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Riječ urednika

Poštovane kolegice i kolege,

cijenjeni čitatelji,

pred Vama su još jedan Zbornik radova i Zbornik sažetaka simpozija agronoma, u 50. godini njegovog postojanja.

Za 50. hrvatski i 10. međunarodni simpozij agronoma prihvaćeno je 278 priloga koji će biti prezentirani usmeno ili kao poster, od toga 186 iz Hrvatske i 92 iz inozemstva. Od ukupnog broja domaćih radova ili sažetaka, na 57 (30,6%) prvi autor je s Agronomskog fakulteta u Zagrebu, na 38 (20,4%) s Poljoprivrednog fakulteta u Osijeku, na 15 (8,1%) s Poljoprivrednog instituta Osijek, itd. Iz inozemstva su zastupljeni prilozi iz 24 države: Turska (17), Srbija (12), Bosna i Hercegovina (7), Kosovo (8), Italija (7), Bugarska (6), Slovenija (5), Iran (5), Albanija (5), Slovačka (3), Moldavija (2), Južna Koreja (2), Rusija (2), Rumunjska (1), Mađarska (1), Makedonija (1), Egipat (1), Češka (1), Grčka (1), Alžir (1), Njemačka (1), Francuska (1), Austrija (1) i Ukrajina (1).

Kao i prethodnih godina, teme simpozija vezane su uz sve grane poljoprivrede, a izlaganja će se održati u okviru devet sekcija: 1) Agroekologija, ekološka poljoprivreda i zaštita okoliša, 2) Agroekonomika i agrosociologija, 3) Genetika, oplemenjivanje bilja i sjemenarstvo, 4) Povrćarstvo, ukrasno, aromatično i ljekovito bilje, 5) Ratarstvo, 6) Ribarstvo, lovstvo i pčelarstvo, 7) Stočarstvo, 8) Vinogradarstvo i vinarstvo i 9) Voćarstvo. Radovi iz područja zaštite bilja, poljoprivredne tehnike i tehnologije te sigurnosti hrane uvršteni su u jednu od postojećih sekcija sukladno temi prispjelog rada.

U plenarnim predavanjima predočeno je stanje i prijedlog razvitka poljoprivrede Hrvatske te "zelena infrastruktura" i razvoj u okviru održivosti poljoprivredne proizvodnje. Posebna pozornost posvećena je tlima Hrvatske u strategiji zaštite tala Europske Unije povodom Međunarodne godine tla - 2015., koju FAO provodi pod krilaticom "Zdravo tlo za zdrav život". Ono po čemu ćemo sigurno pamtiti 2014. godinu su katastrofalne poplave koje su zahvatile gotovo cijelu Hrvatsku, osobito županjsku Posavinu, gdje su utvrđene i najveće posljedice. U skladu sa zadržavanjem vode na poplavljenoj površini preporučene su agrotehničke mjere sanacije i rekultivacije tala za ponovnu uspostavu biljne proizvodnje na tim površinama. U svjetlu aktualnih, kaotičnih klimatskih ekstrema predočeni su učinci klimatskih promjena na biljne bolesti te na fiziologiju voćaka i kvalitetu voća.

U okviru simpozija organiziran je okrugli stol na temu "Etički trendovi u znanosti i nastavi" i "Zaštita autohtonih poljoprivrednih proizvoda".

Predočeni prilozi tiskani su u cjelovitom obliku (119 radova) ili kao sažetak (159 sažetaka), a nalaze se u tiskanom (knjiga) i elektronskom obliku (USB stick i web http://sa.agr.hr). Svaki rad tiskan u Zborniku radova je recenziran od dva recenzenta. Sažeci su pregledani od voditelja sekcije i neznatno korigirani, pri čemu nije mijenjan smisao rečenice. Na žalost, zbog kratkog roka za pregled nije bilo vremena za autorizaciju teksta pa su moguće određene pogreške za koje se unaprijed ispričavam.

Nadam se da će ovi radovi i sažeci biti relevantan izvor informacija svima koji ih budu trebali. Ovom prigodom želim zahvaliti svim autorima, recenzentima i voditeljima sekcija na poslanim prilozima i doprinosu pri uređivanju radova ili sažetaka.

Osobito zahvaljujem pokroviteljima simpozija – Predsjedniku Republike Hrvatske, Ministarstvu znanosti, obrazovanja i sporta RH, Ministarstvu poljoprivrede RH te suorganizatorima simpozija na nesebičnoj suradnji i svekolikoj potpori.

Svim agronomima, posebice autorima priloga, bivšim i sadašnjim, čestitam 50. obljetnicu simpozija agronoma - 2015. godine.

Zagreb, 27. siječnja 2015.

Prof. dr. sc. Milan Pospišil

Glavni urednik

A Word from the Editor

Dear Colleagues,

Respected readers,

In your hands are one more Book of Abstracts and the Proceedings of the Symposium on Agriculture, in the 50th year of its existence.

278 contributions have been accepted for oral or poster presentation at the 50th Croatian and 10th International Symposium on Agriculture, 186 of which are from Croatia and 92 from other countries.

Of the total number of domestic papers and abstracts, the first author in 57 (30.6%) comes from the Faculty of Agriculture in Zagreb, in 38 (20.4%) from the Faculty of Agriculture in Osijek, in 15 (8.1%) the Agricultural Institute in Osijek, etc.

Foreign contributions represent 24 countries: Turkey (17), Serbia (12), Bosnia and Herzegovina (7), Kosovo (8), Italy (7), Bulgaria (6), Slovenia (5), Iran (5), Albania (5), Slovak Republic (3), Moldova (2), Republic of Korea (2), Russia (2), Romania (1), Hungary (1), Macedonia (1), Egypt (1), Czech Republic (1), Greece (1), Algeria (1), Germany (1), France (1), Austria (1) and Ukraine (1).

As in previous years, the symposium topics cover all branches of agriculture, and presentations are divided into nine sections: 1) Agroecology, Ecological Agriculture and Environmental Protection, 2) Agricultural Economics and Rural Sociology, 3) Genetics, Plant Breeding and Seed Production, 4) Vegetable Growing, Ornamental, Aromatic and Medicinal Plants, 5) Field Crop Production, 6) Fisheries, Game Management and Beekeeping, 7) Animal Husbandry, 8) Viticulture and Enology and 9) Pomology. The papers in fields of plant protection, agricultural engineering and technology and food safety are included in one of the offered sections in accordance with their topics.

The plenary lectures illustrate the current situation and the proposal for development of Croatian agriculture, as well as "green infrastructure" and sustainable development of agricultural production. Special attention is given to Croatian soils within strategy for protection of European Union soils created on the occasion of the International Year of Soil - 2015 and implemented by FAO under the slogan "Healthy soil for healthy life". Year 2014 will most be remembered by the catastrophic floods that affected almost entire Croatia, especially Županjska Posavina where the flooding had greatest consequences. In accordance with the retention of water on flooded surfaces, agro-technical practices for soil rehabilitation and re-cultivation are recommended in order to re-establish crop production in those areas. In light of current chaotic climate extremes, the effects of climate change on plant diseases and the physiology of fruit trees and fruit quality are presented. As part of the Symposium a roundtable discussion on "Ethical trends in research and teaching" and "Protection of autochthonous agricultural products" is organized.

Submitted contributions are printed as full text papers (119 papers) and abstracts (159 abstracts) and are available in paper form (book) or in electronic form (USB and web http://sa.agr.hr). Each paper included in the Proceedings was reviewed by two reviewers. Abstracts were reviewed and slightly revised by relevant section moderators, but their meaning remains unchanged. Unfortunately, due to short time for reviewing, text authorization was not possible and I apologize for the errors that might have sneaked in.

I hope that these papers and abstracts will be a relevant source of information to all who will need them.

I thank all authors, reviewers and section moderators for sending contributions and for editing the papers and abstracts.

Special thanks goes to the President of the Republic of Croatia, the Ministry of Science, Education and Sport of the Republic of Croatia, the Ministry of Agriculture of the Republic of Croatia under whose patronage the Symposium is held as well as to the co-organizers for their unselfish collaboration and comprehensive support.

To all agronomists, especially to authors, former and current I congratulate the 50th anniversary Symposium – 2015.

Zagreb, 27 January 2015
Prof. Milan Pospišil, PhD
Editor-in-Chief

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Croatian 50 2015 10 International Symposium on Agriculture

Section 1

Book of Abstracts

Agroecology, Ecological Agriculture and Environment Protection

50 Hrvatski 10 Međunarodni Simpozij Agronoma

Zbornik sažetaka

Agroekologija, ekološka poljoprivreda i zaštita okoliša

Utjecaj gustoće usjeva i obrade na eroziju tla vodom

Ivica KISIĆ, Ferdo BAŠIĆ, Igor BOGUNOVIĆ, Sofija STANKOVIĆ

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Sažetak

Erozija tla vodom i vjetrom prati civilizaciju od njezina postanka. Antropogena erozija do sada je nepovratno uništila 430 milijuna hektara poljoprivrednog zemljišta ili oko 30 % ukupnih obradivih površina na planetu Zemlji. Samo u Hrvatskoj je preko 80 % obradivih površina izloženo eroziji različita intenziteta, a u brdsko brežuljkastim područjima erozija tla vodom je primarni problem gospodarenja tlom. Cilj je ovog rada istražiti utjecaj okopavinskih kultura rijetkog sklopa, kukuruza i soje te ozimih usjeva gustog sklopa, pšenice i uljane repice na eroziju tla vodom pri različitim načinima obrade tla i različitom porastu istraživanih usjeva. Istraživanja su provedena u zoni obronačnog pseudogleja na oraničnim površinama poduzeća „Poljodar Tim“ d.d., na parceli Freivogelov brijeg, u selu Blagorodovac, nedaleko Daruvara. Pokus je započeo 1995. godine sjetvom kukuruza. U istraživanjima je primijenjen uobičajen plodored za ovo područje: kukuruz - soja - ozima pšenica - uljana repica te mješoviti usjev ječam-soja. Navedeni plodored je bio ponovljen četiri puta. U svakoj godini istraživanja, bilježili su se iznosi erozije tla vodom svaki put nakon oborina koje su uzrokovale površinsko otjecanje. Količina oborina se pratila pomoću kišomjera na mjestu provedbe pokusa. Nakon analize rezultata od svake pojedine godine pokusa, utvrđena je pojačana erozija tla vodom pri uzgoju okopavinskih kultura, kukuruza i soje, odnosno godišnja erozija viša od tolerantne na kontrolnoj varijanti i obradi uz/niz nagib. Kod uzgoja ozimih usjeva gustog sklopa godišnja erozija prelazila je tolerantnu samo na kontrolnoj varijanti dok je na ostalim varijantama bila ispod tolerantne vrijednosti i nije značajna. Provedena 20-godišnja istraživanja ukazuju da eroziju tla vodom ne možemo u potpunosti zaustaviti. Odabirom optimalnog načina obrade i plodoreda eroziju možemo svesti u tolerantne okvire.

Ključne riječi: okopavine, ozimine, erozija vodom, obrada

sa2015_a0101

Influence of plant density and tillage on soil loss by water

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Abstract

Soil erosion by water is a great issue in all parts of world. Anthropogenic erosion until now irretrievably destroyed 430 million hectares of arable land, or about 30 % of the total arable land on the planet Earth. Here in Croatia, over 80 % of all cultivable area is under influence of variable intensity erosion, and in some parts of country (especially in hilly region) erosion is a primary problem in soil management. In this paper soil erosion by water was investigated on the results of experiment with five agricultural crops in the zone of Stagnosols on the arable land of firm „Poljodar Tim" – agriculture, transport and services from Daruvar, on the plot of Freivogel´s hill, in the village of Blagorodovac, near Daruvar. This experiment began in year of 1995 by sowing maize. Crops included in crop rotation were in crop rotation: maize – soybean - winter wheat - oil seed rape and double crop barley-soybean, each of them repeated four times in crop rotation. Every time after rainfall, soil loss was measured and noted just like the amount of rainfall, which was measured by pluviometer in the experimental place. The aim of this project was to investigate the influence of row crops - maize and soybean and high density crops - winter wheat and oil rape seed on soil erosion by water in different tillage systems and plant density of investigation crops. After result analysis of every experimental year, increased soil loss were determined in growing row crops, maize and soybean. Respectively, yearly erosion rates were above tolerant erosion on the control plot and the plot with ploughing up/down the slope. Yearly erosion rates in growing high density crops were above tolerant erosion only on control plot, and in other plots erosion rates were well below the tolerant and were not significant. Conducted 20-year-old research suggests that soil erosion water can not completely stop. Choosing the optimal treatment method and crop rotation erosion can be reduced in the tolerant limits.

Key words: row crops, high density crops, soil erosion by water, tillage

sa2015_a0101

Emisije C-CO_2 iz tla u vegetaciji tritikalea

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Sažetak

Pravilnim gospodarenjem poljoprivrednim tlom (obrada, gnojidba, navodnjavanje) može se presudno utjecati na emisiju CO_2 iz tla, sekvestraciju organskog ugljika odnosno zdravlje tla (plodnost i kvalitetu). Zbog nedostatka istraživanja i vlastitih nacionalnih podataka, a vezanih za tematiku disanja tla (CO_2 emisiju ili fluks) u realnim agroklimatskim uvjetima provodi se istraživanje u Zapadnoj Panonskoj poljoprivrednoj podregiji RH, na rubu granice s Parkom prirode Lonjsko polje. U vegetacijskoj 2014. g. utvrđen je utjecaj mineralne gnojidbe (N+P+K) na emisiju C-CO_2 iz tla tijekom uzgoja pšenoraži (tritikale) (sjetva 24.10.2013. / žetva 18.07.2014.). Pokus je postavljen još 1996. godine s ciljem utvrđivanja utjecaja gnojidbe dušikom na prinos ratarskih kultura, te kvalitetu podzemne i površinske vode (prvenstveno NO_3^-). Istraživanje je 2011. g. prošireno i na praćenje utjecaja na atmosferu (emisija C-CO_2). Pokus se sastoji od 10 tretmana (svaki u 4 ponavljanja) koji se razlikuju u primijenjenim dozama dušika (od 0 do 300 kg ha^{-1}), ukupna veličina pokusa je gotovo 4,5 ha, tip tla je drenirani pseudoglej ravničarski distrični. Područje je karakteristično za umjerenu kontinentalnu klimu. Od listopada 2013. do studenog 2014. provedeno je 7 mjerenja. Srednje godišnje vrijednosti C-CO_2 fluksa kretale su se od 10,4 kg ha^{-1} po danu određenih na varijanti br. X (crni ugar-obrada bez sjetve) do 26,1 kg ha^{-1} po danu zabilježenih na varijanti br. I (kontrola-negnojeno) i VI (sa primijenjenih 250 kg N ha^{-1}).

Ključne riječi: pšenoraž (tritikale), gnojidba, C-CO_2 fluks, disanje tla

sa2015_a0102

C-CO_2 emissions from soil in triticale vegetation

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Abstract

Agricultural soil management (tillage, fertilization, irrigation) can have a crucial influence on the emission of CO_2 from the soil, soil organic carbon sequestration or soil health (fertility and quality). Due to the lack of research and our own national data related to the topics of soil respiration (CO_2 or flux) in the real agroclimatic conditions of Western Pannonian agricultural subregion, on the edge of the Nature Park Lonjsko polje, field experiment was conducted. At 2014 the effect of mineral fertilizer (N + P + K) on CO_2 emissions from soil during the cultivation of triticale (sowing 24.10.2013. / harvesting 18.07.2014.) was determined. Experiment trial was conducted in 1996 with the aim of determining the effect of nitrogen fertilization on the yield of different agricultural crops, and on the quality of groundwater and surface water (primarily NO_3^-). At 2011 research was extended to the monitoring of fertilization impact on the atmosphere (CO_2 emissions). The experiment consists of 10 treatments (each in 4 replicates), which differ in the applied nitrogen doses (from 0 up to 300 kg N ha^{-1}), total size of the experiment is nearly 4.5 ha, type of soil is drained lowland distric Stagnosols. The area has typical temperate continental climate. From October 2013 to November 2014 seven measurements were conducted. Mean annual values of C-CO_2 flux ranged from 10.4 kg ha^{-1} per day noted in the variant no. X (black fallow-tillage without sowing) up to 26.1 kg ha^{-1} per day recorded in the variant no. I (control-unfertilized) and VI (with applied 250 kg N ha^{-1}).

Key words: triticale, fertilization, C-CO_2 efflux, soil respiration

sa2015_a0102

Climate change and droughts

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Abstract

Global warming is the most significant problem threatening the agriculture of the world and it is experienced at different levels in different parts of the world. Climate change and resultant global warming ultimately result in significant droughts throughout the world. Global increases in temperatures and decreases in precipitations cause the water and drought problems. The precipitation levels below the normal averages have significant impacts over land and water resources and ultimately result in changes in hydrological balance. Droughts are natural phenomenon and have become highly complex issue with global warming and climate change. The present study summarizes the impacts of global warming on droughts and presents the possible measures to mitigate such impacts.

Key words: global warming, climate change, drought, precipitation

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Advanced technology for active hail suppression in the Republic of Moldova

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Abstract

Hail suppression activity based on the rocket technology of transportation and dissemination of a nucleating reagent into hail-producing clouds in the Republic of Moldova is presented. At the moment the agricultural area being under the hail protection is about 1.5 million hectares, i.e., 50% of the territory of the Republic of Moldova.

The basic elements of the hail protection technology in the Republic of Moldova up to now are a specialized antihail rocket system «Alazan-6» for cloud seeding with hail-watch radar signal returns from cloudy cells and a specialized automatic control system ACS-MRL. The system provides collection and processing of the radar-tracking data about clouds with hail-watch radar return signal and gives information about the type of falling precipitation. The system allows control of the cloudy atmosphere for checking the probability of hail formation over the whole territory of the Republic of Moldova as well as over a border-part territory of Romania and Ukraine (up to 100 km from the border) in a *non-stop* mode. The applied technology of hail protection provides high operating efficiency, 84 % ≤ E ≤ 92 %.

Key words: hail suppression, rocket technology, agricultural area protection

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Influence of climate change on management of Bulgarian agricultural cropping systems

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Abstract

Bulgaria is a part of EU market. Main agriculture crops in Bulgaria are wheat, corn, sunflower and vegetables and therefore this research focuses on intensive agricultural production. Horticulture is situated at the interface between agroecosystem and society. Therefore it is very important to establish the relationship between change of climate conditions, management of agricultural cropping systems and soil quality with special emphasis on soil biota. Soil food web includes plants and other organisms that occupy different positions in the food chain, which are linked by multiple ecological networks. A review of the literature showed that changes in climate conditions will impact the soil multitrophic interactions and processes controlling these interactions.

The main aim of this review is to analyze current level and different aspects of agricultural production and to put this into the context of global climate change.

The average monthly temperatures, absolute maximum and absolute minimum air temperature, precipitation patterns and relative humidity at the beginning of this century for the arable land in region of Plovdiv were examined. A rising trend in the average monthly temperature in summer and fall of absolute minimum air temperatures during the winter months was determined when compared with climatic conditions of the 20th century. We determined an increase in annual rainfall amount and dynamic change in its distribution through seasons and within different years (e.g., in 2014 there is an increase of 400 mm to the annual amount of rainfall).

Soil-borne pathogens are responsible for about 50 % of diseases that affect major crops in Bulgaria and together with plant-parasitic nematodes cause enormous loss in agriculture every year. In this review, we focus on soil biota diversity and function influenced by combination of climatic factors and cropping systems. Based on current knowledge about new trends of challenges in sustainable agricultural production, mitigating climate strategies could be promoted.

Key words: climate, managing cropping systems, soil biota, agroecosystem

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CSS-CropEnviron: a module of CSS (Cropping System Simulator model) for the GHGs dynamic balance of crops

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Abstract

Croplands may play an important role in climate change mitigation. Therefore, it is fundamental to do a precise estimate of their CO_2-eq emissions. Agriculture contributes to the increase of atmospheric greenhouse gases (GHGs) through disturbance of soil and vegetation C pools (e.g. ploughing/tillage and management of crop residues) and the biospheric fluxes of other GHGs, but also through field or farm operations (e.g. emission of fossil fuels from energy sources needed for tillage practices or in the application of organic amendments and chemicals). A complete description of all ecosystem C-eq fluxes is really expensive in terms of field measurements. Moreover, it is often no longer obtainable from already concluded survey data collection.

This work presents *CSS-CropEnviron*, the module for dynamically estimating components of the GHG budget in Cropping System Simulator (*CSS*) model. *CSS* is a model, written in the SEMoLa language, formed by a collection of modules that simulate, at daily step, crop and soil biogeochemical processes and their interactions with the environment. *CSS-CropEnviron* computes daily CO_2 autotrophic and heterotrophic respiration, net and gross primary production, in order to estimate yearly ecosystem C related balances (NEP and NBP, i.e. ΔSOC). The GHG budget considering both C and N CO_2-eq emissions, is based at farm scale. The module has been evaluated on 3-year continuous maize crop intensively monitored for CO_2 ecosystem fluxes (a combination of Eddy covariance and soil respiration continuous monitoring).

Key words: modelling, cropping system, GHGs, environment, emissions

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Soil quality and pesticide residues in soils on organic and conventional farms in Serbia

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Abstract

Study was carried out in the framework of the IPA project Agriculture Contribution towards Clean Environment and Healthy Food on seven pilot farms located in Srem and Bačka, the border region of Serbia. The investigation was conducted at three representative farms certified for organic production and four conventional farms, and within them 96 production fields with different history of farming practices. The aim was to compare the impact of organic and conventional farming systems on soil quality and to evaluate the content of pesticide residues in soil. The results showed high variability in soil fertility not only between the farming systems (organic/conventional), but also within the same production system - between different locations and even between plots on the same farm. Soil samples taken from conventional farms had lower pH values and lower humus contents compared to the samples from the organic farms. The results of the analysis of pesticide residues in soil samples from the conventional farms have shown the presence of sulphonylurea herbicides, metolachlor, terbuthylazine and pendimethalin, as well as the residues of some fungicides (difenoconazole, flusilazole, folpet, chlorothalonil, trifloxystrobin, epoxiconazole, pyrimethanil) and some insecticides. Soil samples originating from farms certified for organic production were pesticide free, or residues were below the LOD.

Key words: soil fertility, herbicides, fungicides, insecticides

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Distribution of *Prunus spinosa* L. soil weed seed bank near railway

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Abstract

Determination of soil weed seed bank is of exceptional importance for study of weed population dynamics, as well as for planned weed control. In agro eco-systems, knowledge on soil weed seed bank in certain region provides better choice of cultural practices, as well as more rational herbicide use. Woody weed species *Prunus spinosa* L. has great ecological adaptability and therefore it is present in different ecological conditions. On the territory of the municipality Novi Sad, this weed species can be found near railways, on pastures and forest edges, between roads and fields, and along the canals network and the river waterway. During 2013 and 2014 soil sampling and determination of weed seed number was performed in stand of this weed species. The study was performed at three localities near Novi Sad (Futog, Kisač and Kać). Sieving of soil samples was done in laboratory conditions using copper sieves with mesh size of 0.25 mm, and sieved samples were dried at room temperature. This procedure was followed by separation of weed seeds from soil particles and their determination. Analysis of weed seed bank from the studied localities showed that in the top soil layer of 0-10 cm at locality there was the highest number of 718 seeds per m^2 of weed species *Prunus spinosa* L. At all three studied localities, seeds of weed species *Prunus spinosa* L. were concentrated in the first two layers of 0-20 cm. Seeds of weed species *Stellaria media* (L.) Vill., *Urtica dioica* L., *Amaranthus retroflexus* L., and *Chenopodium album* L., had the highest numerical dominance in relation to other weed species.

Key words: seed bank, *Prunus spinosa* L., bush, invasive species

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Resistance of weed species *Amaranthus retroflexus* L. to ALS inhibitors

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Abstract

In intensive agricultural production, weed herbicide resistance is becoming an increasing problem. Frequent use of herbicide of the identical action mechanisms leads to selection of resistant weeds and elimination of susceptible biotypes. Until now, a total of 426 cases of resistance occurrence have been determined worldwide. Currently, resistance to ALS – inhibitors has been recorded in 143 weed species. So far, in the Republic of Serbia herbicide resistance has been confirmed on several locations to triazine herbicides for the following weed species: *Abutilon theophrasti* Medic., *Amaranthus retroflexus* L., *Chenopodium hybridum* L., *Setaria viridis* (L) Beauv., as well as to ALS inhibitors: *Amaranthus retroflexus* L., *Datura stramonium* L. and *Echinochloa crus-galli* L. on several locations. During 2013 resistance research has expanded to other sites of Serbia. Resistance of weed species *Amaranthus retroflexus* L. to the active ingredient nicosulfuron was tested in laboratory conditions. Seeds of *Amaranthus retroflexus* L. were collected from maize crop at locality Kovin, from soybean crop at locality Budisava and from ruderal site, i.e. control at locality Begeč. In the study herbicide nicosulfuron was applied in a range of herbicide rates of 20; 30; 40; 50 and 100 g a.i./ha. Statistically significant difference was not found in epicotyls and hypocotyls lengths of seeds from locality Kovin, whereas in seeds hypocotyls and epicotyls lengths of weed species *Amaranthus retroflexus* L. from locality Budisava, statistically significant difference was established in comparison to the control.

Key words**:** resistance, ALS inhibitors, *Amaranthus retroflexus* L., herbicides, nicosulfuron

sa2015_a0109

Fungicides are similarly affecting flora and carabid beetles in both organic and conventional vineyards

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Abstract

Organic management is generally leading to improve soil quality and biodiversity compared to conventional systems. However, in organic management, Cu-based fungicides are used enabling environmental pollution. Therefore, it is legitimate to investigate if organic farming is more close to natural environment than the conventional one. However, it is very difficult to compare the two systems and many authors did not use correct comparison procedures. While many references are reporting the toxicity of Copper to different single species, there are missing comparisons in terms of whole vegetation communities and carabid beetles species compositions especially between organic and conventional vineyards. Thus an investigation was carried out in two conventional vineyards, three organic vineyards and as a reference three natural sites (permanent meadows and set aside) in Friuli venezia Giulia (Italy). In spring, summer and autumn during 2010, ground beetles were sampled by means of pitfall traps and seasonal flora surveys were carried out according to Braun-Blanquet. Soil phisico-chemical characteristics were recorded as well.

Canonical correspondence analysis (CCA) showed that fungicide applications and the soil texture characteristics are the main factors impacting both, plants and carabid beetles community. However, conventional and organic vineyards resulted much overlapped showing no difference between them according to the soil and plant community composition. On the other hand, organic vineyards were separated from conventional one according to soil texture characteristics and carabid beetles community. Despite different managements, carabid beetles and plant community, seems to be affected mostly by fungicides and copper, both total and bioavailable (DTPA). Organic C was not significantly different between different managements. IndVal analysis found only *Harpalus affinis*, *Harpalus distinguendus* and *Harpalus pygmaeus* to be significantly associated to conventional vineyards and neither one to organic vineyards. Regarding plants we found only species significantly associated to vineyards irrespectively organic or conventional (*Cynodon dactylon*, *Lolium perenne*, *Plantago major* subsp. *major*, *Taraxacum* sect. *Taraxacum*, *Trifolium repens* subsp. *repens* and *Veronica persica*). Thus both managements are similarly stressed at community level if compared to natural sites.

Key words: organic vineyards, conventional vineyards, carabid, plant community, CCA

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Isolation, characterization and genetic identification of natural fungal strains from decomposing hazelnut husk

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Abstract

The goal of this study was to determine the fungi enabling the degradation of hazelnut husk and awkward some chemical properties of decomposing hazelnut husk which is an agricultural organic waste. For that purpose, an amount of hazelnut husk picked from hazelnut gardens was stacked on a land and left under aerobic conditions for fragmentation. The fungal strains which use hazelnut husk were detected by molecular techniques in samples which were taken periodically for 2 years.

Efficient Cellulase-producing fungi were isolated from different sampling time in hazelnut husk composting process decayed lignocellulosic waste etc using different isolation strategies. Among the various isolates obtained from different environment, five different fungi were selected depending upon the diameter of clear zone produced in Carboxy methyl cellulose agar for further screening in liquid media and one potent strain NASC3 was identified as efficient cellulolytic fungi. Molecular identification of strain NASC3 was done by PCR amplification of 18s rDNA region using primers ITS4 and ITS5. The amplified products were sequenced and analyzed using ClustalW. The phylogenetic analysis of strain NASC3 showed and identified as *Penicillium piceum* IMI 392509^T, *Penicillium citrinum* C1-1^T, *Emericella rugulosa* 14^T, *Penicillium brasilianum* KUC1433^T, *Acremonium* sp. ATT196^T, *Penicillium verruculosum* 101119^T, *Penicillium piceum* IMI 392509^T and *Aspergillus tubingensis* SAB-B3C-T^T.

Key words: hazelnut husk, fungi, decomposing, compost, identification

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Fumigantna učinkovitost 1,8-cineola i eugenola na stadij kukuljice kestenjastog brašnara *Tribolium castaneum* (Herbst) (Insecta: *Coleoptera: Tenebrionidae*)

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Sažetak

Fumigantna učinkovitost komponenata 1,8-cineola i eugenola testirana je na stadij kukuljice kestenjastog brašnara *Tribolium castaneum* (Herbst). Određen je mortalitet i aktivnost rasta kukuljica oba spola, kao i razlike u osjetljivosti između spolova kukuljica *T. castaneum* na ispitivane komponente. Komponente su testirane u 3 koncentracije 120, 300 i 600 µl 350 ml^{-1}vol. u kontroliranim uvjetima na 30±1°C; 70-80 % rvz, u tami tijekom 48 sati. Kukuljice *T. castaneum* su pokazale različitu osjetljivost ovisno o apliciranoj komponenti i koncentraciji. Toksičnost 1,8-cineola i eugenola očitovala se dvojako. Kao prvo mortalitetom tretiranih kukuljica, dok je kod preživjelih kukuljica uočena pojava „adultoid" jedinki i deformiranih imaga. Povećanjem koncentracije 1,8-cineola (sa 120 na 300 i 600 µl 350 ml^{-1}vol.) značajno je smanjen postotak normalno razvijenih živih imaga koji su se razvili iz preživjelih tretiranih kukuljica muškog spola (56,25 %; 31,25 % i 18,75 %; F=25,0; *df*=3; *P*<0,05). Utvrđeno je da su kukuljice muškog spola općenito senzibiljnije na obje testirane komponente. U tretmanu s 1,8-cineolom (300 µl 350 ml^{-1}vol), kod muškog spola je uočeno značajno više deformiranih živih jedinki u odnosu na ženski spol (22,50 %, odnosno 10,00 % F=6,82; *df*=1; *P*=0,040), kao i značajno manji postotak živih jedinki imaga koji su se razvili iz tretiranih preživjelih kukuljica (31,25 %; odnosno 55,00 %; F=9,42; *df*=1; *P*=0,0220), što ukazuje na općenito bolje preživljavanje kukuljica ženskog spola. Razlika učinkovitosti po spolu bila je slabije izražena u tretmanu s eugenolom. Sve ukupno, bolje djelovanje je ostvareno s 1,8-cineolom, dok s eugenolom nije postignut zadovoljavajući učinak na testirane kukuljice.

Ključne riječi: fumigacija, 1,8-cineol, eugenol, *Tribolium castaneum,* kukuljica

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Fumigant efficacy of 1,8-cineole and eugenol on the pupal stage of *Tribolium castaneum* (Herbst) (Insecta: *Coleoptera: Tenebrionidae*)

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Abstract

The fumigant efficacy of 1,8-cineole and eugenol compounds was tested on the pupal stage of the red flour beetle *Tribolium castaneum* (Herbst). Mortality and growth activity of both sexes were determined, as well as differences in sensitivity to the tested compounds between the sexes of *T. castaneum* pupae. Compounds were tested at 3 doses rate 120, 300 and 600 µl 350 ml^{-1}vol. at 30 ± 1°C and 70±10 % r.h. in darkness during 48 h. *T. castaneum* pupae showed different sensitivity depending on the applied compound and dose. Manifestation of 1,8-cineole and eugenol toxicity was twofold. First, as mortality of the treated pupae, whereas among survived pupae the appearance of adultoids and deformed adults was detected. With increasing dose of 1,8-cineole (from 120 to 300 and 600 µl 350 ml^{-1}vol.), percentage of live adults, which normally developed from survived treated male pupae, significantly decreased (56.25 %; 31.25 % and 18.75 %; F=25.0; *df*=3; *P*<0.05). Male pupae were generally more sensitive to both tested compounds. In the treatment with 1,8-cineole (300 µl 350 ml^{-1}vol) significantly more deformed live male individuals were observed with regard to females (22.50 %, respectively 10.00 % F=6.82; *df*=1; *P*=0.040), as well as significantly lower percentage of live adults which developed from treated survived pupae (31.25 %; respectively 55.00 %; F=9.42; *df*=1; *P*=0.0220) indicating that female pupae generally stand a better chance of survival. Efficiency differences between sexes were less expressed in the treatment with eugenol. Overall, better efficiency was performed with 1,8-cineole, while eugenol had not accomplished satisfactory impact on the tested pupae.

Key words: fumigation, 1,8-cineole, eugenol, *Tribolium castaneum,* pupae

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Usporedba uvijeta uzgoja tartufa i šampinjona

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Sažetak

Područja oko rijeka Mirne i Raše u Istri pogodna za intenzivnu poljoprivredu no poznata su i kao nalazišta podzemnih gljiva, tartufa. Bijeli tartuf (*Tuber magnatum* Pico), najveća je i najcjenjenija vrsta tartufa. Za razliku od tartufa proizvodnja šampinjona (*Agaricus bisporus*) pripada u proizvodnju gljiva u zaštićenim prostorima i vrlo je zahtjevna grana agronomije. Supstrat za proizvodnju gljiva se sastoji od fermentirane slame, pilećeg gnojiva i gipsa. Omjer navedenih sastojaka, kvaliteta navedenih komponenti te tehnologija proizvodnje su ključni faktori za proizvodnju kvalitetnog supstrata. Cilj ovog rada bio je usporediti različite uvjete uzgoja bijelog tartufa i gljiva šampinjona prvenstveno u sadržaju teških metala u uzgojnom mediju. Istraživanje uzgoja šampinjona provedeno je tijekom četiri vegetacijska ciklusa na uobičajenom supstratu za uzgoj šampinjona. Pokus je postavljen u 4 ponavljanja po dizajnu slučajnog bloknog rasporeda sa 2 faktora. Istovremeno, analizirani su uzorci tla s tri međusobno udaljene lokacije u području rijeka Mirne i Raše u Istri poznate kao nalazišta tartufa. Svi uzorci analiziranu su na sadržaj ukupnih teških metala Zn, Fe (esencijalni), Pb i Cd (toksični) digestijom zaltotopkom. Podaci su statistički obrađeni ANOVOM F-testom, dok su prosječne vrijednosti ispitivanih parametara ispitivane Duncanovim multiplim testom na razini značajnosti $p \leq 0,01$. Utvrđeni sadržaj teških metala u supstratu kao i u tlu kretao se u nizu Fe>Zn>Pb>Cd. Statistički značajna razlika ($p \leq 0,01$) utvrđena je između sadržaja svih istraživanih elemenata. Naime, u supstratu je utvrđen sadržaj Fe 2 084,55 mg kg^{-1}, a u tlu 28 631,67 mg kg^{-1}, Zn 137,39 mg kg^{-1} (supstrat): 80,96 mg kg^{-1} (tlo), Pb 2,28 mg kg^{-1} (supstrat): 15,21 mg kg^{-1} (tlo), Cd 0,175 mg kg^{-1} (supstrat): 0,46 mg kg^{-1} (tlo). Utvrđene vrijednosti bile su ispod granica propisanih Pravilnikom o zaštiti od onečišćenja poljoprivrednog zemljišta osim Zn čije su utvrđene vrijednosti bile više od onih propisanih za pjeskovita tla (60 mg kg^{-1}). Kako bi se dobili odgovarajući parametri za utvrđivanje pogodnosti šampinjona i tartufa kao funkcionalne hrane, u budućim istraživanjima, potrebno je provesti detaljnije analize i usporedbu translokacije teških metala iz uzgojnog medija u tartufe i šampinjone.

Ključne riječi: tartufi, šampinjoni, uvjeti uzgoja

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Comparison of growth conditions of truffles and champignon mushrooms

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Abstract

The areas around the river Mirna and Rasa in Istria are suitable for intensive agriculture but they are also known as the site of underground mushrooms, truffles. White truffle (*Tuber magnatum* Pico) is the largest and the most precious sort of truffles. Unlike truffle production of mushrooms champignon (*Agaricus bisporus*) belongs in mushroom production in protected areas and very demanding branch of agriculture. The substrate for mushroom production consists of fermented straw, chicken manure and gypsum. The ratio of the ingredients, the quality of these components and production technology are key factors for the production of high-quality substrates. The aim of this study was to compare the different growth conditions in the cultivation of white truffle and mushrooms, primarily in the heavy metals content in growing medium. The study of mushroom cultivation was conducted during four cycles of vegetation on the normal substrate for the cultivation of mushrooms. Trials were conducted in four replicates per design randomized complete block design with two factors. At the same time, soil samples were analysed from three mutually distant locations in the river Mirna and Rasa in Istria known as truffle aria. All samples were analysed for total content of heavy metals: Zn, Fe (essential), Pb and Cd (toxic) digestion by aqua-regia. Data were statistically analysed by ANOVA with F-test, while the average values were examined Duncan 'level of significance $p \leq 0.01$. Determined heavy metal content in the substrate and in the soil were ranged in a series of Fe>Zn>Pb>Cd. Statistically significant differences ($p \leq 0.01$) was found between the content of all investigated elements. Namely, the determined contents of Fe in the substrate was 2 084.55 mg kg^{-1} and in the ground 28 631.67 mg kg^{-1}, Zn 137.39 mg kg^{-1} (substrate): 80.96 mg kg^{-1} (ground), Pb 2.28 mg kg^{-1} (substrate): 15.21 mg kg^{-1} (ground), Cd 0.175 mg kg^{-1} (substrate): 0.46 mg kg^{-1} (ground). Determined values were below the limits prescribed by the Croatian Regulations except Zn whose established values were slightly higher than those prescribed for sandy soil (60 mg kg^{-1}).In order to get the appropriate parameters for determining benefits mushrooms and truffles as functional foods, in future research, it is necessary to carry out detailed analysis and comparison of translocation of heavy metals from the growing medium in truffles and in mushrooms.

