centra za poljoprivredu hranu i selo Zavoda za vinogradarstvo i vinarstvo. Cilj ovog rada je usporedba osnovnih parametara kvalitete, fizikalno-kemijskih analiza i senzornih ocjena, vina sorte Merlot, berbi 2012.-2014. godine, u vinogradarskim zonama proizvodnje. Analizirani su i obrađeni podaci za vina kojima je provedena službena kontrola kvalitete u postupku izdavanja rješenja za stavljanje vina u promet u periodu od 01. rujna 2012. do 30. lipnja 2015. Najveći broj ispitivanih uzoraka vina sorte Merlot potječe iz vinogradarske zone C II, zatim iz zone CI, dok je zona B najmanje zastupljena. Analizom ispitivanih parametara kvalitete u 198 vina, njih 63 zadovoljilo je kriterij kategorije vrhunske kakvoće, 118 vina zadovoljilo je kriterij kategorije kvalitetne kakvoće dok su kod 17 vina utvrđene mane ili bolesti.

Ključne riječi: vino, kvaliteta, vinogradarska zona, sorta Merlot

sa2016_ao808

Basic indicators of Merlot wines quality from different wine-growing zones in Croatia, harvest 2012-2014

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Abstract

Food and beverages quality is defined as a set of inherent product, system or process characteristics that fulfill consumers and other interested parties requirements (HR EN ISO 9000: 2005). In Croatia, the official wine quality control includes physical-chemical testing and sensory evaluation. During the sensory evaluation, evaluators are familiar with basic information about the product, including wine-growing zone of production (B, C and C II). Merlot is a grape variety recommended in all Croatian sub regions and it is currently the most common red variety after Plavac mali in Croatia. In this study wines produced from Merlot variety were sensory evaluated by the method of 100 positive points (source: OIV) and statistically analyzed by using the official data from Croatian Centre for Agriculture, Food and Rural Affairs, Institute of Viticulture and Enology. The aim of this study is to compare the basic quality parameters, both physical-chemical and sensory for wines of Merlot variety, harvest 2012-2014, in vinicultural areas of production. Data of wines that were submitted to the official quality control in the process of issuing of Decision of wine marketing were analyzed and processed for period from 1 September 2012 to 30 June 2015. The largest number of Merlot wines, comes from wine-growing zones C II, followed by zone C, while wines from zone B were the least represented. The quality parameters of 198 wines were analyzed. The results show that 63 wines were met the criteria of premium category, 118 wines met the criteria of quality category while in 17 wines were detected different defects or disease.

Key words: wine, quality, wine growing area, Merlot variety

sa2016_a0808

Kemijski sastav destilata dobivenih od vina s manom

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Sažetak

Cilj rada bio je istražiti kemijski sastav destilata dobivenih od vina s manom. Istraživanje je provedeno na vinskim destilatima dobivenim destilacijom suhog bijelog vina sorte Chardonnay kod kojeg je utvrđena mana oksidacije u mirisu. Destilacija vina provedena je pomoću jednostavnog destilacijskog uređaja (alambic), a istraživan je učinak dvostruke destilacije i količine odvojenog prvog toka na kemijski sastav dobivenih destilata.

Temeljem dobivenih rezultata može se zaključiti da oksidirano vino kao i od njega dobiveni destilati u ovom pokusu prema nekim parametrima kemijskog sastava odstupaju od vrijednosti koje se zahtijevaju u proizvodnji visokokvalitetnih vinskih destilata. Visoka koncentracija acetaldehida u dobivenim vinskim destilatima ukazuje da primijenjeni postupci destilacije nisu dali očekivane efekte pa se stoga ne mogu preporučiti za destilaciju oksidiranih vina.

Ključne riječi: destilacija, vinski destilat, oksidacija vina, acetaldehid.

sa2016_a0809

Chemical composition of distillates get from deffect wines

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Abstract

The aim of this study was to investigate the chemical composition of the distillate obtained from wine with off-flavour. The research was conducted on the wine distillates obtained by distillation of dry white wine Chardonnay with oxidation off-flavour. Distillation of wine was carried out using a simple distillation pot still (alambic). The effect of the double distillation and separation of the first fraction on the chemical composition of the distillate was investigated.

Based on the obtained results suggest that oxidized wine and distillates obtained in this experiment, according to some chemical parameters deviate from the values required in the production of high quality wine distillates. High concentration of acetaldehyde in the resulting wine distillates suggests that the applied procedures for distillation have not produced expected effects and therefore cannot be recommended for distillation of oxidized wines.

Key words: distillation, wine distillate, wine oxidation, acetaldehyde

sa2016_a0809

Vinogradarske površine, proizvodnja grožđa i promet vina u Hrvatskoj - sorte Graševina, Malvazija istarska i Plavac mali

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Sažetak

Vinogradarska područja Hrvatske, prema prirodnim uvjetima za uzgoj vinove loze, dijele se na regije Istočna kontinentalna Hrvatska, Zapadna kontinentalna Hrvatska i Primorska Hrvatska. Više od 54% od ukupnih vinogradarskih površina nalazi se u regijama Kontinentalne Hrvatske. U sortnoj zastupljenosti Hrvatske prednjače Graševina (oko 22%) i Malvazija istarska (oko 8%) kao najzastupljenije bijele sorte, a kao najzastupljenija i najznačajnija crna sorta ističe se Plavac mali (oko 8%). Cilj rada je, na razini Hrvatske, prikazati navedene sorte kroz zasađene površine, proizvodnju grožđa te prometovanje vina koje je proizvedeno od tih sorata. U ovom radu koriste se službeni podaci Hrvatskog centra za poljoprivredu hranu i selo, Zavoda za vinogradarstvo i vinarstvo, te službeni podaci Agencije za plaćanja u poljoprivredi ribarstvu i ruralnom razvoju. Analizirajući podatke zasađenih površina pod navedenim sortama, zaključno s 2014., Graševina je najzastupljenija u podregiji Hrvatsko Podunavlje (oko 42%), Malvazija istarska u podregiji Hrvatska Istra (oko 99%), a Plavac mali u podregiji Srednja i južna Dalmacija (oko 93%). Analizom i obradom podataka za period od 2011.-2014. godine, a koji se odnose na proizvodnju grožđa i promet vina, utvrđeno je da postoje značajne razlike tijekom analiziranih godina. Pretpostavka je da su utvrđene razlike uvjetovane ponajprije različitim klimatskim prilikama, različitim ekonomskim interesima te potrebama potencijalnih potrošača u pojedinoj godini.