Key words: truffles, champignon mushroom, growth conditions

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Niske koncentracije štetnih elemenata u tlima obiteljskih poljoprivrednih gospodarstava istočne Hrvatske

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Sažetak

Intenzivna poljoprivreda i neadekvatna gnojidba, ali i druge antropogene aktivnosti, mogu rezultirati povećanjem štetnih elemenata u tlu. Cilj ovog istraživanja bio je ispitati koncentracije toksičnih teških metala (Cr, Cd, Pb, Hg i As) u tlima obiteljskih poljoprivrednih gospodarstava istočne Hrvatske (Osječko-baranjska županija i Vukovarsko-srijemska županija).

Uzorci oraničnog sloja tla (0-30 cm) su prikupljeni s 26 obiteljskih gospodarstava iz 12 mjesta Osječko-baranjske i Vukovarsko-srijemska županije (ukupno 113 poljoprivrednih parcela, 87 iz Osječko-baranjske županije i 26 iz Vukovarsko-srijemske županije). Raspon pH tla je bio od iznimno kiselih (3,8 u KCl) do alkalnih (7,7 u KCl) tala. Sadržaj humusa se kretao od osrednje humusnog (1,5 %) do iznimno humusnog (4,9 %) tla.

Koncentracije Cd (avg: 0,42 mg kg^{-1}), Cr (avg: 45,9 mg kg^{-1}), Pb (avg: 17,2 mg kg^{-1}), Hg (avg: 0,05 mg kg^{-1}) i As (avg: 8,35 mg kg^{-1}) su unutar maksimalno dopuštenih koncentracija (MDK) propisanih pravilnikom o zaštiti poljoprivrednog zemljišta od onečišćenja (NN 32/10). Rezultati istraživanja su pokazali statistički značajne razlike ($p<0,0001$) za koncentracije svih pet elemenata između istraživanih obiteljskih gospodarstava i statistički značajne razlike za As, Cd, Cr i Pb ($p < 0,0001$) i Hg ($p < 0,05$) između mjesta gdje su najviše koncentracije As, Cd, Hg i Pb bile u Baranji (Darda i Kopačevo) te Cr u Županjskoj regiji (Prkovci), Vinkovačkoj (Soljani) i Baranji (Darda). Iako su sve koncentracije značajno ispod MDK, u deset uzoraka iz Darde su utvrđene koncentracije Cd i Pb bliže graničnim vrijednostima, dok je na dva lokaliteta u Prkovcima utvrđen nizak pH što može rezultirati povećanjem raspoloživosti istraživanih toksičnih elemenata. Na takvim je lokalitetima neophodno istražiti raspoloživu frakciju teških metala u tlu.

Ključne riječi: arsen. kadmij, krom, olovo, živa, oranični sloj

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Low concentrations of toxic trace elements in soils of family farms in eastern Croatia

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Abstract

Intensive agriculture and inadequate fertilization can cause an increase of toxic trace elements in soil. The aim of our research was to investigate the levels of toxic trace elements (Cr, Cd, Pb, Hg and As) in soils of family farms in eastern Croatian (Osijek- Baranja and Vukovar-Sirmium County).

Samples of surface soil (0-30 cm) were collected from 26 family farms from 12 villages and cities of Osijek-Baranja and Vukovar-Sirmium County (total of 113 agricultural plots, 87 from Osijek-Baranja County and 26 from Vukovar-Sirmium County). The range of soil pH was of extremely acidic (3.8 in KCl) to alkaline (7.7 in KCl). The organic matter content ranged from mediocre (1.5 %) to highly organic soils (4.9 %).

The concentrations of Cd (avg: 0.42 mg kg^{-1}), Cr (avg: 45.9 mg kg^{-1}), Pb (avg: 17.2 mg kg^{-1}), Hg (avg: 0.05 mg kg^{-1}) and As (avg: 8.35 mg kg^{-1}) were within the maximum permissible concentrations (MPC) prescribed by the Croatian legislation for arable land. The results showed statistically significant differences ($p < 0.0001$) for concentrations of all five investigated elements between family farms and statistically significant differences for As, Cd, Cr and Pb ($p < 0.0001$) as well as Hg ($p < 0.05$) between the locations. The highest concentration of As, Cd, Hg and Pb were in Baranja region (Darda and Kopačevo) and highest Cr concentrations were in Županja region (Prkovci), Vinkovci region (Soljani) and Baranja region (Darda). Although all concentrations were below the MPC, ten samples from Darda showed concentrations of Cd and Pb close to the limit values, while two sites in Prkovci had low pH, which increases the availability of the investigated toxic trace elements, therefore in these locations it is necessary to conduct a more detailed investigation that will include the trace element available fraction as well.

Key words: arsenic, cadmium, chromium, lead, mercury, surface soil

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Utjecaj kontaminacije tla kadmijem na međuodnos koncentracije Fe, Zn, Mn, Cu, K i Cd u zrnu ozime pšenice

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Sažetak

Kadmij je toksičan i kancerogen element koji može utjecati na akumulaciju drugih elemenata u zrno ozime pšenice. Cilj ovog rada bio je ispitati međuodnos koncentracija željeza (Fe), cinka (Zn), mangana (Mn), bakra (Cu), kalija (K) i kadmija (Cd) u zrnu ozime pšenice uzgajane ne nekontaminiranom i tlu kontaminiranom Cd. Pokus je bio postavljen po potpuno slučajnom planu s dva tretmana (Cd) u četiri ponavljanja. Kultivari ozime pšenice (52) uzgajani su u posudama, a žetva je obavljena u punoj zriobi. Prikupljeni uzorci zrna su razoreni mokrim postupkom, mješavinom dušične kiseline (HNO_3) i vodikovog peroksida (H_2O_2) mikrovalnom tehnikom. Koncentracija elemenata u uzorcima utvrđena je direktnim mjerenjem pomoću ICP-OES tehnike.

Značajna veza (r_s) utvrđena je između koncentracije Fe i svih ostalih elementa u zrnu pšenice na nekontaminiranom tlu, dok je na tlu kontaminiranom Cd, koncentracija Fe u zrnu bila u statistički značajnoj vezi jedino sa koncentracijom Zn i Mn u zrnu. Na tlu kontaminiranom Cd, koncentracija Cd u zrnu bila je u statistički značajnoj negativnoj vezi sa koncentracijom Cu i K u zrnu, dok na nekontaminiranom tlu nije utvrđena veza između koncentracije Cd i Cu u zrnu. Statistički značajna veza pozitivnog smjera utvrđena je između Mn i Cd na nekontaminiranom ali i na kontaminiranom tlu, no na kontaminiranom tlu utvrđena veza je puno slabija. Dobiveni rezultati ukazuju na to da kontaminacija tla Cd može utjecati na odnose ispitivanih elemenata u zrnu pšenice.

Ključne riječi: kadmij, željezo, cink, mangan, koncentracija u zrnu, ozima pšenica

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Soil Cd contamination influences on the interdependence of Fe, Zn, Mn, Cu, K and Cd concentration in winter wheat

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Abstract

Cadmium is a toxic and cancerogenic metal that can influence on accumulation of other elements in winter wheat grain. The aim of this paper was to examine relationship between iron (Fe), zinc (Zn), manganese (Mn), cuprum (Cu), potassium (K) and cadmium (Cd) grain concentration on uncontaminated and Cd contaminated soil. Experiment was set up according to a completely randomized design with two treatments (Cd) and four replicates. Winter wheat genotypes (52) were grown in pots and grain was harvested in full maturity. Collected samples were wet digested with HNO_3 and H_2O_2 in microwave vessels. A concentration of elements was determined by inductively coupled plasma-optical emission spectrometry (ICP-OES) technique.

Significant correlation (r_s) was found between Fe concentration and concentration of all other elements in grain on uncontaminated soil while on Cd contaminated soil Fe grain concentration was in correlation only to Zn and Mn grain concentration. On Cd contaminated soil Cd grain concentration was in statistically significant negative correlation with Cu and K grain concentration while on uncontaminated soil there was no relationship of Cd to Cu. On the other hand, Cd was in statistically significant positive relationship to Mn both on uncontaminated and Cd contaminated soil, but on contaminated soil relationship was weaker. Results indicate that there are differences in interdependence of element concentration in grain under different soil Cd levels.

Key words: cadmium, iron, zinc, manganese, grain concentration, winter wheat

sa2015_a0115

Plodnost tala obiteljskih poljoprivrednih gospodarstava istočne Hrvatske

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Sažetak

Cilj istraživanja je bio utvrditi plodnost tala obiteljskih poljoprivrednih gospodarstava istočne Hrvatske. Uzorci tla iz oraničnog sloja (0-30 cm) su prikupljeni s 30 obiteljskih poljoprivrednih gospodarstava tijekom 2013. i 2014. godine na području Vukovarsko-srijemske i Osječko-baranjske županije. Ukupno je prikupljeno 250 uzoraka tla. Na uzorcima su određene osnovne agrokemijske analize: aktivna i supstitucijska kiselost, sadržaj humusa, AL-pristupačni fosfor i kalij, hidrolitička kiselost i sadržaj zemnoalkalnih karbonata.

Na osnovi izmjerenih vrijednosti supstitucijskog aciditeta utvrđeno je da se tla kreću od jako kiselih (pH_{KCl}= 3,78) do alkalnih (pH_{KCl}=7,71). Sadržaj humusa se kretao od 0,79 % do 4,88 %, odnosno od siromašnih do vrlo humoznih tala. Sadržaj AL-pristupačnog P_2O_5 je bio od 2,52 mg/100g tla do 100 mg/100g tla. Klasi jako siromašnih tala pripada 5,6 % istraživanih tala, klasi siromašnih 39,2 %, dok su ostala tla dobre i visoke opskrbljenosti fosforom. Opskrbljenost tla AL-pristupačnim K_2O se kretala od od 9,08 mg/100g tla do 100 mg/100g tla. Klasi jako siromašnih tala pripada 6,0 % istraživanih tala, klasi siromašnih 41,2 %, dok su ostala tla dobre i visoke opskrbljenosti kalijem. Hidrolička kiselost je izmjerena u 112 uzoraka tla i kretala se od 1,27 cmol(+)kg^{-1} do 7,48 cmol(+)kg^{-1}, od čega je na 72 lokacije potrebno provesti kalcizaciju. Sadržaj zemnoalkalnih karbonata određen je u 143 uzorka i bio je u rasponu od 0,41 % do 15, 23 %. Na osnovi provedenih istraživanja može se zaključiti da je na više od 50 % obiteljskih poljoprivrednih gospodarstava uključenih u istraživanje opskrbljenost tla AL-pristupačnim fosforom i kalijem zadovoljavajuća. Na više od 85 % analiziranih gospodarstava utvrđen je sadržaj humusa manji od 2,5 %, što ukazuje na značajnu potrebu organske gnojidbe.

Ključne riječi: plodnost tla, AL-pristupačni fosfor i kalij, humus, reakcija tla

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Soil fertility of family farms in Eastern Croatia

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Abstract

The aim of the research was to determine soil fertility of family farms in Eastern Croatia. Soil samples from surface soil (0-30 cm) were collected from 30 family farms during 2013 and 2014 in Vukovar - Sirmium and Osijek - Baranja County. A total of 250 soil samples were collected. The samples were analysed for main soil agrochemical properties: active and exchangeable acidity, soil organic matter content (SOM), AL - available phosphorus and potassium, hydrolytic acidity and carbonate content.

Based on the measured values of the exchangeable acidity it was found that the soils range from highly acidic (pH KCl = 3.78) to alkaline (pH KCl = 7.71). The SOM content ranged from 0.79 % to 4.88 %, i.e. from poor to the very rich soils regarding the organic matter content. The content of AL - available P_2O_5 ranged from 2.52 mg/100g up to 100 mg/100 g of soil. Regarding the P content 5.6 % samples belonged to the class of very poor soils, 39.2 % of the samples were in the class of poor soils while the rest of the soil was good and high in supply of phosphorus. Soil supply of AL – available K_2O ranged from 9.08 mg/100 g of soil up to 100 mg/100 g of soil. The results indicate that 6.0 % belonged in the class of very poor soils, 41.2 % in the class of poor soil, while other soils were good and high in K supply. Hydrolytic acidity was measured in 112 samples and ranged from 1.27 cmol(+)kg^{-1} to 7.48 cmol(+)kg^{-1}. Out of these 112 locations on 72 is necessary to implement liming. Carbonate content was determined in 143 samples and was in the range of 0.41 % up to 15.23 %. Based on the research it can be concluded that over 50 % of family farms involved in the research have satisfactory supply of soil AL - available phosphorus and potassium. At more than 85 % of the analysed farms SOM was determined below 2.5 %, which indicates a need for organic fertilization.

Key words: soil fertility, AL-available phosphorus and potassium, soil organic matter, pH

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Model procjene fertilizacijske vrijednosti organskih gnojiva

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Sažetak

Potreba i opravdanost primjene organskih gnojiva temelji se na fertilizacijskom, ekološkom i ekonomskom utjecaju na poljoprivrednu proizvodnju, plodnost tala i ekosustav, a potencijal organske gnojidbe u najvećoj mjeri je posljedica intenziteta i prostorne distribucije stočarske proizvodnje, ali i sveobuhvatnog gospodarenja organskom tvari poljoprivrednog i prerađivačkog podrijetla. Cilj je ovoga rada prikaz modela procjene vrijednosti organskih gnojiva koji se temelji na isplativosti i direktnom fertilizacijskom učinku organske gnojidbe. Osnovne ulazne vrijednosti modela su ukupne koncentracije glavnih hranjivih elemenata (N, P, K) u gnojivu koje se uz karakteristike poljoprivredne proizvodnje i ostala svojstva gnojiva koriste za izračun ekonomske isplativosti primjene i direktne fertilizacijske vrijednosti organskih gnojiva. Karakteristike poljoprivredne proizvodnje obuhvaćaju vrstu proizvodnje i karakteristike gospodarstva, posebice broj, udaljenost i plodnost proizvodnih površina, a ostala svojstva gnojiva obuhvaćaju C/N odnos, NH_4-N/NO_3-N odnos, te koncentraciju sekundarnih i mikrohraniva. Navedena svojstva gnojiva koriste za procjenu pogodnosti za tla različite opskrbljenosti raspoloživim hranivima, prvenstveno fosforom i kalijem. Model rezultira procjenom isplativosti aplikacije gnojiva na površinama različite plodnosti (minimalno tri kategorije: siromašno, srednje plodno, plodno tlo) i udaljenosti (npr. < 2 km, 2-5 km, > 5 km) koja je direktna posljedica fertilizacijske vrijednosti gnojiva, plodnosti tla i organizacije proizvodnje.

Ključne riječi: organska gnojiva, kompjutorski model, glavna hraniva, mikroelementi

Napomena

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The model for organic fertilizer value evaluation

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Abstract

The need and justification of the use of organic fertilizers is based on nutritional, ecological and economic impact on agricultural production, soil fertility and ecosystem. The potential of organic fertilization largely is the result of the intensity and spatial distribution of livestock production, as well as comprehensive management of organic matter of agricultural and processing origin. The aim of this paper is to present evaluation model of organic fertilizers based on cost-effectiveness and direct nutritional effect of organic fertilization. The basic input data of the model are the total concentrations of the major plant nutrients (N, P, K) in the fertilizer, characteristics of the agricultural production and other properties of fertilizers used to calculate the cost-effectiveness of application and direct nutritional impact of organic fertilizers. Characteristics of agricultural production include the type of production and the characteristics of the farm, in particular the number, distance and fertility of soil, and other characteristics of fertilizers include C/N ratio, NH_4-N/NO_3-N ratio, and the concentration of secondary and micronutrients. The above properties of fertilizers are used to estimate suitability for soils of different fertility, primarily bioavailability of phosphorus and potassium. The model results in the assessment of the cost-effectiveness of fertilizer application on the soils of different fertility (minimum in three categories: low fertile, medium fertile, fertile soil) and distance (eg. <2 km, 2-5 km,> 5 km), which is a direct consequence of the value of manure, soil fertility and organization of production.

Key words: organic fertilizer, decision support system, macronutrients, micronutrients

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Učinkovitost gnojidbe ozime pšenice dušikom

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Sažetak

Cilj rada je bio utvrditi učinkovitost gnojidbe ozime pšenice dušikom na temelju prinosa zrna ozime pšenice, iznošenja dušika prinosom zrna i pristupačnosti mineralnog dušika u tlu s ciljem optimizacije gnojidbe dušikom. U sezoni 2013/2014. proveden je poljski pokus gnojidbe pšenice dušikom u četiri razine: 0 kg N ha^{-1} (kontrola), 140 kg N ha^{-1} (optimalna gnojidba), 105 kg N ha^{-1} (smanjena gnojidba) i 175 kg N ha^{-1} (povećana gnojidba). Pokus je postavljen na dva lokaliteta Josipin Dvor i Ernestinovo, te su uzgajane dvije sorte ozime pšenice Srpanjka i Renata. Gnojidba dušikom je prema rezultatima prosječnih prinosa zrna za oba lokaliteta i obje sorte rezultirala značajnim povećanjem prinosa u odnosu na kontrolni tretman. Raspon visine prinosa zrna pšenice je iznosio od 3,94 t ha^{-1} (kontrola) do 5,96 t ha^{-1} (povećana gnojidba). Iako su primjenom gnojidbe dušikom povećane prosječne koncentracije dušika u zrnu pšenice na oba lokaliteta, utvrđene razlike između koncentracija dušika nisu bile statistički značajne. Između dvije sorte pšenice je zabilježena značajna razlika prosječnih koncentracija dušika u zrnu, koja je za sortu Srpanjka iznosila 1,09 %, a za sortu Renata 1,27 %. Značajna promjena pristupačnosti dušika u tlu uslijed primjene gnojidbenih tretmana zabilježena je za amonijski dušik na lokalitetu Ernestinovo za dubinu tla od 0 do 60 cm. Rezultati ukazuju da je optimalna gnojidba na lokalitetu Ernestinovo rezultirala značajno najvećim povećanjem pristupačnosti amonijskog dušika u tlu prije prve prihrane (25,36 mg $N\text{-}NH_4$ kg^{-1}), dok je prije druge prihrane značajno najvećim povećanjem pristupačnosti amonijskog dušika rezultirala povećana gnojidba (40,74 mg $N\text{-}NH_4$ kg^{-1}). Učinkovitost ozime pšenice u korištenju dušika bila je prema prosječnim vrijednostima za obje sorte najveća za smanjenu gnojidbu (28,23 %), a najmanja za povećanu gnojidbu (18,94 %). Ostvareni prinos po jedinici hraniva dodanog gnojidbom (agronomska učinkovitost) također je obzirom na prosjek obje sorte bio najveći za smanjenu gnojidbu (49,51 kg kg^{-1}) i najmanji za povećanu gnojidbu (30,58 kg kg^{-1}). Prema tome, agronomska učinkovitost gnojidbe ozime pšenice dušikom je opadala s porastom doze gnojidbe.

Ključne riječi: gnojidba dušikom, ozima pšenica, učinkovitost korištenja dušika, agronomska učinkovitost

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The efficiency of winter wheat nitrogen fertilization

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Abstract

The aim of the study was to determine the effectiveness of winter wheat nitrogen fertilization based on grain yield of winter wheat, nitrogen removal by grain yield and the availability of mineral nitrogen in the soil in order to optimize nitrogen fertilization. Field experiment of winter wheat nitrogen fertilization was conducted in four levels: 0 kg N ha^{-1} (control), 140 kg N ha^{-1} (optimal fertilization), 105 kg N ha^{-1} (reduced fertilization) and 175 kg N ha^{-1} (increased fertilization) in the season 2013/2014. The experiment was set up at two sites Josipin Dvor and Ernestinovo, and two cultivars of winter wheat Srpanjka and Renata were grown. Nitrogen fertilization resulted in a significant increase of grain yield compared to the control treatment according to the average results of the grain yield for both sites and both cultivars. The average grain yield ranged from 3,94 t ha^{-1} (control) up to 5,96 t ha^{-1} (increased fertilization). Although the application of nitrogen fertilization increased average nitrogen concentrations in wheat grain at both sites, determined differences between the nitrogen concentrations were not statistically significant. A significant difference in average concentrations of nitrogen in wheat grain was recorded between the two wheat cultivars, which for the cultivar Srpanjka was 1,09 %, and for the cultivar Renata 1,27 %. A significant change in the nitrogen availability in soil due to the application of fertilization treatments was observed for ammonium nitrogen at the site Ernestinovo for soil depth 0-60 cm. The results indicated that the optimum fertilization on the site Ernestinovo resulted with significantly the highest increment in the availability of ammonium nitrogen in the soil before the first top dressing (25,36 mg $N\text{-}NH_4$ kg^{-1}), while before the second top dressing, increased fertilization resulted with significantly the highest increment of ammonium nitrogen availability (40,74 mg of $N\text{-}NH_4$ kg^{-1}). The nitrogen efficiency use of winter wheat was according to the average values for both cultivars, the highest for reduced fertilization (28,23 %), and the lowest for increased fertilization (18,94 %). Yield per unit of added nutrient by fertilization (agronomic efficiency) was according to the average values for both cultivars also the highest for reduced fertilization (49,51 kg kg^{-1}) and the lowest for increased fertilization (30,58 kg kg^{-1}). Accordingly, the agronomic efficiency of winter wheat nitrogen fertilization was decreasing with increase of fertilization doses.

Key words: nitrogen fertilization, winter wheat, nitrogen efficiency use, agronomic efficiency

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Macronutrients content in grain of organically produced maize, wheat and soybean

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Abstract

Organically produced crops have high nutritional value, irrespective to generally lower yields. Their grains have higher contents of proteins and mineral compounds. The aim of experiment was to determine variations in macroelements: N, P, K, Ca and Mg in grain of organically produced maize (var. Rumenka), spelt wheat (var. Nirvana) and soybean (var. Lidija) during 2012 and 2013. Only in maize, organic fertilizer DIX 10N was applied.

2012 was stressful year, with extremely low precipitation during grain filling period. In regard to that, grain yields of maize and soybean were about 30-60 % lower in 2012 while spelt wheat had 15 % higher yield in 2012 than in 2013. There were no significant differences in grain yield between DIX 10N treatment and control of maize.

N content in grain of all three crops was slightly increased in 2013 as well as DIX 10N increased N in maize grain. In comparison to N, content of P and K slightly varied in both years. Spelt and soybean had increased P content in 2012 and K content was generally higher in soybean. Soybean grain was also characterised with the higher Ca and Mg level. Unfavourable 2012 expressed positive effect on Ca and Mg raise in spelt wheat, as well as on Mg accumulation in maize grain.

Drought conditions reflected on grain yield decrease with increased concentration of mineral elements, such P, Ca and Mg. Soybean grain could be considered mainly as source of N, Ca and Mg, while spelt is rich in N and P. Applied fertilizer didn't show significant influence on variation of macroelements in maize grain.

Key words: organic production, nitrogen, phosphorus, potassium, calcium, magnesium

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Utjecaj kiselosti oraničnog sloja dreniranog pseudoglejnog tla na prinos ozime pšenice u 2012. godini

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Sažetak

Na pokusnom polju u Popovači od 1996. godine provodi se istraživanje s različitim količinama gnojidbe mineralnim dušikom (0-300 kg). U vegetacijskoj godini 2011/12. kao test kultura uzgajana je ozima pšenica. S obzirom da su na pokusu u 2010. godini uzeti uzorci tla u vrlo gustoj mreži od 15x15 m, a za rad je korištena novo konstruirana sonda, dobiveni su podaci o prostornom rasporedu pH vrijednosti tla na ukupnoj pokusnoj površini od 4 ha, na temelju 200 pojedinačnih uzoraka tla. Žetva ozime pšenice u 2012. godini provedena je prema pravilima za preciznu poljoprivredu (precision farming), te je požeto ukupno 180 pojedinačnih odvaga zrna na temelju kojih je izračunat prinos u t ha^{-1}. Karta prostorne raspodjele prinosa ozime pšenice prema pokusnim varijantama izrađena je geostatističkom metodom „ordinary kriging“ s pravilnom mrežom uzorkovanja od 15x15 m (ArcGIS, ESRI, 2012.). Na temelju usporedbe prikaza karte prinosa pšenice i karte pH vrijednosti tla, može se zaključiti kako je uz dušik, bitan čimbenik visine prinosa zrna i pH vrijednost tla. Apsolutni raspon vrijednosti prinosa kretao se od 0,12 - 9,23 t ha^{-1}. Niska pH vrijednost tla djelovala je na smanjenje prinosa, dok su u slučaju povoljne reakcije tla prinos raste do maksimalno zabilježenih vrijednosti. Usporedba prostorne varijabilnosti pH vrijednosti tla ukazuje na presudan utjecaj pH vrijednosti oraničnog sloja tla na prinos pšenice u 2012. godini, bez obzira na razinu gnojidbe mineralnim dušikom.

Ključne riječi: precizna poljoprivreda, “ordinary kriging”, ozima pšenica, pH vrijednost tla, mineralna dušična gnojidba

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The effect of arable soil layer acidity in drained Stagnosols on winter wheat grain yield in 2012

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Abstract

Since 1996, research with different amounts of mineral nitrogen fertilization (0-300 kg) is conducted on the experimental field in Popovača. During the vegetation year 2011/12 winter wheat was grown as a test crop. Given that the soil samples at the experiment in 2010 were taken in a very dense grid of 15x15 m, and the sampling was performed using newly designed probe, data on the spatial distribution of soil pH on the total experimental area of 4 ha were obtained based on 200 individual soil samples. The harvest of winter wheat in 2012 was carried out according to the rules of precision farming. Total of 180 individual grains weights was harvested and winter wheat grain yield was calculated in t ha^{-1}. Map of the grain yield spatial distribution according to the fertilization treatments was made by geostatistical method of "ordinary kriging" using a regular sampling grid of 15x15 m (ArcGIS, ESRI, 2012). Based on the comparison of the grain yield and soil pH spatial variability, it can be concluded that the soil pH was an important factor influencing winter wheat yield performance, beside the substantial effect of nitrogen. The absolute range of yield values ranged from 0.12 to 9.23 t ha^{-1}. Low soil pH value led to decrease in grain yield, whereas in the case of favourable soil pH, yield was increased to a maximum values recorded. Comparison of the soil pH spatial variability indicated decisive effect of the soil pH value in arable layer on winter wheat grain yield in 2012, regardless of the mineral nitrogen fertilization level.

Key words: precision farming, ordinary kriging, winter wheat, soil pH, mineral nitrogen fertilization

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Influence of the soil traits on some biologically active polyphenolic substances in *Moltkia petraea* (Tratt.) Griseb. (*Boraginaceae*)

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Abstract

The relation between the contents of biologically active phenolic compounds (total polyphenols, TP; tannins, T; total flavonoids, TF; total phenolic acids, TPA) and soil traits in ten *Moltkia petraea* (Tratt.) Griseb. populations, growing in Croatia, Bosnia and Herzegovina, and Montenegro was investigated. The concentration of TP was 3.97–6.61 %, 3.91–6.07 %, and 3.26–5.53 % of dried weight in leaves, flowers, and stems, respectively. The content of TF was 0.37–1.13 %, 0.18–0.52 %, and 0.04–0.31 % in leaves, flowers and stems, while the content of TPA was 1.58–3.43 %, 1.71–3.26 %, and 1.50–2.92 % in the same organs (leaves, flowers, stems). The soil was characterized by very high content of organic matter (4.19–36.26 %) and by high variability in the content of $CaCO_3$ (from below the limit of quantification to 50.59 %). pH (in 1 M solution of KCl) was 6.59–7.33, while the content of nitrogen was 0.33–0.70 %. The content of P_2O_5 and K_2O was 1.22–11.09 mg per 100 g of soil and 26.61–125.00 mg per 100 g of soil, respectively. The results showed that there was no strong connection between biologically active substances and chemical traits of soil. Negative Spearman Rank Order Correlation was found between phosphorus content in soil on the content of total phenols in leaves and stems, and also on the content of total phenolic acids in flowers ($r_s = -0.81$; −0.81, and −0.73, $p<0.05$, respectively) and also a negative influence of organic matter in soil on the content of total tannins in stems ($r_s = -0.67$, $p<0.05$). It is possible to conclude that the biosynthesis of phenolic compounds in *Moltkia petraea* was affected more by some other factors (e.g. genetic factors) rather than the soil conditions.

Key words: *Moltkia petraea*, phenolic compounds, soil traits, biologically active substances, plant habitats

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Hiperspektralna mjerenja svojstava dreniranog pseudogleja pod različitom gnojidbom mineralnim dušikom

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Sažetak

Spektralni podaci sadrže informacije o organskom i mineralnom sastavu tla što može biti osobito korisno u istraživanju kvalitete tla u okviru precizne poljoprivrede. Cilj rada obuhvatio je procjenu mogućnosti primjene hiperspektralne spektroskopije u vidljivom i blisko infracrvenom (VNIR) dijelu elektromagnetskog spektra u predviđanju pedoloških svojstava na razini poljskog pokusa. Dvjesto zrakosuhih i usitnjenih uzoraka tla s pokusa površine 4 ha uzorkovanih nakon žetve ozime pšenice 2010. godine na dubini od 30 cm skenirano je spektroradiometrom (raspon valnih duljina: 350-2500 nm; ASD Inc., USA) u svrhu određivanja razlika u spektralnom odazivu tla tretiranog sa deset različitih količina mineralnog dušičnog gnojiva (0-300 kg N ha^{-1}). Analizom glavnih komponenata (PCA) utvrđena je određena razlika između varijanata s višim i onih s nižim količinama dušika, uvjetovana varijabilnošću pH vrijednosti tla, mehaničkog sastava kao i sastava organske tvari u tlu nakon višegodišnje mineralne gnojidbe u različitim klimatskim prilikama. Regresijom parcijalnih najmanjih kvadrata (PLSR) na temelju refleksije vidljivog i blisko infracrvenog spektra tla dobiveni su predikcijski modeli ukupnog ugljika u tlu (TC %), ukupnog dušika u tlu (TN %) i pH vrijednosti tla. Utvrđena je vrlo jaka korelacija i niska srednja kvadratna pogreška (RMSE) između predviđenih i referentnih vrijednosti za kalibracijski, odnosno validacijski model (TC %: R^2=0.91 i R^2=0.89, RMSEC=0.119 i RMSEV=0.127; TN %: R^2=0.91 i R^2=0.90, RMSEC=0.011 i RMSEV=0.012; pH: R^2=0.82 i R^2=0.65, RMSEC=0.405 i RMSEV=0.572). Rezultatima se utvrđuje primjenjivost hiperspektralne (VNIR) spektroskopije kao dodatnog alata u analizama pedoloških svojstava kvalitete tla u uvjetima intenzivnog uzgoja ratarskih kultura i precizne poljoprivrede.

Ključne riječi: spektroskopija, refleksija, vidljivi i blisko infracrveni spektar, analiza glavnih komponenata, regresija parcijalnih najmanjih kvadrata, gnojidba

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Hyperspectral sensing of Stagnosols properties under variable mineral nitrogen fertilization

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Abstract

Spectral data contain information on soil organic and mineral composition which can be useful for monitoring of soil quality, especially in domain of precision farming. The objective of the research was to evaluate the possibility of using hyperspectral VNIR spectroscopy for farm-scale prediction of soil properties. Two hundred air-dried and grinded soil samples taken from the field experiment of 4 ha area after winter wheat harvest in 2010 at depth of 30 cm were scanned with FieldSpec®3 spectroradiometer (wavelength range: 350-2500 nm; ASD Inc., USA) to identify differences in the spectral response of the soil treated with ten different rates of mineral nitrogen fertilizer (0-300 kg N ha^{-1}). Principal component analysis (PCA) revealed certain delineation between higher- and lower-N level treatments conditioned by differences in soil pH, texture and soil organic matter composition after a long-term mineral fertilization under variable climate regime. Partial least square regression (PLSR) was used to build prediction models of total carbon content (TC %), total nitrogen content (TN %) and soil pH based on the visible and near infrared spectra. Very strong correlation and low root mean square error were obtained between predicted and measured values for the calibration and validation dataset, respectively (TC %: R^2=0.91 and R^2=0.89, RMSEC=0.119 and RMSEV=0.127; TN %: R^2=0.91 and R^2=0.90, RMSEC=0.011 and RMSEV=0.012; pH: R^2=0.82 and R^2=0.65, RMSEC=0.405 and RMSEV=0.572). Results indicated that hyperspectral VNIR spectroscopy is applicable method for more efficient analysis of soil quality properties under intensive crop production.

Key words: soil spectroscopy, visible/near infrared reflectance, principal component analysis, partial least square regression, fertilization

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Procjena organskog ugljika u tlu difuznom reflektantnom spektroskopijom u vidljivom i blizu infracrvenom spektru

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Sažetak

Difuzna reflektantna spektroskopija je brza, nedestruktivna, jeftina metoda koja ponekad može biti dobra alternativa za poboljšanje ili kao zamjena za konvencionalne metode analize tla. Cilj ovog rada je ocijeniti potencijal difuzne reflektantne spektroskopije za procjenu organskog ugljika u poljoprivrednom tlu. Spektralna baza se sastoji od 363 uzoraka površinskih horizonata tla (0-25 cm) uzetih iz antropogenih tala razvijenih na krednim, paleogenim i kvartarnim sedimentima u srednjoj Dalmaciji, Hrvatska. Prosječan sadržaj organskog ugljika, analiziranog metodom Kotzmana, iznosi 17,13 g C kg^{-1} i varira u rasponu 1,3-37,35 g C kg^{-1}. Spektralni otisci uzoraka tla uzeti su raspona 350 - 1050 nm (VIS-NIR). Ustanovljavanje nelinearnih odnosa između organskog ugljika i reflektantnih spektralnih otisaka, te izradu modela procjene izvršili smo korištenjem data mining alata - boosted regresion trees. Točnost prognoznog modela za testne uzorke ocijenjena je korištenjem koeficijenta determinacije (R^2) i korijena srednje kvadratne pogreške (RMSE). Ustanovljena vrijednost R^2 za testne uzorke iznosi 0,62, a RMSE 0,162. Ovi rezultati pokazuju da je boosted regression trees model prihvatljiv za predviđanje organskog ugljika u tlu.

Ključne riječi: reflektantna spektroskopija, organski ugljik tla, boosted regresion trees

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Visible and near infrared diffuse reflectance spectroscopy for assessment of soil organic carbon

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Abstract

Diffuse reflectance spectroscopy is rapid, non-destructive, inexpensive method and sometimes it can be a good alternative that can be used to enhance or replace conventional methods of soil analysis. The aim of this paper is to evaluate the potential of diffuse reflectance spectroscopy for assessment of soil organic carbon (SOC) in agricultural soil. A spectral database was constructed from 363 top-soil samples (0–25 cm) collected from anthropogenic soils formed on Cretaceous, Palaeogene and Quaternary sediments in middle Dalmatia, Croatia. An average soil organic carbon content, analyzed by method of Kotzman, was 17,13 g C kg^{-1} and varies in the range from 1,3-37,35 g C kg^{-1}. The soil spectral reflectance was measured under controlled laboratory conditions using an ASD FieldSpec spectroradiometer operating in spectral range 350 - 1050 nm (VIS–NIR spectral region). We used data mining techniques - boosted regresion trees to examine nonlinear relationships between SOC and the reflectance spectra. The accuracy of the prediction model for train set assessed using R-squared (R^2) and Root Mean Squared Error (RMSE) were 0,62 and 0,162 respectively. These results suggest that boosted regression trees model is acceptable for prediction of soil organic carbon (SOC).

Key words: reflectance spectroscopy, soil organic carbon, boosted regression trees

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Study of lignocelulosic biomass pretreatment

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Abstract

Pretreatment of lignocelluloses biomass is usually intended for preparing disposable organic material for the enzymatic reactions, dividing hemicelluloses from the structure and destroying crystalline structure of the cellulose.

During this process the change of the composition ratio within lignin : hemicelluloses : cellulose, which influence on the particle size, degree of polymerization, pore volume, solubility rate etc. is expected to happen. Although there are different types of pretreatment such as mechanical, thermal, acidic, alkaline, (said chemical), as well as biological method.

Our study has been focused in preparing biomass for the anaerobic digestion for methane profit, using calculated mixtures of different agro-forestry residues such as wheat straw, mais straw etc., premixing them with animal wastes like manures and other organic wastes. Experimental series have been performed with wide ratios of C:N and the results were positive promising the great future.

Then we have followed a systematic procedure for the anaerobic biologic digestion process design simulated in a fixed capacity chosen. As a result we have recommended an engineering flow sheet for the specified biochemical process.

Key words: biomass pretreatment, methane process design, lignocelluloses material, anaerobic digestion

sa2015_a0124

Anaerobic composting of organic waste, in glass composters, under different conditions

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Abstract

Today we see interest in composting process, from economic, agricultural and environmental point of view. Composting is a method of the biochemical degradation of organic material. Composition process of compost affects its production and quality of soil, and also prevents and controls the erosion. The aim of this study was to determine physical and chemical properties of organic waste mixture during the composting process. Composting experiments were carried out in glass composters, which were placed in incubators under anaerobic condition, for both mesophilic (37°C) and thermophilic (50°C) conditions, respectively. The organic residues which have been analyzed are: straw, leaves, cow manure, and humus. Various physical and chemical parameters were analyzed in order to evaluate the composting material before and after the process: organic matter, ash, organic carbon, total nitrogen, phosphate, potassium, pH, electric conductivity. The physical and chemical parameters of compost were analyzed at an interval of seven days.

Key words: organic waste, composting, anaerobic processes, mesophilic, thermophilic

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Design and construction of pilot scale aerated static pile composting systems

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Abstract

The amount of agro-industrial waste, animal manure, which is a by-product of animal production and waste emerged from plant production has increased due to increase in agricultural production both in Turkey and in the world. Therefore, a sustainable management of waste is required, and is a major challenge facing agricultural and industrial sectors in Turkey. Composting, which is one of the valorisation methods used to accelerate decomposition and stabilization of organic waste, is well known and is getting widespread. This study covers design and instrumentation of four-automatically controlled pilot scale aerated static pile composting systems based on engineering principles. With this system, basic scientific data (decomposition rates of composting materials, optimum temperature and humidity values, etc) which are required for construction of large-scale composting facilities and operation of composting process will be obtained. The system consists of aeration system pipes, control and data acquisition, measurement of composting variables (temperature, CO_2/O_2/CH_4, volumetric flow rates, energy consumption). In this study, each components of this system will be introduced. This study has been conducted under the program of 1007 of the scientific and technological research council of Turkey.