Ključne riječi: vinogradarske površine, sorte, proizvodnja grožđa, promet vina

sa2016_a0810

Wine growing areas, grape production and wine trade in Croatia - varieties Graševina, Malvazija istarska i Plavac mali

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Abstract

Based on natural conditions for wine growing in Croatia, viticulture regions are divided into regions of Eastern Continental Croatia, Western Continental Croatia and Coastal Croatia. More than 54% of total areas under vineyards are located in regions of Continental Croatia. Varietal representation in Croatia is as followed: the most common white varieties are Graševina (app. 22%) and Malvazija istarska (app. 8%), while the most represented and most important red variety is Plavac Mali (app. 8%). The aim of this paper is to show these varieties through aspects of planted areas, grapes production and wine trade on territory of Croatia. Data presented in this paper are sourced from database of Croatian Center for Agriculture, Food and Rural Affairs, the Department of Viticulture and Enology, and Paying Agency for Agriculture, Fisheries and Rural Development. Analyzing data of areas under vineyards planted with referred varieties, ended with year 2014, Graševina is the most abundant in sub region of Hrvatsko Podunavlje (app. 42%), Malvazija istarska in sub region of Hrvatska Istra (app. 99%), a Plavac mali in sub region of Srednja i južna Dalmacija (app. 93%). Analyses and evaluation of the data that refers to the period from year 2011 to 2014, the results show differences in grape production and wine trade in the mentioned period. It can be assumed that those differences are result of different climate conditions, different economic interests and potential consumer demands in individual year.

Key words: wine growing areas, varieties, grape production, wine trade

sa2016_a0810

Poboljšanje točnosti određivanja ukupne kiselosti vina prilagodbom kalibracije FTIR spektroskopije

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Sažetak

Suvremena analitička tehnika, infracrvena spektroskopija s Fourierovom transformacijom (FTIR) donosi mnoge prednosti u analiziranju vina: uštedu vremena, jednostavno rukovanje, dobru preciznost i točnost za veliki broj ispitivanih parametara. Kao indirektnu kemometrijsku metodu treba ju oprezno primjenjivati uz kontinuiranu kontrolu kvalitete rezultata i prilagodbu kalibracije zbog poboljšanja točnosti nakon postupka standardizacije. Postupak standardizacije je neophodan jer se njime korigiraju razlike u optici instrumenta, kompenzira zanošenje instrumenta, uklanjaju varijacije u frekvenciji valova i normaliziraju spektralni uvjeti. Poželjno je da instrument bude izvan rutinske upotrebe što kraće vrijeme, pa je cilj ovoga rada bio pokazati kako se kalibracijski model i točnost ispitivanja za parametar ukupne kiselosti može provesti za samo nekoliko dana. Za prilagodbu nagiba i odsječka kalibracijskog pravca, FTIR je kalibriran s 36 uzorka vina poznatih vrijednosti ukupne kiselosti u rasponu od 4,3 - 8,6 g/L. Izračunati su deskriptivni statistički parametri, koeficjenti korelacije, te vrijednosti nagiba i odsječaka. Nova kalibracija ukupne kiselosti validirana je usporednom metodom s 41 uzorkom vina. Rezultati dobiveni FTIR metodom uspoređeni su s rezultatima referente metode prema OIV-u za definirano radno područje. Rezultati pokazuju visoku linearnu korelaciju (r = 0,9935) što potvrđuje opravdanost prilagodbe kalibracije nakon provedene standardizacije.

Ključne riječi: FTIR spektroskopija, vino, ukupna kiselost, kemometrija

sa2016_a0811

Accuracy improvement of wine total acidity determination by FTIR spectroscopy calibration adjustment

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Abstract

Modern analytical technique, infrared spectroscopy with Fourier transform (FTIR) has brought many advantages in wine analysis: time-saving, easy handling, good precision and accuracy for a large number of testing parameters. As an indirect chemometric method must be carefully applied with continuous quality control of results and performing calibration adjustment after the standardization. The standardization procedure is required because is able to correct for differences between instruments optics, compensates for instrument drift, removes variations in wave frequency and normalize spectral conditions. It is desirable that the instrument is outside of routine uses as short time as possible, so the goal of this study was to show how the calibration model and testing accuracy for the parameter of total acidity can be improved in a couple of days. To adjust slope and intercept of a calibration curve the FTIR was calibrated with 36 wine samples of known total acidity values, ranging from 4.3 to 8.6 g/L. The descriptive statistical parameters, the correlation coefficients, slope and intercept values were calculated. New calibration of total acidity was validated by cross-over method with 41 wine samples. The results obtained by FTIR were compared to a reference method according to OIV in a defined range. The results show a high linear correlation (r = 0.9935), which confirms necessity of calibration adjustment after the standardization procedure.

Key words: FTIR spectroscopy, wine, total acidity, chemometrics

sa2016_a0811

The use of protective gases in wine maintenance care

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Abstract

Recently the technology of the creation of reductive conditions during the production of must and wine treatment has greatly established itself in the production of white wines. Professional literature indicates the possibility of using protective gases such as nitrogen, carbon dioxide and argon for the purpose of preventing the solubility of oxygen in wine and consequently preservation of the freshness of wine. The aim of this research was to determine whether the atmosphere of protective gases retains the freshness of the wine as well as whether there is any difference between the gases. Having filled stainless steel containers of a closed type with the protective gases before filling with the wine, we observed sensory characteristics of the wine after six months of maintenance care of the wine in a protective atmosphere. All wines nurtured in the atmosphere of protective gases displayed, in comparison with the control, accentuated character of a variety. The best results of the sensory evaluation were recorded in the wine nurtured in the protective atmosphere of argon gas.

Key words: wine, technological process, protective gases, aroma.

sa2016_a0812

Croatian 51

II International Symposium on Agriculture

2016

Book of Abstracts

Section 9

Pomology

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Zbornik sažetaka

Voćarstvo

Utjecaj ekoloških čimbenika na mineralni sastav lišća i ploda višnje Maraske

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Sažetak

Antioksidacijska, antimikrobna, antikancerogena i ina svojstva višnje Maraske (*Prunus cerasus* var. *marasca*) svrstavaju je u kategoriju „funkcionalne hrane“, koja ima terapeutski utjecaj na ljudsko zdravlje. Osim fizikalno–kemijskih značajki tla, uvjeta dozrijevanja, transporta i skladištenja značajan utjecaj na kemijski sastav ploda imaju klimatski čimbenici, agrokemijske mjere te količine i odnos među komponentama kemijskog sastava. Provedena istraživanja imala su za cilj utvrditi utjecaj fizikalno–kemijskih značajki tla na mineralni sastav lišća i ploda višnje Maraske u dvije klimatski različite godine (2012 i 2013). Opskrbljenost lišća i ploda višnje Maraske makro i mikroelementima značajno se razlikovala ovisno o godini istraživanja, fizikalno-kemijskim svojstvima tla i ekspoziciji voćnjaka. Fizikalno-kemijskom analizom plodova utvrđene su značajne razlike u postotnom udjelu koštica, količini suhe tvari, ukupnih kiselina, antioksidativnom kapacitetu i melatoninu. Postotni udio koštica u plodu bio je čak za 2 % veći u 2013. u odnosu na 2012. godinu. Vrijednosti ukupne vodotopive suhe tvari u obje godine istraživanja nisu se značajnije razlikovale i bile su za 6,61-6,73 % veće u odnosu na ostale vrste višanja. Za razliku od ukupne vodotopive suhe tvari nešto veće vrijednosti ukupnih kiselina u plodu višnje Maraske utvrđene su u 2013. godini (1,84 g/L jabučne kiseline) u odnosu na 2012. godinu (1,52 g/L jabučne kiseline), što se može dovesti u svezu s različitim klimatskim prilikama.

Ključne riječi: višnja Maraska, mineralni sastav, suha tvar, ukupne kiseline

sa2016_a0901

The influence of environmental factors on the mineral content of the leaves and fruit of sour cherry Marasca

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Abstract

Antioxidant, anti-microbial, anti-cancer and other properties places Marasca sour cherry (*Prunus cerasus* var. *marasca*) in the category of "functional foods", which has a therapeutic effect on human health. In addition to physical and chemical properties of the soil, ripening conditions, transport and storage, a significant impact on the chemical composition of the fruit have the climate conditions and agrochemical measures as well as ratio and the relationship between the components of the chemical composition. The investigations were aimed to determine the effect of physical and chemical properties of the soil on the mineral content of the leaves and fruit of sour cherry Marasca in two years (2012 and 2013) which had different climate conditions. Supply of leaves and fruit of sour cherry Marasca with macro and micro elements differed significantly depending on the year of research, physical and chemical properties of soil and orchards exposure. Physical and chemical analysis of the fruit showed significant differences in the percentage of the seeds, the amount of dry matter, total acids, antioxidant capacity and melatonin. The percentage part of seeds in the fruit was 2% higher in 2013 compared to 2012. The values of total water soluble solids in both years did not differ significantly, and were 6.61 to 6.73% higher compared to other types of sour cherries. Unlike the total water soluble solids, slightly higher values of total acids in the fruit of sour cherry Marasca were determined in 2013 (1.84 g/L malic acid) compared to 2012 (1.52 g/L malic acid), that can be correlated with different climate conditions.

Key words: sour cherry Marasca, total water soluble solids, mineral composition, total acids

sa2016_a0901

Fruit pomological characteristics of sea buckthorn (*Hippophae rhamnoides* L.) from Turkey

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Abstract

The Sea buckthorn (*Hippophae rhamnoides* L.), one of the most important wild edible fruits widely grown in Northeastern part of Turkey, is characterized by resistance to hard environmental conditions and looks spectacular, especially in autumn and winter when it is decorated with orange berries. It is unique fruit species that can fix atmospheric nitrogen. Climatic conditions in Northern Anatolia are suitable for the growing of the Sea buckthorn, which can be encountered in various dry areas as well as by riversides. Local people traditionally processed or preserved sea buckthorn fruits (berries). The decorative sea buckthorn shrubs/trees and berries are an important element of natural landscape in Northeastern Anatolia. The aim of the study was to define the biodiversity among trees/shrubs, berries and leaves of the sea buckthorn accessions based on morphological and biochemical data. In the present study we examined around 100 seed propagated native sea buckthorn genotypes and results showed a high diversity among accessions in terms of plant, leaf and berry characteristics. Berry diameter, length and 100 berry weight ranged from 5.48 to 7.18 mm; 6.64 to 9.14 mm and 15 to 26 g, respectively. A wide variability of berry skin colour was observed to be yellow, light yellow, dark yellow, yellow orange, orange and dark orange. The anthocyanin content varied from 7 to 38 mg/l berry juice. The total phenolic content and antioxidant activity of genotypes we also found to be very variable.

Key words: antioxidants, sea buckthorn, total phenolics, minerals

sa2016_a0902

Kemijsko prorjeđivanje šljiva (*Prunus domestica* L.) amonijevim tiosulfatom

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Sažetak

U pokusnom voćnjaku Zavoda za voćarstvo, Hrvatskog centra za poljoprivredu, hranu i selo u proljeće 2015. godine provedeno je prorjeđivanje šljiva sorti Topstar plus i Tophit amonijevim tiosulfatom. Stabla su posađena 2006. godine, cijepljena na podlogu WaVit i WaxWa. Cilj istraživanja bio je utvrditi utjecaj prorjeđivanja na rodnost i kvalitetu plodova. Provedeni su slijedeći tretmani: kontrola (K), jedno tretiranje ats – om (ATS x 1) i dva tretiranja ats - om (ATS x 2). Prvi tretman ats – om proveden je u vrijeme pune cvatnje 13.4., a drugi 15.4 s amonijevim tiosulfatom koncentracije 1.5 %. Mjerena svojstva su: prirod po stablu, masa i veličina, topiva suha tvar i čvrstoća ploda. Rezultati su statistički obrađeni analizom varijance i LSD testom.

Prirod po stablu sorte Tophit je bio značajno najmanji kod dva tretiranja ATS-om (9,53 kg), dok se ostala dva tretmana nisu značajno razlikovala (K: 44,13 kg, ATS x 1: 40,01 kg). Masa ploda sorte Tophit se između svih tretmana značajno razlikovala (K: 39,97 g, ATS x 1: 64,29 g, ATS x 2: 72,18 g). Prirod po stablu sorte Topstar plus bio je značajno najmanji kod tretmana ATS x 1 (13,93 kg), dok kod tretmana ATS x 2 (20,93 kg) i kontrole (26,87 kg) razlika nije bila statistički značajna. Masa ploda sorte Topstar plus iznoslila je 51,15 g (ATS x 2), 54,45 g (K) i 57,74 g (ATS x 1). Tretmani ATS x 2 i ATS x 1 su se značajno razlikovali.

Kod sorte Tophit najbolji učinak prorjeđivanja imao je tretman ATS x 1, a kod Topstara plus ATS x 2.

Ključne riječi: amonijev tiosulfat, šljiva, plod

sa2016_a0903

Chemical thinning of plums (*Prunus domestica* L.) with ammonium thiosulphate

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Abstract

In spring of 2015 in experimental orchard of the Institute of Pomology chemical tinning of Topstar plus and Tophit plum varieties was conducted. Fruit trees were planted in 2006. Trees were grafted on rootstocks WaVit and WaxWa. The aim of this study was to estimate thinning effect on yield and fruit quality. The trail had following treatments: control (C), single application of ATS (ATS x 1) and double applications of ATS (ATS x 2). First application of ATS was conducted at full bloom in 13.4. Second application of ATS was conducted in 15.4. Concentration of applied ATS was 1.5 %.

Following characteristics were measured: yield per tree, weight, size, firmness and soluble solids content of fruit. Data were statistically processed by variance analysis and LSD test.

Yield per tree of Tophit was significantly lowest at double applications of ATS (9.53 kg), while there was no significant difference between other two treatments (C: 44.13 kg, ATS x 1: 40.01 kg). Fruit weight was significantly different in all treatments (K: 39.97 g, ATS x 1: 64.29 g, ATS x 2: 72.18 g). Yield per tree of Topstar plus was significantly lowest at ATS x 1 (13.93 kg), while ATS x 2 (20.93 kg) and control (26.87 kg) weren't significantly different. Fruit weight was significantly different between ATS x 2 and ATS x 1 (ATS x 2: 51.15 g, K: 54.45 g, ATS x 1: 57.74 g).

Best thinning effect for Tophit variety had single application of ATS, and for Topstar plus double applications of ATS.