Key words: composting, instrumentation, aerated static pile composting

sa2015_a0126

Water contaminants in Republic of Moldova and their characterization

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Abstract

The water management is one of the key problems for many countries including Republic of Moldova. In some cities groundwater has become an exclusive source of drinking water supply. Some chemical parameters of water were determined by study of groundwater bodies in Prut river basin and were later on used for the groundwater classification. Monitoring of groundwater properties was conducted by sampling from water wells. The results of chemical analysis were used for the preliminary identification, characterization and classification of groundwater bodies. The chemical composition of groundwater highlights the importance monitoring of groundwater bodies. Some heavy metals were analyzed in surface water from national monitoring network. One hot spot (contaminated region) is the old pesticide deposit "Chismichioi", which was studied for the assessment of actual status at the surrounding territory. It is one of the biggest deposits of toxic substances at the Low Danube Euro-region. The following spectrum of POPs was identified in the samples: DDE, DDD, DDT, a-HCH, b-HCH, g-HCH. The other toxic organic substances were studied also at this site: PAHs, triazine pesticides and some other heavy metals. The general conclusion about the situation around "Chismichioi deposit" is that the level of pollution from the time of the origination (in 1979) is not changed in general. The zones with high pollution were eliminated and recommendation was proposed for the mitigation of negative impact to the environmental and water resources in this area of Moldova.

Key words: groundwater monitoring, heavy metals, environmental risk assessment

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Agricultural water management in Turkey and concept of virtual water

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Abstract

Water is the vital component of life. Although it is a renewable source, it is a limited resource too. Water management encompasses the activities and services required for development, distribution and various uses of water resources. The basic target in agricultural water management is to prevent waste of water and to provide efficient water use in agriculture. Water is essential in production of all kind of goods and various amounts of water are used in production processes of goods and produces. The water used in production process of an agricultural or industrial goods or services is called "virtual water". The concept of "virtual water" allows us to comprehend the role of water in production processes. With regard to available water resources, Turkey is classified as country experiencing water deficits and it is expected to be classified as water-poor country in the next decade. Therefore, Turkey should make a great effort in water resources planning and management. Since agricultural production is the greatest water consuming sector in Turkey, water saving should initially be planned in food production. There is a close relationship between virtual water transfer-trade and water resources management. Virtual water trade is a significant tool in efficient water resources management. The countries experiencing water deficits may not produce the goods and services requiring large amounts of water and export such products and transfer virtual water. In this way, water saving is provided in one hand and maximum outcomes are achieved per water unit on the other hand. In this study, agricultural water use of Turkey was briefly assessed and effects of virtual water trade on agricultural water management were discussed.

Key words: agriculture, water management, virtual water, Turkey

sa2015_a0128

Natural treatment systems as an alternative treatment system for domestic waste water treatment in rural sections of Turkey

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Abstract

Natural treatment systems are used as an alternative to conventional treatment systems. They are commonly used for the treatment and management of municipal and industrial wastewaters and these processes use minimal energy, labor and minimal or no chemicals. In most cases, this approach results in a system that costs less to build and operate and requires less energy than mechanical treatment alternatives. Among those natural treatment systems, the constructed wetlands are the systems emulating the natural wetland systems. They are commonly used for treatment of domestic and industrial wastewater in specially designed basins with aquatic plants and easily be used for small-to-medium sized communities. Serious interest in natural methods for waste treatments has reemerged throughout the world. Constructed wetlands with their cheaper and easy construction, low energy and labor costs, easy operation, maintenance and monitoring were specified as the primary issue in rural development strategy document of State Planning Organization of Turkey. Almost all the systems in Turkey are designed as sub-surface horizontal flow type constructed wetlands and most of them are not able to perform as expected because of errors and mistakes made during the design, construction, operation and maintenance of these systems. In this study, general issues to be considered in design, construction, operation and maintenance of sub-surface horizontal flow constructed wetlands commonly used in rural parts of Turkey for domestic wastewater treatment purposes were assessed and current implementations in Kayseri Province were investigated. Potential mistakes made in their design, construction, operation and maintenance of them were pointed out and possible solutions were proposed

Key words: natural treatment, constructed wetlands, waste water, rural sections, Turkey

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Utjecaj kanalizacijskih ispusta Cavtat i Trašte na prekogranični prijenos zagađivala tijekom turističke sezone

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Sažetak

JASPPer je EU/IPA projekt koji ima za opći cilj očuvati morski okoliš u pograničnom području Hrvatske (Konavle) i Crne Gore (Herceg Novi, Tivat i Kotor). Područje je izloženo intenzivnom turizmu između travnja i listopada, podudarajući se s toplinskom stratifikacijom obalnog mora, koje je recipijent otpadnih voda iz Ispusta Cavtat (IC) na dubini 65 m i Ispusta Trašte (IT) na dubini 40 m. Mjerenja fizikalno-kemijskih parametara (dubina, temperatura, salinitet, indirektno reducirana gustoća) i koncentracije nutrijenata, otopljenog kisika, klorofila a i štetnih bakterija upotrebljena su za procjenu utjecaja IC i IT na obalno more u kolovozu 2014. Akustički Doppler-ov strujomjer je položen na morsko dno u blizini IC kako bi se definirao režim strujanja (brzina i smjer) u finoj razlučivosti (svaki metar vodenog stupca), no podaci će biti dostupni tek nakon završetka zadatka, uključujući mjerenja iz kontrastnog perioda tj. van turističke sezone (izmiješani vodeni stupac zimi). Abundancija bakterija i koncentracija nutrijenata otkrili su da nije bilo značajnog pritiska na okoliš i potencijala za prijenos zagađivala između Hrvatske i Crne Gore, iako je bilo očito da su bakterijska opterećenja značajno ovisna o ispustu otpadnih voda. Istraživanje nije bilo usredotočeno na incidente u okolišu, već na uobičajeni rad obaju ispusta.

Ključne riječi: nutrijenti, eutrofikacija, otpadne vode, turizam, okoliš

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The impact of the sewage outfalls Cavtat and Trašte on the cross-border transfer of pollutants during tourist season

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Abstract

JASPPer is EU/IPA project whose overall objective is the preservation of the marine environment in the bordering area of Croatia (Konavle) and Montenegro (Herceg Novi, Tivat and Kotor). The area is exposed to intense tourism between April and October, coinciding with the thermal stratification of the coastal sea, which is the recipient of the wastewaters from the Outfall Cavtat (OC) at depth of 65 m and Outfall Trašte (OT) at depth of 40 m. The measurements of physico-chemical parameters (depth, temperature, salinity, indirectly reduced density) and concentration of nutrients, dissolved oxygen, chlorophyll a and harmful bacteria were employed to estimate the impact of OC and OT on the coastal sea in August 2014. The Acoustic Doppler Current Profiler was settled at the seabed near OC to define currents' regime (velocity and direction) in fine resolution (every metre of the water column), but the data will be available only after the termination of the assignment, including the measurements from the contrasting period i.e. off the tourist season (mixed water column in winter). The bacterial abundance and concentration of nutrients revealed that there was no significant pressure on the environment and potential for the transfer of pollutants between Croatia and Montenegro, although it was obvious that bacterial loadings were highly dependent on the release of the wastewaters. The research was not focused on the environmental accidents, but on the common work of both outfalls.

Key words: nutrients, eutrophication, wastewaters, tourism, environment

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Methodology for natural hazards risk assessment: Ukraine experience

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Abstract

Natural hazards in Ukraine pose a serious problem to communities and form a roadblock to sustainable development. Earthquakes, landslides and floods have a strong impact on the environment as well as on local economies.

Floods occur at 27% of the territory of Ukraine (165,000 km^2). One third of population of Ukraine lives in potentially dangerous areas. Landslides pose an additional threat both in inland and coastal areas of Ukraine. Abrasion and landslides are causing loss of recreational areas and agricultural lands, disappearance of unique landscapes. Earthquakes pose a threat to assets and on the environment as the triggers of landslides and other geotechnical problems. 120 000 km^2 of Ukrainian territory (about 20 %) is located in seismically dangerous areas.

The paper presents analysis of methods and models for floods, landslides and seismic risks assessment, methodology for risk mapping, natural hazards forecasting, national standards and guidelines related to risk management in Ukraine. Methodologies and models used in Ukraine to assess natural hazard are focused more on assessment of primary, direct economic loss. Recommendations for improvement of methodologies, including assessment of indirect, intangible as well as secondary loss, are given.

Key words: natural hazards, risk assessment, risk management

Acknowledgements

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Nanomaterials and crops: potential risks and food safety

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Abstract

It is expected that nanoagriculture significantly improves current agronomic practices, by enhancing the efficiency of managements of inputs to crops. Even though nanoagriculture is just beginning to explore the applications of nanotechnology, it has a great potential with new tools for the molecular treatment of diseases, weed control and enhancing the ability of plants to absorb nutrients. However, nanotechnologies are developing at a much faster rate than our knowledge of their impact on health and the environment.

Several questions were raised about the fate of nanomaterials in the agro-environment, both those used in agriculture as fertilizers or for plant protection, as well as those resulting from uncontrolled or accidental flows of nanomaterials.

Vascular plants and crops are of special concern as they could be exposed to risks of bioaccumulation of metal nanoparticles (MeNPs) and their subsequent entry into the food chain. So far, very few studies have been conducted on the plant's response to the exposure to MeNPs.

Several experiments are currently running at University of Udine to study the possible toxicity of CeO_2 and TiO_2 NPs on barley (*Hordeum vulgare* L.) with the aim (i) to clarify whether such materials influence the growth cycle of barley and the quality of caryopsis, and (ii) to evaluate the possible MeNPs bioaccumulation in organs.

The preliminary results suggest the potential of meNPs to modify crop physiology and to compromise the composition of barley caryopsis.

Key words: cerium oxide nanoparticles, titanium oxide nanoparticles, *Hordeum vulgare*, phenology, caryopses nutritional quality

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Ultrasonic technology for production of antibacterial nanomaterials and their coating on textiles

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Abstract

A method for production of antibacterial ZnO nanoparticles has been developed. The technique combines passing an electric current with simultaneous application of ultrasonic waves. Using high power ultrasound a cavitation zone is created between two zinc electrodes. This leads to the possibility to create a volumetric electrical discharge in water. Creation of such discharge leads to the depletion of the electrodes and the formation of ZnO nanoparticles, which demonstrate antibacterial properties. At the end of this reaction the suspension of ZnO nanoparticles is transported to a specially developed ultrasonic reactor, where the nanoparticles are deposited on the textile. The nanoparticles are embedded into the fibers by the cavitation jets (which are formed due to asymmetric bubble collapse in the presence of a solid surface) directed towards the surface of textile at very high velocities. Fabrics coated with ZnO nanoparticles using the developed method showed good antibacterial activity against *E. coli*.

Key words: cavitation, nanoparticle, ultrasound, antibacterial textile

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Digitalizacija staništa NATURA 2000 na području značajnog krajobraza "Donji Kamenjak"

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Sažetak

Donji Kamenjak (južna Istra, Premantura) izniman je primjer biološke raznolikosti. Oko petine ukupne površine zauzimaju staništa NATURA 2000. U cilju održivog upravljanja staništima dane su smjernice te je izrađena karta staništa. Kartiranje je provedeno upotrebom recentnih ortofoto snimaka i terenskim istraživanjima tijekom 2014. godine. Tipizacija staništa usklađena je prema Nacionalnoj klasifikaciji staništa (NKS). Ukupna kartirana površina na području Donji Kamenjak i medulinski arhipelag iznosi 407 ha od čega su 18,8 % NATURA 2000 staništa. Među utvrđenim zajednicama dominiraju stijene i strmci mediteranskih obala *Plantagini-Limonietum cancellati* H-ić (1934) 1939 (NKS kod: F.4.1.1.) te travnjaci *Chrysopogoni-Euphorbietum nicaeensis* H-ić (1956) 1958 (NKS kod: C.3.5.3.2.), koji se uslijed napuštanja tradicionalnog sustava uzgoja stoke slabo koriste kao pašnjačke površine. Također su ustanovljeni travnjaci *Chrysopogoni-Airetum capillaris* H-ić (1956) 1963 (NKS kod: C.3.6.2.2.) te sastojine *Juniperus oxycedrus* (NKS kod: D.3.4.2.3.) nastale u procesu sukcesije. Kao optimalno pašno opterećenje za ovakve travnjake preporučujemo 1 do 2 ovce / ha (umjereni intenzitet). Rezultati ovih istraživanja mogu doprinijeti očuvanju biljne raznolikosti te održivosti staništa u procesu sukcesije.

Ključne riječi: Donji Kamenjak, vegetacija, NATURA 2000, pašno opterećenje, GIS

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Digitization of Natura 2000 habitats in the area of significant landscape "Donji Kamenjak"

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Abstract

Donji Kamenjak (south Istria, Premantura) is an exceptional example of biodiversity. About one fifth of the total area occupied by the NATURA 2000 habitat. In order to develop a sustainable habitat management, guidelines and habitat map were made. Mapping was conducted using recent orthophoto images and field research during 2014. Typification of habitats was adjusted according to the National Classification of habitats (NCS). The total mapped areas in Donji Kamenjak and Medulin archipelago is 407 hectares of which 18.8 % of Natura 2000 habitats. Among the established communities dominated are: rocks and cliffs of the Mediterranean coasts *Plantagini-Limonietum cancellati* H-ić (1934) 1939 (NCS code: F.4.1.1.) and grasslands *Chrysopogoni-Euphorbietum nicaeensis* H-ić (1956) 1958 (NCS code: C. 3.5.3.2.), which are due to the abandonment of traditional livestock farming systems rarely used as pastures. Also, we established grasslands *Chrysopogoni-Airetum capillaris* H-ić (1956) 1963 (NCS code: C.3.6.2.2.) and stands of *Juniperus oxycedrus* (NCS code: D.3.4.2.3.) incurred in the process of succession. As the optimal load grazing for these grasslands we recommend 1 to 2 sheep / ha (moderate intensity). The results of this research can contribute to the conservation of plant diversity and sustainability of habitats in the process of succession.

Key words: Donji Kamenjak, vegetation, Natura 2000, load grazing, GIS

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Prisutnost i zastupljenost samoniklih vrsta voćaka u Park šumi Starčevica

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Sažetak

Predmet ovog istraživanja bila je inventarizacija, odnosno utvrđivanje prisutnosti i zastupljenosti samoniklih vrsta voćaka Park šume Starčevica. U radu su prikazani i rezultati analiza karakteristika lokaliteta i pratećih drvenastih vrsta u zajednici. Inventarizacija samoniklih vrsta voćaka izvršena je na bazi reprezentativnih uzoraka u skladu s jednom od osnovnih metoda - "releve" - uzimanjem fitocenoloških snimaka na probnim površinama. Odabrana veličina probnih površina (poligona) iznosila je 20 x 20 metara. Nakon prikupljanja podataka na terenu (određivanja lokacija korištenjem GPS-a), izrađena je karta korištenjem programa WinGIS 2000. Zastupljenost samoniklih vrsta jabuke, kruške, trešnje i oskoruše na proučavanom području utvrđena je korištenjem standardne metode švicarsko-francuske fitocenološke škole Braun-Blanquet-a. Za svaku voćnu vrstu utvrđeni su brojnost, pokrovnost i stupanj prisutnosti. Na 37 poligona inventarizirano je ukupno 1134 stabla od čega 43 stabla divlje jabuke, 27 stabala divlje kruške, 110 stabala divlje trešnje i 3 stabla oskoruše. Ostala stabla predstavljaju ostale šumske vrste.

Ključne riječi: divlja jabuka, divlja kruška, divlja trešnja, oskoruša, karta, fitocenološki snimak

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Determination of the presence and representation of wild fruit trees in Starčevica forest park

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Abstract

The aim of this research was to do inventory and to determine the presence and representation of wild fruit trees in Starčevica Forest Park, and to analyse the site and associated woody species in community. Inventory of wild fruit trees was done on the basis of representative samples in accordance with one of the basic methods - "releve" - taking phytocoenological records from the plot area. Selected plots size (polygons) was 20 x 20 meters. After the data was gathered in the field (determination of locations using GPS) the map was created using WinGIS 2000 program. Representation of the wild trees of apple, pear, cherry and service tree in the study area was determined using the standard methods of the Swiss-French phytocenological school, Braun-Blanquet's. For each fruit species abundance, cover and degree of presence were determined. On 37 polygons 1134 trees were inventoried, of which 43 wild apple trees, 27 wild pear trees, 110 wild cherry trees and 3 service trees. Other trees represent other forest types.

Key words: wild apple, wild pear, wild cherry, service tree, map, phytocenological records

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Endemična travnjačka zajednica sa šiljevinom (*Schoenus nigricans* L.) u podnožju planine Obruč

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Sažetak

Planina Obruč (sjeverozapadni Dinaridi, Hrvatska) uvrštena je zbog iznimno vrijednog biljnog svijeta u botanički važna područja Hrvatske (Important Plant Area, IPA). U podnožju ove prirodoznanstveno vrijedne planine u predjelu Zala/Brgudac na nadmorskoj visini od oko 500 m pronašli smo travnjačke sastojine u kojima prevladava crnkasta šiljevina (*Schoenus nigricans* L.). Izgledom i ekologijom ove se travnjačke sastojine razlikuju od svih dosad poznatih biljnih zajednica Obruča, odnosno sjeverozapadnih Dinarida. Koristeći metodu standardnih vegetacijskih istraživanja (srednjoeuropska fitocenološka škola) utvrdili smo botanički sastav i fitocenološku pripadnost ove specifične biljne zajednice. Na temelju uvida u desetak načinjenih vegetacijskih snimki proučavane sastojine moguće je uvrstiti u endemičnu asocijaciju *Genisto holopetalae-Caricetum mucronatae* Horvat 1956. Štoviše, ove se travnjačke sastojine mogu izdvojiti u posebnu, dosad neopisanu subasocijaciju s crnkastom šiljevinom i travom modrom beskoljenkom (*Molinia coerulea* (L.) Moench s.l.) kao razlikovnim vrstama. Istražene sastojine jasno su određene karakterističnim vrstama zajednice, kao i brojnim vrstama sveze *Saturejon subspicatae*, odnosno reda *Scorzoneretalia villosae*. Zbog napuštanja tradicijskog gospodarenja proučavane sastojine izložene su sekundarnoj sukcesiji, koju je još više ubrzalo riperanje tla i pošumljavanje sadnicama crnog bora prije nekoliko desetljeća.

Ključne riječi: *Genisto holopetalae-Caricetum mucronatae*, planina Obruč, *Schoenus nigricans*, sjeverozapadni Dinaridi

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Endemic grassland community with black bogrush (*Schoenus nigricans* L.) at the foot of Mount Obruč

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Abstract

Due to its exceptionally valuable flora, Mount Obruč (north-western Dinarides, Croatia) has been declared an Important Plant Area (IPA) of Croatia. At the foot of this scientifically valuable mountain, in the area of Zala/Brgudac, at an elevation of approximately 500 metres, grassland stands with *Schoenus nigricans* L. as the dominant species have been found. With their appearance and ecology, these grassland stands differ from all the, until now, known plant communities on Obruč and the north-western Dinarides. Using the method of standard vegetation research (Central European School of Phytosociology) we have determined the botanical composition and phytosociological classification of this specific plant community. On the basis of ca. ten vegetation relevés, this stand can be included in the endemic association of *Genisto holopetalae-Caricetum mucronatae* Horvat 1956. Moreover, these grassland stands can be separated as a specific, previously undescribed sub-association with *S. nigricans* and *Molinia coerulea* (L.) Moench s.l. as distinctive species. The studied stands are clearly distinguished by the characteristic species of the community, and also by the numerous species of the *Saturejon subspicatae* alliance and the *Scorzoneretalia villosae* order. Since these areas are not maintained in the traditional way anymore, the studies stands are left to secondary succession, which was accelerated by the ripping of the soil and the planting of black pine seedlings a few decades ago.

Key words: *Genisto holopetalae-Caricetum mucronatae*, Mount Obruč, *Schoenus nigricans*, north-western Dinarides

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Prenamjena pulpe buče u sirovinu za proizvodnju zelene energije

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Sažetak

Buča se uzgaja prvenstveno s ciljem proizvodnje bučinog ulja. Udio sjemenki za proizvodnju bučinog ulja, u odnosu na cijelu buču iznosi 3%, dok se 97% od ukupne mase odnosi na puplu i koru. Dio pulpe koja čini najveći dio ostatka proizvodnje bučinog ulja samo se manjom mjerom koristi u neposrednoj hranidbi svinja. Iz tog razloga zbrinjavanje tih ostataka zahtjeva upotrebu novijih tehnologija. Jedna od takvih je anaerobna fermentacija koja predstavlja način obrade poljoprivrednih ostataka s visokim udjelom organske tvari. Prema legislativi EU, poljoprivredna biomasa se suprotno dosadašnjoj praksi (zaoravanje), više ne smije ostavljati neposredno na tlu. Slijedom navedenog, pulpa buče mogla bi se koristiti kao sirovina za proizvodnju bioplina procesom anaerobne fermentacije, čime bi se iskoristila cjelokupna masa buče. Nadalje, nakon procesa anaerobne fermentacije ostati će fermentirani ostatak, koji je u skladu s legislativom Europske unije. Anaerobna fermentacija provesti će se u laboratorijskom bioplinskom postrojenju u Sloveniji, nakon ćega će se izraditi krivulje proizvodnje bioplina. Kao sirovine koristiti će se: zelena masa buče i nedozreli plodovi buče te pulpa dozrelih buča. Za proizvodnju bioplina biti će korišten mezofilni proces anaerobne fermentacije. Od kemijskih analiza digestiranog ostataka odrediti će se pH uzoraka, elektroprovodljivost, ukupni dušik, kalij i natrij te mikro, makroelementi i teški metali (Ca, Mg, Mn, Zn, Cu, Fe, Pb, Cd, Ni, As, Hg, Co, Cr).

Ključne riječi: pulpa buče, anerobna fermentacija, fermentirani ostatak.

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Utilization of pumpkin pulp as row material in green energy production

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Abstract

Cultivation of pumpkins is primarily carried out for the purposes of pumpkin seed production for pumkin seed oil production. When talking about cultivation of pumpkin for seeds, it should be noted that the proportion of seeds for further processing in respect of the entire pumpkin is only about 3%, whereas 97% is the remaining pulp. In addition, pumpkin fruit can be used in the juvenile stage as vegetable, and in the ripe stage for animal feed. Since it represents a potential threat to the environment, there is a need for finding the proper solution for processing and quality disposal of such waste. In addition, due to increasingly stringent environmental regulations, the disposal of organic waste. Thus, anaerobic digestion is a technology that could solve problems concerning organic waste disposal, and could lead to achieving a sustainable utilization of agricultural biomass as a RES. Given the above, but also from the aspect of its composition and potential, pumpkin pulp could be suitable raw material for the process of anaerobic digestion, and biogas production. Anaerobic digestion will be carried out at the University of Ljubljana Faculty of Biotechnology, in mesophilic conditions, for a period of 21 or 30 days at T=37°C in a temperature-controlled incubator and will be give full-scale production of biogas from pumpkin pulp. Grinded pumpkin pulp and immature fruits of pumpkin will be used as substrate. Analysis of fermented residue will be carried out at the University of Zagreb Faculty of Agriculture. Determination of pH, electrical conductivity, total nitrogen will be conducted as well as spectrophotometric and determination of potassium and sodium using atomic absorption spectrometry will be conducted. The content of trace elements and heavy metals will be determined by atomic absorption spectrometry (Ca, Mg, Mn, Zn, Cu, Fe, Pb, Cd, Ni, As, Hg, Co, Cr).

Key words: pumpkin pulp, anaerobic digestion, fermented residue.

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Section 2

Book of Abstracts

Agricultural Economics and Rural Sociology

50 Hrvatski 10 Međunarodni Simpozij Agronoma

Zbornik sažetaka

Agroekonomika i agrosociologija

Prerequisite for the development of ecotourism on the territory of the town of Zlatograd and possible environmental issues

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Abstract

The basis for the development of ecotourism in Bulgaria is the tourist resource that provides a system of protected areas and historic cultural heritage. One of the key elements of ecotourism are the environmental protection and the creation of real opportunities for economic prosperity and livelihood of communities in settlements near the protected areas. Tourism is considered a priority in the economic development not only in Zlatograd Municipality, but also in Smolyan District. The main prerequisite for the successful development of tourism in the municipality is the realistic assessment of the factors that are relevant to tourism. The studied area is one of the few significant Rhodope areas which has a huge potential for the development of ecotourism. Zlatograd Municipality is located about 300 km from the capital Sofia and 70 km from the international resort Pamporovo. The town of Zlatograd is already using its rich potential for tourism. The natural and historical factors are those which give a competitive advantage to Zlatograd Municipality.

Object of this study is the town of Zlatograd as an ecotourism destination and the possible environmental issues resulting from the development of tourism.

Key words: anthropogenic pressures, sustainable management, ecotourism, biodiversity, protected areas

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Strateško planiranje u agrobiznisu - iskustva razvijenih zemalja i lekcije za Hrvatsku

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Sažetak

Strateški menadžment se može definirati kao umjetnost i znanost formuliranja, primjene i procjene učinaka unakrsno funkcionalnih odluka koje omogućuju organizaciji postići svoje ciljeve (David, 2007.). Cilj je strateškog poslovnog upravljanja stvoriti stratešku tj. konkurentsku prednost u odnosu na ostale organizacije na tržištu…(Brester i Penn, 1999.). Prema istim autorima, odnosno Porteru (1980.), uspješne tvrtke primjenjuju jednu od tri strategije: (1) strategiju niskih troškova -"*a low-cost strategy*", (2) strategiju diferencijacije -"*differentiation strategy*", i (3) strategiju fokusiranja -"*focus strategy*". Polazeći od pretpostavke i istraživanja kako je postizanje i zadržavanje konkurentske prednosti (David, 2011) i poslovni uspjeh u pozitivnoj vezi sa strateškim planiranjem na razini organizacije, predmet rada je primjena strateškog upravljanja u agrobiznisu koji obuhvaća literaturni pregled istraživanja u pojedinim zemljama Europe, SAD-a, Južne Amerike, Australije i Novog Zelanda. Analizirani su dostupni radovi u Hrvatskoj koji se odnose na primjenu strateškog menadžmenta u agrobiznisu, točnije djelatnosti poljoprivrede i prehrambene industrije. Cilj je rada utvrditi raširenost primjene koncepta strateškog menadžmenta tvrtki iz područja agrobiznisa u Hrvatskoj i prevladavajuće strategije.

Ključne riječi: strateško upravljanje, agrobiznis.

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Strategic planning in agribusiness – the experiences of developed countries and lessons for Croatia

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Abstract

Strategic management can be defined as the art and science of formulating, implementing, and evaluating cross-functional decisions that enable an organization to achieve its objectives (David, 2007). The purpose of strategic business management is to build a strategic (or competitive) advantage over rival firms (or organizations)…(Brester and Penn, 1999). According to same authors, respectively Porter (1980), successful companies employ one of three strategies: (1) a low-cost strategy, (2) a differentiation strategy, or (3) a focus strategy. Based on the assumptions and research that strategic management is all about gaining and maintaining competitive advantage (David, 2011) and that business success is positively related to strategic planning at organizational level, the object of paper is the application of strategic management in agribusiness, which includes a literature review of research in the various countries of Europe, USA, South America, Australia and New Zealand. We analysed the available papers in Croatia, which relate to the application of strategic management in agribusiness, namely agriculture and food industries. The aim of the paper was to determine the extent of application of the concept of strategic management in agribusiness companies in Croatia and the prevailing strategies.

Key words: strategic management, agribusiness.

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Samoniklo i uzgajano bilje kao moguća turistička atrakcija na primjeru Primorsko-goranske županije

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Sažetak

Pojedine turističke regije u svijetu temelje svoju turističku ponudu na atrakcijama biljnog svijeta (Provansa – lavanda i aromatično bilje, Južnoafrička republika – bogata i endemična flora, Azija – ljekovito bilje/“herbalni“ turizam itd.). Prema klasifikaciji turističkih atrakcija biljni svijet je stoga u mnogim krajevima visoko rangiran zbog važnosti za razvitak turizma. Iako Primorsko-goranska županija obiluje biološkom raznolikošću, životinjski (fauna) i biljni svijet (flora i vegetacija) je još uvijek nedovoljno iskorišten turistički resurs. Cilj rada je provesti anketu među turističkim zajednicama i turističkim djelatnicima na području Primorsko-goranske županije i utvrditi u kojoj se mjeri uvriježila spoznaja o bilju kao vrijednoj i potencijalnoj turističkoj atrakciji te u kojoj je mjeri turizam temeljen na samoniklom endemičnom, rijetkom, dekorativnom, ljekovitom i/ili uzgajanom (stare autohtone sorte) bilju uopće razvijen. Na temelju rezultata istraživanja pripremljen je i pregled mogućih „biljnih“ turističkih atrakcija za područje. Najveći napredak u ovom području razvitka turizma očit je na otoku Lošinju, iako i drugdje postoje naznake turističke ponude bazirane na bogatstvima biljnog svijeta. Predlažu se neke od mogućnosti za unaprjeđenje turističke ponude temeljene na atrakcijama biljnog svijeta u Primorsko-goranskoj županiji.

Ključne riječi: flora, autohtone sorte, ljekovito i aromatično bilje, turistička atrakcija, Primorsko-goranska županija

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Wild-growing and cultivated plants as a possible tourist attraction using the example of the County of Primorje-Gorski Kotar

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Abstract

Some tourist regions around the world base their offer of tourism on the attractions of the plant world (Provence – lavender and aromatic plants, South Africa – rich and endemic flora, Asia – medical plants and herbal tourism etc.). Among tourist attractions, the plant world is in many places highly ranked with regard to its importance for tourism. Although the County of Primorje-Gorski Kotar abounds in biodiversity, its fauna, flora and vegetation are still underutilised as a tourism resource. The aim of this paper is to conduct a survey among tourist boards and tourism professionals in the area of the County of Primorje-Gorski Kotar and to determine to what extent plants have been recognised as a valuable and potential tourist attraction and to what extent tourism based on wild-growing endemic, rare, decorative, medicinal and/or cultivated plants (old indigenous cultivars) has been developed. Based on the results of the survey, we prepared an overview of possible plant-based tourist attractions for the region. The greatest progress in this area of tourism is noticeable on the island of Lošinj, although some indications for a tourism offer based on local plants also exist elsewhere. Furthermore, we recommended some steps to increase the offer of tourism based on the attractions of the plant world in the County of Primorje-Gorski Kotar.

Key words: flora, indigenous cultivars, medicinal and aromatic plants, tourist attraction, County of Primorje-Gorski Kotar

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Analiza ekonomike proizvodnje pšeničnog brašna u istočnoj Hrvatskoj

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Sažetak

Opći cilj istraživanja bio je utvrditi stavove o agroekonomskim pitanjima povezanim s preradom pšenice. Istraživanjem, koje je provedeno u 2013. godini, je obuhvaćeno ukupno 18 mlinova različitih preradbenih kapaciteta i starosti izgradnje na području četiri županija istočne Hrvatske, izabranih namjernim odabirom, s ciljem prikupljanja podataka o činjeničnom stanju, uvjetima proizvodnje i prodaje, a zbog sagledavanja tržišnog stanja izdvojenog sektora na tržištu Republike Hrvatske. Podaci su prikupljeni prigodno sastavljenim upitnikom. Temeljem prikupljenih podataka pokazalo se koji su najzastupljeniji finalni proizvodi izdvojenih i ispitanih proizvodniih kapaciteta, utvrđeni su prosječni iznosi troškova po jedinici finalnog proizvoda, materijala proizvodnje (osnovni i pomoćni materijali, energija, ambalaža, inventar i sl.), iznos troškova sredstava za rad (amortizacija, troškovi održavanja imovine, premije osiguranja, kamate na kredite, troškovi čuvanja objekta i opreme), iznos troškova radne snage i ukupan iznos proizvedenih sporednih proizvoda. Obavljenom statističkom analizom prikupljenih podataka o proizvodnji pšeničnog brašna, izdvajanjem 22 varijable kod kojih je bilo moguće primijeniti parametrijske statističke metode. Primjenom Kolmogorov-Smirnov Z-testa (testiranjem značajnosti odstupanja od Gaussove krivulje), utvrđeno je kako distribucija rezultata za većinu varijabli statistički značajno odstupa od Gaussove krivulje, stoga se u analizi podataka koristile ne parametrijske statistička metode.

Ključne riječi: brašno, troškovi, upitnik, proizvodnja

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Economic analysis of production wheat flour in eastern Croatia

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Abstract

The overall objective of the study was to determine positions on the agroeconomic issues related to the processing of wheat. The survey, conducted in 2013, included a total of 18 mills of various processing capacities and age of building in the four counties of eastern Croatian elected deliberate choice, with the aim of collecting data on the facts, the conditions of production and sales, and due consideration of the market situation separated sector on the Croatian market. Data were collected conveniently constructed questionnaire. Based on the collected data showed that the most common final products isolated and surveyed proizvodniih capacity, average cost per unit is the final product, material production (basic and auxiliary materials, energy, packaging, inventory, etc..), The costs of funds for the work (depreciation, maintenance of assets, insurance premiums, interest on loans, the cost of keeping the facility and equipment), the amount of labor costs and the total amount produced by-products. Performed statistical analysis of the data collected on the production of wheat flour, allocating 22 variables for which it was possible to apply parametric statistical methods. By using the Kolmogorov-Smirnov Z-test (testing the significance of deviations from the Gaussian curve), it was found that the distribution of results for most variables significantly deviates from the Gaussian curve, so the data analysis used non parametric statistical methods.

Key words: flour, costs, questionnaire, production

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Section 3

Book of Abstracts

Genetics, Plant Breeding and Seed Production

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Zbornik sažetaka

Genetika, oplemenjivanje bilja i sjemenarstvo

Inheritance of the high oleic trait in high oleic sunflower genotypes

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Abstract

All High Oleic (HO) sunflower genotypes derived from the Pervenets mutant. Research on genetic control of the HO trait led to several hypotheses on the number of genes, on their dominance relationships and maternal influence on the trait. Our approach to study the inheritance of the HO trait was based on the cross between HO inbred lines only. Therefore, Pervenets allele (*Ol*) was homozygous. All variation observed across generations was due to other genetic factors. Two HO inbred lines were crossed and each successive plant generation was analyzed (F_1, F_2 and F_3). A classical approach based on segregation pattern fitting and a quantitative genetic approach (generation means) were performed. Parental lines and F_1 plants showed a HO stable phenotype. Conversely, in the F_2 plant generation some individual seeds appeared showing a low oleic phenotype. In the seeds collected from one plant a longitudinal gradient in oleic acid content was found. A phenotypical maternal effect was suggested on the trait. A 13:3 segregation ratio (non recombinant – recombinant) fitted well the data. The hypothesis of epistasis or suppression was supported and thus the hypothesis that two genes, in addition to *Ol*, were involved in HO trait control. Using the F_3 seed families as unit of measurement, the two-gene model failed. A third element seems involved in HO trait control. This element could be a combination of modifier genes. These results give some indications for breeding activity in HO sunflower.

Key words: HO phenotype, Segregating Population, Half-seed Technique

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Oplemenjivačka vrijednost križanaca IBM populacije kukuruza u Hrvatskoj i Turskoj

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Sažetak

Oplemenjivačka vrijednost inbred linija *per se* manje je važna od oplemenjivačke vrijednosti hibrida u oplemenjivanju kukuruza. Isto tako, u istraživanjima vezanim uz mapiranje lokusa kvantitativnih svojstava, ispitivanje križanaca cijepajućih populacija (nakon križanja s elitnim komplementarnim linijama testerima), predstavlja glavni fokus istraživanja. U svrhu genetičkog ispitivanja svojstava kukuruza (fotosintetska aktivnost tijekom cvjetanja i prinos zrna) u nekoliko okolina s više ili manje povoljnim uvjetima, korišteni su križanci (TC) populacije međukrižanih B73×Mo17 (IBM) rekombinantnih inbred linija (RIL). Ukupno 212 križanih IBM rekombinantnih inbred linija, zajedno sa četiri standarda posijano je prema nepotpunom bloknom dizajnu u dva ponavljanja u dvije geografski udaljene okoline Hrvatske (Osijek) i Turske (Altınova). Na obje lokacije utvrđene su statistički značajne razlike unutar križanaca IBM RIL za vrijednosti maksimalnog kvantnog prinosa fotosustava II (Fv/Fm) i indeksa učinkovitosti fotosinteze (PI_{ABS}). Razlike u srednjim vrijednostima između lokacija nisu bile statistički značajne za Fv/Fm (0.80 i 0.81), dok je za PI_{ABS} (5.09 i 3.93) utvrđena statistička značajnost, kako u Osijeku, tako i u Altınovi. Rezultati za prinos zrna, kao i agronomski te kvantitativno- genetički aspekti pokusa bit će objašnjeni i prezentirani.

Ključne riječi: geografski udaljene okoline, IBM populacija, kukuruz, oplemenjivačka vrijednost križanaca, kvantitativna genetika

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Testcross performance of IBM maize population in Croatia and Turkey

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Abstract

In hybrid breeding, *per se* performance of inbreds is less important compared to hybrid performance. Subsequently, in an experiment on mapping of quantitative trait loci, testcross evaluation of segregating populations after testcrossing to elite complementary tester inbreds is of major interest. We used testcrosses (TC) of the intermated B73xMo17 (IBM) recombinant inbred line (RIL) population to study genetics of maize traits relevant to plant performance (photosynthetic performance during flowering and grain yield) in several (non) stress environments. Total of 212 testcrossed IBM RILs together with four hybrid checks were planted as an incomplete block design with two replications in two distant environments of Croatia (Osijek) and Turkey (Altinova). There were significant differences among the TC IBM RILs for maximum quantum yield of photosystem II (Fv/Fm) and photosynthetic performance index on absorption basis (PI_{ABS}) in both locations. Mean difference between two distant locations was not significant for Fv/Fm (0.80 and 0.81) and significant for PI_{ABS} (5.09 and 3.93) in Osijek and Altınova, respectively. Results for grain yield as well as agronomic and quantitative genetic aspects of the experiment will be presented and discussed.