Key words: ammonium thiosulphate, plums, fruit

sa2016_a0903

Organoleptička analiza sušenih šljiva podvrgnutih mehaničkim i kemijskim predtretmanima

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Sažetak

Sušenjem svježih plodova šljive može se dobiti nutritivno vrijedan proizvod. Tržište prihvaća sušene plodove šljive koji su tamno plave boje, mirisa, okusa i arome šljive, te čvrste teksture mesa. Svi ostali strani mirisi i okusi su neprihvatljivi. Za učinkovito sušenje ploda i dobivanje kvalitetnog proizvoda, plodove šljiva prije sušenja treba tretirati određenim postupcima. Cilj istraživanja bio je na temelju organoleptičke analize tri sorte šljiva: Bistrica, President i Topend utvrditi koji predtretman je najpogodniji u procesu sušenja.

Plodovi sorti šljiva u istraživanju tretirani su: pilot abrazijom u trajanju 5, 10 i 15 min, potapanjem u vodu na temperaturama 22 °C i 60 °C, te potapanjem u otopinu KOH sa tri razrjeđenja (0,55%, 1,0% i 1,5%) na dvije temperature (22 °C i 60 °C), uz kontrolni uzorak. Plodovi su sušeni u M. Buchner AG Typ 16B sušari kapaciteta do 30 kg. Organoleptičkom analizom ocjenjivani su sušeni plodovi na ljestvici od 1 do 7. S obzirom na intenzitet boje, mirisa i teksture ploda najbolje ocijenjena sorta je Topend, dok je sorta Bistrica najbolje ocijenjena za okus i aromu. Rezultati tretiranja plodova predtretmanima prije procesa sušenja najučinkovitija se pokazala pilot abrazija u trajanju 15 minuta i to u skraćivanju vremena potrebnog za sušenje kao i u organoleptičnom ocijenjivanju. Predtretmani sa KOH pokazali su se agresivniji u degradaciji kožice ploda kao što je rezultiralo neujednačeno sušenje ploda, te su ujedno i slabije ocijenjeni u organoleptičkoj analiza.

Po svim ukupnim parametrima prilikom pripreme plodova (sortiranje, odvajanje koštice od mesa, tretiranja predtretmanima), ponašanja ploda prilikom sušenja i manipulacijom gotovog proizvoda sorta Bistrica pokazala je izuzetnu prikladnost za sušenje.

Ključne riječi: šljiva, predtretmani, sušenje, organoleptička analiza

sa2016_a0904

Organoleptic analysis of dried plums treated with mechanical and chemical pre-treatments

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Abstract

Nutritive valuable product can be obtained by drying of fresh plum fruits. Market accepts dried plum fruits which are of dark blue colour, plum-like scent, taste and aroma, and of firm flesh texture. Other foreign fragrances and flavours are considered to be unacceptable. To enhance efficiency of drying, plum fruits need to be pre-treated. The aim of this research was to determine which pre-treatment is most suitable in the drying process based on organoleptic analysis of three plum cultivars: Bistrica, President and Topend.

Fruit of plum cultivars in trial were treated with: pilot abrasion in duration of 5, 10 and 15 min, dipping in water tempered to 22 °C and 60 °C, and dipping in KOH solution diluted to 0,55%, 1,0% and 1,5% and tempered to 22 °C and 60 °C, plus control sample. Fruits were dried in M. Buchner AG Typ 16B drier of 30 kg capacity. Dried fruits were graded on 1 - 7 scale in organoleptic analysis with regards to colour intensity, fruit flavour and texture. Cv. Topend overall scored the best, whereas cv. Bistrica had the best score for taste and aroma. Results of pre-treatments prior to drying indicated that 'pilot abrasion in duration of 15 min' was the most efficient in shortening of the drying process, as well as in organoleptic tasting. Pre-treatments with KOH were aggressive on fruit skin and resulted in skin degradation as well as in uneven drying of fruits and therefore scored lower in organoleptic tasting.

According to all parameters included in fruit preparation (sorting, stone removal, pre-treatments), fruit behaviour during drying process and manipulation of finished product cv. Bistrica has showed exceptional adaptability to drying.

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

sa2016_a0904

Morfološka deskripcija žižule (*Zizphus jujuba* Mill.) na Istarskom poluotoku

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Sažetak

Žižula (*Ziziphus jujube* Miller) je voćna vrsta porijeklom iz Kine, ali je zbog izražene prilagodbe uvjetima tla i klime raširena u različitim dijelovima svijeta. U hrvatskom i slovenskom dijelu Istre stabla žižula posađena su uglavnom u kućnim vrtovima i na njima je zamijećena morfološka različitost. Zbog toga je cilj istraživanja bio morfološki opisati stabla žižule zasađena na različitim lokacijama u Istri. Prema dosadašnjim saznanjima ovo je prva morfološka deskripcija stabala žižule u Istri. Sedam uzoraka je prikupljeno duž slovenskog i hrvatskog dijela istarskog poluotoka, a morfološki opis je proveden koristeći deskriptore iz Resgen 29 projekta te prilagođene UPOV deskriptore za maslinu. Duljina plodova se kretala od 27,15±2,43 mm do 18,57±1,69 mm, dok je širina plodova bila od 20,45±1,94 mm do 13,25±1,84 mm. Duljina koštice bila je od 18,93±2,28 mm do 12,24±1,11 mm dok je širina koštice bila od 8,35±0,62 do 5,33±0,67 mm. Na temelju oblika ploda uzorci su podijeljeni u dvije grupe (jajoliki i izduženi), a koštice u grupe (izdužene i eliptične). U ovom istraživanju utvrđena je morfološka varijabilnost između uzoraka, ali je problem predstavljao nedostatak službenih deskriptora za žižulu.

Ključne riječi: *Ziziphus jujube* Mill., morfologija, varijabilnost, domaća populacija

sa2016_a0905

The morphological description of jujube (*Zizphus jujuba* Mill.) in Istrian peninsula

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Abstract

Jujube is the fruit that is native in China but because of a great adaptability to soil and climatic conditions it is widespread in different parts of the world. In the Croatian and Slovenian part of the Istrian peninsula jujube trees are planted mostly in house gardens and there is a morphological difference between jujube trees. The aim of this research was to describe morphologically some of jujubes present on the Istrian peninsula. To our knowledge this is the first morphological description of jujubes in Istria. The seven samples along Slovenian and Croatian part of Istrian peninsula were collected and described using descriptors from Resgen 29 project and adapted Olive - guidelines for the conduct of tests for distinctness, uniformity and stability (UPOV). The fruit length varies from 27.15±2.43 mm to 18.57±1.69 mm, while fruit width was from 20.45±1.94 to 13.25±1.84 mm. The stone length was from 18.93±2.28 mm to 12.24±1.11 mm while stone width was from 8.35±0.62 to 5.33±0.67 mm. According to the fruit shape the samples are divided into two groups (ovoid and elongated), while stones are divided into groups (elongated and elliptic). In our research we found the morphological variability between samples but the problem is the lack of official descriptors for jujubes.