Key words: distant environments, IBM population, maize, testcross performance, quantitative genetics

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Imbibicija, klijanje i rani rast hibrida kukuruza u različitim uvjetima osmopriminga

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Sažetak

Na učinak osmopriminga sjemena, kao jednostavne i okolišno prihvatljive metode kojom je moguće ublažiti posljedice abiotskog stresa na rast, razvoj i realizirani prinos kukuruza utječe niz čimbenika. Cilj ovog rada bio je procjena učinka vremena trajanja osmopriminga (12, 24, 36 i 48 sati), vodnog potencijala osmotske otopine dobivene primjenom polietilen glikola 6000 (-0,295 i -0,735 MPa) i genotipa (FAO grupa 300, 400, 500 i 600) na imbibiciju, klijanje (energiju klijanja i klijavost) te rani rast (duljinu i prinos svježe mase korjenčića i stabljike klijanaca) domaćih hibrida kukuruza. Rezultati analize varijance ukazali su na značajnost učinka vremena trajanja osmopriminga, vodnog potencijala osmotske otopine i genotipa, kao i na značajnost njihovih interakcija za istraživana svojstva. Korelacije između svojstava bile su od značajno negativnih do pozitivnih. Dobiveni rezultati ukazuju da je za postizanje maksimalnog učinka osmopriminga potrebna prilagodba uvjeta osmopriminga za svaku specifičnu grupu genotipova.

Ključne riječi: kukuruz, osmopriming, imbibicija, klijanje, rani rast

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Imbibition, germination and early growth of maize hybrids under different conditions of osmopriming

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Abstract

Effects of seed osmopriming as a simple and environment friendly technique by which is possible to decrease consequences of abiotic stress on growth, development and realised maize yields are determined by many factors. The aim of this study was to evaluate the influence of osmopriming duration (12, 24, 36 and 48 hours), water potential of osmotic solution prepared by using polyethylene glycol 6000 (-0.295 and -0.735 MPa) and genotype (FAO groups 300, 400, 500 and 600) on imbibition, germination (germination energy and germination) and early growth (length and fresh mass yield of seedling radicle and hypocotyl) of domestic maize hybrids. Results of analysis of variance indicated that osmopriming duration, water potential of osmotic solution and genotype as well as their interactions significantly affected all investigated traits. Correlations of investigated traits varied from significantly negative to positive. The obtained results have shown that adjustment of osmopriming conditions for each specific group of genotypes is required to achieve best osmopriming effects.

Key words: maize, osmopriming, imbibition, germination, early growth

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Molekularna varijabilnost lokalnih populacija i komercijalnih kultivara crvene djeteline

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Sažetak

Lokalne populacije crvene djeteline predstavljaju vrijedan izvor genetske varijabilnosti u oplemenjivačkim programima razvoja novih domaćih kultivara adaptiranih za uzgoj u različitim okolinskim uvjetima. Cilj rada bio je proučiti molekularnu varijabilnost između i unutar lokalnih populacija crvene djeteline u odnosu na komercijalne kultivare i utvrditi njihovu međusobnu divergentnost korištenjem AFLP-molekularnih markera. Proučavano je 13 hrvatskih lokalnih populacija i devet domaćih i stranih komercijalnih kultivara. U istraživanje je bilo uključeno 20 individua po populaciji. U AFLP analizi korištena su četiri para kombinacija početnica. AFLP PCR-fragmenti očitani su softverom Gene Mapper V 4.0 i scanAFLP-om. U izračunu koeficijenta sličnosti između parova individua korišten je koeficijent sličnosti prema Dice-u. Matrica sličnosti korištena je u analizi molekularne varijance (AMOVA) i određivanju međupopulacijske udaljenosti (F_{ST}).

Analizom molekularne varijance utvrđene su značajne razlike u varijabilnosti između grupa populacija [lokalne populacije vs. kultivari; (Φ_{ST}= 0,031; p<0,001)], između individua unutar grupa (Φ_{ST}= 0,037; p<0,001) i unutar svih proučavanih populacija (Φ_{ST}= 0,932; p<0,001). Analizom varijance utvrđena je veća varijabilnost kod lokalnih populacija u odnosu na kultivare.

Ključne riječi: *Trifolium pratense* L., AFLP, AMOVA, PCoA

Napomena

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Molecular variability of local populations and commercial cultivars of red clover

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Abstract

Local populations of red clover represent valuable source of genetic variability in breeding programs for developing novel domestic cultivars adapted for production in different environmental conditions. The goals of this research were to study molecular variability among and within local populations of red clover in relation to commercial cultivars, and to assess their mutual diversity using AFLP molecular markers. The study covered 13 Croatian local populations and nine domestic and introduced commercial cultivars. Each population was represented by 20 individual plants. Four combinations of primers were used for AFLP analysis. Gene Mapper v.4.0 and scanAFLP software was applied for visualization of AFLP PCR fragments. Similarity between pairs of individuals was calculated using Dice similarity coefficient. The matrix of similarity was used in analysis of molecular variance (AMOVA) and assessment of distance among populations (F_{ST}).

The results of AMOVA indicate significant differences in variability among groups of populations [local populations vs. cultivars; (Φ_{ST}= 0,031; p<0,001)], among individuals within groups (Φ_{ST}= 0,037; p<0,001) and within all populations (Φ_{ST}= 0,932; p<0,001). Analysis of variance showed greater variability in local population in relation to cultivars.

Key words: *Trifolium pretense* L., AFLP, AMOVA, PCoA

Remark

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Procjena kombinacijskih sposobnosti za morfološka i gospodarska svojstva kod duhana tipa virdžinija

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Sažetak

U Hrvatskoj u proizvodnji virdžinijskog duhana zastupljeni su citoplazmatsko muško sterilni (CMS) F1 hibridi. Duhan je samooplodna vrsta i heterozis je manje izražen nego kod strano-oplodnog bilja. Poljski pokus s deset novih oplemenjivačkih linija virdžinijskog duhana, njihovim test-križancima s dva linijska testera, te dva standarda, kultivara raširena u proizvodnji, izveden je na tri hrvatske lokacije (Virovitica, Kutjevo1 i Kutjevo2) tijekom 2014. godine. Na sve tri lokacije je primijenjena agrotehnika uobičajena u širokoj proizvodnji. Na lokaciji Kutjevo2 pokus je i navodnjavan. U vegetaciji je izvršene ocjena visine biljke, datuma cvatnje i broja listova, širine devetog lista (S), duljine devetog lista (D), omjera S/D te površina devetog lista. Nakon berbe utvrđeni su prinos, prosječna cijena i ukupna vrijednost osušenog lišća. Analizom varijance utvrđene su signifikantne razlike između kontrola i linija i test-križanaca za sva ispitivana svojstva osim za vrijednost. Nekoliko linija i test-križanaca imalo je signifikantno veći prinos, cijenu i vrijednost u odnosu na standarde.

Opća kombinacijska sposobnosti (OKS) oplemenjivačkih linija bila je signifikantna za sva svojstva osim za visinu biljke, omjer S/D i cijenu, dok je OKS testera bila signifikanta za sva svojstva osim za visinu biljke, duljinu devetog lista, prinos i vrijednost. Specifična kombinacijska sposobnost test-križanaca bila je signifikantne samo za širinu i površinu devetog lista.

Ključne riječi: duhan, oplemenjivačka linija, hibrid, kombinacijska sposobnost

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Combining abilities for morphological and agronomic traits of flue-cured tobacco

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Abstract

In Croatia in flue-cured tobacco production CMS F1 hybrids are grown. Tobacco is a self-pollinated species and, heterosis is less expressed than in the open-pollinated species. In 2014 a field trial with ten new breeding lines of flue-cured tobacco, their test-hybrids with two line testers, and two controls, standard varieties widespread in the commmercial production, was set up at three locations (Virovitica, Kutjevo1 and Kutjevo2) in Croatia. The cultural practices at all three locations were as recommended for commercial flue-cured tobacco production. At the location Kutjevo2 irrigation was additionally included. During vegetation, plant height, number of days to flowering, number of leaves per plant, 9-th leaf length (L) and width (W), L/W ratio and the leaf area were assessed. After harvesting and curing leaf yield, average price and value/ha were determined. Analysis of variance showed significant differences between the controls and tested lines and hybrids for all the analyzed traits except for value. Several lines and hybrids had significantly higher yield, price and value as compared to the standards. General combining ability (GCA) of the experimental lines was significant for all the traits except for plant height, W/L ratio and price and, GCA of testers was significant for all the traits except for plant height, length of the ninth leaf, yield and value. Specific combining ability of test-hybrids was significant only for width and area of the ninth leaf.

Key words: flue-cured tobacco, breeding line, hybrid, combining ability

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Genetska sličnost samooplodnih linija kukuruza i prinos zrna njihovih križanaca

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Sažetak

Fusarium verticillioides (Sacc.) Nirenberg uzročnik je truleži klipa i kontaminacije zrna kukuruza mikotoksinima (fumonizinima), koji su štetni za ljude i životinje. Na temelju preliminarnih istraživanja otpornosti samooplodnih linija kukuruza (IL) i njihovih križanaca prema truleži klipa, za ispitivanje nasljeđivanja truleži klipa i kontaminacije zrna mikotoksinima, odabrano je 7 IL kukuruza (jedna IL sa visokom razinom otpornosti na trulež klipa – potencijalni izvor otpornosti i 6 IL različite razine otpornosti/osjetljivosti). Odabrane IL križane su po shemi dialela, a 42 dobivena križanca (21 direktni križanac i 21 reciprok) 2013. godine posijana su u pokusu postavljenom po RCBD u četiri ponavljanja. Cilj ovog istraživanja je bio proučiti korelaciju između genetske sličnosti (GS) za parove odabranih IL kukuruza dobivene uz pomoć SSR markera i prinosa zrna njihovih pripadajućih križanaca. GS između IL kretala se je od 0.22 do 0.67. GS između potencijalnog izvora otpornosti i ostalih IL kretala se je od 0.22 do 0.43, osim u jednom slučaju (0.61). Prinos zrna križanaca kretao se od 4.78 t/ha (IL1xIL2) do 8.77 t/ha (IL3xIL4). Korelacija između GS vrijednosti za 21 par IL kukuruza i prinosa zrna njihovih pripadajućih križanaca je bila r = 0.19.

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Ključne riječi: kukuruz, *Fusarium verticillioides*, prinos zrna, SSR markeri, genetska sličnost

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Genetic similarity of maize inbred lines and grain yield of their respective crosses

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Abstract

Fusarium verticillioides (Sacc.) Nirenberg causes Fusarium ear rot (FER) and maize grain contamination with mycotoxins (fumonisins) harmful to humans and animals. Based on the preliminary investigation of resistance of maize inbred lines (IL) and their crosses to FER, for the study of inheritance of FER and grain contamination with mycotoxins, seven maize IL were chosen (one IL with high level of resistance to FER – a potential source of resistance, and 6 IL with different level of resistance/susceptibility). Selected IL were crossed according to diallel scheme and 42 obtained crosses (21 direct crosses and 21 reciprocal crosses) were planted in the trial set up as RCBD in four replications in 2013. The objective of the present investigation was to study correlation between genetic similarity (GS) of maize inbred pairs revealed by SSRs and grain yield of their respective crosses. GS among IL ranged from 0.22 to 0.67, while GS between the potential source of resistance and the other IL ranged from 0.22 and 0.43, except in one case (0.61). Grain yield of crosses ranged from 4.78 t/ha (IL1xIL2) to 8.77 t/ha (IL3xIL4). Correlation between the GS values of the 21 maize inbred pairs and grain yield of their respective crosses was r = 0.19.

Financial support for part of the work within this study has been provided by the Croatian Ministry of Science, Education, and Sports research grant No. 106-1780691-2144, No. 106-1780691-2035, and No. 178-1780691-0688.

Key words: maize, *Fusarium verticillioides*, grain yield, SSR markers, genetic similarity

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Genotipske razlike u osnovnim svojstvima kvalitete zrna jarog pivarskog ječma pri različitim gnojidbama dušikom

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Sažetak

Na eksperimentalnom polju Bc Instituta d.d. u Botincu postavljen je 2014. g. poljski pokus sa ciljem da se prouči utjecaj gnojidbe dušikom (N) na osnovna svojstva kvalitete zrna pivarskog ječma. Gnojidba N obavljena je u osnovnoj obradi tla u jesen te u vegetaciji tijekom busanja i vlatanja. Ukupne količine dodanog N iznosile su 84, 125, 134 i 152 kg/ha. U pokusu je bilo uključeno 19 genotipova jarog ječma: tri Bc sorte jarog ječma, Bc Alarik, Erih i Bc Kalnik, 10 Bc eksperimentalnih linija jarog ječma te šest sorti jarog ječma ostalih sjemenarskih kuća iz RH (Trojanac, Calcule, Quench, Prestige, Matej i Fran). Sukladno količini dodanog N između gnojidbi su uočene statistički značajne razlike za prinos zrna, hl masu i % zrna 1. klase. Gnojidba sa najmanje N rezultirala je najnižim prinosom, najnižom hl masom te najvišim % vlage zrna u žetvi, najvećim % zrna 2. klase i najvećim % nečistoća što upućuje na to da takav ječam ne bi zadovoljio stroge kriterije pivarske industrije prilikom otkupa. Razlike između sorata u prinosu zrna bile su nesignifikantne. Kao sorte sa višom hl masom i većim % zrna 1. klase izdvojile su se Quench, Prestige, GS 1799/95, Fran, Matej i Bc Alarik. Iste kultivare karakterizira manji % zrna 2. klase i manji % otpada. Interakcija genotip x gnojidba bila je nesignifikantna za sva svojstva upućujući na podjednaku reakciju kultivara na N gnojidbu.

Ključne riječi: gnojidba dušikom, jari ječam, kvaliteta, svojstva zrna, prinos

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Genotypic differences in basic spring malting barley grain quality parameters under different nitrogen fertilization regimes

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Abstract

In 2014 a field experiment was set up at the Bc Institute's experimental field in Botinec in order to investigate the effect of nitrogen (N) fertilization on the basic malting barley grain quality parameters. N fertilization was performed before winter plowing and in vegetation during tillering and stem elongation. The total amounts of added N were 84, 125, 134 and 152 kg/ha. In experiment 19 genotypes of spring barley were included: three Bc cultivars, Bc Alarik, Erih and Bc Kalnik, 10 Bc experimental lines and six cultivars of other seed companies from Croatia (Trojanac, Calcule, Quench, Prestige, Matej and Fran). In accordance with the amount of added N statistically significant differences among N fertilizations were observed for grain yield, test weight and in % of the 1st class grains. Fertilization with 84 kg N/ha resulted in the lowest yield, lowest test weight, highest % of grain moisture, highest % of 2nd class grains and highest % of impurities, what suggests that such barley would not meet the criteria of the brewing industry. Differences among cultivars in grain yield were not significant. Cultivars Quench, Prestige, GS 1799/95, Fran, Matej and Bc Alarik were distinguished as cultivars with high test weight and high % of 1st class grains. The same cultivars were characterized with lower % of 2nd class grains and lower % of impurities. Genotype x fertilization interaction was not significant suggesting that all cultivars similarly responded to N fertilization.

Key words: grain characteristics, N fertilization, quality, spring barley, yield

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Molekularna analiza primki bosiljka (*Ocimum basilicum* L.)

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Sažetak

Cilj istraživanja bila je analiza genetske raznolikosti primki bosiljka (*Ocimum basilicum* L.) Kolekcije ljekovitog i aromatičnog bilja (Sveučilište u Zagrebu, Agronomski fakultet, Zavod za sjemenarstvo) kao dijela Nacionalne banke biljnih gena. Sedamdeset i osam primki bosiljka koje pripadaju različitim morfotipovima ('pravi' bosiljak, sitnolisni bosiljak, salatnolisni bosiljak, ljubičasti bosiljak A, ljubičasti bosiljak B) analizirano je pomoću biljega AFLP. Upotrebom šesnaest kombinacija restrikcijskih enzima i početnica AFLP dobiveno je 2,449 polimorfnih biljega. Analizom molekularne varijance (AMOVA) utvrđeno je da je većina genetske raznolikosti uzrokovana razlikama između primki unutar morfotipova, dok je preostala raznolikost gotovo jedanko raspodijeljena između morfotipova unutar skupina morfotipova razvrstanih na temelju antocijanskog obojenja stabljike ('zeleni' vs. 'ljubičasti' morfotipovi), te između navedenih skupina morfotipova. Bayesovskom analizom genetske strukture primke su razvrstane u dvije skupine. Većina primki 'zelenog' morfotipa pridružena je Skupini A, dok je Skupina B uključila većinu primki 'ljubičastog' morfotipa. Jasno odvajanje primki 'zelenog' od 'ljubičastog' morfotipa bilo je vidljivo i na temelju rezultata Analize glavnih koordinata (PCoA) kao i Analize skupina provedene metodom sparivanja susjeda (NJ), obje na temelju matrice Diceove udaljenosti između primki. Utvrđivanje genetske raznolikosti primki bosiljka je prvi korak za buduće pridruživajuće kartiranje s ciljem utvrđivanja biljega povezanih s glavnim sastavnicama eteričnog ulja.

Ključne riječi: *Ocimum basilicum* L., primka, morfotip, genetska raznolikosti, biljezi AFLP

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Molecular characterization of basil (*Ocimum basilicum* L.) accessions

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Abstract

The aim of the research was to assess genetic diversity among basil (*Ocimum basilicum* L.) accessions held at the Collection of Medicinal and Aromatic Plants (University of Zagreb, Faculty of Agriculture, Department of Seed Science and Technology) as a part of the National Bank of Plant Genes. Seventy-eight basil accessions belonging to five basil morphotypes (True basil, Small-leaf, Lettuce-leaf, Purple basil A and Purple basil B) were analysed using AFLP markers. Sixteen AFLP primer combinations yielded a total of 2,449 polymorphic markers. Analysis of molecular variance (AMOVA) revealed that most of the genetic diversity was attributable to differences among accessions within morphotypes, while the remaining variability was almost equally distributed among morphotypes within groups of morphotypes classified according to anthocyanin coloration on stems ('green' vs. 'purple' morphotypes) and among the groups. Bayesian analysis of genetic structure resulted in assignment of the investigated accessions to two clusters. Most of the accessions belonging to 'green' morphotypes were assigned to Cluster A, while the Cluster B included most of the accessions belonging to 'purple' morphotypes. The separation of 'green' vs. 'purple' morphotypes was confirmed further by principal co-ordinate analysis (PCoA) and the neighbour-joining cluster analysis, both based on pairwise Dice's distance matrix between accessions. The assessment of the genetic diversity of the basil accessions is the first step for the future association mapping studies aimed at identifying markers associated with main essential oil compounds.

Key words: *Ocimum basilicum* L., accession, morphotype, genetic diversity, AFLP markers

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Hranjive tvari i hranidbene vrijednosti silaže BMR hibrida kukuruza

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Sažetak

Kukuruzna silaža dobiva se siliranjem cijele biljke, te sadrži velike količine energije čije iskorištenje otežava lignin, te smanjuje dostupnost celuloze i hemiceluloze. Stoga su oplemenjivanjem stvoreni hibridi s BMR mutiranim genom, koji smanjuje udio lignina i povećava probavljivost cijele biljke kukuruza. Cilj istraživanja je bio komparirati hranidbene vrijednosti i probavljivosti hibrida s BMR genom u odnosu na konvencionalni hibrid. U istraživanju su korištena tri hibrida od čega dva s BMR genom i jedan konvencionalni hibrid (standard). Na temelju kemijskih analiza pridruženi su koeficijenti probavljivosti hranjivih tvari po DLG sustavu. Kemijskom analizom nisu utvrđene značajne statističke razlike u osnovnom kemijskom sastavu izuzev udjela proteina u suhoj tvari koji je bio veći kod BMR hibrida u odnosu na standard za 19 do 30%. Analiza određivanja deterđentskih vlakana pokazala je značajne statističke razlike na nivou $P<0,05$ za svojstvo udjela ADV-a, te ADL-a na nivou $P<0,01$. Najznačajnija jedinica za ocjenjivanje energetske vrijednosti krmiva – ukupne probavljive tvari, pokazale su značajne razlike između standarda i hibrida s BMR genom. Kod standardnog hibrida utvrđen je NEL i NEM od 5,88 MJ tj. 6,34 MJ, dok je kod hibrida s BMR genom utvrđen NEL 6,32 odnosno 6,50 MJ i NEM od 6,78 do 7,08MJ. Ostvarene vrijednosti ukazuju da se od 1 kg suhe tvari BMR hibrida može proizvesti 0,2 l više mlijeka mliječne masti 4% i 0,015 kg mesa u odnosu na standardne hibride.

Ključne riječi: kukuruz, BMR gen, lignin, probavljivost

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Nutrients and nutritional value of silage BMR corn hybrids

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Abstract

Corn silage was prepared by the ensiling of the whole plant, and contains large amounts of energy and fiber. Lignin complicates utilization of energy, and reduces the availability of cellulose and hemicellulose. Therefore, hybrids with the BMR mutated gene were made by breeding, which reduce proportion of lignin and increase digestibility of the whole corn plant. The aim of this research was to compare the nutritional value and digestibility of BMR hybrids with conventional hybrid. In this study we have used three hybrids, two with BMR gene and one conventional hybrid like standard. The coefficient of digestibility of nutrients was calculated on the base of chemical analysis and value DLG table. Chemical analysis showed no significant statistical differences in the chemical composition except for protein content in dry matters, which was higher in BMR hybrids in relation to the standard of 19 to 30%. Analysis determining detergent fibers showed significant statistical differences at the level of $P<0.05$ for property content ADF and ADL at the level of $P<0.01$. The most important unit for evaluating the energy value of feed - total digestible nutrients has showed significant differences between the standards and BMR hybrids. Values of NEL and NEM for standard hybrid was amounted 5.88 MJ i.e. 6.34 MJ, while the hybrids with the BMR gene had NEL 6.32 - 6.50 MJ and 6.78 – 7.08MJ respectively for NEM. The obtained values indicate that 1 kg of dry matter BMR hybrids can produce 0.2 liters more milk of milk fat 4% and 0.015 kg more meat in relation to standard hybrids.

Key words: corn, BMR gene, lignin, digestibility

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Utjecaj norme sjetve na prinos i masu 1000 zrna soje

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Sažetak

U većem broju poljskih eksperimenata je utvrđeno da soja može proizvesti relativno slične prinose u širokom rasponu gustoće sklopa. Poljski pokus s 11 kultivara soje sijanih kod tri sjetvene norme (550, 600 i 650 zrna po m^2) postavljen je u 2014. vegetacijskoj godini na tri lokacije Zagreb, Botinec i Oborovo. Eksperimentalni dizajn je bio split-plot s četiri ponavljanja. Glavni faktor su bile norme sjetve a podfaktor su bili kultivari. Pokusna parcelica se sastojala od tri reda duljine 6m s međurednim razmakom od 45 cm. Nakon žetve kombajnom utvrđeni su prinos zrna i masu 1000 zrna. Agrotehnički postupci na svim lokacijama su bili u skladu s preporukama za komercijalnu proizvodnju soje. Analiza varijance pokazala je da su srednji kvadrati lokacija, kultivara i interakcije kultivar × lokacija bili visoko signifikantni i za urod zrna i masu 1000 zrna, dok srednji kvadrati za normu sjetve nisu bili signifikantni niti za jedno od ispitivanih svojstava. Za prinos zrna najveći učinak je utvrđen za lokaciju, koja je sudjelovala s 59,3% u ukupnoj sumi kvadrata, dok je doprinos kultivara i interakcije kultivar × lokacija u ukupnoj varijabilnosti bio 11% odnosno 5,2%. Za masu 1000 zrna učinak sorte bio najznačajniji izvor varijabilnosti s udjelom od 58,2% u ukupnoj sumi kvadrata, dok je doprinos lokacije i interakcije kultivar x lokacija bio mnogo manji (10% odnosno 8,2%).

Ključne riječi: soja, norma sjetve, prinos zrna, masa 1000 zrna

sa2015_a0310

The effect of different seeding rates on yield and 1000 kernel weight of soybean

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Abstract

Many field research experiments have established that soybean can produce relatively similar yields from large changes in plant density. A field trial including 11 soybean cultivars was set up at three seeding rates (550, 600 and 650 grains per m^2) in 2014 growing season at three locations, Zagreb, Botinec and Oborovo. The experimental design was a split-plot with four replications. Main plots were seeding rates and subplots were cultivars. Each subplot consisted of three 6-m rows, 45 cm apart. Plots were machine-harvested and grain yield and 1000 kernel weight were determined. The cultural practices at all three locations were as recommended for commercial soybean production. The analysis of variance showed that the mean squares of locations, cultivars and cultivar × location interaction were highly significant for both grain yield and 1000 kernel weight, whereas the mean square of seeding rate was not significant for either of the examined traits. For grain yield the highest effect was observed for location, which accounted for 59.3% of the total sum of squares, whereas the contribution of cultivars and cultivar × location interaction terms contributed 11% and 5.2%, respectively in total variation. For 1000 kernel weight the effect of cultivar was the most pronounced source of variation accounting for 58.2% of the total sum of squares, whereas the contribution of location and the interaction cultivar x location were much lower (10% and 8.2%, respectively).

Key words: soybean, seeding rate, grain yield, 1000 kernel weight

sa2015_a0310

Tolerancija na višestruki stres – postoji li univerzalni lijek?

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Sažetak

Iako su mnogi odgovori na stres specifični za pojedini tip stresa, razvidno je iz novijih istraživanja da su neki odgovori na stres općeniti, te stoga potencijalno pridonose istraživanju nespecifične tolerancije na višestruki stres. Kvantitativno-genetičke analize su identificirale genetske korelacije između svojstava tolerancije na više stresova, pokazujući da selekcija na toleranciju jednog tipa stresa je povezana sa selekcijom na toleranciju drugog tipa stresa. Naša istraživanja tolerancije na stres kod kukuruza su pokazala moguću vezu između tri *gst* gena i pet parametara fluorescence klorofila ukazujući na povezanost glutation transferaze (gst) s regulacijom apsorpcije fotona, disipacije energije i omjera hvatanja ekscitona i disipacije. Ovaj rezultat omogućuje vjerodostojno fiziološko tumačenje da su *gst* geni kod kukuruza povezani s učinkovitosti fotosinteze općenito, te konačno s tolerancijom na višestruki stres. Glavni cilj našeg odobrenog projekta Hrvatske zaklade za znanost je objasniti i integrirati genetičke i fiziološke mehanizme tolerancije na višestruki stres kod kukuruza u uvjetima povećane gustoće sklopa, suše, napada kukuruzne zlatice i infekcije fuzarija kao i prekomjerne količine kadmija u tlu. Preliminarni rezultati genetičkih i fizioloških analiza bit će prikazane.

Ključne riječi: kukuruz, višestruki stres, fotosinteza, fiziologija, kvantitativna genetika

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Multiple stress tolerance – is there a panacea?

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Abstract

Whereas many stress responses appear to be specific to different types of stress, it is clear that some stress responses are general and potentially confer tolerance to multiple types of stress. Quantitative genetic studies have identified genetic correlations among stress-tolerance traits, such that selection for tolerance to one type of stress has been associated with tolerance to another type of stress as a correlated selection response. In our study in maize stress tolerance, the putative association of three *gst* genes with five chlorophyll fluorescence parameters might suggest that glutathione transferase is linked with regulation of photon absorbance and exciton dissipation, as well as in trapping/dissipation ratio and therefore provides physiological plausibility that the maize *gst* family is associated with photosynthetic efficiency in general, and eventually with multiple-stress tolerance. The main goal of our project granted by Croatian Science Foundation is to elucidate and integrate common genetic and physiological mechanisms underlying the multiple-stress tolerance in maize for high plant density, drought, *Diabrotica* and *Fusarium* attacks as well as cadmium excess in soil. Preliminary results of genetic and physiological analyses conducted in field and pot experiments in 2014 will be presented.

Key words: maize, multiple stress, photosynthesis, physiology, quantitative genetics

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Populacijska varijabilnost sjemena crvene djeteline

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Sažetak

Istraživanje je provedeno sa sjemenom 12 populacija crvene djeteline (*Trifolium pratense* L.) različitog podrijetla s ciljem procjene varijabilnosti svojstava sjemena (mase 1000 zrna i boje sjemene ovojnice) i utvrđivanja povezanosti istraživanih svojstava sa svojstvima imbibicije, klijanja (energije klijanja i klijavosti) te ranog rasta klijanaca (duljine i zelene mase klijanaca). Varijabilnost mase 1000 zrna populacija bila je u većem rasponu. Boja sjemene ovojnice populacija, tj. udio žutog, dvobojnoj i ljubičastog sjemena bio je različit. Utvrđena je značajna povezanost varijabilnosti svojstava sjemena sa svojstvima imbibicije, klijanja i ranog rasta klijanaca. Rezultati potvrđuju da svojstva sjemena mogu značajno utjecati na klijanje sjemena pa se dobrim izborom populacije (kultivara) za sjetvu povećava mogućnost realizacije dobrog sklopa i prinosa mase crvene djeteline.

Ključne riječi: crvena djetelina, sjeme, varijabilnost, klijanje

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Population variability of red clover seed

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Abstract

Investigation was undertaken to estimate variability of seed traits (thousand seed weight and seed coat colour) of twelve red clover (*Trifolium pratense* L.) populations with different origin and to evaluate correlations between investigated traits and traits of imbibition, germination (germination energy and germination) and early growth of seedlings (length and fresh mass of seedlings). Variability of thousand seed weight was in wider range. Seed coat colour, e.g. share of yellow, bi-colour and violet seed was different. Significant correlations between variability of seed traits and traits of imbibition, germination and early seedling growth were found. Results confirmed that seed traits may significantly influence on seed germination and indicated that good choice of population (cultivar) seed for sowing may increase possibility to achieve realization of satisfying stand density and mass yield of red clover.

Key words: red clover, seed, variability, germination

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Oplemenjivačka vrijednost križanaca IBM populacije ispitivane u rjeđem i gušćem sklopu

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Sažetak

Oplemenjivačka vrijednost inbred linija *per se* manje je važna u oplemenjivanju kukuruza nego oplemenjivačka vrijednost hibrida. Također, u istraživanjima vezanim uz QTL mapiranja, primarni interes predstavljaju križanci cijepajućih populacija (nakon križanja s elitnim komplementarnim linijama testerima). U svrhu genetičkog ispitivanja važnih svojstava kukuruza – fotosintetska aktivnost tijekom cvjetanja i prinos zrna – u nekoliko više ili manje povoljnih okolina, korišteni su križanci (TC) populacije međukrižanih B73×Mo17 (IBM) rekombinantnih inbred linija (RIL). Ukupno 216 genotipova je korišteno u pokusima, 212 križanih IBM rekombinantnih inbred linija, zajedno sa četiri standarda. Svi genotipovi posijani su po nepotpunom bloknom planu u dva ponavljanja i dvije gustoće sjetve – normalna (~57.000 biljaka/ha) i visoka (~86.000 biljaka/ha). Utvrđene su statistički značajne razlike unutar križanaca IBM RIL za vrijednosti maksimalnog kvantnog prinosa fotosustava II (Fv/Fm) i indeksa učinkovitosti fotosinteze (PI_{ABS}) pri obje gustoće sjetve. Razlike srednjih vrijednosti između dvije gustoće sjetve nisu bile statistički značajne za oba parametra: 0.80 i 0.81 za Fv/Fm, te 5.09 i 5.03 za PI_{ABS}. To znači da je učinak visoke gustoće sjetve na fotosintetičke parametre u iznadprosječno vlažnoj sezoni vrlo slab. Rezultati prinosa zrna, te kvantitativno-genetički i agronomski parametri pokusa bit će također izloženi i objašnjeni.

Ključne riječi: IBM populacija, kukuruz, fotosintetska učinkovitost, kvantitativna genetika, križanci

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Testcross performance of IBM maize population grown in low and high plant densities

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Abstract

Per se performance of maize inbreds in maize breeding is less important than hybrid performance. Also, in an experiment on QTL mapping, testcross evaluation of segregating populations after testcrossing to elite complementary tester inbreds is of primary interest. Testcrosses (TC) of the intermated B73×Mo17 (IBM) recombinant inbred line (RIL) population were used to study genetics of maize traits relevant to photosynthetic performance during flowering and grain yield in several (non)stress environments. Total of 216 genotypes were used in trials, 212 testcrossed IBM RILs along with four hybrid checks. All genotypes were planted in an incomplete block design with two replications in two plant densities – normal (~57.000 plants/ha) and high (~86.000 plants/ha). There were significant differences among the TC IBM RILs for maximum quantum yield of photosystem II (Fv/Fm) and photosynthetic performance index on absorption basis (PI_{ABS}) within both densities. Mean difference between two densities was not significant for both parameters: 0.80 and 0.81 for Fv/Fm and 5.09 and 5.03 for PI_{ABS} in normal and high plant density, respectively. It indicates no effect of high plant density for photosynthetic performance parameters in the extraordinarily wet growing season. Results for grain yield as well as agronomic and quantitative genetic aspects of the experiment will be presented and discussed.

Key words: IBM population, maize, photosynthetic performance, quantitative genetics, testcrosses

sa2015_a0313

Procjena stabilnosti indirektnih pokazatelja kvalitete i reoloških svojstava ozime pšenice kod dvije razine gnojidbe dušikom

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Sažetak

Stabilnost indirektinih pokazatelja kvalitete i reoloških svojstava ozime pšenice jedan je od zahtjeva mlinsko-pekarske industrije. U cilju određivanja stabilnosti pokazatelja kvalitete ozime pšenice, tijekom trogodišnjeg ispitivanja posijano je 19 genotipova u osam okolina (kombinacija lokacija x godina) kod reducirane (80 kgN/ha) i optimalne gnojidbe dušikom (180 kgN/ha). Stabilnost ispitivanih svojstava procijenjena je uz pomoć varijance stabilnosti prema Shukla modelu. Kod obje razine dušika, genotip Mihelca pokazao je stabilnost u svih pet indirektnih pokazatelja kvalitete, dok je genotip Sana imao najmanju stabilnost (0/5 vs. 1/5). Prikaz varijanci stabilnosti za farinografska svojstva kod obje razine dušika, pokazuje da su genotipovi Aura, Prima i Tina najstabilniji zbog uočene stabilnosti u svih sedam farinografskih pokazatelja, dok je genotip Renan imao najmanju stabilnost (0/7 vs. 1/7). Stabilnost u najvećem broju ekstenzografskih pokazatelja kod obje razine dušika imao je genotip Golubica (4/5 vs. 5/5) dok su najmanju stabilnost imali genotipovi Banica i Soissons (Banica 1/5 vs. 0/5; Soissons 1/5 vs. 1/5). Vrijednosti korelacija Shukla pokazatelja stabilnosti između dvije razine dušika bile su značajne samo za pojedine ispitivane pokazatelje kvalitete. Rezultati ovog istraživanja upućuju da je oplemenjivanje s naglaskom na kvalitetu potrebno provoditi kod više razina gnojidbe i u više okolina kako bi dobili bolji uvid u stabilnost ispitivanih svojstava.

Ključne riječi: ozima pšenica, stabilnost, kvaliteta, reološka svojstva, gnojidba

sa2015_a0314

Estimate of the stability of indirect quality parameters and rheological properties of winter wheat at two nitrogen fertilization levels

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Abstract

The stability of quality parameters and rheological properties is one of the requests of baking industry. In order to determine the stability of these winter wheat quality indicators 19 genotypes were sown during the three growing seasons in eight environments (location x year) with reduced (80 kgN/ha) and optimum (180 kgN/ha) nitrogen fertilization. The stability of investigated traits was estimated with variance of stability following Shukla model. At both nitrogen levels, genotype Mihelca showed the stability in all five indirect quality parameters, while genotype Sana had the lowest stability (0/5 vs. 1/5). Variance of stability for pharinograph parameters at both nitrogen levels showed that genotypes Aura, Prima and Tina were the most stable genotypes in all seven pharinograph parameters, while the lowest stability was found in genotype Renan (0/7 vs. 1/7). The stability in most extensograph parameters at both nitrogen levels were expressed by genotype Golubica (4/5 vs. 5/5), while the lowest stability was found in genotypes Banica and Soissons (1/5 vs. 0/5 and 1/5 vs. 1/5 respectively). Correlation values of the Shukla stability indicators between two nitrogen fertilization levels were significant only for some investigated quality parameters. Results of the present study suggests that breeding focused at quality should be performed at multiple fertilization levels and environments in order to get better insight into the stability of investigated traits.

Key words: winter wheat, stability, quality, rheological propertis, fertilization

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Nova generacija Bc hibrida kukuruza FAO grupe 600

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Sažetak

Osim genotipa, najveći utjecaj na prinose kukuruza ima okolina, odnosno interakcija genotipa i okoline. Razlike u plodnosti tla, klimatski uvjeti, pojave bolesti i dr. uvelike utječu na visinu i stabilnost prinosa kukuruza. Christiansen (1982.) ističe da se samo 10% svih površina u svijetu, pod uzgojem kulturnog bilja, može uvrstiti u kategoriju područja gdje biljke nisu izložene stresnom utjecaju okoline. Iz ovih razloga neophodno je kreirati nove inbred linije i hibride kukuruza s većim stupnjem tolerantnosti prema biotskim i abiotskim stresovima, koji se javljaju u određenim proizvodnim uvjetima. Tako Duvick (1997.) navodi da se glavnina genetskog poboljšanja prinosa odnosno većih prinosa hibrida novije generacije u odnosu na stare može pripisati povećanoj tolerantnosti na stresna uvjete.

Cilj ovog istraživanja je bio ispitati tri nova hibrida FAO grupe 600 (Dugi, Riđan i Bc 616) u vegetacijskim godinama 2012., 2013. i 2014. na dvije do četiri lokacije na prinos zrna i sadržaj vode u zrnu. Sva tri ispitivana hibrida zabilježila su veće prinose i manji sadržaj vode u zrnu u odnosu na dva ispitivana standarda, a to je naročito bilo izraženo u ekstremno sušnoj 2012. godini kada su te razlike bile i statistički visoko opravdane. U 2014. godini, koja je bila izrazito vlažna, sva tri ispitivana hibrida su kao i u 2012. i 2013. godini zabilježila veće prinose, manji sadržaj vode u zrnu i manji broj slomljenih biljaka u odnosu na dva standarda.

Ključne riječi: kukuruz, hibridi, prinos, stres

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New generation of Bc maize hybrids from FAO 600

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Abstract

Beside genotype, the greatest impact on maize yield has environment and the interaction of genotype by environment. Differences in soil fertility, climatic conditions, diseases and others greatly affect the amount and yield stability of maize. Christiansen (1982) pointed out that there are only 10% of arable areas where the plants are not exposed to stressful environmental impact. For these reasons it is necessary to create new maize inbred lines and hybrids with a higher degree of tolerance to biotic and abiotic stresses, which occur in specific production conditions. So Duvick (1997) states that the majority of genetic improvement of yield and higher yields of newer generation of hybrids compared to the old can be attributed to increased tolerance to stressful conditions. The aim of this study was to examine three new hybrids from FAO 600 (Dugi, Riđan and BC616) in 2012, 2013 and 2014 on two to four locations for grain yield and moisture. All three hybrids had higher yields and lower grain moisture than the two standards, and this was particularly expressed in the extremely dry year 2012 when these differences were statistically highly significant. In 2014, which was very wet, all three hybrids as in 2012 and 2013 recorded higher yields, lower moisture content in grain and a smaller number of broken plants compared to the two standards.

Key words: maize, hybrids, grain yield, stress

sa2015_a0315

Učinak genotipa na prinos zrna i volumen kokičavosti kukuruza kokičara

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Sažetak

Kukuruz kokičar je široko rasprostranjen i bilježi stalni trend rasta proizvodnje. U oplemenjivanju kukuruza kokičara cilj je unaprijediti kako prinos, tako i kvalitetu zrna. Kvaliteta zrna ovisi primarno o volumenu kokičavosti i broju neiskokičanih zrna. Volumen kokičavosti definira se kao volumen dobivenih kokica po gramu zrna kukuruza kokičara (cm^3/g). Ciljevi ovog rada bili su utvrditi učinak genotipa na prinos zrna, volumen kokičavosti i postotak neiskokičanih zrna, te usporediti dvije metode kokičanja. Poljski pokus sa 18 hibrida kukuruza kokičara postavljen je po slučajnom bloknom rasporedu u tri ponavljanja, u Osijeku 2013. godine. Nakon ručne berbe i krunjenja, uzoci zrna pažljivo su sušeni do optimalne vlage za kokičanje (13.5% ± 0.5%). Kokičanje je rađeno u aparatu za kokičanje i mikrovalnoj pećnici. Utvrđen je visokoopravdan učinak genotipa za prinos zrna. Prosječan prinos zrna hibrida kretao se od 4.5 t/ha do 7.6 t/ha. Za volumen kokičavosti i postotak neiskokičanih zrna dobiveni su visokoopravdani učinci genotipa i interakcije genotip x metoda kokičanja. Kod metode kokičanja u aparatu za kokičanje, prosječni volumen kokičavosti iznosio je 33.5 cm^3/g a kretao se od 24 cm^3/g do 40 cm^3/g. Prosjek neikokičanih zrna iznosio je 5.5% a kretao se od 2.5% do 15.6%. Kod metode kokičanja u mikrovalnoj pećnici, prosječni volumen kokičavosti iznosio je 34.2 cm3/g a kretao se od 27 cm3/g do 43 cm3/g. Prosjek neikokičanih zrna iznosio je 4.7% a kretao se od 2.2% do 10.3%. Nije utvđena opravdana korelacija između prinosa zrna i volumena kokičavosti (r= 0.30). Dobiveni rezultati ukazuju da je moguće izdvojiti produktivnije hibride sa većim prinosom zrna i većim volumenom kokičavosti. Za konačnu procjenu volumena kokičavosti i broja neiskokičanih zrna potrebno je koristiti obje metode kokičanja.

Ključne riječi: kukuruz kokičar, hibrid, prinos zrna, volumen kokičavosti.

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Effect of genotype on popcorn grain yield and expansion volume

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Abstract

Popcorn is very popular snack food in a large part of the world. Modern popcorn breeding aims to improve yield and quality together. Quality is measured primarily by the popping expansion volume and the number of unpopped kernels. Expansion volume is defined as the volume of popped corn per gram of unpopped corn (cm^3/g). The objectives of this investigation were to determine the effects of genotype on grain yield, expansion volume, and percent of unpopped kernels and to compare two methods of popping. Field experiment was conducted with 18 popcorn hybrids at Osijek in 2013. Manually harvested and shelled ears of each plot were dried slowly until the kernels reached the optimum moisture for popping (13.5% ± 0.5%). Methods of popping were conventional popping (popping machine) and microwave popping. A significant effect of genotype on grain yield was observed. Grain yield varied from 4.5 t/ha to 7.6 t/ha. Genotype and genotype x popping method interaction affected the expansion volume and percentage of unpopped kernels. In conventional popping, expansion volume averaged 33.5 cm^3/g and varied among hybrids from 24 cm^3/g to 40 cm^3/g. Unpopped kernels averaged 5.5% and varied among hybrids from 2.5% to 15.6%. In microwave popping, expansion volume averaged 34.2 cm^3/g and varied among hybrids from 27 cm^3/g to 43 cm^3/g. Unpopped kernels averaged 4.7% and varied among hybrids from 2.2% to 10.3%. There was no significant correlation between grain yield and volume expansion (r= 0.30). The results indicated that it is possible to select more productive popcorn hybrids with higher yield and greater popping expansion volume. Breeders should conduct evaluations for expansion volume using both popping methods.

Key words: popcorn, hybrid, grain yield, expansion volume

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Učinak selekcije kod dviju razina gnojidbe dušikom na pekarsku kakvoću ozime pšenice

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Sažetak

Gnojidba s dušikom (N) povećava prinos zrna kao i sadržaj proteina u zrnu (GPC), ali predstavlja značajan trošak proizvodnje i ima negativan utjecaj na okoliš. Stoga je zadatak oplemenjivača stvoriti kultivare sa boljom efikasnošću korištenja dušika. Cilj rada bio je procijeniti učinak selekcije provedene kod visoke (N_1) i niske (N_0) razine N gnojidbe u F6 generaciji dvaju križaqnaca pšenice Golubica x Emesse (G×E) i Verbunkos x Soissons (V×S) na pekarsku kakvoću proizvedenih F_7 potomstava uzgajanih kod N_1 i N_0. Kod oba križanja i roditelji i potomstva imali su manje vrijednosti za GPC i sedimentaciju (ZSV) kod N_0 u odnosu na N_1. Kod križanja G×E prosječni GPC na obje razine N bio je podjednak za F_7 potomstva izabrana kod N_0 (13,9% i 14,1%) i kod N_1 (14.8% i 14.9%). Kod križanja VxS vrijednost GPC na N_1 bile su također slične za obje varijante selekcije dok su kod N_0 gnojidbe, F_7 potomstva izabrana kod N_1 imala veću GPC vrijednost (14.4%) u odnosu na N_0 selekciju (13.5%). Prosječna ZSV kod križanja GxE, opažena na obje razine N bila je podjednaka za F_7 potomstva izabrana kod N_0 (49 i 51 ml) i kod N_1 (55 i 56 ml). Kod križanja VxS vrijednost ZSV na N_1 bile su također slične za obje varijante selekcije dok su kod N_0 gnojidbe, F_7 potomstva izabrana kod N_1 imala veću ZSV vrijednost (45 ml) u odnosu na N_0 selekciju (40 ml). Rezultati pokazuju da je selekcija kod optimalne razine N gnojidbe prikladna za poboljšanje svojstava pekarske kakvoće i za uvjete reducirane gnojidbe dušikom.

Ključne riječi: pšenica, proteini, pekarska kakvoća, selekcija, gnojidba

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Effect of selection at two nitrogen fertilization levels on bread-making quality of winter wheat

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Abstract

Fertilization with nitrogen (N) increases grain yield (Y) and grain protein content (GPC), but represents a significant cost of production and has a negative impact on the environment. Therefore the task of breeders is to create cultivars with better N use efficiency .The aim of this study was to estimate the effect of selection, conducted at high (N_1) and low (N_0) levels of N fertilization among F_6 progenies of wheat crosses Golubica x Emesse (G×E) and Verbunkos x Soissons (V×S), on bread making quality of F_7 progenies grown under N_1 and N_0. Parents as well as the progenies of both crosses had lower values of GPC and sedimentation (ZSV) at N_0 than at N_1. In G×E the average GPC value at both N levels was comparable for, the F_7 progenies selected at N_0 (13,9% and 14,1%) and N_1 (14,8% and 14,9%). In V×S GPC values at N1 were similar for both selection variants while at N_0 F_7 progenies selected at N_1 had higher GPC value (14.4%) as compared to the N_0 selection (13.5%). The average ZSV value of the cross G×E at both N levels was similar for F_7 progenies selected at N_0 (49 and 51 ml) and N_1 (55 and 56 ml). In V×S ZSV values at N_1 were also similar for both selection variants while at N_0 F_7 progenies selected at N_1 had the higher average ZSV value (45 ml) in comparison to the selection conducted at N_0 (40 mL). The results indicate that selection conducted at optimal N level will be succesful in improving bread making quality of wheat genotypes adapted to N-deficient environments.

Key words: wheat, proteins, quality, selection, fertilization

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Dialelna analiza otpornosti na fuzarijsku palež klasa kod ozime pšenice

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Sažetak

Oplemenjivanje na otpornost prema fuzarijskoj paleži klasa (FHB) je jedna od glavnih metoda za sprječavanje ove široko rasprostranjene bolesti strnih žitarica. U ovom radu prikazujemo rezultate analize dialela za otpornost prema FHB koja je uključila osam roditeljskih linija i njihove F1 križance bez reciproka, provedene u uvjetima prirodne i umjetne infekcije. U oba uvjeta infekcije zaraza FHB ocijenjena je vizualno i dobiveni su usporedivi rezultati otpornosti (koeficijent korelacije između prosjeka ocjena otpornosti između svih 36 proučavanih genotipova r=0,69**). Na osnovi sume rangova ocjena otpornosti u uvjetima prirodne i umjetne infekcije kao najotpornija roditeljska linija istakla se linija 20810.2.8. Ista roditeljska linija imala je i najviše vrijednost GCA za otpornost (najnegativnija GCA vrijednost ocjene intenziteta zaraze sa FHB), -1.01 u uvjetima prirodne i -15.48 u uvjetima umjetne infekcije. Pet najotpornijih križanaca i u uvjetima prirodne i u uvjetima umjetne infekcije uključivali su kao roditelja liniju 20810.2.8. Najvišu SCA vrijednost otpornosti na FHB u uvjetima prirodne infekcije imao je križanac Marina x FR1E1_4 (-1.64), a u uvjetima umjetne infekcije križanac 20810.2.8. x Golubica (-15.07). Uočena je prisutnost heterozisa za otpornost jer su mnogi križanci pokazali intenzitet oboljenja na razini ili čak manji od razine otpornijeg roditelja.

Ključne riječi: dialel, fuzarijska palež klasa, GCA, ozima pšenica, SCA

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Diallel analysis of resistance to fusarium head blight in winter wheat

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Abstract

Breeding cultivars resistant to fusarium head blight (FHB) is the method of choice for controlling this widespread disease of cereals. We present the results of diallel analysis of FHB resistance involving parental lines and F1s excluding reciprocals under conditions of natural and artificial infection. Under both conditions visual disease symptoms on the heads were assessed and, comparable FHB resistance scores were obtained with correlation coefficient based on mean values for all 36 genotypes of $r=0.69$ ($p<0.01$). Based on the rank-sums for FHB score under both natural and artificial infection conditions the most resistant parental line was 20810.2.8. The same parental line also expressed the highest GCA for resistance (= negative GCA values for FHB scores) under natural and artificial infection conditions, -1.01 and -15.48, respectively. The five most resistant hybrids under both natural and artificial infection conditions all included the parental line 20810.2.8. The highest SCA effects for resistance were under conditions of natural infections found in the cross Marina x FR1E1_4 (-1.64), and under conditions of artificial infection in the cross 20810.2.8. x Golubica (-15.07). Heterosis for resistance was a general phenomenon and several hybrids developed disease on the level or even less than their more resistant parent.

Key words: diallel, fusarium head blight, GCA, SCA, winter wheat

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Parametri fluorescencije kod tri genotipa kukuruza u uvjetima vodnog stresa i stresa uzrokovanog kadmijem

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Sažetak

Suša i kadmij su značajni okolišni čimbenici koji negativno utječu na fotosintezu biljke. Cilj ovog istraživanja je bio istražiti utjecaj kombinacije vodnog stresa i stresa uzrokovanog kadmijem na fotosintetsku aktivnost kukuruza. Sjeme tri genotipa kukuruza (B84, OS6-2 i B84xOS6-2) je posijano u plastične 20-litarske kante u pet ponavljanja. Postavljeni su tretmani: dovoljno vode/bez kadmija, dovoljno vode/5 mg Cd u tlu, nedovoljno vode/bez kadmija, nedovoljno vode/5 mg Cd u tlu za svaki genotip. Biljke su zalijevane po potrebi, a tijekom metličanja tretmani sa nedovoljno vode nisu zalijevani devet dana pri čemu je svaki dan mjerena fluorescencija klorofila. Nakon toga su opet uobičajeno zalijevani i fluorescencija klorofila je mjerena dodatnih sedam dana. Najniže Fv/Fm vrijednosti su bile kod tretmana nedovoljno vode/5 mg Cd u tlu kod linije B84(0.67) koja je također imala i najviše vrijednosti Fv/Fm parametra (0.81) u tretmanu dovoljno vode/bez kadmija. Općenito, najniže Fv/Fm vrijednosti izmjerene su u tretmanima nedovoljno vode/5 mg Cd u tlu, a najviše u tretmanima dovoljno vode/bez kadmija što ukazuje na negativan učinak kombinacije vodnog stresa i stresa uzrokovanog kadmijem. Statistička analiza je pokazala značajne učinke genotipa, dana, vode, kadmija kao i interakcije genotip×kadmij and voda×dan.

Ključne riječi: fluorescencija klorofila, kukuruz, vodni stres, kadmij, fotosinteza

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Chlorophyll fluorescence parameters of three maize genotypes challenged by water and cadmium stress

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Abstract

Drought and cadmium are major environmental factors that negatively affect plant photosynthesis. The aim of this study was to evaluate the effect of combined water and cadmium stress on maize photosynthetic activity. Seeds of three maize genotypes (B84, OS6-2 and B84xOS6-2) were planted in plastic 20 liter pots in five replications. Treatments were set up as: well watered/no cadmium, limited watered/no cadmium, well watered/ 5 mg Cd/kg of soil, limited watered/5 mg Cd/kg of soil for each genotype. Plants were watered as needed and during tasseling limited watered treatment wasn´t watered for nine days, after which it was watered again as usual. During that period chlorophyll fluorescence was measured every day. After watering the limited watered treatment chlorophyll fluorescence was measured for additional seven days. Lowest Fv/Fm values were in limited watered/5 mg Cd/kg of soil treatment for line B84 (0.67) which also had the highest Fv/Fm value (0.81) in well watered/ no cadmium treatment. In general, lowest values were in limited watered/5 mg Cd/kg of soil treatments and the highest in well watered/no cadmium treatments which indicates the severity of combined water and cadmium stress. Statistical analysis has shown significant effects of genotype, day, water, cadmium, as well as genotype×cadmium and water×day interactions.

Key words: chlorophyll fluorescence, maize, water stress, cadmium, photosynthesis

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Reakcija oplemenjivačkih populacija lucerne (*Medicago sativa* L.) na sušne uvjete

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Sažetak

Ciljevi istraživanja bili su utvrditi utjecaj suše na prinos 23 oplemenjivačke populacije/sorte lucerne, procijeniti odnose između dugogodišnjih prinosa lucerne u drugoj i trećoj godini uzrasta i ukupne količine oborina tijekom vegetacijskog razdoblja lucerne te identificirati i izabrati populacije s visokim potencijalom prinosa u sušnim uvjetima proizvodnje. Istraživanje je provedeno tijekom dvije uzastopne sušne godine (2011., 2012.) na pokusnom polju Poljoprivrednog instituta Osijek. Prinosi zelene mase i suhe tvari utvrđivani su u drugoj i trećoj godini uzrasta lucerne, a u svakoj godini ispitivanja pokus je košen pet puta. Stresni uvjeti izazvani sušom utjecali su na smanjenje prinosa kod većine ispitivanih populacija lucerne, ali značajno manje u odnosu na gubitke koje suša može izazvati kod većine drugih poljoprivrednih kultura. Usporedbom prosječnih godišnjih prinosa različitih materijala lucerne u drugoj i trećoj godini uzrasta, ostvarenim u dugogodišnjim ispitivanjima, i ukupnih količina oborina tijekom vegetacijskog razdoblja potvrđena je visoka tolerantnost lucerne na sušu. Oplemenjivačka populacija ABP 13 ostvarila je najveće prosječne prinose zelene mase i suhe tvari u obje godine ispitivanja. Visoki prinosi dobiveni su i populacijama ABP 8, 3, 11 i 17. Navedene populacije pokazale su visok potencijal prinosa i stabilnost u stresnim uvjetima izazvanim sušom te predstavljaju vrijedan genetski materijal za naš daljnji oplemenjivački rad.

Ključne riječi: lucerna, suša, prinos krme, oplemenjivačka populacija, izbor

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Drought stress responses of alfalfa (*Medicago sativa* L.) breeding populations

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Abstract

The objectives of this research were to determine the effect of drought stress on yield in 23 alfalfa breeding populations/cultivars, to evaluate the relationships between long-term alfalfa yields in second and third year of production and total precipitation during the alfalfa growing season, to screen and select breeding populations with high yield potential in drought conditions. The study was conducted in two consecutive dry years (2011 and 2012) at the experimental field of the Agricultural Institute Osijek. The yields of green mass and dry matter were determined in the second and third growing seasons, where in each year of the investigation experiment was cut off five times. Stressful conditions caused by drought resulted in reduced yields in most of the populations of alfalfa, but were substantially less than the losses that drought can cause in most other crops. It was confirmed that alfalfa has high ability to tolerate drought by evaluating the relationships between long-term yields of established alfalfa (in second and third growth season) and total precipitation during the growing season. Breeding population ABP 13 obtained the highest average yields of green mass and dry matter during two consecutive dry years. Populations ABP 8, 3, 11 and 17 had high yields. Listed populations showed high yield potential and stability under drought stress and presented valuable genetic resources for our future breeding work.

Key words: alfalfa, drought, forage yield, breeding population, selection

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Sequence related amplified polymorphism markers based genetic analysis of orange cultivars

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Abstract

Citrus is the most produced fruit group with over the 130 million tons of production. Orange (*Citrus sinensis* L. Osb.) is the first economically important citrus species in the world. Turkey has very suitable ecelogical conditions to produce of citrus especially for fresh consumption. In this research Sequence Related Amplified Polymorphism (SRAP) markers were used to determine genetic diversity and relationships among 86 orange cultivars. Twenty-one SRAP primers produced a total of 134 fragments and 36 of them were polymorphic. The number of average polymorphic fragments per primer was 1.71. Cophenetic correlation between ultrametric similarities of tree and similarity matrix was found to be high ($r = 0.96$; $P<0.01$), suggesting that the dendrogram strongly represented the similarity matrix.The unweighted pair group method arithmetic average (UPGMA) analysis demonstrated that the accessions had a similarity range from 0.87 to 1.00. There was very low genetic variation orange cultivars studied. Some cultivars based on hybrid origin were clearly separated from others. 'Chironja' was the most distant cultivar with similarity level of 0.87. Similarly 'Ambersweet' clearly distinguished from others in the dendrogram. Orange cultivars showed high level of similarity and most of them were nearly identical. There was no variation among the clones of same cultivar such as 'Washington Navel' and 'Valencia'. Our results indicated that most of orange cultivars originated from single mother tree through mutations. Because of this most of orange accessions were not distinguished. This study revealed that the SRAP markers can be utilized to estimate genetic diversity and relationships among orange accessions.

Key words: citrus, *Citrus sinensis*, genetic diversity, SRAP

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Procjena kombinacijske sposobnosti linija kukuruza za prinos zrna i trulež stabljike

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Sažetak

Fusarium graminearum je patogen koji uzrokuje trulež klipa i stabljike kukuruza. Osim smanjenja prinosa *F. graminearum* producira mikotoksine koji predstavljaju opasnost za zdravlje životinja te čine kukuruz neupotrebljivim u ishrani stoke. Cilj ovog rada bio je procijeniti kombinacijske sposobnosti 7 inbred linija kukurza za prinos i trulež stabljke. U pokusu su korištena 42 dialelna test križanca. Pokus je bio postavljen 2013. na lokaciji Rugvica po slučajnom bloknom rasporedu u 4 repeticije, a proučavani su prinos zrna i trulež stabljike. Prinos test križanaca se kretao od 4.78 t/ha (IL1xIL2) do 8.77 t/ha (IL3xIL4). Učinci OKS za prinos kretali su se od -1.1 (IL1) do 0.58 (IL7), a SKS od -1.25 (IL1xIL2) do 1.24 (IL3xIL4). Trulež stabjike kretala se u rasponu od 2.25% (IL3xIL4) do 25.88% (IL1xIL2). Učinci OKS za trulež stabljike kretali su se od -4.78 (IL4) do 3.29 (IL2), a SKS od -9.31 (IL1xIL5) do 9.71 (IL3xIL6). Koeficijent korelacije između prinosa zrna i truleži stabljike iznosio je -0.61.

Ključne riječi: kukuruz, prinos zrna, trulež stabljike, OKS, SKS

sa2015_a0322

Estimation of combining ability of maize inbred lines for grain yield and stalk rot

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Abstract

Fusarium graminearum is a pathogen that causes ear and stalk rot in maize. Besides yield loss, *F. graminearum* produces mycotoxins, which represent danger to animal health and, therefore, the maize becomes unusable for livestock feed. In order to estimate the combining abilities for yield and stalk rot of 7 inbred lines, a field experiment including 42 diallel test crosses and set up as RCBD with 4 replications was in 2013 conducted at the location Rugvica. Grain yield and stalk rot were observed. Grain yield of test crosses ranged from 4.78 t/ha (IL1xIL2) to 8.77 t/ha (IL3xIL4). GCA estimate for yield ranged from -1.1 (IL1) to 0.58 (IL7), and SCA from -1.25 (IL1xIL2) to 1.24 (IL3xIL4). Stalk rot ranged from 2.25% (IL3xIL4) to 25.88% (IL1xIL2). GCA estimates for stalk rot ranged from -4.78 (IL4) to 3.29 (IL2), and SCA from -9.31 (IL1xIL5) to 9.71 (IL3xIL6). Correlation coefficient between grain yield and stalk rot was -0.61.

Key words: maize, grain yield, stalk rot, GCA, SCA

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Screening some Turkish and foreign apricot cultivars for self-compatible and self-incompatible using molecular markers

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Abstract

Turkey is the most important country in terms of apricot production in the world. Apricot has been produced throughout Anatolia since ancient times for its edible fruit, but mostly in Eastern Anatolia. In flowering plants, gametophytic self-incompatibility is one of the major problem preventing self-fertilization controlled by a single locus with some allelic variants. Among the fruits, apricots also shows self-incompatibility especially originated from Middle-Asian and Iranian-Caucasian. In our research, we have studied some apricot cultivars in terms of self-compatible/incompatible in Turkey. Apricot cultivars used in this study consisted of 30 Turkish and 45 foreign accessions. Analyses were carried out using AprFBC8-F and AprFBC8-R, EM-PC2consFD and EM-PC3consRD primer pairs to determine self-incompatible allels and SRc-F and SRc-R primer pairs to determine self-compatible allels. After the DNA isolation and PCR process, PCR product was conducted in metaphor agarose. According to results, 8 of 30 Turkish cultivars were self-compatible whereas 22 of them were self-incompatible which carriying between *S2-S13* allels. Because of Turkish apricots are mostly self-incompatible pollinator cultivars should be considered for plantation new orchards with these self-incompatible cultivars.

Key words: apricot, fertilization, self-compatibility

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Novosti u propisima i proizvodnji poljoprivrednog reprodukcijskog materijala

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Sažetak

Proces usklađivanja hrvatske legislative s pravnom stečevinom Europske unije je posao koji je službeno počeo sredinom prošlog desetljeća. Premda je taj proces u principu završen zbog svakodnevnih izmjena i dopuna ili objave novih propisa Europske unije (EU) obvezni smo i dalje stalno pratiti i usklađivati se s promjenama.

Ulaskom Republike Hrvatske u EU uniju započelo je aktivno sudjelovanje hrvatskih predstavnika u procesima pripreme i donošenja propisa iz područja poljoprivrednog reprodukcijskog materijala.

U nadležnim tijelima EU još uvijek traje rasprava i izrada nacrta Uredbe o poljoprivrednom reprodukcijskom materijalu, koja će zamijeniti postojeće marketinške direktive EU o proizvodnji i stavljanju na tržište poljoprivrednog reprodukcijskog materijala.

Godina i pol dana članstva je prekratko razdoblje da bi se mogli osjetiti svi pozitivni ili negativni učinci pristupanja. Hrvatska mora ubrzati postupak primjene novih standarda, da bi mogla uhvatiti korak s naprednim državama članicama odnosno izboriti se za ulazak i opstanak na jedinstvenom tržištu EU.

U radu su predstavljene novosti o propisima u području poljoprivrednog reprodukcijskog materijala, kao i budući planovi i obveze koje moramo ispuniti. Prvenstveno to se odnosi na izmjenu postojeće neodržive situacije, odnosno podizanje razine kvalitete proizvodnje sadnog materijala voća (*Citrus* spp., *Prunus* spp.), kao i na potrebu izmjene i dopune Zakona o sjemenu, sadnom materijalu i priznavanju sorti poljoprivrednog bilja („Narodne novine“, br. 140/05, 35/08, 25/09, 124/10, 55/11 i 14/14).

Ključne riječi: propisi u području poljoprivrednog reprodukcijskog materijala, usklađivanje, unaprjeđenje kvalitete sadnog materijala voća

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News in regulations and production of agricultural propagating material

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Abstract

The process of harmonization of Croatian legislation with the *acquis communautaire* is a task which officially started in the middle of last decade. Although the process is basically finished with everyday amendments or adoptions of new EU regulations we are obliged to continue to constantly monitor and comply with the changes.

With Croatian accession to the European Union active participation of Croatian representatives has begun in the process of preparation and adoption of regulations in the field of agricultural reproductive material.

In the competent authorities of the EU is still an ongoing debate and drafting of the New Regulation on agricultural reproductive material, which will replace the existing directives of the EU on the production and marketing of plant propagating material.

A year and a half of membership in the European Union is too short period for perceiving effects of membership. Croatia needs to speed up the procedure of implementation of new standards, in order to catch up with advanced Member States countries, or fight for entry and survival in the single EU market.

This paper presents news about regulations in the field of agricultural reproductive material, as well as future plans and obligations that we must fulfill. Primarily this applies to modification of existing unsustainable situation, as well as raising the quality of planting material for fruit (*Citrus* spp., *Prunus* spp., and the need for amending the Law on Seeds, Planting Material and Registration of Varieties of Agricultural Plant.

Key words: regulations in the field of agricultural reproductive material, harmonization, improving the quality of planting material of fruit.

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Provedba Nacionalnog programa očuvanja i održive uporabe biljnih genetskih izvora za hranu i poljoprivredu u Republici Hrvatskoj

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Sažetak

Nacionalni program očuvanja i održive uporabe biljnih genetskih izvora za hranu i poljoprivredu u Republici Hrvatskoj usvojen je u listopadu 2013. godine za trogodišnje razdoblje, od 2014. do 2016. godine.

Temeljni cilj donošenja Nacionalnog programa bio je stvoriti pravni temelj za sustavnu brigu o bioraznolikosti postojećih poljoprivrednih biljnih vrsta u Rebublici Hrvatskoj. Osim nacionalnih zakonskih i provedbenih akata, pravni okvir za izradu i provedbu programa temelji se i na međunarodnoj Konvenciji o biološkoj raznolikosti i dokumentima FAO Komisije za genetske izvore za hranu i poljoprivredu. Nacionalnim programom su utvrđene strateške smjernice razvoja nacionalne politike za očuvanje biljnih genetskih izvora te međunarodne suradnje. Financijska sredstva za provedbu u 2014. godini osigurana su iz Državnog proračuna.

Provedba Nacionalnog programa započela je početkom 2014. godine. U svibnju navedene godine Radna grupa za kontrolu stanja kolekcija i opreme u okviru Nacionalne banke biljnih gena obišla je sve lokacije obuhvaćene Nacionalnim programom (kontinentalna, središnja i primorska Hrvatska, te je izradila Izvješće o provedenoj kontroli stanja kolekcija na terenu. Voditelji radnih skupina za Industrijsko bilje, Krmno bilje, Ljekovito i aromatično bilje, Povrće, Vinovu lozu, Voće, Žitarice i kukuruz i Dokumentacijsko – informacijski sustav dostavili su svoja polugodišnja izvješća. Završno izvješće o provedbi donosi se siječnju za prethodnu godinu provedbe Nacionalnog programa. Ovim predavanjem prikazane su glavne aktivnosti i rezultati provedbe Nacionalnog programa u 2014. godini.

Ključne riječi: Nacionalni program, strateške smjernice, glavne aktivnosti, izvješća i rezultati provedbe u 2014. godini.

sa2015_a0325

The implementation of the National programme for conservation and sustainable use of plant genetic resources for food and agriculture in Croatia

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Abstract

The national program of conservation and sustainable use of plant genetic resources for food and agriculture in the Republic of Croatia was adopted in October 2013 for a three year period, from 2014 to 2016.

The basic goal of the National Programme was to create a legal basis for the systematic care of the existing biodiversity of agricultural plant species in the Rebublic of Croatia. In addition to national acts and implementing regulations, the legal framework for the creation and implementation of programs is based on the international Convention on Biological Diversity and documents of the FAO Commission on Genetic Resources for Food and Agriculture. The National Programme determines strategic guidelines for the development of national policy of conservations of plant genetics resources, and for the international cooperation. Funding for implementation in 2014 is provided in the State Budget.

Implementation of the National Program began in early 2014. In May of that year, the Working Group for the control of the inventory collection and equipment within the National Plant Gene Bank visited all locations which are included in the National Programme (continental, central and coastal Croatia), and has produced a report on the conducted checking of the collections in the field. The heads of the working groups for Industrial crops, forage crops, medicinal and aromatic herbs, vegetables, vines, fruits, cereals and corn and Documentation - information System have submitted their semi-annual report. The final report on the implementation is submitted to January for the previous year of implementation of the National Programme. This lecture presents the main activities and results of the implementation of the National Program in 2014.

Key words: National programme, strategic guidance, the main activities, reports and results of the implementation in 2014.

sa2015_a0325

Genetic variation of S-alleles in wild and sweet cherry population of Czech Republic

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Abstract

Sweet cherry is an important and valuable crop to Czech Republic. A number of wild cherry cultivars have been developed for fruit production and therefore numerous genetic studies have been conducted for the species to understand genetic self-incompatibility mechanism. Gametophytic self- incompatibility is controlled by multi allele S-locus where two tightly linked genes, S-RNase and SFB (S haplotype-specific F-box), determine the specificity of the pollen and the style. As part of this objective we investigated the S-genotype of 91 cheery cultivars i.e. 50 wild and 41 sweet cherry. S- locus analysis was carried out by PCR analysis of S-RNase and SFB genes. PCR was done using conserved primers and fragments detection was carried out by capillary electrophoresis. The genotypes where the length of amplicon had similarity with other alleles were confirmed with the appropriate allele-specific primers for the known alleles. We identified 16 different S haplotypes: S1, S2, S3, S4, S5, S6, S9, S12, S13 and S16 (Sweet cherry) and S7, S14, S18, S19, S21, S22 (wild cherry) and cultivars were assigned to 24 incompatibility groups. Ten new incompatible group varieties were determined for wild cherry which could serve as universal pollinator. S-haplotypes for sweet cherry S1, S3 and S4 were the most frequent and S2 was less frequent in Czech Republic. Other S-haplotypes that were common in northern and central Europe are S5 and S6. The wild cherry populations differed significantly with respect to allelic frequencies from sweet cherry cultivars; alleles S1, S3 and S4, which are more frequent in sweet cherry, were less frequent in the wild cherry collections. S-haplotypes S14, S16 and S22 were the most frequent and S18 was less frequent in wild populations of cherry in Czech Republic. The results evidently provide cross-compatibility information for cross design and orchard management. The results also reveal the S-locus diversity of this plant material.

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Key words: *Prunus avium*, *S*-allele, *S-RNase*, *F-box*

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Croatian 50 2015 10 International Symposium on Agriculture

Section 4

Book of Abstracts

Vegetable Growing, Ornamental, Aromatic and Medicinal Plants

50 Hrvatski 10 Međunarodni Simpozij Agronoma

Zbornik sažetaka

Povrćarstvo, ukrasno, aromatično i ljekovito bilje

Morfološka svojstva češnjaka Zadarske županije

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Sažetak

Na hrvatskom tržištu postoji velika potražnja za domaćim češnjakom, a sadašnja proizvodnja nije dostatna zbog nedostatka kvalitetnog sadnog materijala i neodgovarajućeg skladištenja. U cilju očuvanja domaće autohtone sorte češnjaka od nestajanja i unaprjeđenja proizvodnje, pokrenut je projekt revitalizacije proizvodnje češnjaka u Zadarskoj županiji poznatoj po povoljnim ekološkim uvjetima za njegov uzgoj. Sadni materijal je prikupljen s 4 lokacije iz okolice Benkovca: Bruška (E1), Lisičić (E2), Rodaljice (E3) i Gornji Karin (E4). Poljski pokus postavljen je u jesen 2012. godine u Zadarskoj županiji (Buković) i Zagrebu (Maksimir). Tijekom vegetacije jednom mjesečno su utvrđivani broj listova i visina biljke, dok su pri berbi analizirana morfološka svojstva lukovice (masa, visina, promjer i broj češnjeva). Ekotip E4 je na obje lokacije razvio najviše biljke s najvećim brojem listova. Najveću masu lukovice ostvario je ekotip E2 (25,2 g) na lokaciji Buković, odnosno, ekotip E4 na lokaciji Maksimir (44 g). Na lokaciji Buković lukovice češnjaka razvile su manji broj češnjeva (2,9 do 4,8) u odnosu na lokaciju Maksimir (5,2 do 7,6). Na obje lokacije najvećim brojem češnjeva u lukovici isticali su se ekotipovi E1 i E2. Testirani ekotipovi prema morfološkim svojstvima uz potrošnju u svježem stanju imaju potencijal različite primjene u prerađivačkoj i farmaceutskoj industriji.

Ključne riječi: *Allium sativum* L., masa i promjer lukovice, prinos, broj češnjeva

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Morphologic traits of garlic from Zadar County

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Abstract

There is a great demand for domestic garlic on the Croatian market, and current production is not sufficient due to the lack of quality planting material and inappropriate storage. In order to preserve the local ecotypes of garlic and improve the production, a revitalization of garlic production in Zadar County was initiated, due to favorable environmental conditions for its cultivation in this region. Plant material was collected from four locations from the vicinity of Benkovac: Bruška (E1), Lisičić (E2), Rodaljice (E3) and Gornji Karin (E4). Field trial was set up in the autumn of 2012 in Zadar County (Buković) and Zagreb (Maksimir). During the growing season leaf number and plant height were measured monthly, while morphological traits of bulbs (mass, height, diameter and number of cloves) were analyzed during harvest. At both locations, ecotype E4 developed highest plants with the highest number of leaves. The highest mass of bulb achieved ecotype E2 (25.2 g) at location Buković, respectively, ecotype E4 (44 g) at location Maksimir. Garlic bulbs from location Buković developed smaller number of cloves (2.9 to 4.8) in comparison with the bulbs from location Maksimir (5.2 to 7.6). At both locations the largest number of cloves per bulb developed ecotypesE1 and E2. According to morphological traits, beside for fresh use tested ecotypes could be used in the processing and pharmaceutical industry.

Key words: *Allium sativum* L., bulb mass and diameter, yield, number of cloves

sa2015_a0401

Sadržaj teških metala i sastav masnih kiselina u ekotipovima jadranskog češnjaka (*Allium sativum* L.)

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Sažetak

Cilj istraživanja bio je odrediti teške metale i sastav masnih kiselina 27 ekotipova češnjaka prikupljenih s 21 različite lokacije u sjeverno-istočnom dijelu Jadranske regije. Sadržaj suhe tvari lukovice češnjaka ekotipova Brgud, Konavle, Kurtovići, Ljubitovica, Primorski Dolac (proljetni), Rastok i Vojnić bio je veći od 40%. Najmanja koncentracija Cu zabilježena je kod ekotipa Polača Knin (0,72 g/kg svježe tvari; ST), dok je najveća zabilježena kod Opuzen ozimi (4,34 g/kg ST). Najveći sadržaj Zn zabilježen je kod Opuzen proljetni (23,1 g/kg ST), dok je najniža koncentracija (6,9 g/kg SM) zabilježena kod ekotipova Golubić i Kurtovići. Najmanja koncentracija Cd zabilježena je kod ekotipa Ljubitovica bijeli i Trnbusi 3 proljetni (0,06 i 0,09 g/kg ST). U lukovicama češnjaka s lokacija Rastok, Vojnić i Konavle je zabilježena najveća koncentracija Cd (0,44, 0,41 i 0,39 g/kg ST). Ukupne masne kiseline u lukovici češnjaka bile su od 29,1 do 69,4 mg/kg suhe tvari. Omjer linoleinska/alpha-linoleinska kiselina se smatra važnim čimbenikom u prehrani. Hrvatski ekotipovi češnjaka pokazuju veliku varijabilnost te je na lokacijama Brgud, Kričke, Golubić 1 i 2 zabilježen najmanji omjer linoleinske/alpha-linoleinske kiseline (5,74, 5,79, 5,81 i 5,88). Studija je pokazala kako testirani ekotipovi češnjaka imaju visok sadržaj nutritivno važnih komponenti, kao što su masne kiseline te da su sve komponente kvalitete pod značajnim utjecajem genotipa i lokacije uzgoja.