Key words: *Ziziphus jujube* Mill., morphology, variability, domestic population

sa2016_a0905

Rasprostranjenost i štetnost žute narančine štitaste uši – *Aonidiella aurantii* (Maskell) na agrumima u Hrvatskoj

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Sažetak

Proizvodnja agruma u Hrvatskoj obuhvaća vrste iz rodova *Citrus, Fortunella i Poncirus,* a područje njihova uzgoja je između 42° i 44° sjeverne geografske širine. Većina proizvodnje agruma odnosi na Satsuma mandarinu, (*Citrus unshiu* (Swingle) Markow.), dok se kao podloga najčešće koristi trolisni limun (*Poncirus trifoliata* (L.) Raf.), jer dobro podnosi niske temperature koje se tijekom zime javljaju u obalnom pojasu. Osim mandarine, u Hrvatskoj se na pojedinim lokalitetima u manjem opsegu uzgaja naranča (*Citrus sinensis* (L.) Osbeck), limun (*Citrus limon* (L.) Burm.) i četrun (*Citrus medica* L.).

Aonidiella aurantii (Hemiptera: Coccidea: Diaspididae) gospodarski je važan štetnik agruma koji osim agruma napada vinovu lozu (*Vitis vinifera* L.), maslinu (*Olea europea* L.) i smokvu (*Ficus carica* L.), a registrirana je i na drugim voćkama i drveću. Napad jačeg intenziteta ove štitaste uši gotovo redovito rezultira sušenjem listovam, opadanjem listova kao i sušenjem grana.

A. aurantii, prvi je puta na području Hrvatske registrirala Schmidt 1949 na vinovoj lozi. Tijekom 2015. faunističkim istraživanjem u sklopu Programa posebnih nadzora „*Organisms harmful to plants – Croatian 2015 Official Survey*" utvrdili smo široku rasprostranjenost *A. aurantii* na agrumima u Hrvatskoj, osobito u Splitsko dalmatinskoj i Dubrovačko neretvanskoj županiji, gdje je i najintenzivniji uzgoj agruma. U radu će biti prikazani rezultati istraživanja u 2015.

Ključne riječi: *Aonidiella aurantii*, agrumi, faunističko istraživanje, program posebnog nadzora, Hrvatska

sa2016_a0906

Distribution and harmfulness of California red scale – *Aonidiella aurantii* (Maskel) on citrus species in Croatia

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Abstract

Production of citrus species in the Republic of Croatia comprises of species within the genera of *Citrus*, *Fortunella* and *Poncirus*, and the area of their growing is located between 42° and 44° of northern geodetic latitude. The majority of citrus production in Croatia is oriented to Satsuma mandarin (*Citrus unshiu* (Swingle) Markow), while the most used rootstock is trifoliate lemon (*Poncirus trifoliata* (L.) Raf.), which are proved to be resistant to the low temperatures in the coastline during winter period. Apart from mandarin, at some localities in Croatia sweet orange (*Citrus sinensis* (L.) Osbeck), lemon (*Citrus limon* (L.) Burm.) and citron (*Citrus medica* L.) are grown but in much narrow scope.

Aonidiella. aurantii (Hemiptera: Coccidea: Diaspididae) is a significant pest of economic importance. Apart from citrus species it causes damages on vine (*Vitis vinifera* L.), olive (*Olea europea* L.) and fig (*Ficus carica* L.) and it is also registered on other fruit species and trees. An intensive attack of the mentioned scale insect very often results with drying and falling of leaves as well as branches drying.

A. aurantii was recorded for the first time in Croatia on vine by Schmidt in 1949. During the faunistic investigation in 2015 within the scope of Survey program „*Organisms harmful to plants – Croatian 2015 Official Survey*“, we have determined widespread of California red scale on citrus species in Croatia. It is particularly spread in Splitsko-dalmatinska and Dubrovačko-neretvanska county, where is the majority of citrus production. Results of the faunistic investigation in 2015 will be presented in the poster.

Key words: *Aonidiella aurantii*, citrus, faunistic investigation, survey, Croatia

sa2016_a0906

Utjecaj kaolinske gline na fotosintetsku učinkovitost i urod kruške

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Sažetak

Svaka biljka ima određene ekološke zahtjeve za svoj rast i razvoj. Nepovoljni ekološki uvjeti mogu uzrokovati stres na biljkama što rezultira nižim urodom. Na fotokemijsku aktivnost biljke također utječu ekološke prilike. Stres poput visoke temperature i jakog zračenja u popodnevnim satima uzrokuje snižavanje fotosinteze u listovima kruške. Kaolin, bijela glina, štiti biljke od ekstremnih temperatura i ultraljubičastog zračenja povećanjem refleksije lista. Tijekom toplinskog stresa kaolin smanjuje temperaturu listova i povećava fotosintetsku učinkovitost. Kaolin se koristi za ublažavanje negativnih učinaka stresa. Cilj ovog istraživanja je utvrditi učinak kaolina na proces fotosinteze, urod i kvalitetu ploda kod dva kultivara krušaka (Abbe Fetel i Conferance). Istraživanje je provedeno u pokusnom voćnjaku Tovljač na Poljoprivrednom institutu Osijek. Utjecaj folijarne primjene kaolinske gline (Cutisan) na listovima krušaka, mjerenjem fluorescencije klorofila *a*, proučavan je tijekom ljeta 2015. godine. Korištena je fluorescencija klorofila *a* kako bi se procijenila učinkovitost aplikacije kaolina u smanjivanju stresa uzrokovanog visokim temperaturma i jakim zračenjem. Rezultati dobiveni OJIP testom pokazuju da kaolin na listovima kruške štiti listove od visokog zračenja zato što listovi koji su tretirani kaolinom pokazuju višu fotosintetsku učinkovitost u popodnevnim satima od listova koja nisu tretirana kaolinom. Urod stabala, kod obje sorte, koja su tretirana kaolinom bio je veći u odnosu na netretirana stabla. Rezultati ukazuju da se primjena kaolina može smatrati korisnom tehnološkom mjerom i učinkovitim sredstvom za smanjenje stresa stabala kruške, što može utjecati na povećanje uroda i njegovu kvalitetu.

Ključne riječi: kaolin, kruška, stres, fluorescencija klorofila *a*, OJIP test

sa2016_a0907

Effect of kaolin clay application on photosynthetic efficiancy and yield of pear cultivars

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Abstract

Each plant has certain environmental requirements for its growth and development. Unfavourable environmental conditions can produce a stress on plants resulting in lower yields. The photochemical activity is also affected by environmental stresses. Environmental stresses such as a high midday temperature and high irradiance result in a midday depression of photosynthesis in pear. Kaolin, white clay, protects plants from extreme heat and ultraviolet radiation by increasing leaf reflectance. During heat stress kaolin reduces the temperature of leaves and increases photosynthetic efficiency. Kaolin is used to mitigate the negative effects of those stresses on plant. The objectives of this experiment were to evaluate the effects of kaolin on photosynthesis, fruit yield and quality in two pear cultivars (Abbe Fetel and Conferance). Experiment were performed in the experimental orchards Tovljač, Agricultural institute Osijek. The effect of foliar applications of kaolin clay (Cutisan) on pear leaves by measuring chlorophyll *a* fluorescence (Fv/Fm), were studied during summer 2015. We used the chlorophyll *a* fluorescence to evaluate the benefit of this application against stressful conditions, caused by high temperature and high irradiance. The results by the OJIP test showed that a kaolin on the pear leaves could protect leaves against high irradiance, because pear leaves sprayed with kaolin showed a higher photosynthetic efficiency at mid-day compared to trees non-treated with kaolin. The total fruit weight (yield) from the kaolin sprayed pear trees, in both cultivars, was higher than in untreated trees. The results indicate that the application of kaolin should be considered as useful technological measure and effective tool for reducing stress of pear trees, which can effect on increasing of yield and its quality.