Ključne riječi: kadmij, bakar, cink, linoleinska/alpha-linoleinska kiselina, suha tvar

sa2015_a0402

Heavy metals and fatty acid composition in Adriatic garlic (*Allium sativum* L.) ecotypes

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Abstract

The aim of this study was to determine the heavy metals and fatty acid composition of garlic bulbs of 27 ecotypes collected from 21 locations in northeastern Adriatic region (Croatia). Ecotypes Brgud, Konavle, Kurtovici, Ljubitovica, Primorski Dolac spring, Rastok and Vojnic had garlic bulbs with more than 40% of dry matter. Lowest bulb Cu concentration was recorded in ecotype from Polaca Knin (0.72 g/kg fresh weight; FW), whereas highest in sample Opuzen winter (4.34 g/kg FW). Highest bulb Zn concentration was recorded in ecotype Opuzen spring (23.1 g/kg FW), while lowest concentrations (6.9 g/kg FW) were found in ecotypes Golubic and Kurtovici. Lowest bulb Cd concentrations were found in ecotypes Ljubitovica White and Trnbusi 3 spring (0.06 and 0.09 g/kg FW). In ecotypes from locations Rastok, Vojnic and Konavle were found the highest Cd concentration in the bulb (0.44, 0.41, 0.39 g/kg FW). Garlic bulbs contained from 29.1 to 69.4 mg/kg DW total fatty acids. Linoleic/alpha-linoleic acid ratio is an important dietary factor, and an alpha-linoleic acid-rich Mediterranean diet is recommended. Croatian garlic ecotypes showed great variability, and garlic from locations Brgud, Kricke, Golubic 1 and 2 had the lowest linoleic/alpha-linoleic acid ratios (5.74, 5.79, 5.81 and 5.88). The study revealed that garlic bulbs had high levels of nutritionally important components, such as fatty acids, and that all quality components were strongly influenced by genotype and location.

Key words: cadmium, copper, zinc, linoleic/alpha-linoleic acid, dry matter

sa2015_a0402

Utjecaj lokacije i izravnog prekrivanja na kakvoću gomolja mladog krumpira (*Solanum tuberosum*)

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Sažetak

Krumpir je jedna od najvažnijih namirnica u ljudskoj prehrani te se uzgaja u različitim agroekološkim uvjetima. Mediteransko područje Hrvatske je osobito važno za proizvodnju mladog krumpira. Poljski pokus proveden je na dvije lokacije (Pula i Split) tijekom dvije godine te je testiran utjecaj izravnog prekrivanja agrotekstilom na koncentraciju minerala, ugljikohidrata, vitamina C i suhe tvari kod pet kultivara krumpira. Koncentracija minerala u gomolju značajno je ovisila o godini uzgoja, dok su razlike između lokacija zabilježene u sadržaju P, Ca i Fe. Sorte su se značajno razlikovale obzirom na koncentraciju N, P, K, Mg i Fe u gomolju, dok nije bilo razlika u koncentraciji Ca. Prekrivene biljke imale su veći sadržaj K u odnosu na neprekrivene, no nije bilo utjecaja prekrivanja na koncentraciju ostalih minerala. Veća koncentracija saharoze, škroba i suhe tvari zabilježena je Splitu u odnosu na Pulu, dok se koncentracija glukoze, fruktoze i vitamina C nije razlikovala između lokacija. Godina uzgoja utjecala je na sadržaj fruktoze i saharoze. Sorte su se razlikovale obzirom na koncentraciju saharoze, škroba, vitamina C i suhe tvari, no ne glukoze i fruktoze. Prekrivene biljke su imale veću koncentraciju ugljikohidrata i suhe tvari u gomoljima u odnosu na neprekrivene, no koncentracija vitamina C je bila veća u neprekrivenim biljkama. Parametri kakvoće gomolja mladog krumpira ovise o agroekološkim uvjetima uzgoja, no kultivar i tehnologija uzgoja također značajno utječu.

Ključne riječi: agrotekstil, kultivar, minerali, ugljikohidrati, vitamin C

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Effect of location and direct covering on the quality of young potato tubers (*Solanum tuberosum*)

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Abstract

Potato is one of the most important foods in human diet and it has been grown under different environmental conditions. Mediterranean area of Croatia is particularly important for production of young potato. A field experiment was conducted at two locations (Pula and Split) during two years. The effect of direct covering with agro-textile on the concentration of minerals, carbohydrates, vitamin C and dry matter in five cultivars of potato was tested. The concentration of minerals in tubers depended on the year of growing, while the differences between locations were observed in concentration of P, Ca and Fe. Concentration of N, P, K, Mg and Fe in tubers was depended on cultivar, but not the concentration of Ca. Covered plants had a higher concentration of K compared to non-covered, but there was no impact of covering on concentrations of other minerals. A higher concentration of sucrose, starch and dry matter was observed in Split compared to Pula. The concentration of glucose, fructose, and vitamin C did not differ between locations. Year of growing influenced the content of fructose and sucrose. Cultivars differed in the concentration of sucrose, starch, vitamins C, and dry matter, but not in glucose and fructose. Covered plants had a higher concentration of carbohydrates and dry matter in tubers, but the concentration of vitamin C was higher in non-covered plants. Quality parameters of potato tubers depend on the environment, but cultivar and technology are also important.

Key words: agro-textile, cultivar, minerals, carbohydrate, vitamin C

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Response of broccoli transplants to addition of selenate

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Abstract

Selenium is a trace element, which is essential for humans and animals. Its essentiality for plants is still debatable, although it can exert positive effect: it functions as an antioxidant, increases the tolerance of plants to UV-induced oxidative stress, delays senescence and promotes the growth of ageing seedlings. In the present study the effect of Se(VI) on physiological and biochemical characteristics of broccoli transplants (*Brassica oleracea* var. *italica*) under controlled conditions were studied. In 3 to 4 leaf stage plants were treated with 0.5 mL of Se(VI) solution in various concentrations: 2, 5, 10, 20 and 50 mg Se L^{-1}. Selected parameters were measured for 11 days. Photochemical efficiency was unaffected the day after Se(VI) addition regardless Se concentration. The negative effect was observed 4 and 8 days after exposure to low and high Se(VI) concentrations. Higher Se doses (20 and 50 mg Se L^{-1}) did not significantly decrease the photochemical efficiency even with longer exposures, although the values were the lowest. The photosynthesis for all Se exposed plants as well as control plants increased from day 1 to 6 and decreased from day 6 to 11. Addition of 20 mg Se L^{-1}positively affected chlorophylls, carotenoids and anthocyanins in the period from day 4 to 8 and a subsequent positive effect of increased content of carotenoids on photochemical efficiency was observed. Other Se(VI) concentrations did not affect the measured pigments. Overall no substantial effect of Se(VI) addition on broccoli transplants was observed indicating that broccoli can cope with relatively high Se concentrations.

Key words: selenium, *Brassica oleracea* var. *italica*, photochemical efficiency, carotenoids, chlorophylls, anthocyanins

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The influence of the tray cells volume on the morphological parameters of cabbage seedlings (*Brassica oleracea* var. *capitata*)

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Abstract

The objective of the study was to determine the cell volume of multicell-trays which could be used for growing of cabbage seedlings. Trays with different cell volume were tested (80, 37, 30, 20 and 18 cm^3), and related number of cells per tray was 40, 84, 104, 160 and 209, respectively. The mono-factorial experiment was set up according to the randomized block scheme with three replications, located at the agricultural school in Prishtina. Next morphological parameters of cabbage seedlings were measured: fresh and dry weight of root, stem and leaf, stem height and diameter, number of leaves and leaf area. The results show that the volume of cell has a great influence on the morphological parameters. Significant impact on the leaf area was found, and it ranged from 309.8 cm^2 at cell volume of 80 cm^3 (40 cells per tray) to 111.11 cm^2 at the variant with 18 cm^3 (209 cells per tray). Also, significant differences were shown by other parameters, such as fresh and dry weight of stem. Opposite to the other parameters, the highest stem was measured at the volume 18 cm^3 (17.72 cm) while the lowest was recorded at the volume 37 cm^3 (15.55 cm). It can be concluded that variants with 84 and 104 plants per tray (volume 37 and 30 cm^3, respectively) can be proposed for cabbage seedlings growing. In spite of small number of plants per tray, trays with 40 cells (volume 80 cm^3) could be recommended as well, because they showed high values of some biometric indicators.

Key words: cabbage, tray, cell volume, morphological parameters

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Dynamic modeling of tension-controlled-irrigation of container grown nursery plants

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Abstract

A simulation model of a closed-loop, feedback control system monitoring moisture tension in the root medium was developed and tested for micro irrigation. The system characteristic equation developed and with parameters and environmental disturbance affecting the system. The calibration and validation of the model was done using experimental data collected for *Acer rubrum* in late summer of Wooster, Ohio, USA. An Evaluation of the model was done using a stochastic based vapor pressure deficit (VPD) evapotranspiration (ET) transfer function. The simulation model underestimated total irrigation water 25% and overestimated irrigation frequency from 0.5 d to 0.69 d according to experimental validation data (14 day period). It was observed that the medium hydraulic characteristics and accuracy of the tensiometer were very critical in the success of the feedback control system for real time scheduling of irrigation and control of the medium tension. A medium water-release curve gives very important information about the tension level of the medium at a certain depth. In order to show spatial variability, two replicates were used for medium analysis in the experimental procedure. Results of the simulation model of the control system indicated that medium tension could successfully schedule irrigation for container grown nursery plants assuming an accurate soil-water release curve was known, tensiometers were properly located and calibrated, and irrigation rates were within certain bounds.

Key words: irrigation scheduling, *Acer rubrum,* red maple, evapotranspiration

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Dynamic behavior and residual pattern of thiamethoxam and its metabolite clothianidin in swiss chard using liquid chromatography-tandem mass spectrometry

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Abstract

A simultaneous method was developed to analyze thiamethoxam (TMX) and its metabolite clothianidin (CLO) in Swiss chard using tandem mass spectrometry (in the positive electrospray ionization mode using multiple reaction monitoring mode) to estimate the dissipation pattern and the pre-harvest residue limit (PHRL). Thiamethoxam (10%, WG) was sprayed on Swiss chard grown in two different areas under greenhouse conditions at the recommended dose rate of 10 g/20 L water. Samples were collected randomly up to 14 days post-application, extracted using quick, easy, cheap, effective, rugged, safe (QuEChERS) acetate-buffered method and purified via a dispersive solid phase extraction (d-SPE) procedure. Matrix matched calibration showed good linearity with determination coefficients (R^2) ≥ 0.998. The limits of detection (LOD) and quantification (LOQ) were 0.007 and 0.02 mg/kg. The method was validated in triplicate at two different spiked concentration levels. Good recoveries (n = 3) of 87.48–105.61% with relative standard deviations (RSDs) < 10 were obtained for both analytes. The rate of disappearance of total thiamethoxam residues in/on Swiss chard was best described by first-order kinetics with half-lives of 6.3 and 4.2 days. It can be predicted from the PHRL curves that if the residues were < 19.21 or 26.98 mg/kg at 10 days before harvest, then total TMX + CLO concentrations would be below the maximum residue limits during harvest.

Key words: Thiamethoxam, metabolite, clothianidin, Swiss chard, LC/MS/MS, dissipation, half-life

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Učinak abiotskih čimbenika na dinamiku rasta i prinos radiča i salate u plutajućem akvaponu

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Sažetak

Akvaponika je kombinirani sustav uzgoja riba i biljaka u recirkulirajućem sustavu koji omogućuje uzgoj raznih vrsta lisnatog povrća i začinskog bilja, a u Hrvatskoj je manje poznat. Cilj istraživanja bio je utvrditi dinamiku rasta radiča i salate u plutajućem akvaponu u odnosu na hidroponski sustav plutajućih ploča (plutajući hidropon). Istraživanje je provedeno u ljetnom razdoblju 2014. godine na pokušalištu Maksimir Agronomskog fakulteta u Zagrebu. Pokus je postavljen po split-plot metodi u tri repeticije, a uključivao je po dvije sorte salate ('Great Lakes' i 'Vegorka') i radiča ('Tržaški salatnik' i 'Palla rossa'). Sjetva je obavljena u polistirenske ploče ispunjene perlitom. Tijekom vegetacije analizirana su morfološka svojstava biljaka (ukupna masa biljke, masa i dužina korijena, masa i visina nadzemnog dijela, broj listova i dužina najdužeg lista). Utvrđene su statistički opravdane razlike u navedenim morfološkim svojstvima istraživanog lisnatog povrća između sustava uzgoja, odnosno, hranivih otopina različitih abiotskih čimbenika. Značajno veće vrijednosti zabilježene su u plutajućem hidroponu. Sorta kod obje vrste nije imala opravdan učinak niti na jedno promatrano svojstvo. Obje istraživane vrste najveći prinos ostvarile su u hidroponskom sustavu, radič sorta 'Tržaški salatnik' (1,295 kg/m^2) i salata sorta 'Great Lakes' (1,96 kg/m^2).

Ključne riječi: *Cichorium intybus* L. *var. foliosum, Lactuca sativa* L., masa listova, prinos

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Growth dynamics and yield of radicchio and lettuce as affected by abiotic factors in floating aquapon

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Abstract

Aquaponics is combination of fish farming and plant production in recirculating system which enables cultivation of various vegetable crops and aromatic plants, and in Croatia is less known. The aim of this research was to determine the growth dynamics of raddichio and lettuce in floating aquapon compared to floating hydropon. The experiment was conducted in summer period 2014 on experimental station Maksimir at Faculty of Agriculture in Zagreb. The experiment was set up according to split-plot design in three replications and included two cultivars of radichio ('Tržaški salatnik' and 'Palla rossa') and two cultivars of lettuce ('Great Lakes' and 'Vegorka'). Sowing was conducted in polystyrene panels filled with perlite. Morphological traits of plants (total plant mass, root mass and length, shoot mass and height, number of leaves and length of the longest leaf) were analyzed continuously during the growing period. Statistically significant differences in these morphological traits of tested leafy vegetables between growing systems, ie, nutrient solution, were determined. Significantly higher values were observed in the floating hydropon. Variety in both species had no significant effect on any of the observed traits. The highest yield researched species achieved in the hydroponic system, chicory cultivar 'Tržaški salatnik' (1,295 kg/m^2) and lettuce 'Great Lakes' (1.96 kg / m2).

Key words: *Cichorium intybus* L. *var. foliosum*, *Lactuca sativa* L., leaves mass, yield

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Utjecaj hranjive otopine na mineralni sastav radiča i salate u plutajućem akvaponu

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Sažetak

Akvaponika je kombinacija zatvorenog recirkulirajućeg sustava akvakulture i hidropona u kojem otopina nastala pri uzgoju riba osigurava hranjiva za uzgoj biljaka. Zbog testiranja ovog sustava uzgoja u Hrvatskoj, tijekom ljetnog razdoblja 2014. provedeno je istraživanje s lisnatim povrćem. Cilj istraživanja je bio utvrditi utjecaj hranjive otopine iz akvaponskog sustava na mineralni sastav po dvije sorte radiča i salate u usporedbi s plutajućim hidroponom sa standardnom hranjivom otopinom. Pokus je postavljen po split-plot metodi u tri repeticije, a uključivao je po dvije sorte radiča ('Tržaški salatnik' i 'Palla rossa') i salate ('Great Lakes' i 'Vegorka'). Tijekom razdoblja uzgoja provedena je analiza kemijskog sastava biljnog materijala i hranjive otopine. U hidroponu koji nije nadopunjavan, u hranjivoj otopini došlo je do povećanja koncentracije svih makrohranjiva (7,135 mg NH_4^+/L, 20,67 mg P/L, 116,67 mg Ca^{2+}/L i 42,8 mg Mg^{2+}/L). Sastav hranjive otopine akvapona tijekom vegetacije bio je ujednačen, a koncentracija makrohranjiva (0,117 mg NH_4^+/L, 2,88 mg P/L, 61,66 mg Ca^{2+}/L i 15,1 mg Mg^{2+}/L) bila je niža nego u hidroponu, izuzev NO_3^- iona čija je prosječna koncentracija bila podjednaka u akvaponu i hidroponu (47,5 i 55,65 mg/L). Analizom mladih listova radiča i salate uzgojenih u akvaponu utvrđena je viša koncentracija nitrata, kalcija i magnezija te niža koncentracija ukupnog dušika, fosfora i kalija u odnosu na biljke iz hidropona.

Ključne riječi: hranjiva otopina, dušik, fosfor, kalij

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The effect of nutrient solution on mineral content of raddichio and lettuce in floating aquapon

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Abstract

Aquaponics is combination of closed recirculating aquaculture and hydroponics in which nutrient-rich effluent from fish tanks is used to fertirigate plants. In order to research this cultivation system in Croatia, an experiment with leafy vegetables was conducted during summer period 2014. The aim of this research was to determine the effect of nutrient solution on mineral content of two cultivars of radicchio and lettuce grown in floating aquapon compared to hydropon with standard nutrient solution. The experiment was set up according to split-plot design in three replications and included two cultivars of radicchio ('Tržaški salatnik' and 'Palla rossa') and two cultivars of lettuce ('Great Lakes' and 'Vegorka'). During the growing period plant material and nutrient solutions were analyzed. There was an increase in the concentration of macronutrients (7.135 mg NH_4^+/L, 20.67 mg P/L, 116.67 mg Ca^{2+}/L and 42.8 mg Mg^{2+}/L) of the nutrient solution in hydropon system, which is not supplementing. The composition of the nutrient solution in aquapon was uniform during the growing period, and the concentration of macronutrients were lower (0.117 mg NH_4^+/L, 2.88 mg P/L, 61.66 mg Ca^{2+}/L and 15.1 mg Mg^{2+}/L), with the exception of NO_3^- whose average concentration was approximately the same in aquapon and hydropon (47.5 and 55.65 mg/L). Baby leaves of lettuce and radicchio grown in aquapon had higher concentrations of nitrate, calcium and magnesium, and lower concentrations of total nitrogen, phosphorus and potassium in comparison to hydropon.

Key words: nutrient solution, nitrogen, phosphorus, potassium

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Morfološka svojstva mrkve uzgajane u konsocijaciji s nevenom

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Sažetak

Istraživana je konsocijacija mrkve (*Daucus carota* L.) i nevena (*Calendula officinalis* L.) na površini Visokog gospodarskog učilišta u Križevcima. Interes za uzgojem bilja u konsocijaciji proizlazi iz potrebe za promjenama dosadašnjeg konvencionalnog uzgoja i smanjivanja primjene kemijskih sredstava u procesu proizvodnje bilja prema integriranoj i ekološkoj proizvodnji. Mrkva je dvogodišnja biljka iz porodice *Apiaceae.* Uzgaja se na manjim površinama u obiteljskom vrtu ili na oranicama za proizvodnju svježe mrkve ili sirovine za preradu. Uzgojem mrkve u konsocijaciji s nevenom pretpostavlja se da će se uz manju primjenu kemijskih sredstava i hraniva postići veći prinos i kvaliteta mrkve. U pokusu su istraživana morfološka svojstva mrkve iz uzgoja u konsocijaciji i uspoređena s kontrolom. Praćenjem rezultata poljskog pokusa uočeno je da su mrkve najdužeg korijena u svim terminima mjerenja dobivene u kontroli (100% mrkva), dok je širina korijena najveća u konsocijaciji u kojoj je zastupljenost nevena 90%. Najviše biljke kao i biljke sa najvećim brojem listova u svim terminima mjerenja zabilježene su u konsocijaciji u kojoj je zastupljenost nevena 75%. Ako promatramo sve istraživane parametre u svim terminima mjerenja, konsocijacija s nevenom pozitivno je utjecala na većinu morfoloških svojstava mrkve. Takav način uzgoja je ekološki prihvatljiv jer se bez korištenja kemijskih sredstava i mineralnih gnojiva postižu zadovoljavajući prinos i kvaliteta.

Ključne riječi: *Daucus carota* L., *Calendula officinalis* L., konsocijacija, morfološka svojstva

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Morphological properties of carrot in consociation with marigold

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Abstract

Research is based on testing of consociation of carrot (*Daucus carota* L.) with marigold (*Calendula officinalis* L.) in area of College of Agriculture at Križevci. The interest in consociated plants growing derives from need for changes in former conventional farming and reducing application of chemical substances in process of producing plants toward integrated and ecological production. Carrot is a biannual plant from *Apiaceae* family. It is cultivated on smaller areas in family gardens or plough lands for production of fresh carrot or raw material for further processing. By growing carrot in consociation with marigold it is assumed that the higher yield and carrot quality will be achieved through reduced usage of nutrients and chemical substances. In the experiment morphological features of carrot from consociation growth were tested and compared to control. By following field results it is noted that the carrots with the longest root in all terms of measurements have come from control growth (100%), while the widest roots come from consociation in which marigold is represented with 90%. The tallest plants, as well as the plants with the highest number of leaves in all measuring terms are noted in consociation in which the marigold is represented with 75%. If we are observing all researched parameters in all terms of measuring, marigold consociation has had a positive impact on most of the morphological features of carrot. Such way of growing is ecologically acceptable, because we are achieving a satisfactory yield and quality without using chemical substances and mineral fertilizers.

Key words: *Daucus carota* L., *Calendula officinalis* L., consociation, morphological properties

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Morfološki pokazatelji i sadržaj C vitamina u listu dragoljuba (*Tropaeolum majus*)

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Sažetak

Dragoljub (*Tropaeolum majus* L.) je visokovrijedna, jednogodišnja zeljasta biljka koja obiluje vitaminom C i mnogim tvarima koji ga čine prirodnim antibiotikom, antimikotikom, purgativom, diuretikom i pravim eliksirom zdravlja. Uz mnogobrojne dobrobiti za zdravlje, dragoljub je također i ukras svakom vrtu. Cilj ovog istraživanja bio je utvrditi utjecaj različitih uvjeta uzgoja na morfološka svojstva visokog i niskog dragoljuba te odrediti sadržaj vitamina C u listu ta dva tipa dragoljuba. Uzgoj dragoljuba u komori s kontroliranim uvjetima rezultirao je kraćim vremenom nicanja te većim postotkom klijavosti u odnosu na uzgoj na otvorenom. Prosječan sadržaj vitamina C u listovima dragoljuba iznosio je 204,16 mg/100g svježe tvari za visoki dragoljub te 189,27 mg za niski. Stoga, dragoljub se može svrstati među visoko vrijede namirnice za ljudsku ishranu s obzirom da sadrži veće vrijednosti vitamina C u odnosu na opće poznate namirnice kao što su limun, paprika, naranča. Ova nedovoljno istražena biljka sa svojim ljekovitim svojstvima te velikim potencijalom za korištenje u farmaceutskoj industriji zaslužuje svoje mjesto u ljudskoj ishrani i na tržištu.

Ključne riječi: dragoljub, vitamin C, listovi, morfološki pokazatelji, način uzgoja

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Morphological characteristics and content of vitamin C in the *Tropaeolum majus* leaves

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Abstract

Nasturtium (*Tropaeolum majus* L.) is a high-quality, annual herbaceous plant that abounds with vitamin C and many substances that make it a natural antibiotic, antifungal, purgative, diuretic and a real elixir of health. In addition to numerous health benefits, nasturtium is also a decoration for every garden. The aim of this study was to determine the effect of different growing conditions on the morphological characteristics of high and low nasturtium plants and determine the content of vitamin C in the leaves of two nasturtium types. Growing nasturtium in growth chamber resulted in a shorter emergence time and a higher germination percentage compared to cultivation in the open air. The average vitamin C content in the leaves of nasturtium was 204.16 mg $100g^{-1}$ fresh weight in high nasturtium, and 189.27 mg in low one. Therefore, nasturtium can be classed as highly valuable plant for human nutrition as it contains higher levels of vitamins C than generally known groceries such as lemon, pepper and orange. This insufficiently explored plant with medicinal properties and a handful of great potential in the pharmaceutical industry deserves a larger place in the human diet as well as in market.

Key words: *Tropaeolum majus*, vitamin C, leaves, morphological characteristics, cultivation method

sa2015_a0411

Study on the variation of oregano under the conditions of three ecological zones in Kosovo

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Abstract

This paper is a study on the identification of genetic variations in oregano plants in three ecological zones of Kosovo (Sharri Mountain, Karadaku Mountain and Bjeshket e Nemuna Mountain). Initially, three points in each zone were determined to take samples for measurements and assessment in order to cover the whole width of the possible morphological variation. In all points of the zones, a total of 10 plants were taken as samples. In order to see if the variation is confirmed or random, the statistical analysis based on the variance analysis was performed and measurements were conducted for the biometric parameters of oregano. The variation of the studied features was more emphasized between zones than within zones. The results of the analysis show a strong positive correlation between the height of the plants and the height of the marketable parts, the height of plants with the height of the leaves with a correlation coefficient, of the height of the plants with the width of the leaves with a correlation coefficient. Yet, there is a negative correlation between the height of plants and the number of main sprigs. It should be mentioned that oregano plant is more present in areas which are more distant from settlements of the zone and that we have observed an uncontrolled use of the plant. This species is constantly witnessing genetic erosion which is gradually endangering and even leading to the extinction of its variation which is present and rich in these areas. Therefore, it is necessary to undertake measure to protect this plant.

Key words: variation, plant, zone

sa2015_a0412

Antioxidant and neuroprotective activities of *Origanum glandulosum* extract and identification of its active constituents

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Abstract

Algerian oregano is commonly used as a spice and in traditional medicine. *Origanum glandulosum* Desf belonging to the *Lamiaceae* family is rich in polyphenols, and essentials oil, which may have antibacterial, antioxidant and other bioactive properties, but little is known about phenolic composition. In the present, phenolic composition, and antioxidant capacity of *Origanum* were evaluated after extraction aerial parts with ethyl acetate. Moreover, the extract was used to isolate and research neuroprotective compounds through the inhibition Amyloid-β peptide (Aβ) aggregation. Results obtained showed that extract had the highest total phenolic content, which was 58.8 ±1.2 mg GAE/g of dry weight (dw) and flavonoid contents with 26.7 ± 1.4 mg QE/g dw. The extract studied showed also most interesting antioxidant activity and significant anti-aggregative activity. HPLC-DAD coupled with mass spectrometry and NMR analyses were used to separate and identify the major compounds present in the oregano extract. Rosmarinic acid, two new cyclolignans: Globoidnan A and B, lithospermic acid and three flavonoids were identified in the extract. Indeed, Rosmarinic acid and Globoidnan A showed significant anti-aggregative activity against Aβ aggregation (IC_{50} 7.0 and 12.0 mM, respectively). In conclusion, the results revealed that *O. glandulosum* extract can be considered to be a rich source of antioxidants and its active compounds could have neuroprotective potential.

Key words: *Origanum glandulosum*, antioxidant, neuroprotective activity, polyphenol, LC-NMR

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Some physico-chemical and microbiological properties of fermented Physalis (*Physalis peruviana*) fruits

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Abstract

The aim of current study was to determine some physico-chemical (proximate analysis, antioxidant activity, total phenol content, mineral contents) and microbiologic properties of fermented Physalis (Cape gooseberry) fruits. The acidity values were stated as 0.47% in brine and 1.11% in products with vinegar. Radical activity values of physalis with brine, vinegar and raw changed between 0.754% (brine) to 4.30% (raw material). In addition, total phenol contents of samples ranged from 0.473 mg GAE/100 ml to 4.30 mg GAE/100 ml. The oil contents of physalis fruits (raw, salted and fermented in vinegar) were found to be 2.25%, 1.03% and 1.17%, respectively. The microbiological analysis were carried out at the end of fermentation, and the total number of bacteria in brine was found to be 8 times more than that in the product with vinegar. Potassium was found as the highest element, and it was followed by P, Mg and Ca in descending order. As Physalis fruits are rich in unsaturated fatty acids, as well as with Ca, Mg, K and P, they can be considered as an important food source in terms of human health and nutrition. Physalis is as nutritionally important as the exotic fruits.

Key words: Cape gooseberry fruit, fermentation, total phenol, antioxidant activity, minerals

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Fertilization of gladiolus in different periods of flowering in the region of Saratov Volga

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Abstract

Gladiolus has a leading position among flowering plants because of its decorative qualities. For more of the decorative effect of plants of gladiolus is of importance the peculiarity of variety, the appropriate nutritional conditions for each variety. No information on varietal responsiveness to fertilizers in the region of Saratov Volga region. The aim of this research was to determine the necessary balance of nutrients in accordance with the biological characteristics and needs of the different varieties of gladiolus and also the optimal timing of their application. The early and late varieties of gladiolus react in different ways to fertilizer. This is due primarily to the peculiarities of growth, biochemical processes, as well as the climatic conditions of cultivation. The early and late varieties of gladiolus cultivated in the same agronomic conditions, but the phases of growth and development in them pass at different times. The results of phenological observations and agrochemical soil research were used to develop a system of mineral nutrition for early and late varieties. Studies have shown that for early varieties application of nitrogen and potassium on 29/05-2/06 (phenophase 2-3 leaves) and 25/06-29/06 (phenophase 5-6 leaves) improves the decorative effect plants, increases the weight of corms. Combination of nitrogen, potassium and phosphorus proved most favorable for the late varieties and it was applied on 10/06-14/06 (phenophase 2-3 leaves) and 5/07-10/07 (phenophase 5-6 leaves).

Key words: gladiolus hybrid, phenology, agricultural technology

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Effects of BA and NAA on regeneration of narcissus bulbs under *in-vitro* condition

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Abstract

Propagation of narcissus by natural vegetative methods is very slow. However, tissue culture is commonly used as a useful tool for rapid propagation of narcissus plant. Different types of explants were tested and finally bulb chips are used as explants. Hence, an experiment was conducted to evaluate the effects of BA and NAA (0.1, 2 and 4 ppm) on regeneration of chips of narcissus bulbs under *in-vitro* condition. Experiment was conducted based on completely randomized design by factorial arrangement with 5 replications in each treatment in modified MS medium. Bulb, root and leaf number and length were evaluated. The result of analysis variance revealed that BA (Benzyl adenine) significantly ($P \leq 0.05$) affected bulb number and diameter. Hence, BA at rate 2 and 4 ppm significantly ($P \leq 0.05$) improved bulb number and diameter, respectively. However, NAA did not significantly ($P \leq 0.05$) affect all measured traits. However, NAA had slightly positive effects on root number and length. The results also revealed that incorporation of BA and NAA did not significantly affect bulb and root length. However, combination of BA (3 ppm) and NAA (4 ppm) had the highest effects on leaf number and length.

Key words: benzyl adenine, bulb, *in-vitro,* MS medium

sa2015_a0416

Secondary metabolite production by *Lilium ledebourii* under *in-vitro* condition

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Abstract

In this experiment, different elicitors such as nano particles of heavy metals and growth regulators were used for secondary metabolites induction under *in vitro* condition. Experiments were conducted to evaluate the effect of different concentrations of Iron and Zinc oxide nano particles (0, 10, 25, 50, 75 and 100 mg l^{-1}), Humic acid (0, 50, 100, 500 and 1000 mg l^{-1}) and Benzyladenine (0, 1, 2, 3 and 4 mg l^{-1}) on total Phenol content, antocyanine and flavonoid of *Lilium ledebourii* Bioss under *in-vitro* condition. Experiment was done based on completely randomized design with six replications. Analysis of variance indicated that total Phenol content, Flavnoide and antocyanine content were significantly ($P \leq 0.01$) differed compared to control. Mean comparison by Duncan's multiple range tests showed that the maximum amount of phenolic content of plantlet was obtained in media containing 1 mg l^{-1} BA. However, the highest content of anthocyanin was obtained from treated plantlets by HA at rate 500 mg l^{-1}. The results also revealed that the highest concentration of flavonoids in 270, 300 and 330 nm wave lengths were obtained in Chelated Iron (10 mg l^{-1}), Iron Oxide (25 mg l^{-1}) and benzyladenine (1mg l^{-1}), respectively.

Key words: abiotic stress, flavnoide, *in-vitro*, nano particles, phenol content

sa2015_a0417

Plantlet regeneration from protoplasts of *Fritillaria imperialis*

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Abstract

There is no published method recommended for protoplast isolation and regeneration from *Fritillaria imperialis* L**.** The present study reports the isolation and regeneration of protoplasts from callus of *Fritillaria imperialis* L**.** A range of parameters which influence the isolation and regeneration of *F. imperialis* protoplasts were researched. From the results obtained, callus fresh weight (FW) of 0.4 g produced the highest number of viable protoplasts, which was 1.12×10^5 protoplasts/g FW. The best treatment for isolation of *F. imperialis* protoplast (7.8×10^5 protoplasts/g FW) was 2% cellulase and 0.1% pectinase with 9% manitol for 8 h. For enhancement of the protoplasts division and the percentage of colony formation, different concentrations from casein hydrolysate, 2.4-D and BA were used. The results revealed that cell wall and colony formation were better in a liquid medium than those on a semi-solid medium. The highest plating efficiency (1.26×10^6 per g FW) and highest callus formation was obtained by using a medium containing 0.5 mg l^{-1} 2.4-D, 1 mg l^{-1} BA and 200 mg l^{-1} casein hydrolysate. Micro calli were formed after one month of culture. Many plantlets were formed on the calli after transfer of the proliferated calli to regeneration medium. The highest plantlet regeneration (100%) was obtained by using a medium containing 0.5 mg l^{-1} NAA, 1.5 mg l^{-1} BA.

Key words: callus formation, *Fritillaria imperialis* L., plant regeneration, protoplast culture

sa2015_a0418

Status biogenih elemenata u travi sportskog travnjaka „SP Mladost“ u Zagrebu

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Sažetak

Jedan od najznačajnijih sportskih travnjaka Grada Zagreba nalazi se unutar „SP Mladost“. Njegova značajnost je u tome što se nalazi na sportskom atletskom borilištu te se koristi za atletske discipline kao što su bacanje diska, koplja, kladiva te kao zona zagrijavanja natjecatelja pa je stoga podvrgnut intenzivnom gaženju. Osobito važna uloga sportskog travnjaka Grada Zagreba SP Mladost vezana je za održavanje Memorijala Borisa Hanžekovića. Tada je travnjak više dana za redom pod velikim opterećenjem i stresom od gaženja i udaranja pa optimalan status hraniva može ublažiti stradanje te potaknuti brži oporavak travnjaka. Pri tome osobito važnu ulogu ima status fosfora u biljci jer utječe na rast i razgranjenje korijena, ali i na i tvorbu klorofila, a time na boju i kvalitetu travnjaka. Cilj istraživanja je bio utvrditi status biogenih elemenata u travi kao ključnog pokazatelja dizajna prihrane za potrebe što boljeg i kvalitetnijeg travnjaka. U tu su svrhu uzorkovanja i analize listova trava provedena tri puta tijekom vegetacije 2012. godine. Utvrđeno je da su količine dušika, kalija i magnezija u travi unutar granica koje sugeriraju literaturni navodi, dok su količine fosfora nedostatne. Količine biogenih elemenata u travi, utvrđene analizom uzoraka, kreću se od 2,66 – 3,60% N, 0,14 – 0,19% P, 1,83 – 2,94% K i 0,12 – 0,24% Mg. Temeljem rezultata istraživanja predlaže se regenerativna gnojidba travnjaka s većom količinom fosfora kao i intenzivnija njega tijekom vegetacije.

Ključne riječi: dušik, fosfor, kalij, sportski travnjak

sa2015_a0419

Status of essential elements in the grass of sports lawn on "SP Mladost" in the City of Zagreb

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Abstract

One of the most important sports lawns of the City of Zagreb is located inside the "SP Mladost". As a part of sports athletics arena has a great significance because it is used for athletic events such as the discus throw, javelin, hammer throw, and as a competitors warm up zone, so it is subjected to intense stamping. Particularly important role of sports lawn of the City of Zagreb on SP Mladost is related to the maintenance of the Memorial Boris Hanžeković. At that time the lawn is for several days in a row under heavy load and stress from stamping and kicking, but the optimal nutrient status can alleviate starvation and encourage faster recovery of the lawn. For this reason important role has the status of phosphorus in the plant because it affects the growth and branching of the root, but also to the formation of chlorophyll, and therefore the color and quality of the lawn. The aim of the research was to determine the status of biogenic elements in the grass as a key indicator for nutrition design for the purposes of better lawn with higher quality. For this purpose, sampling and analysis leaves of grass conducted three times during the growing season in 2012. It was found that the grass leaves content of nitrogen, potassium and magnesium is within the limits suggested by literature data, while phosphorus was deficient. Content of mineral elements in the grass, determined by samples analysis, ranged from 2.66 to 3.60% N, 0.14 to 0.19% P, 1.83 to 2.94% C, and from 0.12 to 0.24% Mg. Based on the research results regenerative fertilization of lawns is proposed with a greater amount of phosphorus as well as intensive care during the growing season.

Key words: nitrogen, phosphorus, potassium, sports lawn

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Dendrološko-krajobrazna valorizacija smokve (*Ficus carica* L.) u vrtovima Šibenika

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Sažetak

Tradicija uzgoja smokve (*Ficus carica* L.) na području grada Šibenika je u većoj mjeri vezana za ruralna područja, a u sustavu gradskog zelenila je rijetka i sporadična. Upravo zbog izrazito dekorativnih karakteristika te kulturološke vrijednosti smokve, neophodno je smokvi dati onaj značaj u krajobraznoj arhitekturi koji joj pripada obzirom na njen doprinos vizualnom obliku u autentičnosti prostora. Cilj ovog rada je izvršiti krajobraznu valorizaciju, inventarizaciju i predočiti estetsku ocijenu vrtnih krajobraza sa smokvom. Provedena je taksonomska analiza vrtova sa smokvom, kao prostornim akcentom, na području Šibenika. Prema rezultatima terenskih istraživanja evidentno je, obzirom na tip habitusa (po Erhardtu i dr. 2002), da u vrtovima dominiraju vrste ukrasnog bilja grmolike forme (19 svojti), a potom slijedi forma stabla (13 svojti). Temeljem dobivenih rezultata istraživanja vizualnog oblika, putem anketnog ispitivanja, može se zaključiti da građani ugodno doživljavaju parkovne prostore sa smokvom te da ista ima veliki značaj za krajobraz, što se može koristiti i u brandiranju Šibenika i okolice.