Key words: kaolin, pear, stress, chlorophyll fluorescence, OJIP test

sa2016_a0907

Utjecaj slabobujnih podloga na kvalitetu ploda trešnje (*Prunus avium* L.) sorte 'Regina' tijekom dozrijevanja

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Sažetak

Vanjski i unutarnji parametri kvalitete ploda trešnje (*Prunus avium* L.) sorte 'Regina' cijepljene na šest slabobujnih podloga: Gisela3, Gisela5, Gisela6, PHL-C, PiKU1 i Weiroot72 praćeni su tijekom dozrijevanja na stablu. Pokus je proveden u pokusnom voćnjaku Zavoda za voćarstvo Hrvatskog centra za poljoprivredu, hranu i selo u Donjoj Zelini, a postavljen je po slučajnom bloknom rasporedu s 2 stabla u 3 repeticije za svaku od podloga u pokusu. Promjena boje ploda trešnje, tj. pojava crvene boje povezana je s pojačanim napadom štetnika koji polažu jaja u plod. Cilj ovog istraživanja bio je utvrditi broj dana od prve promjene boje do zriobe te odrediti odgovarajuće vrijednosti boje izražene u CIE *L*a*b** sustavu. Mjerenja boje ploda na označenim plodovima započela su od prve pojave crvene boje (fenološka faza - BBCH 85) i vršena su višekratno u razmacima od 4 dana.

Berba (fenološka faza - BBCH 89) je izvršena u dva navrata, i to 18. i 21. dan od prvog mjerenja boje. Uz boju su na plodovima mjerene masa, visina, širina i debljina ploda, tvrdoća, topljiva suha tvar, ukupne kiseline te pH. Iz izmjerenih vrijednosti boje ploda (*L*a*b**) izračunate su kromatske vrijednosti Hue i Chroma te dE*. Utvrđen je značajan utjecaj podloga, mjerenja te interakcije podloga*mjerenje na vanjsku i unutarnju kvalitetu ploda sorte Regina. Masa ploda kretala se od 7,73 g (Gisela5) do 12,45 g (PHL-C). Kromatska vrijednost Hue se kretao od 24,05 (Weiroot72) do 33,25 (PiKU1), a Chroma od 9,77 (Weiroot72) do 4,02 (PiKU1). dE* (razlika prosječne višegodišnje i izmjerene kromatske vrijednosti boje ploda) se za sve podloge osim za Weiroot72 kretao unutar ± 1.0.

Ključne riječi: trešnja, slabobujne podloge, kvaliteta ploda, zrioba

sa2016_a0908

Effect of dwarfing rootstocks on fruit quality of sweet cherry (*Prunus avium* L.) cv 'Regina' during maturation

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Abstract

Outer and inner fruit quality parameters of sweet cherry (*Prunus avium* L.) cv. 'Regina' grafted on six dwarfing rootstocks: Gisela3, Gisela5, Gisela6, PHL-C, PiKU1 and Weiroot72 were on-tree monitored during ripening. The trial was implemented in research orchard of the Institute of Pomology of the Croatian Centre for Agriculture, Food and Rural Affairs in Donja Zelina, and it was set up according to randomized design with two trees in three repetitions for each of the rootstock in trial. Colour change of the sweet cherry fruit skin, or emersion of a red colour is connected with intensive occurrence of pests that lay eggs in fruits. The main aim of this research was to determine number pf days from the first colour change until the ripening and to determine corresponding colour values expressed in CIE *L*a*b** system. Colour measurements on marked fruits started with the first appearance of red colour (phenological stage – BBCH 85) and were performed multiple times at regular intervals of 4 days.

Harvest (phenological stage - BBCH 89) was carried out twice - 18 and 21 days from the first colour measurement. Fruit skin colour, weight, height, width and depth, fruit firmness, soluble solids, total acidity and pH were measured. Out of measured *L*a*b** colour values chromatic values Hue and Chroma and dE* were calculated. Significant influence of rootstocks, measurements and interaction of rootstock*measurements on inner and outer fruit quality parameters of sweet cherry variety 'Regina' was identified. Fruit weight ranged from 7.73 g (Gisela5) to 12.45 g (PHL-C). Hue value ranged from 24.05 (Weiroot72) to 33.25 (PiKU1), and Chroma from 9.77 (Weiroot72) to 4.02 (PiKU1). dE* (difference between average multiannual and measured fruit skin colour) for all rootstock in the trial except for Weiroot72 was within ± 1.0 range.

Key words: sweet cherry, dwarfing rootstocks, fruit quality, ripening

sa2016_a0908

Nutritional values of strawberry tree (*Arbutus unedo* L.) and mediterranean hackberry (*Celtis australis* L.)

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Abstract

Strawberry tree (*Arbutus unedo* L.) grows to 9 - 12 m tall and has globular, orange-red fruits that are generally used for obtaining alcoholic drinks, jams and marmalades. Hackberry (*Celtis australis* L.) is a deciduous tree that can grow 20 m to 25 m in height and is commonly known as Mediterranean hackberry or the European nettle tree. The fruit of hackberry are seldom used for nutritional purposes. The nutritional and physicochemical properties of ripe strawberry tree and hackberry fruit from Istria (Marasi village near Vrsar, Croatia) were determined, including total fiber, protein, and mineral contents. This analysis demonstrates that strawberry tree fruit and hackberry fruit are a valuable source of dietary fiber, protein, and minerals. The seasonal differences associated with the different growth stages for the element composition, total phenolic content, and phenolic profile were also determined for hackberry leaves. Potassium and calcium were predominant minerals present in hackberry fruit mesocap and strawberry tree fruits. Water and ethanol extracts were prepared from fruits and leaves of both plant species and their phenolic profiles and antioxidant and antimicrobial activities were investigated. This study demonstrates that water and ethanol extracts of strawberry tree fruits and leaves contain gallic acid, epicatechin, catechin and anthocyanins delphinidin-3,5-di-O-glucoside, cyanidin-3,5-di-O-glucoside, and pelargonidin-3,5-di-O-glucoside., while hackberry fruit and leaves collected at different growth stages contain epicatechin, gallic acid, vanillic acid, 3,4-dihydroxybenzaldehyde, delphinidin-3,5-di-O-glucoside, cyanidin-3,5-di-O-glucoside, and pelargonidin-3,5-di-O-glucoside. These extracts also show some antimicrobial and antifungal activities. Ethanol extracts prepared from hackberry as well as strawberry tree leaves, showed antifungal activity against the most important fungal opportunistic pathogen *C. albicans* and against opportunistic pathogenic yeast *C. parapsilosis.* Further studies are thus needed to identify and define the active ingredients of these hackberry leaf ethanol extracts.