Ključne riječi: smokva, florističko istraživanje, valorizacija, estetska vrijednost, krajobraz

sa2015_a0420

Dendrological-landscape valorisation of the fig (*Ficus carica* L.) in gardens of Šibenik

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Abstract

The tradition of growing figs (*Ficus carica* L.) on the area of town Šibenik is greatly connected to rural areas, and in the system of urban greenery it is rare and sporadic. Because of its decorative characteristics and cultural value, it is necessary to give importance to the fig in landscape architecture that belongs to it regarding its contribution to the visual form of the authenticity of the area. The aim of this research is to execute landscape valorisation, inventarisation and to present aesthetic opinion of garden landscape with fig. The taxonomic analysis of fig gardens with a spatial accent was completed in Šibenik area. According to the results of field research and considering the habitus type (according to Ehhardt and oth. 2002) it is obvious that gardens are dominated by decorative plants with bushy forms (19 families), followed by tree shapes (13 families). Based on the results of research of visual forms, through the survey, it can be concluded that the park spaces with fig citizens perceived as pleasant. Therefore fig has great significance for the landscape, which can be used in branding of Šibenik and it ssurroundings.

Key words: fig, floristic research, valorisation, aesthetic value, landscape

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Section 5

Book of Abstracts

Field Crop Production

50 Hrvatski 10 Međunarodni Simpozij Agronoma

Zbornik sažetaka

Ratarstvo

The effects of seed priming and nıtrogen doses on seedling growth traits of bread wheat (*Triticum aestivum* L.) varieties

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Abstract

This study was conducted to investigate the effects of seed pre-treatments (control, pure water, 100 and 200 ppm GA_3) and nitrogen doses (0, 25, 50 and 75 kg ha^{-1}) on seedling growth of bread wheat (*Triticum aestivum* L.). The field experiments were conducted at Süleyman Demirel University, Agricultural Research and Experiment Station throughout the growing season of 2007-08 and 2008-09. The winter wheat cultivars, Dagdas-94, Bagci-2002, and Karahan-99 were used in these experiments. The seeds which had been soaked up for 3 hours before sowing had been air dried at room temperature and then planted. Nitrogen dosages were applied with planting.

The effects of seed priming on seedling growth traits were found to be significant. Gibberellic acid treatment (200 ppm) reduced the mean time for 50% germination and increased the length of seedling nearly 33%. Due to increase in the length of seedling, its stems turned out to be yellow and white and lodged. Nitrogen doses on the seedling growth traits were not found to be significant.

Key words: seed priming, wheat seedling, gibberellic acid, nitrogen doses

sa2015_a0501

Prinos vlakna i celuloze stabljike konoplje (*Cannabis sativa* L.) u ovisnosti o gustoći sjetve i gnojidbi dušikom

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Sažetak

Konoplja (*Cannabis sativa* L.) je sve do kraja 18. stoljeća bila nezamjenjiva prediva kultura od čijih se vlakana izrađivala odjeća, konopci i sl. Masovna pojava jeftinih sintetičkih vlakana te stroga kontrola ili čak zabrana uzgoja kao preventivna mjera u borbi protiv njene upotrebe kao droge rezultirali su time da je njezin ekonomski značaj u tolikoj mjeri smanjen da je gotovo potpuno nestala iz proizvodnje, prerade i uporabe. U svijetlu ponovne renesanse konoplje sve je veći interes za njezin uzgoj kako unutar EU tako i širom svijeta. Pored tradicionalnih proizvoda sve veću važnost dobiva uzgoj konoplje kao sirovine za potrebe različitih industrija. Budući da vlakna konoplje, ali i drvenasti dio (pozder) sadrže visok postotak celuloze pobudila je veliki interes kao sirovina za proizvodnju papira.

Cilj ovih istraživanja bio je odrediti optimalnu gustoću sjetve i gnojidbu dušikom pri kojima je moguće dobiti visoke prinose vlakna i celuloze u stabljici konoplje. Istraživanja su provedena kroz poljske pokuse postavljene u sjeverozapadnoj Hrvatskoj (Križevci) tijekom tri godine. Istraživane su tri gustoće sjetve (100, 200 i 300 klijavih sjemenki/m^2) i četiri razine gnojidbe dušikom (0, 60, 120 i 180 kg/ha). Pokus je postavljen po split-blok metodi u pet ponavljanja. U pokusu je korištena mađarska dvodomna sorta Kompolti.

Prosječni prinos suhe tvari stabljike iznosio je 12,3 t/ha. Gušća sjetva (200 i 300 klijavih sjemenki/m^2) i veće količine dušika (120 i 180 kg N/ha) rezultirali su značajno većim prinosima suhe tvari stabljike.

Ostvaren je prosječni prinos vlakna od 3,13 t/ha. Za postizanje visokih prinosa vlakna trebalo bi sijati 200 klijavih sjemenki/m^2 uz gnojidbu sa 60 kg/ha N.

Prosječan prinos celuloze ostvaren u ovim istraživanjima je 6,65 t/ha. Za visoke prinose celuloze trebalo bi sijati minimalno 200 klijavih sjemenki/m^2 uz gnojidbu s najmanje 120 kg/ha N.

Ključne riječi: konoplja, gustoća sjetve, gnojidba dušikom, prinos, vlakno, celuloza

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Fibre and cellulose yield of hemp stem (*Cannabis sativa* L.) depending on sowing density and nitrogen fertilization

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Abstract

Until the end of the 18th century hemp (*Cannabis sativa* L.) was an irreplaceable spinnable culture and its fibres were used in production of clothes, ropes etc. Mass emergence of cheap synthetic as well as a strict control or even ban of cultivation as prevention measure in the fight against its usage as a drug substance resulted in reduction of its economic importance to such an extent that it almost completely disappeared from production, processing and usage. In the light of renewed renaissance of hemp, the interest for its cultivation is increasing, not only in the EU member states, but also worldwide. Hemp cultivation as raw material for the needs of various industries is rapidly increasing in importance along with traditional products. Since hemp fibres, as well as its woody part (shives) contain a large percentage of cellulose, they raised great interest as raw material for paper production.

The aim of this study was to determine the optimum sowing density and nitrogen fertilization which would enable high yields of fibre and cellulose in the hemp stem.

The investigations were carried out by means of field experiments in north-west Croatia (Križevci) during a three-year period. Three different sowing densities (100, 200 and 300 viable seeds/m^2) and four nitrogen rates (0, 60, 120 and 180 kg/ha) were investigated in the experiment. The experiment was set according to split-block method in five replications. The Hungarian dioecious cultivar Kompolti was used in the experiment.

Average dry matter yield of the stem amounted to 12.3 t/ha. Higher density (200 and 300 viable seeds/m^2) and higher quantity of nitrogen fertilization (120 and 180 kg N/ha) resulted in higher yields of the dry matter of the stem.

Average fibre yield amounted to 3.13 t/ha. In order to achieve high fibre yield, it is necessary to sow 200 viable seeds/m^2 and fertilize with 60 kg/ha N.

Average cellulose yield achieved in these researches amounted to 6.65 t/ha. If production aim is high yield of cellulose, it should be sown at least 200 viable seeds/m^2 and fertilized with at least 120 kg/ha N.

Key words: hemp, sowing density, nitrogen fertilization, yield, fibre, cellulose

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Possible cultivation of some maize cultivars for ensilage as second crop under Kayseri conditions

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Abstract

The present research was conducted over the experimental fields of Erciyes University Agricultural Faculty during the year 2011 under second crop conditions. As the plant material, 24 registered hybrid maize cultivars were selected from the registration list of the Ministry of Food Agriculture and Livestock. While there were not any significant differences in plant height, diameter and dry matter content of the cultivars, significant differences were observed in other investigated parameters of the cultivars. Average plants height, diameter and dry matter content of the cultivars were respectively observed as 203.6 cm, 22.3 cm and 44.3%. Among the cultivars, Hido had the shortest emergence period and PR31D24 had the longest emergence period. The cultivars BC5610, BC8605 and Hido were the earliest ones to reach the silage maturity through forming top and cob tassels earlier. On the other hand, the cultivars PR31D24 and PR31G98 were the latest ones to reach the silage maturity. While the cultivars DKC-5783, Hacıbey, Hido and Shemal (1.6-1.7) had the highest number of cob per plant, the cultivars Prestige, PR31A34, PR31G98 and Kuadro (0.7) had the least number of cobs per plant. The cultivar Korimbos had the highest number of leaf and the cultivars Almagro, Prestige and Kuadro had the least number of leaves per plant. While the cultivar Hacıbey (51951 kg/ha) and Oran (51594 kg/ha) had the highest herbage yields, the cultivar Maxima 524 (31586 kg/ha) had the least herbage yield. Since the earliness is to be taken into consideration under second crop conditions, the cultivar Hido may be recommended for its earliness, the cultivars BC 5610 and BC 8605 may be recommended for their herbage yields and the cultivars Hacıbey, Oran and Korimbos may be recommended for their higher number of leaf and cob under Kayseri and similar ecological conditions.

Key words: maize, silage, second crop, yield

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Prinos biomase sirka u različitim okolišima

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Sažetak

Cilj rada bio je ispitati proizvodnost suhe tvari (ST) nadzemne mase glavnih energetskih usjeva za bioplin i hranidbu goveda na području istočne kontinentalne Hrvatske – silažnog sirka i silažnog kukuruza. Ispitivanje je provedenom putem poljskih pokusa u tri različita okoliša (visokoprinosan okoliš u Dalju 2014. s povoljnim temperaturnim i oborinskim režimom tijekom vegetacije te obilnom organskom gnojidbom, srednje prinosan okoliš u Dalju 2013. sa skromnom gnojidbom i sušnim ljetom, i niskoprinosan okoliš u Tordincima 2014. s vrlo kasnim rokom sjetve). Najvećim proizvođačem suhe tvari u svim okolišima pokazao se silažni sirak KWS Tarzan. U najprinosnijem okolišu silažni sirak KWS Tarzan ostvario je prosječni prinos ST 28,0 t/ha, drugi rang prosječnog prinosa imao je silažni sirak KWS Zerberus s 23,9 t/ha, a treći rang silažni kukuruz Drava 404 (Poljoprivredni institut Osijek) s 22,0 t/ha. U srednje prinosnom okolišu KWS Tarzan je ostvario prosječni prinos ST 17,0 t/ha, a za njim je slijedio silažni kukuruz KWS Mikado zasijan u sklopu gušćem od preporučenog za proizvodnju zrna, s 15,7 t/ha ST. U niskoprinosnom okolišu, kod najprinosnije varijante gnojidbe (bioplinski digestat + urea), KWS Tarzan je ostvario prosječni prinos ST 11,8 t/ha, a KWS Zerberus 9,4 t/ha. U istom okolišu gnojidba čistim digestatom polučila je upola manje prinose ST ispitivanih sirkova zbog nedostatka dušika u ishrani biljaka.

Ključne riječi: prinos suhe tvari, silažni sirak, silažni kukuruz, okoliš

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Biomass yield of sorghum in different environments

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Abstract

Aim of the work was to assess the dry matter (DM) productivity of the main energy crops for biogas and cattle nutrition at the east of continental Croatia – the whole crop sorghums and whole crop maize. The research was conducted as a field trial in three differing environments: high-yielding environment of Dalj 2014 with favorable air temperatures and precipitation during the vegetation and by generous soil manuring, medium-yielding environment of Dalj 2013 with modest soil fertilization and hot and drought summer, and low-yielding environment of Tordinci 2014 characterized by very late seeding term. The greatest DM producer in all the environments was silage sorghum KWS Tarzan. At the high-yielding environment KWS Tarzan realized average DM yield of 28.0 t/ha, the second was a silage sorghum KWS Zerberus which realized 23.9 t/ha, and the third was silage maize Drava 404 (of the Agricultural Institute Osijek) which realized 22.0 t/ha of DM in average. In the medium-yielding environment KWS Tarzan yielded 17.0 t/ha of DM in average and the following was the silage maize KWS Mikado with 15.7 t/ha of DM when seeded in greater stand density than recommended for grain production. In the low-yielding environment with the highest-yielding fertilization (biogas digestate + urea) KWS Tarzan realized average DM yield of 11.8 t/ha, and KWS Zerberus 9.4 t/ha. At the same low-yielding environment the fertilization with pure biogas digestate has halved the DM yields of investigated sorghums due to the nitrogen insufficiency in plant nutrition.

Key words: dry matter yield, silage sorghum, silage maize, environment

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Sprječavanje smanjenja proizvodnje sjemenskog krumpira u Hrvatskoj

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Sažetak

Površine pod sjemenskim krumpirom stalno se smanjuju u Hrvatskoj. Od 1985. do 1990. godišnja proizvodnja je bila na 500 ha čime je Hrvatska bila jedan od većih proizvođača u okruženju, dok je 2010. proizvodnja bila na 194 ha, a 2014. na 58 ha, što je najmanje do sada.

Zdravstvenim nadzorom uočena su oštećenja uzrokovana s *Alternaria* spp., *Phytophthora infestans*, *Erwinia carotovora*, *Rhizoctonia solani*, *Streptomyces scabies*, *Spongospora subteranea, Fusarium* spp. i *Pytium* spp. dok nazočnost virusa nije bitnije utjecala na proizvodnju.

Oštećenja uzrokovana abiotskim čimbenicima su bila: babičavost, sekundarni rast klica i gomolja, brazde na gomoljima, oštećenja od mraza i visoke vlaga tla, neodgovarajuća gnojidba, oštećenja pokožice te ona nakon primjene herbicida i folijarne prihrane. Usprkos tome kakvoća sjemenskog krumpira je rasla.

Glavni uzroci smanjenja su manji poticaji, nebriga za domaću proizvodnju, neodređena strategija u proizvodnji sjemenskog krumpira i visoki troškovi proizvodnje po hektaru.

Postojeću tradiciju te dobre pedološke i klimatske uvjete mora se iskoristiti za povećanje proizvodnje sjemenskog krumpira. Važno je da kod nas nema karantenski štetnih organizama *Ralstonia solanacearum, Clavibacter michiganensis* ssp. *sepedonicus, Synchitrium endobioticum,* PSTVd-a i *Epitrx* spp. kao što ih ima u zemljama velikim proizvođačima sjemenskog krumpira.

Navedene prednosti moramo iskoristiti da bi povećali našu proizvodnju sjemenskog krumpira i zaustavili njeno propadanje.

Ključne riječi: sjemenski krumpir, zdravstveni nadzor, povećanje proizvodnje

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Preventing decrease of potato seed production in Croatia

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Abstract

Potato seed production has been decreased constantly in Croatia. Production in period 1985 to 1990 was around 500 ha annually that put Croatia among bigger producers in the region. However, in 2010 production was on 194 ha and 2014 on 58 ha what is the lowest till now.

During health surveillance damages caused by *Alternaria* spp., *Phytophthora infestans*, *Erwinia carotovora*, *Rhizoctonia solani*, *Streptomyces scabies*, *Spongospora subteranea, Fusarium* spp. and *Pytium* spp. were found whereas virus presence had not significant influence on production.

Damages caused by abiotic factors were: little potato, coiled sprout, second growth, growth cracks than frost damage and damages caused by high soil humidity and inappropriate fertilising, damage of scarfskin and the ones after herbicide application and foliar fertilisers. Despite to this, quality of seed potato increased.

The main reasons of decrease of potato seed production are lower subsidies, unconcern for domestic production, undefined strategy of potato seed production and high production costs per hectare.

Existing tradition and good pedological and climatic conditions should be utilized to increase potato seed production. Important is that we do not have quarantine harmful organisms *Ralstonia solanacearum, Clavibacter michiganensis* ssp. *sepedonicus, Synchitrium endobioticum,* PSTVd and *Epitrx* spp. whereas they are present in countries with high potato seed production.

Mentioned advantages should be exploited to increase our potato seed production and to stop its declining.

Key words: seed potato, health surveillance, increasing production

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Regional water availability risk assessment of major field crops in Hungary

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Abstract

Field crop species are exposed to various impacts regarding yield performance and among these impacts, climatic factors play significant role. Our research results are obtained from a study evaluating several climatic impacts on 12 main crop species (alfalfa, winter wheat, maize, spring barley, winter barley, rye, oat, peas, rape, sunflower, sugar beet and potato) in a time range of forty years. Temperature, precipitation and radiation data have been analyzed and crop species reactions have been detected. The main goal of this study was to determine regional aspects.

Aridity and water scarcity determine crop production. Physiological water stresses cause irreversible changes in live structures. An assessment study has been conducted at the Szent Istvan University, Gödöllő to evaluate and identify the main factors of drought. The results of the study suggest that the genetic type of soils provides less information in comparison with water management categories. Infiltration rate and water retention are the most influencing properties regarding water management categories, however impact of these may be modified by permeability, hydraulic conductivity and field capacity properties of a soil. Groundwater depth is the strongest factor in drought assessment of an agricultural region, however its relation with drought indices is highly affected by the water management properties of the very soil. PAI drought index proved to be a reliable indicator regarding aridity and water scarcity conditions of an agro-ecological site. The survey has identified risk assessment factors for twelve regions of Hungary represented by meteorological stations (Békéscsaba, Budapest, Debrecen, Miskolc, Mosonmagyaróvár, Nagykanizsa, Nyíregyháza, Pécs, Siófok, Szeged, Szolnok, Szombathely).

The results of the study suggest that variance in cereals', peas' and oil crops' yield is primarily not depending on climatic factors. It is due to the good climatic adaptability of these crops as they can tolerate even extreme weather situations. However changes in agronomic management may have profound effects. The determination effect of climate is much stronger for maize and potato. These crops are more demanding, so mistakes in agronomic management occur by not protecting from the effect of weather extremities. For these two crops it should be marked that the original gene centre of them is the most far away from our country. The strongest climatic influence could be detected in the case of alfalfa and sugar beet.

Key words: climatic factors, yield stability

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Svojstva kukuruznih ekstrudata s dodatkom prosa

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Sažetak

S ciljem poboljšanja nutritivne vrijednosti i fizikalno-kemijskih svojstava kukuruznih ekstrudata, dio kukuruzne krupice obično se zamjenjuje s brašnima drugih žitarica, pesudožitarica, osušenog voća i povrća i sl.

Cilj ovoga rada bio je ispitati utjecaj dodatka brašna prosa (5%, 10% i 15%) na kvalitetu kukuruznih ekstrudata. Smjese vlažnosti 15% ekstrudirane su u laboratorijskom jednopužnom ekstruderu pri temperaturnom profilu 135/170/170 °C, uz primjenu puža konfiguracije 4:1 i sapnice promjera 4 mm. Dobivenim ekstrudatima ispitana su fizikalna, termofizikalna i reološka svojstva te su rezultati uspoređeni s kontrolnim neekstrudiranim uzorcima.

Dobiveni rezultati pokazali su da je s dodatkom prosa došlo do povećanja ekspanzijskog omjera (EO) i lomljivosti, a smanjenja nasipne mase i tvrdoće ekstrudata. Dodatak prosa i postupak ekstruzije imali su značaj utjecaj na promjenu boje, pri čemu se ukupna promjena boje (ΔE) povećala i to proporcionalno udjelu brašna prosa. Nakon provedenog procesa ekstruzije došlo je do smanjenja viskoznosti vrha, viskoznosti pri 92 °C i 50 °C te su ekstrudirani uzorci bili manje skloni retrogradaciji.

Ključne riječi: ekstruzija, kukuruzna krupica, proso, fizikalna svojstva

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Properties of corn extrudates with addition of millet

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Abstract

In order to improve the nutritional value and physico-chemical properties of corn extrudates, a part of corn grits is usually replaced with flour of other cereals, pseudocereals, dehydrated fruits and vegetables, etc.

The aim of this study was to determine the effect of millet flour addition (5%, 10% and 15%) on properties of corn grits extrudates. Samples with 15% of moisture content were extruded in the laboratory single screw extruder at temperature profile 135/170/170 °C, using a screw with compression ratio 4:1 and die with 4 mm diameter. Physical, thermophysical and rheological properties of the obtained extrudates were investigated in relation to non-extruded samples.

The obtained results showed that addition of millet resulted in increase of expansion ratio (ER) and fracturability, and decrease of bulk density (BD) and hardness of extrudates. Addition of millet and extrusion process resulted in significant colour change, where the total colour change (ΔE) increased proportionally to the amount of millet flour. After extrusion process peak viscosity and viscosities at 92 °C and at 50 °C decreased, and the extruded samples were less prone to retrogradation.

Key words: extrusion, corn grits, millet, physical properties

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Determination of nutrient composition of haulms of potatoes (*Solanum tuberosum* L.) varieties

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Abstract

Objective of this study was to determine the nutrient compositions of haulms of 5 different potato varieties (Milva, Laura, Granola, Europrima and Jelly). Relevant plant material of the study was obtained from cultivation sites of Efsane Seed Company. Samplings were taken before the harvest. Samples were dried at 70° for 48 hours and sieved through 1 mm sieve to make them ready for analysis. Mineral contents were analyzed in Perkin Elmer 2100 DV analyzer. Results revealed that fresh forage yield varied between 4165-6703 kg/ha, dry forage yield between 3816-5272 kg/ha, crude protein (CP) ratio between 10.85-14.48%, crude ash (CA) ratio between 5.22-9.10%, ADF (acid detergent fiber) between 22.46-33.94%, NDF (neutral detergent fiber) ratio between 47.99-60.91%.

With regard to mineral contents of potato haulms, iron content varied between 47.35-180.07, manganese content between 28.14-85.15, cobalt content between 0.43-1.13, nickel content between 3.40-8.60, cupper content between 10.84-15.35, zinc content between 4.14-15.60, cadmium content between 1.02-1.55, and lead content between 6.74-9.80 mg/kg/DM.

Data obtained from potato haulms revealed relatively high feed quality values for the haulms of five different potato varieties. Together with rich mineral contents, they may compensate additional mineral needs in animal feeding. Therefore, it was concluded that haulms of these potato varieties could be used as an alternative forage source in places with lack of quality forage.

Key words: potato, alternative feed, nutrient content, mineral content, NDF

sa2015_a0508

Vrijeme tijekom sjetve i cvatnje kukuruza 2014. godine

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Sažetak

Kako su klimatske promjene u našoj zemlji iz godine u godinu sve češće, njima se treba prilagoditi. Cilj rada je: 1) uz pomoć temperature tla u travnju na 5 cm dubine, oborine i maksimalne temperature zraka tijekom cvatnje prikazati vrijeme po dekadama za Zagreb i Osijek tijekom sjetve i cvatnje kukuruza 2014. godine, 2) za set samooplodnih linija kukuruza izračunati sumu toplinskih jedinica (TJ) za razdoblje sjetva-svilanje, i 3) izračunati sumu oborine i TJ za razdoblje od 1. travnja do 30. rujna. Unatoč toplom i vrlo toplom vremenu u travnju i normalno toplom u svibnju, zbog učestalih (u 2. i 3. dekadi travnja, te 1. i 2. dekadi svibnja u Zagrebu je bilo ukupno 31, a u Osijeku 26 dana s oborinom) i ponegdje vrlo obilnih oborina sjetva u 2014. godini bila je otežana, a ponegdje i nemoguća. Nakon sjetve čest problem bila je pokorica, a stajaće vode ugrožavale su mnoge usjeve. Lipanj i srpanj u Zagrebu i Osijeku bili su nešto topliji od višegodišnjeg prosjeka, ali i kišniji (u Zagrebu u srpnju čak 89%). U razdoblju tijekom cvatnje 2014. god. zabilježeno je u Zagrebu 12, a u Osijeku 16 dana s maksimalnom temperaturom zraka većom ili jednakom 30°C. Inbred linija B73 posijana u Rugvici nedaleko Zagreba trebala je od sjetve do svilanja 855 TJ. U 2014. godini u razdoblju od 1. travnja do 30. rujna palo je 521 mm oborine u Osijeku i čak 814 mm u Zagrebu, pri čemu je u Osijeku nakupljeno 1565 TJ, a u Zagrebu 1472 TJ.

Ključne riječi: kukuruz, sjetva, svilanje, oborine, toplinske jedinice

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Weather conditions during planting and flowering of maize in 2014

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Abstract

As climatic changes in Croatia increasingly occur year after year adequate adaptation is required. The aim of this paper is: 1) to show weather conditions per ten-day periods (10DP) in Zagreb and Osijek during maize planting and flowering in 2014, using soil temperatures in April at 5 cm below ground, precipitation (P) and maximum air temperatures (MAT) during flowering; 2) to calculate the amount of heath units (HU) for a group of maize inbred lines (IL) for the period planting-silking and 3) to calculate the amount of P and HU for the period from April 1 to September 30. In spite of hot and very hot weather in April and normally warm weather in May because of frequent and in some cases heavy P planting was made difficult, in some places even impossible. In the 2nd and 3rd 10DP of April and in the 1st and the 2nd 10DP in May there were 31 days with P in Zagreb and 26 in Osijek. After planting, crust appears as a frequent problem and standing water jeopardized many crops. June and July in Zagreb and Osijek were somewhat warmer than a multi annual average, also more rainy (even 89 % in Zagreb in July). In the period of flowering there were 12 days in Zagreb and 16 days in Osijek with a MAT higher than or equal to 30° C. Inbred line B73 sown in Rugvica near Zagreb needed 855 HU from planting to silking. During the period from April 1 to September 30 there were 521 mm of P in Osijek and even 814 mm in Zagreb with 1565 HU accumulated in Osijek and 1472 HU in Zagreb.

Key words: maize, planting, silking, precipitation, heath units

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Contraction of leaf during drying of some oriental tobacco varieties

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Abstract

Basmak varieties represent a small percentage in structure of tobacco production in Macedonia, which is quite satisfactory considering the fact that *prilep* and *yaka* varieties have strong pleasant aroma and represent tobacco with high quality. Demand in the market for this variety of tobacco has initiated its production on larger areas. During the three years of surveys in 2009, 2010 and 2011, at the experimental field of Tobacco Science Institute - Prilep comparative studies were conducted on tobacco varieties: *yaka 7-4/2* (control) and some *basmak* varieties: *MK-1, MB-2* and *MB -3*. Between all other characteristics, the contraction of the leaves by belts was also calculated. Contraction of leaf was determined by measuring several parameters before and after drying tobacco: leaf thickness, leaf size and leaf surface. The results showed that there is no legitimacy in terms of the degree of contraction during the drying process among the tested variants. But there is a difference in contraction between control and tested variants.

Key words: contraction, oriental tobacco, variety

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Grain yield of different varieties of buckwheat (*Fagopyrum esculentum* Moench) from field trials at the Biotechnical Faculty

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Abstract

On the experimental field of the Biotechnical Faculty, University of Ljubljana in years 2012 and 2013 two block field experiments were set up in which the growth, development and yield of different buckwheat varieties were monitored. The buckwheat seeds of domestical varieties 'Čebelica', 'Darja', 'Siva' and yet unconfirmed variety 'Trdinova', which is a selection of Dolenjska buckwheat from surrounding of Šentjernej (south-east Slovenia) were sown. The only foreign variety included in the experiment was an Austrian variety 'Bamby', which has been entered in the Slovenian national catalog since 2008. Average grain yield of all buckwheat varieties in 2012 was 1.1 t/ha, in 2013 2.1 t/ha; 1000 kg grain's difference between the two years yield was statistically significant ($p = 0.0000$). Different buckwheat varieties were reacting equal with grain yield to changing weather conditions in both years, what shows interaction of year × variety, which was not statistically significant ($p = 0.20$). In both years average the majority of grain was produced with the variety 'Darja' (2.1 t/ha). Compared with variety 'Darja', the two years average grain yield of selection 'Trdinova' was lesser for 300 kg, but the difference between the varieties was not statistically significant ($p = 0.05$). Average grain yield of the Austrian variety 'Bamby' was 1.7 t/ha, which is statistically equivalent to the selection 'Trdinova'. Almost half lower average yield had varieties 'Čebelica' (1.2 t/ha) and 'Siva' (1.1 t/ha). We believe that it is important to continue to encourage farmers to sowing buckwheat because of its resistance to diseases and pests, short growing season, use of buckwheat flour and grains for human consumption and as honey plant. Field trials of our study show that the autochthonous varieties with larger and more reliable yield have advantage in varieties selection for local growing conditions.

Key words: common buckwheat, *Fagopyrum esculentum*, areas, variety trials, grain yield

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Komparacija proizvodnje bioplina iz siliranog sirka i kukuruzne silaže

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Sažetak

Proizvodnja električne energije iz bioplina zbog kontinuiranog procesa predstavlja sigurnu opskrbu električnog sustava za razliku od drugih obnovljivih izvora energije. Međutim, osiguravanje sirovina koje se koriste za proizvodnju bioplina, predstavlja značajan problem. Za proizvodnju bioplina uglavnom se koristi kukuruzna silaža čija cijena značajno varira, s tendencijom stalnog porasta što se direktno odražava na rentabilnost proizvodnje bioplina, ali i na cijenu hrane. U Njemačkoj 83% bioplinskih postrojenja koriste energetske biljke kao koosupstrat, 15% koriste isključivo energetske biljke, a 2% bioplinskih postrojenja koriste samo gnoj iz stočarske proizvodnje. Alternativa za kukuruznu silažu su biljke i organski materijali koje se ne koriste u prehrani ljudi i životinja. Cilj ovog rada je usporediti energetsku vrijednost kukuruzne silaže i siliranog sirka u koodigestiji s govođom gnojovkom pri termofilnim uvjetima.

Ostvarena proizvodnja bioplina iz kukuruzne silaže iznosi 218,13 $m^3 t^{-1}$ s udjelom metana od 64,68%, a iz siliranog sirka 393,40 $m^3 t^{-1}$ s udjelom metana od 67,48%

Razvoj tržišta biomase je logičan slijed jer izmjenama i dopunama Uredbe o minimalnom udjelu električne energije proizvedene iz OIE i kogeneracije čija se proizvodnja potiče (NN 008/2011) propisuje se da će minimalni udio električne energije iz obnovljivih izvora energije i kogeneracije do 31. prosinca 2020. godine iznositi 17,6%.

Ključne riječi: bioplin, biomasa, kukuruzna silža, silaža sirka

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Comparison of biogas production from sorghum silage and corn silage

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Abstract

Due to continuous process, producing electricity from biogas represents a secure supply of the electrical system unlike the rest of other renewable energy sources. However, provision of raw materials that are used in biogas production can represent a significant problem. Corn silage is generally used in the production of biogas. The price of corn silage often varies significantly with the increasing trend what can be directly reflected on the profitability of biogas production and consequently on the food prices. In Germany 83% of biogas plants are supplemented with energy crops substrates, 15% are supplemented with energy crops solely, and 2% work only with manure from livestock production. Plants and organic materials which are not used in the human and animal nutrition are good substitute for corn silage. The aim of this study was to compare the energy value of corn silage to sorghum silage both used in the co-digestion with cattle manure at thermophilic conditions. Biogas production achieved from corn silage reached 218.13 m^3 t^{-1} with 64.64% of methane content, while sorghum silage reached 393.40 m^3 t^{-1} with 67.48% of methane content.

Developing biomass market is a logical stream since the amendments and additions to the Regulation on the minimum share of electricity produced from renewable energy and cogeneration which production is stimulated (NN 008/2011), provides that the minimum share of electricity from renewable energy and cogeneration will amount 17.6% till December 31, 2020.

Key words: biogas, biomass, corn silage, sorghum silage

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Utjecaj Em tehnologije na prinos soje

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Sažetak

U 2014. godini provedeno je ipitivanje Em tehnologije (primjene efektivnih mikroorganizama) u proizvodnji soje. Godina 2014. bila je vlažna s dvostrukom količinom oborina i prosječnom nižom temperaturom zraka i manjim ukupnom sumom temperatura od višegodišnjeg prosjeka, te sa ledotučom u vegetaciji.

Ispitivanje primjene efektivnih mikroorganizama obavljeno je na proizvodnim površinama Gorup kooperacije d.o.o. u Jagodnjaku, na soji ukupne površine od 6 ha. Na osnovu kemijske analize tla obavljena je gnojidba s 60 kg/ha N, 40 kg/ha P_2O_5 i 60 kg/ha K_2O te folijarno Em aktiv i Tetrafert blat u dva tretmana. Prvi tretman Em aktiv bio je u dozi 5 l/ha i 0,3 l/ha Tetrafert blat u fazi treće troliske soje, a drugi tretman pred početak cvatnje. U kontrolnoj varijanti nije obavljena folijarna prihrana. Em aktiv je u obliku tekućeg koncentrata s 25 sojeva bakterija, kvasaca, aktinomiceta i plijesni koji su izvorno izdvojeni iz preko 80 vrsta korisnih mikroorganizama iz 5 porodica i 10 rodova aerobnih i anaerobnih vrsta.

Primjenom Em tehnologije prinos soje je bio veći za 10 %, a sadržaj vlage u zrnu manji za 5 %.

Ključne riječi: Em aktiv, folijarna prihrana, mikroorganizmi, prinos, soja

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Impact Em technology on soybean yield

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Abstract

In year 2014 Em technology (using effective microorganism) tested in soybean production. Year 2014 was very wet with double precipitation and heals during vegetation, lower temperature and heat units comparing to long term average.

Effective microorganisms were tested on 6 ha soybean production from Gorup kooperacija d.o.o. Jagodnjak. Based on soil analysis fertilization has been done with 60 kg N /ha, 40 kg/ha P_2O_5, 60 kg/ha K_2O. Em aktiv and Tetrafert were applied foliar twice. The first treatment with Em active 5l/ha and Tetrafert 0.3 l/ha was in third trifoliate soybean stage and second before flowering. On control plot foliar treatment was not applied. EM active as liquid concentrate contains 25 strains of bacteria, yeasts, actinomycetes and molds which were originally isolated from over 80 species of beneficial microorganisms from five families and 10 genera of aerobic and anaerobic species. With Em technology soybean yield increased for 10 % and moisture content was 5 % lower.

Key words: EM aktiv, foliar application, microorganisms, yield, soybean

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Utjecaj roka sjetve na proizvodna svojstva hibrida suncokreta

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Sažetak

Suncokret (*Helianthus annuus* L.) jara je kultura koja se u našim proizvodnim uvjetima sije tijekom mjeseca travnja, a optimalni rok za sjetvu je polovinom travnja. Sa svrhom utvrđivanja utjecaja optimalnog i kasnog roka sjetve na proizvodna svojstva hibrida suncokreta, postavljeni su poljski pokusi, prema shemi slučajnog bloknog rasporeda u tri ponavljanja, na pokusnom polju Poljoprivrednog instituta Osijek. U pokusima je bilo 25 hibrida: tri strana i dva domaća priznata hibrida, te 20 novih hibridnih kombinacija suncokreta Poljoprivrednog instituta Osijek. Analizirana su sljedeća svojstva: visina biljke, promjer glave, masa 1000 zrna, hektolitarska masa, urod zrna, sadržaj ulja i urod ulja. U optimalnom roku sjetve (19.04.2013.), visina biljke je bila 188 cm, promjer glave 21 cm, masa 1000 zrna 70,2 g, hektolitarska masa 43,2 kg, urod zrna 5,964 t/ha, sadržaj ulja 49,74%, te urod ulja 2,693 t/ha. U odnosu na kasnu sjetvu (14.05.2013.), u optimalnom roku sjetve, samo je visina biljke bila manja za 17 cm, a ostala svojstva su imala veće vrijednosti: promjer glave za 1 cm, masa 1000 zrna za 1,3 g, hektolitarska masa za 2,4 kg, urod zrna za 0,795 t/ha, sadržaj ulja za 2,08% i urod ulja za 0,472 t/ha. Za sva analizirana svojstva, između rokova sjetve utvrđene su statistički značajne razlike na nivou 5%. Navedeni rezultati pokazuju da su značajno bolji proizvodni rezultati postignuti sjetvom hibrida suncokreta u optimalnom roku, pa prema tome treba izbjegavati kasnu sjetvu.

Ključne riječi: suncokret, hibridi, optimalni rok sjetve, kasna sjetva

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Effect of sowing time on production traits of sunflower hybrids

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Abstract

Sunflower (*Helianthus annuus* L.) is a spring crop which is in our production conditions sown during the month of April, and the optimum time for sowing is mid-April. For the purpose of influence determining of optimal and late time of sowing on production traits of sunflower hybrids, field experiments were set according to randomized complete block design with three replications on the experimental field of the Agricultural Institute Osijek. In the experiments were 25 hybrids: three foreign and two domestic recognized hybrids and 20 new sunflower hybrid combinations of the Agricultural Institute Osijek. The following traits: plant height, head diameter, weight of 1000 grains, hectolitre weight, grain yield, oil content and oil yield were analyzed. In optimal sowing time (19 April 2013), plant height was 188 cm, head diameter 21 cm, weight of 1000 grains 70.2 g, hectolitre weight 43.2 kg, grain yield 5.964 t/ha, oil content 49.74%, and oil yield 2.693 t/ha. In comparison to late sowing (14 May 2013), in optimal sowing time, only the plant height was reduced by 17 cm, and other traits had higher values: head diameter for 1 cm, weight of 1000 grains for 1.3 g, hectolitre weight for 2.4 kg, grain yield for 0.795 t/ha, oil content for 2.08% and oil yield for 0.472 t/ha. For all analyzed traits, between sowing times are found statistically significant differences at the level of 5%. These results show that significantly better production results were achieved by sowing sunflower hybrids in optimal time and therefore should be avoided late sowing.

Key words: sunflower, hybrids, optimal sowing time, late sowing

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Bc hibridi kukuruza u proizvodnim pokusima u 2014. godini

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Sažetak

Pokusi Bc hibrida kukuruza u 2014. godini postavljeni su na raznim lokacijama u različitim agroekološkim uvjetima na području cijele Hrvatske. Sjetva kukuruza je bila nešto kasnija od optimalnih preporučenih rokova zbog duljeg hladnog razdoblja i previsoke vlage tla. Priprema tla i sjetva obavljene su u kratkom razdoblju u solidnim uvjetima. U nicanju i za vrijeme ranog porasta kukuruza uvjeti su bili relativno nepovoljni, pa uslijed pojave pokorice na nekim lokacijama nisu ostvareni preporučeni sklopovi. Pred cvatnju i u cvatnji, klimatski uvjeti su bili povoljni na svim područjima uzgoja kukuruza. Tijekom perioda vegetacije u lipnju i srpnju usjevi kukuruza su primali natprosječno velike količine oborina dok su temperature bile niže od višegodišnjih prosjeka. U kolovozu i rujnu nastavlja se razdoblje učestalih oborina, što je rezultiralo kasnim berbama i sporijim dozrijevanjem kukuruza.