Key words**:** *Arbutus unedo*, *Celtis australis*, nutritional analysis, phenols, antimicrobial activities

sa2016_a0909

Vegetativni rast i rodnost aronije na području Međimurske županije

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Sažetak

Aronija (*Aronia melanocarpa* Elliot) je voćna vrsta koja zauzima sve veći značaj u RH. Zbog nutritivnih i kemijskih svojstava plodova te njihovog pozitivnog utjecaja na ljudsko zdravlje sve je traženija za uzgoj i uporabu. Cilj ovog rada bio je utvrditi dinamiku rasta mladica i rodnost aronije u klimatskim uvjetima Međimurske županije. Vegetativni rast aronije započeo je u rano proljeće 2014. godine i pratio se kontinuirano kroz 9 tjedana. Nakon formiranja cvjetova na 12 grmova su odstranjeni cvjetovi i praćen je daljnji rast mladica (T 1), a na drugih 12 grmova gdje nisu uklonjeni cvjetovi utvrđeni su i parametri rodnosti (T 2). Na početku vegetacije nije bilo značajnih razlika između tretmana. Nakon petog tjedna uočena je razlika u dinamici rasta mladica kod grmova gdje su cvjetovi odstranjeni. Biljke na kojima su ostavljeni cvjetovi u devetom tjednu su zaostale u rastu za 25,6% u odnosu na biljke gdje su cvjetovi odstranjeni. Nisu uočene značajne razlike u promjeru mladica između tretmana. Prosječan broj grozdova po biljci na dvogodišnjim sadnicama iznosio je 9,58, broj bobica po grozdu 12,95, masa plodova po grmu 127,18 g, masa bobice 1,06 g, promjer bobice 12,16 mm, broj sjemenki u bobici iznosio je 3,87 dok je udio topljive suhe tvari u soku bobica iznosio 18,1 Brix - a. Obzirom da su prevladavali povoljni klimatski uvjeti za uzgoj aronije, provedena istraživanja vegetativnog rasta i rodnosti pokazala su dobre rezultate za istraživano uzgojno područje. Budući je aronija relativno nova voćna vrsta u proizvodnji na našem području, potrebno je provoditi daljnja istraživanja vegetativnog i generativnog rasta te unaprijediti tehnologiju uzgoja aronije u cilju postizanja optimalnih priroda i dobre kvalitete plodova.

Ključne riječi**:** aronija, vegetativni rast, rodnost, Međimurska županija

sa2016_a0910

The vegetative growth and productivity of chokeberry in Međimurje County

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Abstract

Aronia (*Aronia melanocarpa* Elliot) is a fruit species that has a significant importance in Croatia. Because of the nutritional and chemical properties of fruits and their beneficial effects on human health, it is more popular for cultivation and use. The aim of this study was to determine the dynamics of growth of shoots and productivity chokeberry in climate Međimurje. Vegetative growth chokeberry started in early spring 2014 and followed up continuously through 9 weeks. After the formation of flowers at 12 bushes were removed and flowers accompanied by a further growth of the shoots (T1) and the other 12 were not removed bushes where flowers are laid down and fertility parameters (T 2). At the beginning of the growing season there were no significant differences between treatments. After the fifth week, a difference in the dynamics of growth of shoots at the bushes where the flowers were removed. Plants in which the flowers were left in the ninth week of the residual growth by 25.6% relative to the plant where the flowers are removed. There were no significant differences in the diameter of the graft between treatments. The average number of bunches per plant to a two-year seedlings was 9.58, the number of berries per cluster 12.95, fruit weight per bush 127.18 grams, berry weight 1.06 g,, berry diameter of 12.16 mm, number of seeds per berry was 3.87 while the share of soluble solids in the juice of berries was 18.1 °Brix -a. Since the prevailing favourable climate for the cultivation of chokeberry, conducted research on vegetative growth and yield have shown good results for the researched area. Since chokeberry relatively new fruit species in production in our area, it is necessary to carry out further research on vegetative and generative growth and improved farming technology chokeberry in order to achieve optimal yields and good quality fruits.

Key words: chokeberry, vegetative growth, productivity, Međimurje County

sa2016_a0910

Utjecaj mineralnog sastava lišća na sadržaj polifenola i antocijana u plodu višnje Maraske

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Sažetak

Višnja Maraska (*Prunus cerasus* var. *marasca*) jedna je od najznačajnijih voćnih vrsta Dalmacije, a areal rasprostranjenosti ograničen je uglavnom na dio područja sjeverne i srednje Dalmacije od Zadra do Makarske, gdje klima i tlo omogućuju postizanje visoke kvalitete ploda i specifične arome. Zbog visokog sadržaja vitamina, minerala te naročito polifenola, među kojima se ističu antocijani, smatra se voćem visoke nutritivne vrijednosti, pa je stoga cilj istraživanja bio utvrditi utjecaj mineralnog sastava lišća na sadržaj polifenola i antocijana u plodu višnje Maraske. U usporedbi s optimalnim vrijednostima po Bergmannu (2,2-3,0 % N/ST; 1,5-2,0 % K/ST i 0,20-0,35 % P/ST), utvrđene koncentracije N bile su optimalne, a P nešto niže od optimalnih u oba uzorkovanja. Koncentracije K u prvom uzorkovanju bile su niže od optimalnih, a u berbi niske do optimalne. Opskrbljenost lišća Ca bila je veća od optimalne, dok su utvrđene vrijednosti Mg bile optimalne u oba uzorkovanja. Koncentracije mikroelemenata značajno su se razlikovale ovisno o analiziranom elementu, mjestu uzorkovanja i vremenu uzorkovanja. Utvrđene vrijednosti polifenola (358,1-613,9 mg/100g) i antocijana (66,2-104,1 mmol/100g) sukladne su literaturnim navodima. Utjecaj mineralnog sastava lišća na sadržaj polifenola i antocijana u plodu nije utvrđen, pa se stoga može zaključiti da variranja vrijednosti polifenola i antocijana u plodu višnje Maraske ovise o mikrolokalitetu (mjestu uzorkovanja) te količini suhe tvari, odnosno stupnju zrelosti.

Ključne riječi: višnja Maraska, mineralni sastav, polifenoli, antocijani

sa2016_a0911

Influence of the mineral composition of the leaves on the content of polyphenols and anthocyanins in the fruit of sour cherry Marasca

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Abstract

Marasca sour cherry (*Prunus cerasus* var. *marasca*) is one of the most important fruit species in Dalmatia (Croatia). Marasca areal distribution is limited mainly to the part of the north and central Dalmatia from Zadar to Makarska, where climate and soil allow the achievement of fruit high quality and specific aroma. Due to the high content of vitamins, minerals and especially polyphenols among which are anthocyanins, it is a fruit of high nutritional value and therefore the aim of the research was to determine the influence of mineral composition of leaves on the content of polyphenols and anthocyanins in the fruit of sour cherry Marasca. Compared with the optimal values according to Bergmann (2.2-3.0 % N/DM, 1.5-2.0 % K/DM and 0.20-0.35 % P/DM), determined N concentrations were optimal, while P concentrations were slightly lower than optimal in both sampling times. Potassium concentrations in the first sampling were lower than optimal, and in the harvest low to optimal. Calcium leaves supply was higher than optimal, while the determined values of magnesium were optimal in both sampling times. Trace elements concentrations were significantly different depending on the analyzed element, the sampling site and the sampling time. The determined values of polyphenols (358.1-613,9 mg/100g) and anthocyanins (66.2-104.1 mmol/100g) were consistent with the literature data. The influence of the mineral composition of the leaves on the content of polyphenols and anthocyanins in the fruit has not been determined and therefore it can be concluded that the variation of polyphenols and anthocyanins in the Marasca sour cherry fruit depend on the micro-location (sampling site) as well as the amount of dry matter or degree of maturity.

Key words: sour cherry Marasca, mineral composition, polyphenols, anthocyanins

sa2016_a0911

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Section 10

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Zbornik sažetaka

Poljoprivredna tehnika

Maize grain as raw material for bioethanol and DDGS production

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Abstract

The maize grain is one of the best renewable raw material for ethanol production, due to the high content of starch in grain. The suitability of 20 maize hybrids from MRI was investigated for bioethanol and DDGS production. The optimization process of enzymatic hydrolysis and fermentation of whole grain flour obtained from the selected maize hybrids by using thermostable enzyme α-amylase Termamyl SC and glucoamylase SAN Extra L, as well as the production microorganism - yeast *Saccharomyces cerevisiae* var. *ellipsoideus* was conducted. The starch content varied from 69.60% (ZP 484) to 74,68% (ZP808). Hybrid ZP 484 (7.66%) has the lowest ethanol content after 48h fermentation and hybrid ZP434 (8.96%) the highest one. Volumetric productivity varied from 1.66 gl^{-1} h^{-1} (ZP341) to 1.87 gl^{-1} h^{-1} (ZP434).The highest bioethanol yield and highest bioethanol yield per arable land have hybrid ZP434 as well as energy effectiveness. The hybrid ZP434 was selected as the most promising bioethanol producer. Bioethanol produced from starchy parts of grain leaving valuable by-products as distillers' dried grain with solubles (DDGS). Its product contains a large amount of protein, ruminal undegradable protein and high energy making them a unique feed ingredient. During bioethanol fermentation maize grain proteins remain in DDGS and further are enriched by yeast proteins. DDGS sample have a high content of protein (29.58% - 36.08%) i.e. threefold higher than in maize grain. DDGS as by product of bioethanol processing could be used as feed staff of many domestic animals.

Key words: alternative fuel, bioethanol, DDGS, maize, starch

sa2016_a1001

Predstavljanje bioplinskog kalkulacijskog alata i zaključaka projekta INEMAD

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Sažetak

Europski istraživački projekt INEMAD – „Unaprijeđeno upravljanje hranjivima i energijom korištenjem procesa anaerobne digestije“ (04/2012 – 04/2016) fokusira se na inovativne strategije povezivanja ratarske i stočarske proizvodnje kroz kreiranje i detektiranje novih tokova hranjiva i energije. Projekt je financiran sredstvima FP7 programa, te projektni konzorcij čini 13 partnera iz 8 EU zemalja (Hrvatska, Belgija, Danska, Nizozemska, Njemačka, Bugarska, Mađarska, Francuska).

Cilj sažetka je znanstvenom sektoru predstaviti bioplinski kalkulacijski alat fokusiran na otkrivanje bioplinskog potencijala na poljoprivrednom gospodarstvu (small scale), te nekoliko ključnih zaključaka projekta INEMAD.

Bioplinski kalkulator nastao je na temelju suradnje Sisačko – moslavačke županije s belgijskim partnerima DLV i Innova Energy. Struktura kalkulatora je podijeljena na 3 segmenta: analiza agro i energetskih podataka, izračun bioplinskog potencijala, te financijski pregled projekta.

Prvi korak je fokusiran na pripremu inventara ulaznih agro i energetskih podataka koji uključuju analizu dosadašnjih energetskih potreba, te vrstu i volumen dostupne sirovine. Temeljem ulaznih parametara, kalkulacijski alat vrši analizu bioplinskog potencijala kroz izračun očekivane godišnje proizvodnje bioplina, električne/toplinske energije i digestata.

U konačnici, kalkulacijski alat kreira izračun temeljnih financijskih parametara projekta koji omogućavaju potencijalnom investitoru pregled različitih investicijskih i operativnih troškova, kao i poticajnih mjera vezanih uz implementaciju projekata obnovljivih izvora energije, a u okviru Programa ruralnog razvoja Republike Hrvatske za razdoblje 2014 – 2020 (Mjera 04 – Ulaganje u fizičku imovinu).

Uz predstavljanje bioplinskog kalkulacijskog alata, znanstveno – istraživački zaključci projekta će također biti prezentirani. Zaključci će se osvrnuti na vrijednost bioplinske proizvodnje u pripremi održivog poljoprivrednog poslovnog koncepta, a obuhvatit će tematiku efikasnosti nutrijenata u toku hranjiva, vrijednosti organskog gnojiva – digestata u poljoprivrednoj proizvodnji i važnosti promocije procesa anaerobne digestije različitim interesnim skupinama (poljoprivredni proizvođači, prerađivačka industrija, znanstvene institucije, javnost).

Ključne riječi: anaerobna digestija, bioplin, digestat, zakonodavni okvir, nutrijenti

sa2016_a1002

Introduction of the biogas calculation tool and INEMAD project findings

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Abstract

The European research project INEMAD - „Improved Nutrient and Energy Management through Anaerobic Digestion“ (04/2012 – 04/2016) focuses on innovative strategies to reconnect livestock and crop production by creating and detecting new nutrient and energy flows. The project is financed by the FP7 programme and the project consortium exists of 13 partners from 8 different EU member states (Croatia, Belgium, Denmark, Netherlands, Germany, Bulgary, Hungary, France).

With this abstract, a biogas calculator that focuses on the potential of (small scale) biogas production on a farm as well as several project results will be presented.

During the project, Sisak – Moslavina County developed a biogas cacluation tool in close collaboration with 2 Belgian partners – DLV and Innova Energy. The tool is organized in 3 segments: agro and energy inventory, biogas potential calculation and financial forecast.

The first part is focused on inventory of agro and energy streams which include scan of the existing energy needs as well as an inventory of available feedstock (type, volumes). Based on the input data, the tool performs an analysis of the biogas potential by calculating annual biogas production, electricity and heat generation and creation of digestate (volume). Finaly, the tool creates a forecast of financial parameters which allow an investor to analyse different investment and operational costs, as well as to get familiar with the subsidy system currently available for the implementation of the Measures of rural development for Republic of Croatia (Measure 04 – Investment in physical assets, 2014 – 2020).

Besides the biogas calculation tool, INEMAD´s scientific – research findings will be briefly presented. The selection of findings will aim to display the value of biogas technology in the preparation of sustainable agro business concepts. These results will enclose topics such as efficiency within the nutrient cycle, the value of organic fertilizer – digestate in agricultural production and the importance of holistic promotion of the AD to different target groups (agro producers, processors, research institutions, general public).

Key words: anaerobic digestion, biogas, digestate, legilastive framework, nutrients

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