Rezultati obrađenih pokusa pokazuju prosječni urod od 12.083 kg/ha i 22,85% vode u zrnu pri berbi, a pokazuje se i prirodna distribucija rezultata rodnosti na način da s duljinom vegetacije raste i urod, a povećava se sadržaj vode u zrnu.

Sagledavajući ostvareni urod u odnosu na brzinu otpuštanja vode iz zrna u ovakvim proizvodnim uvjetima novi Bc hibridi (BC306, BC344, Kekec, Dugi i Riđan) pokazali su prednost pred starijim komercijalnim hibridima.

Ključne riječi: proizvodni pokusi, kukuruz, hibridi, urod

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Bc maize hybrids in production trials in 2014

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Abstract

Trials with Bc maize hybrids were laid out at different locations and agroecological conditions throughout Croatia. Planting was slightly later than the optimal recommended date due to prolonged cold periods and excessive soil moisture. Soil preparation and planting were completed in a relatively short period of time and under solid conditions. During emergence and early growth conditions were relatively unfavourable and due to formation of soil crust at some locations the recommended stands were not achieved. Before and during anthesis climatic conditions were favourable in all maize growing areas. During vegetation period in June and July maize crops received large amount of rainfalls, above average, while the temperatures were below the multi-year average. August and September witnessed periods of frequent rainfalls which resulted in late harvest and slow maize maturity.

The processed results of trials indicated average yield of 12,083 kg/ha at 22.85 % harvest moisture. Natural distribution of yield results was also evident i.e. longer vegetation period resulted in higher yield and increased grain moisture percentage.

Taking into consideration the achieved yield in relation to speed of dry down and harvest grain moisture, under such production conditions the new Bc hybrids (BC306, BC344, Kekec, Dugi and Ridan) showed advantage over those from the later maturity groups.

Key words: production trials, maize, hybrids, yield

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The influence of agrochemical measures on the yield of maize hybrids cultivated on pseudogley

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Abstract

An important limiting factor which affects growth, height and yield stability of many crops grown for food and feed all over the world is soil acidity. To combat soil acidity many measures can be done, such as lime application with or without improvement with manure development or development of germplasm tolerant to acid soils.

In this study, it was examined the influence of different agrochemical measures application on grain yield of maize hybrids, grown for feed on pseudogley, a type of soil with very acid reaction, in rain-fed conditions, as well as on the changes of the chemical properties of the study soil, during 2008, 2009 and 2010. The following selected maize hybrids of FAO maturity group 500 were studied: ZPSC 544, NSSC5043 and KWS LUCE. These hybrids were generally aimed for feed production (either for forage or grain). Agrochemical measures included mineral fertilizers, lime and farmyard manure.

Positive effects of liming were reflected at first on increase of pH values, as well as on available phosphorus. Treatments which include lime increased grain yield. Higher yield potential obtained in variant with mineral fertilizer + lime under unfavourable conditions may suggest that manure incorporation could be inefficient measure for gaining high grain yields under this conditions. When the grain yield of each study year was considered, it could be assumed that 2009 was the year with favourable conditions what was reflected on significantly higher grain yield compared to 2008 (about 35% higher).

Key words: soil acidity, maize hybrids, yield, liming, fertilization

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Utjecaj vremenskih prilika i sorte na agronomska svojstva uljanog lana

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Sažetak

U trogodišnjim poljskim pokusima u sjeverozapadnoj Hrvatskoj (Zagreb - Maksimir) istraživan je utjecaj vremenskih prilika (godine) i sorte na agronomska svojstva (prinos sjemena, udio ulja u sjemenu i prinos ulja) uljanog lana. Istraživanje je provedeno tijekom 2011. - 2013. godine na pokušalištu Agronomskog fakulteta Sveučilišta u Zagrebu. U istraživanje je bilo uključeno 10 sorti uljanog lana: Atalante, Altess, Biltstar, Eole, Flanders, Jantarol, Mikael, Niagara, Oliwin i Princes. Pokus je postavljen prema shemi slučajnog bloknog rasporeda u pet ponavljanja. Od vremenskih parametara, analizirane su: srednje dnevne temperature zraka, broj vrućih dana ($t \geq 30$ °C), količina oborina i trajanje sijanja sunca u godinama istraživanja i višegodišnjem prosjeku (1981.-2010.). Dobiveni rezultati istraživanja pokazali su da na prinos sjemena značajan utjecaj imaju vremenske prilike (osobito količina oborina), sorta i njihova interakcija. Značajno najveći prinos sjemena (2008 kg ha^{-1}) ostvaren je u 2012. godini u kojoj je količina oborina u lipnju (127,9 mm), tj. tijekom cvatnje i ranog razvoja sjemena bila za 31 % veća u odnosu na višegodišnji prosjek (97,4 mm). U isto vrijeme u 2012. godini, zbog visokih temperatura zraka (> 25 °C) smanjen je udio ulja u sjemenu. Najveći udio ulja u sjemenu ostvaren je u 2011. godini s najmanje vrućih dana (3) tijekom lipnja, tj. cvatnje i zametanja sjemena. U prosjeku, najveći prinos sjemena (2052 kg ha^{-1}) ostvarila je sorta Biltstar, a najveći prinos ulja (702 kg ha^{-1}) sorta Niagara. Najveći udio ulja u sjemenu (41,19 % na s.t.) imala je sorta Oliwin.

Ključne riječi: uljani lan, sorta, prinos, vremenske prilike

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The influence of weather conditions and cultivar on the agronomic traits of linseed

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Abstract

The effects of weather conditions (year) and cultivar on the agronomic traits (seed yield, oil content in seed and oil yield) of linseed were investigated in three-year fields trials in northwestern Croatia (Zagreb - Maksimir). The investigations were carried out during 2011 - 2013 at the experimental field of the University of Zagreb, Faculty of Agriculture. The investigations included 10 cultivars of linseed: Atalante, Altess, Biltstar, Eole, Flanders, Jantarol, Mikael, Niagara, Oliwin and Princes. The trials were carried out according to the RCBD in five replications. The weather parameters that were analyzed are: mean daily air temperature, the number of hot days ($t \geq 30$ °C), the amount of precipitations and sunshine duration in the years of research and multi-year average (1981-2010). The obtained results show that weather (especially the amount of precipitations), cultivar and their interaction have a significant influence on the seed yields. Significantly the highest seed yield (2008 kg ha^{-1}) was achieved in 2012 in which the amount of precipitations in June (127.9 mm), i.e. during flowering and early seed development was 31% higher than the long term average (97.4 mm). At the same time in 2012, due to high temperature (> 25 °C) content of oil in seed was reduced. The highest content of oil in seed was achieved in 2011 with a minimum of hot days (3) in June, i.e. during flowering and pollination of seed. On average, the highest seed yield (2052 kg ha^{-1}) achieved cultivar Biltstar and the highest oil yield (702 kg ha^{-1}) achieved cultivar Niagara. The highest oil content in seed (41.19% in DM) achieved cultivar Oliwin.

Key words: linseed, cultivar, yield, weather conditions

sa2015_a0517

Rezultati praćenja krumpirovih cistolikih nematoda programom posebnog nadzora od 2010. do 2013. godine u Hrvatskoj

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Sažetak

Krumpirove cistolike nematode (KCN), zlatnožuta krumpirova cistolika nematoda - *Globodera rostochiensis* (Wollenweber, 1923) i blijedožuta krumpirova cistolika nematoda - *Globodera pallida* (Stone, 1973) najvažniji su štetni organizmi krumpira u svijetu. Osim na krumpiru, najvažnijem domaćinu, ove nematode se mogu razvijati i na drugim vrstama iz porodice *Solanaceae* (npr. rajčica, patlidžan, neke korovne vrste). Obje vrste se nalaze na OEPP/EPPO A2 listi karantenskih štetnika i njihova prisutnost je potvrđena na više područja EPPO regije.

U Hrvatskoj je prvi nalaz *Globodera rostochiensis* zabilježen 2001. godine na području Belice u Međimurskoj županiji (Oštrec i Grubišić, 2002) na poljima gdje je konzumni krumpir uzgajan u monokulturi. Od tada se u sklopu programa posebnog nadzora provodi sustavno praćenje pojave i raširenosti krumpirovih cistolikih nematoda vizualnim pregledima u vegetaciji i prikupljanjem uzoraka tla na cijelom području Hrvatske.

Programom posebnog nadzora kroz laboratorijske analize uzoraka tla potvrđena je prisutnost *G.rostochiensis* na pojedinim lokalitetima Međimurske, Varaždinske, Zagrebačke, Primorsko-goranske županije i prošle godine na jednom uzorku u Ličko-senjskoj županiji u vrlo niskoj populaciji. Sveukupni rezultati laboratorijskih analiza uzoraka tla na prisutnost KCN u Hrvatskoj u razdoblju od 2010. do 2013. godine bit će prezentirani u radu.

Ključne riječi: KCN, program posebnog nadzora, laboratorijska analiza

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The results of the monitoring of the potato cyst nematodes through the survey program in the period of 2010-2013 in Croatia

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Abstract

The potato cyst nematodes (PCN), golden potato cyst nematode - *Globodera rostochiensis* (Wollenweber, 1923) and pale potato cyst nematode - *Globodera pallida* (Stone, 1973) are the most important harmful organisms of potatoes worldwide. In addition to potatoes, the most important host of these nematodes can develop in other species of the *Solanaceae* family (e.g. tomatoes, eggplant, some weed species). Both species are on the EPPO A2 quarantine pests list and their presence has been confirmed in most areas in the EPPO region.

In Croatia, the first record of *Globodera rostochiensis* was recorded in 2001 on the area of Belica in Međimurska County (Oštrec and Grubišić, 2002) in the fields where potatoes for consumption were grown in monoculture. Since then, under the regular survey program carried out systematic monitoring of the occurrence and spread of potato cyst nematodes through the visual inspections in vegetation and collecting soil samples on the whole area of Croatia.

The program of survey through the laboratory analysis of soil samples confirmed the presence of *G.rostochiensis* in some areas of Međimurska, Varaždinska, Zagrebačka, Primorsko-goranska Counties and last year on one sample in Ličko-senjska County in very low population. Overall the results of laboratory analysis of soil samples on the presence of PCN in Croatia in the period from 2010 to 2013 will be presented in the paper.

Key words: PCN, survey program, laboratory analyses

sa2015_a0518

Variability of agronomic and quality traits of winter wheat (*Triticum aestivum L.)* genotypes in Macedonia

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Abstract

The main objective of this research work was to estimate the variability of five wheat cultivars, namely Radika, Milenka and Orovçanka (Macedonia), Pobeda and Novosadska Rana 5 (Serbia), which are most grown cultivars in the last years in Macedonia. The following parameters were analysed: yield, 1000 grain mass, hectolitre weight, protein content, sds-sedimentation test, wet gluten, and Hagberg falling-number. The experiment was located in the production region Pollog (Tetovo), a randomised complete-block design was used, with three replications. Sowing density was 600 kernel/m^2. The results were statistically processed with SPSS 15. Regarding agronomic parameters, Pobeda (7410 kg/ha), NSR 5 (7250 kg/ha), and Orovçanka (7220 kg/ha) demonstrated the best performance for yield; for 1000 grain mass the best values were indicated by the cultivars NSR 5 (44.9 g) and Pobeda (44.6 g), whereas for hectolitre weight Orovçanka had the significant lowest value (75.3 kg) compared to the other cultivars Radika (78.6 kg), NSR 5 (78.8 g), Pobeda (78.9 kg) and Milenka (79.5 kg). For protein content no significant differences were registered, but the overall average protein content was very high (14.76 %). For zeleny-sedimentation test the best performance was achieved by the cultivar Milenka (37 ml), followed by Radika (32.6 ml) and Pobeda (31.6 ml). Further, for wet gluten the best values indicated the cultivars Radika (31, 7%), Milenka (28.9%) and Orovçanka (27.2%). The values of Hagberg falling-number were very high by all cultivars with Radika (566 sec) having the highest and Orovçanka (463 sec) the lowest value. It can be concluded that in Macedonian growing condition, cultivars from Serbia have achieved the best agronomic traits, especially cultivar Pobeda. Domestic cultivars had best performance in quality traits but not in agronomic traits, with the exception of the cultivar Milenka, which had an average performance in agronomic traits. The results of Hagberg falling number indicated that the activity of enzime α-amylase is very low and to ensure high bread making quality the extracted flour from these cultivars must be treated with malt.

Key words: Macedonia, wheat, adaption, agronomic and quality traits

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Resistance of selected maize genotypes against *Fusarium graminearum*

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Abstract

In Kosovo and Albania approximately 60.000 –70.000 ha of maize are cultivated annually. Fungal diseases of maize in particular Fusarium ear rot (FER) are present in both countries and represent a central problem affecting food and feed quality through contamination of the crop with mycotoxins. The aim of the study was to investigate selected maize genotypes for resistance to *Fusarium graminearum* in Kosovo and Albania in order to select resistant genotypes for practical use. The research took place during the vegetative period in 2014 for the second year. For test the same 18 important maize genotypes tested in 2013 (8 from Kosovo and Albania, supplemented with two from Austria) were used. Artificial inoculation was performed with *F. graminearum* incrustrated tooth picks. Disease severity (percentage of diseased ear area) was visually assessed on dehusked ears after ripening. ANOVA analyses showed highly significant differences in FER resistance between the genotypes, ranging from 3.3% to 34.3% ($LSD_{0.05}$=11.4). Highly significant differences in the mean disease level were also present between the countries: in Kosovo the mean disease level was 35.7%, in Albania 5.6%. The genotype by country interaction was also highly significant. The results are similar to those from 2013. Based on results achieved over both years the best genotypes were the landrace LMP-1 from Kosovo and the Austrian hybrid SBL1.

Key words: *Fusarium graminearum*, resistance, *Zea mays*, Kosovo, Albania

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Analysis of benzobicyclon and its metabolite in brown rice and rice straw after field application using liquid chromatography-tandem mass spectrometry

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Abstract

This study was carried out to develop an extraction as well as an analytical method for detecting benzobicyclon and its amino-substituted metabolite (1315P-570) in brown rice and rice straw using liquid chromatography-tandem mass spectrometry (LC-MS/MS) in positive ion mode with multiple reactions monitoring (MRM). The parent as well as the metabolite in rice and rice straw were extracted and analyzed under the same conditions. A correlation coefficient (R^2) of > 0.994 was obtained for matrix-matched calibration curves constructed in various concentration ranges. Recoveries at two fortification levels were satisfactory and ranged between 75.4–118.9% with relative standard deviations (RSDs) < 13%. Under storage conditions (−20°C), the analyte and its metabolite were stable for up to 92 days. The limits of quantitation (LOQs) were lower than the maximum residue limit (MRL) (0.1 mg/kg) set by the Korea Food and Drug Administration for brown rice. Field trials with recommended or double the recommended dose revealed that the herbicide could safely be applied to rice and rice straw, as no residues were detected in the harvested samples. The sensitivity of the developed method was sufficient to ensure reliable determination of benzobicyclon and its metabolite in rice grain and rice straw.

Key words: residue, herbicide, metabolite, unpolished rice, rice straw, analysis

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Analiza rasta tijekom vegetacije šećerne repe ovisno o gustoći sjetve

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Sažetak

U ovom istraživanju praćen je rast šećerne repe u poljskim uvjetima uzgoja tijekom vegetacije šećerne repe u 2014. godini na lokaciji Gradište (Vukovarsko–srijemska županija). Sjetva šećerne repe (hibrid Serenada, KWS) obavljena je 18. ožujka 2014. na međuredni razmak od 50 cm i četiri različita razmaka unutar reda: 13 cm, 15 cm, 17 cm i 19 cm. Tijekom vegetacije u osam rokova (10. i 30. lipnja, 10. i 30. srpnja, 10. i 30. kolovoza te 10. i 20. rujna) uzimani su uzorci pet biljaka šećerne repe na kojima je utvrđena masa svježeg korijena (g/biljci), a u poprečnom presjeku najšireg dijela vrata korijena (*hypocotyl*) određen je promjer, broj kambijalnih prstenova te broj kambijalnih prstenova na 1 cm promjera. Gustoća sjetve je imala značajan utjecaj (P≤0,05) na masu svježeg korijena (g/biljci), promjer korijena (cm), broj kambijalnih prstenova i broj kambijalnih prstenova na 1 cm promjera korijena. Očekivano, najmanju masu korijena imale su biljke sijane na najveću gustoću od 13 i 15 cm (prosječno 156,9 g/biljci u lipnju 589,0 g/biljci u srpnju, 922,7 g/biljci u kolovozu i 1172,4 g/biljci u rujnu), dok su najveću masu korijena imale biljke najrjeđe sjetve na 17 i 19 cm (prosječno 249,2 g/biljci u lipnju 1236,6 g/biljci u srpnju, 2020,8 g/biljci u kolovozu i 2874,6 g/biljci u rujnu). Prosječan promjer korijena ovisno o razmaku unutar reda očekivano je najmanji kod sjetve na najuži razmak (13 cm), te najveći kod sjetve najšireg razmaka u redu (19 cm), dok kod sjetve na razmak od 15 i 17 cm unutar reda nije utvrđena statistički značajna razlika u promjeru korijena. Rast korijena u širinu povećava se sazrijevanjem repe te promjer korijena prosječno za sve gustoće sjetve raste od 4,13 cm u prvoj dekadi lipnja do 12,51 cm u drugoj dekadi rujna pri čemu je promjer varirao od 11,55 cm u najgušćoj sjetvi do 14,79 u najrjeđoj sjetvi. Nadalje, prosječno za sve gustoće sjetve intenzivno stvaranje kambijalnih prstenova utvrđeno je u lipnju te je početkom lipnja broj prstenova iznosio prosječno 4,9, a na kraju lipnja prosječno 7,3. U rujnu je korijen šećerne repe imao prosječno 8,4 kambijalna prstena. Na 1 cm promjera korijena utvrđen je najveći broj prstenova 30. srpnja, prosječno 1,52, a do rujna prosječan broj kambijalnih prstenova na 1 cm promjera nije se statistički značajno mijenjao. Općenito su biljke sijane na širi razmak u redu (17 i 19 cm) kroz cijelu vegetaciju imale prosječno veći promjer (10,36 cm) i masu (korijena 1277,6 g/biljci), u odnosu prosječan promjer (8,89 cm) i masu korijena (808,6 g/biljci) užeg razmaka sjetve unutar reda (13 i 15 cm).

Ključne riječi: kambijalni prstenovi, korijen, masa, promjer, šećerna repa

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Growth analysis of sugar beet in different sowing density during vegetation

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Abstract

The aim of this study was analyses of sugar beet growth in field conditions during 2014 growing season at Gradište (Vukovar-Srijem County). Sugar beet (hybrid Serenade, KWS) was sown on March 18 at inter-row spacing of 50 cm and four different intra-row spacings: 13 cm, 15 cm, 17 cm and 19 cm. During growing season samples of five sugar beet plants were taken in eight terms (10 and 30 June, 10 and 30 July, 10 and 30 August, 10 and 20 September). In each sampling term sugar beet root fresh weight (g/plant) was determined and further, at the cross section of widest hypocotyl part, diameter, number of cambium rings and the number of cambium rings of 1 cm diameter were determined. Sowing density had a significant effect ($P \leq 0,05$) on root fresh weight (g/plant), root diameter (cm), number of cambium rings and the number of cambium rings of 1 cm diameter. As expected, the lowest root weight had plants sown at the highest densities of 13 and 15 cm intra-row spacings (average 156.9 g/plant in June, 589.0 g/plant in July, 922.7 g/plant in August and 1172.4 g/plant in September), while the highest root weight had plants at sowing on 17 and 19 cm intra-row spacings (average 249.2 g/plant in June 1236.6 g/plant in July, 2020.8 g/plant in August and 2874.6 g/plant in September). Furthermore, average root diameter was as expected the lowest at intra-row spacing 13 cm, and the highest at intra-row spacing 19 cm, while intra-row spacing 15 and 17 cm have not statistically significant difference in root diameter. Root growth in width increases with root maturation and the average diameter of all sowing densities increases from 4.13 cm in the first decade of June to 12.51 cm in the second decade of September wherein the diameter varied from 11.55 cm (intra-row spacing 13 cm) to 14.79 cm (intra-row spacing 19 cm). Intensive formation of cambium rings for all densities was found in June, where at the beginning of June, the average number of cambium rings was 4.9, while and at the end of June the average number of cambium rings was 7.3. In September, sugar beet root had on average of 8.4 cambium rings. On July 30 largest number of cambium rings at 1 cm root diameter was on average 1.52 and to the September it was not significantly different. Generally, during the growing season the plants sown at wider intra-row spacings (17 and 19 cm) had on average higher root diameter (10.36 cm) and root weight (1277.6 g/plant) compared to average root diameter (8.89 cm) and root weight (808.6 g/plant) narrower intra-row spacings (13 and 15 cm).

Key words: cambial rings, root, weight, diameter, sugar beet

sa2015_a0522

Selenium fertilization and accumulation in Kral 97 barley (*Hordeum vulgare* L.) cultivar

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Abstract

Selenium (Se) is a micronutrient and required only in small amounts to maintain normal cellular functions of many organisms. However, high amounts of Se salts may exhibit toxicity in susceptible organisms. Barley (*Hordeum vulgare L.*) is a precious food source for animals. Thus, in the current study the accumulation of Selenium (Se) was researched in root and stem parts of registered barley cultivar Kral 97 upon soil application of sodium selenite (Na_2SeO_3) in liquid state at the doses of 1, 2, 3, and 4 g ha^{-1}. Se concentrations in samples were analyzed by hydride generation (FIAS-400) Atomic Absorption Spectrophotometry (Perkin Elmer AAnalyst 800) with the detection limit of 0,003 mg kg^{-1}. The experimental soil comprised of 30% sand, 23% clay and 46% silt, containing an average Se content of 0.832 mg kg^{-1} with a pH of 8.3. Results indicated that the total Se content in root and stem was calculated to be 0.279 and 0.231 mg kg^{-1}, respectively. Detection limits of Se between doses were observed to be ranging from 0.092 to 0.524 mg kg^{-1} for root and from 0.082 to 0.411 mg kg^{-1} for stem. This type of fluctuation for selenium content in root and stem parts can be explained by experimental and analytical heterogeneity. It was observed that there were not any significant differences in Se accumulation of experimental doses, indicating that Kral 97 is not accumulating Se by increasing soil application of the element up to 4 g ha^{-1}. Given that some of the other barley varieties accumulate selenium, further studies should be carried out on Kral 97.

Key words: Selenium accumulation, Sodium Selenite, Kral 97, Barley cultivar, *Hordeum vulgare* L.

sa2015_a0523

Reakcija ratarskih kultura na melioracijsku gnojidbu fosforom (pregled)*

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Sažetak

Niska razina biljkama pristupačnog fosfora (P) često ograničava plodnost tla u Hrvatskoj, te u Bosni i Hercegovini (BiH). Cilj ovoga rada je pregled novijih rezultata (osam stacioniranih poljskih pokusa) reakcije ratarskih kultura (kukuruz, pšenica, soja i ječam) na melioracijsku gnojidbu fosforom. MAP (monoamonijev fosfat: 12% N + 52% P_2O_5) ili trostruki superfosfat (45% P_2O_5) korišteni su kao izvori fosfora. Unatoč niskom sadržaju pristupačnog P u tlu (ispod 10 mg P_2O_5 /100 g određenog prema AL-metodi), reakcija usjeva na gnojidbu u četiri pokusa u Hrvatskoj bila je skromna ili bez signifikantne razlike prinosa. Međutim, u BiH je primjenom 1580 kg P_2O_5/ha prinosi kukuruza su povećani, ovisno o godini, od 16 do 40% (Kozarska Dubica), od 8 do 38% (Gradiška) i od 6 do 18% (Laktaši). Također, primjenom 975 kg P_2O_5/ha je prinos soje (Odžak) povećan za 20%.

Pretpostavljamo da AL-metoda nije pouzdan kriterij za procjenu opskrbe fosforom za sva analizirana tla. S druge strane, većina analiziranih tala ima i druga ograničenja prinosa kao što su nizak pH i nepovoljna fizikalna svojstva.

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Congress Book (http:// agribalkan.org), Balkan Agricultural Congress, 8-11 Sept. 2014, Edirne, Turkey p. 901-902.

Ključne riječi: gnojidba fosforom, prinos zrna, kukuruz, pšenica, soja, ječam

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Response of field crops to ameliorative phosphorus fertilization*

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Abstract

Low levels of plant available phosphorus (P), are often limiting factor of soil fertility in Croatia and Bosnia and Herzegovina (B&H). Aim of this study was survey recent investigations of field crops (maize, wheat, soybean and barley) response to ameliorative P fertilization. Eight stationary field experiments were tested. Either MAP (monoammonium phosphate: 12% N + 52% P_2O_5) or triplephosphate (45% P_2O_5) were used as source of P. In spite of low levels of available P (ammonium lactate method: below 10 mg P_2O_5/100 g of soil), response of the field crops to applied fertilization in four experiments in Croatia was mainly moderate or without significant differences. However, in B&H by using the rate of 1580 kg P_2O_5/ha maize yields were increased, depended on year, from 16 to 40% (Kozarska Dubica), from 8 to 38% (Gradiska) and from 6 to 18% (Laktasi). Also, by using 975 kg P_2O_5/ha soybean yield in Odzak trial was increased for 20%. We presume that AL-method is not suitable as universal criterion of P supplies. From other side, majority of tested soils have very low pH and unfavorable physical properties.

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Key words: phosphorus fertilization, grain yield, maize, wheat, soybean, barley

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Section 6 **Book of Abstracts**
Fisheries, Game Management and Beekeeping

50 Hrvatski
10 Međunarodni Simpozij Agronoma

Zbornik sažetaka
Ribarstvo, lovstvo i pčelarstvo

Istraživanje selektivnosti pridnene povlaćne mreže koće s različitom veličinom oka (otvora)

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Sažetak

S ciljem utvrđivanja razine selektivnosti između mreža s različitim otvorima na saki, provedeno je istraživanje u kanalskom području te otvorenom dijelu srednjeg Jadrana korištenjem metode eksperimentalnog koćarenja s pokrovnom sakom (cover/cod-end method). Analizom podataka utvrđena je značajna razlika razine selektivnosti između mreža ovisno o sastavu pridnenih vrsta te dužinske strukture populacija. Pristupom Republike Hrvatske Europskoj Uniji sva ribarska plovila koja obavljaju gospodarski ribolov pridnenom povlačnom mrežom u ribolovnom moru RH trebaju zamijeniti tradicionalnu saku veličine oka 40 mm romboidnog tega sukladno odredbama Uredbe Vijeća 1967/2006, tzv. Mediteranske uredbe. Prema Uredbi, pridnena povlačna mreža mora imati saku s otvorima veličine 40 mm kvadratnog tega, koja može biti zamijenjena sa sakom veličine oka 50 mm romboidnog tega (uz dokaz da je više ili jednako selektivna kao prethodna). Provedena istraživanja pokazuju značajan porast selektivnosti mreža s kvadratnim tegom od 40 mm i romboidnim tegom od 50 mm u odnosu na tradicionalnu mrežu. Ova razlika se očituje kako u selektivnosti obzirom na broj i masu, tako i na dužinsku strukturu eksploatiranih populacija. Mreža sa sakom romboidnog tega od 50 mm se pokazala manje selektivnom od sake s kvadratnim tegom od 40 mm za većinu gospodarskih važnih vrsta

Slijedom navedenog može se zaključiti da će primjena novih tehničko-konstrukcijskih mjera u odnosu na tradicionalnu saku imati dugoročni pozitivni učinak na stanje obnovljivih bioloških resursa u moru.

Ključne riječi: selektivnost, pridnena povlačna mreža, pridnene zajednice, Jadransko more

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Investigation of selectivity of bottom trawl net with different code-end mesh configuration

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Abstract

In order to determine the selectivity level of bottom trawl nets with different cod-end configurations, experimental bottom trawl survey has been conducted in the channel area and in the open part of central Adriatic Sea using the cover/cod-end method. Analysis of the data showed significant differences of selectivity between nets depending on the composition of demersal species and population length structure. By accessing the Croatia to European Union all fishing vessels engaged in bottom – trawl fisheries in Croatian fisheries waters are obliged to replace the traditional 40 mm diamond meshed cod-end in accordance with the provisions of Council Regulation 1967/2006. This Regulation defines the technical characteristics of fishing gears and methods of their use for the protection of fishery resources in the Mediterranean. According to the Regulation, bottom trawl nets must have a 40 mm square meshed cod-end which can be replaced by 50 mm diamond meshed cod-end (with scientific proof that it is more or equally selective as the previous one). Research has shown a significant increase in the selectivity of the 40 mm square meshed and 50 mm diamond meshed cod-ends compared to traditional cod-end. This difference is reflected in both the selectivity according to the number and weight, as well as in the length structure of exploited populations. Bottom trawl net with 50 mm diamond meshed cod-end proved to be less selective then one with 40 mm square meshed cod-end for most of the commercial important species. Therefore, it can be concluded that the application of new technical measures compared to the traditional code-end will have a long term positive effect on the state of renewable bio-resources in the sea.

Key words: Selectivity, bottom trawl net, demersal organisms, Adriatic Sea

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Korištenje bioloških indikatora za procjenu stanja pridnenih naselja Jadranskog mora

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Sažetak

Prelazak s dosadašnjeg načina opisivanja stanja pridnenih resursa putem klasičnih holističkih i analitičkih modela (u pravilu jednovrsnih) na ekosustavni pristup u ribarstvu zahtijeva promjenu i u modelima koji se koriste za opisivanje stanja. U novije vrijeme za Jadransko more se koristi pristup kojim se stanje resursa opisuje putem bioloških indikatora i pripadajućih referentnih točaka. Ovaj pristup je razrađen u okviru FAO AdriaMed projekta i sastoji se od dva seta indikatora: populacijski indikatori za gospodarski najvažnije vrste (učestalost pojavljivanja, biomasa, abundancija, dužinska struktura, spolna struktura, …) i indikatori zajednica koji uključuju masene i brojčane udjele najvažnijih i referentnih skupina organizama (hrskavičnjače, glavonošci, plava riba, bijela riba, BOI vrste…). Korištenjem navedenih indikatora i referentnih točkaka (definiranih kroz percentile pojedinih vrijednosti u serijama dugih nizova podataka prikupljenih tijekom unificiranih znanstvenih istraživanja) moguće je na jednostavan, te svim dionicima u ribarstvu razumljiv način, opisati stanje resursa i promjene koje se događaju u eksploatiranim ekosustavima, a sve s ciljem davanja znanstvene podloge za uspostavu dugoročno održivog gospodarenja resursima. Korištenje ovog pristupa opisano je na primjerima populacija oslića, trlje blatarice, muzgavca i škampa u Jadranskom moru na osnovu podataka prikupljenih tijekom ekspedicija MEDITS od 1996. do 2014. godine u Jadranskom moru.

Ključne riječi: biološki indikatori, pridneni resursi, Jadransko more.

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The application of biological indicators for assessment the state of demersal communities in the Adriatic Sea

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Abstract

Advancing from the classic holistic and analytical models (mostly single-species) for describing the status of demersal resources to the ecosystem approach in fisheries requires a change in the models used in describing the state of resources. More recently alternative approach has been used in the Adriatic Seafor describing the state of resources through biological indicators and associated reference points. This approach was developed in the framework of FAO AdriaMed project and consists of two sets of indicators: population indicators for commercially important species (frequency of occurrence, biomass, abundance, population length and sex composition, etc.) and community indicators that include the weight and the number ratios of the most important and reference group of organisms (cartilaginous species, small pelagic and demersal fish species, cephalopods, BOI species, etc.). Using these indicators and reference points (defined by percentiles of individual values from the long data series collected during the unified scientific surveys) provides a simple, and for all stakeholders in the fisheries understandable way, for describing the state of resources and changes that occur in exploited ecosystems. The aim of these methods is to provide scientific basis for the establishment of long-term sustainable management of resources. The use of this approach is described in the examples of populations of hake, red mullet, musky and horned octopus and Norway lobster in the Adriatic Sea on the basis of data collected during MEDITS surveys from 1996 to 2014 in the Adriatic Sea.

Key words: biological indicators, demersal resources, Adriatic Sea

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Genetske analize roda Cobitis iz Hrvatske i Kine

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Sažetak

Vijun, *Cobitis elongatoides* je vrsta iz porodice Cobitidae koja je rasprostranjena u dunavskom slivu Evrope, sa prilično stabilnim populacijama. Ova je vrsta široko rasprostranjena u svim manjim pritocima Save i Drave u Hrvatskoj. Cobitidae i njihova filogenetska analiza su važni u rasvjetljavanju evolucijske prilagodbe slatkovodnih riba u Aziji i Europi. Čitav mitohondrijski genom vrste *C. elongatoides* je sekvenciran s ciljem stjecanja genetske informacije koja je bitna da se utvrdi evolucijski i genetski identitet te filogenetska slika porodice Cobitidae. Genom je bio 16.540 bp duljine, a sadržavao je 22 transferna RNA gena, 13 protein-kodirajućih gena (PCGs), dva ribosomalna RNA gena, kontrolnu regiju (D-loop). U mitohondrijalnom genomu *C. elongatoides* i drugih Cobitis vrsta kao *Cobitis sinensis, Paramisgurnus dabryanus* i *Misgurnus bipartitus* utvrđena je 89%, 88% odnosno 91% identičnost srekvenciranih nukleotidnih baza.

Ključne riječi: Cobitidae, *Cobitis elongatoides*, mitohondrijalni genom

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Genetic analysis of the genus Cobitis from Croatia and China

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Abstract

Danubian spinned loach, *Cobitis elongatoides*, is a species of loach distributing in the watershed of the Danube basin, Europe, and its populations are quite stable. This species is widespread in all small rivers of the Sava and Drava tributaries in Croatia. Cobitidae and its phylogenic analysis are of importance in elucidating evolutionary adaptations in freshwater fishes in Asia and Europe. The complete mitochondrial genome of *C. elongatoides* was sequenced with the aim of obtaining genetic information essential to inferring its evolution and genetic identity and phylogenetic analysis of Cobitidae fish. The genome was 16,540 bp in length, and contains 22 transfer RNA genes, 13 protein-coding genes (PCGs), two ribosomal RNA genes, a displacement loop region (D-loop). The mitogenomes from *C. elongatoides* and other loaches like *Cobitis sinensis*, *Paramisgurnus dabryanus*, and *Misgurnus bipartitus* have 89%, 88% and 91% nucleotide sequence identity, respectively.

Key words: Cobitidae, *Cobitis elongatoides*, mitochondrial genome

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Potencijalni utjecaji nekih alohtonih vrsta riba na hrvatsko morsko ribarstvo

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Sažetak

Sve promjene u morskim ekosustavima imaju određeni učinak na korisnike morskih bioresursa, prije svega na morsko ribarstvo. Utjecaj klimatskih promjena na sektor morskoga ribarstva je složen, a učinci mogu biti i pozitivni i negativni u gospodarskom smislu. Promjene obuhvaćaju cijeli morski okoliš, od promjena u migracijskom obrascu riba u otvorenom moru, potencijalne promjene u sezoni rasta i vremena potrebnog za uzgoja riba, te potencijalni porast broja invazivnih vrsta. Ovo je dovelo do povećanog broja ulova određenih novih vrsta riba, ali i ugrozilo ulov i proizvodnju drugih. U proteklih trideset godina u Jadranskom moru zabilježene su brojne nove vrste riba. U ovom radu se iznose svi trenutni i potencijalni socio-ekonomski utjecaji nekih novih vrsta u jadranskoj ihtiofauni na hrvatsko morsko ribarstvo. Posebna pozornost se pridaje vrstama: plavotočkasta trumpetača *Fistularia commersonii*, tamna mramornica *Siganus luridus*, i srebrnoprugasta napuhača *Lagocephalus sceleratus*.

Ključne riječi: alohtone ribe, utjecaji, morsko ribarstvo

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The potential impacts of some alien fish species on the Croatian Marine fisheries

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Abstract

Any change in marine ecosystems has effect on users of marine bioresources, primarily in marine fisheries. The impact of climate chnage on the marine fisheries sector is complex and the effects can be both positive and negative in economic temrs. Changes include the entire marine environment, the change int he migration patterns of fish in open waters, potential change sin the growing season and the time required for fish farming, as well as a potential increase in the number of invasive species. This has led to an increased number of new fish species (allochthonous) caught, but also to the management of fish and other produce. Numerous new allochthonous fish species have been recorded in the Adriatic Sea in the past thirty years. This work presents the actual and potential socio-economic imapcts of some new species in the Adriatic ichthyofauna on Croatian marine fisheries. Special attention i sgiven to next species: bluespotted cornetfish *Fistularia commersonii*, dusky spinefoot *Siganus luridus*, and puffer fish *Lagocephalus sceleratus*.

Key words: allochthonous fish, impacts, marine fisheries

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Hrana obogaćena probioticima kao modulator enteralne mikrobne flore u kalifornijske pastrve (*Oncorhynchus mykiss*)

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Sažetak

Potreba za održivom akvakulturom potakla je brojna istraživanja o mogućnostima uporabe probiotika na uzgajanim organizmima. Probiotik *Lactobacillus rhamnosus* sa peptonskom vodom umiješan je u hranu pastrve sa svrhom tretiranja dvaju skupina koncentracijama od 10^7 CFU (G1) i 10^8 CFU (G2). Skupina G3 hranjena je hranom samo sa peptonskom vodom. U prvom u nizu protočnih bazena bila je kontrolna skupina, zatim G1, G2 i na kraju G3 skupina. Ribe su tretirane 6 tjedana, a uzorkovane su prije početka pokusa, neposredno nakon njegova završetka te tri tjedna nakon završetka. Prije početka pokusa, ribe u crijevima i u crijevnom sadržaju nisu sadržavale detektabilne razine bakterija mliječne kiseline. Broj vijabilnih laktobacila iz crijevnog sadržaja povećao se u skupinama G1 i G2 sa <10 CFU/mL na početku pokusa na razine između 2 x 10^2 i 4 x 10^5 CFU/mL (G1), te između 4,2 x 10^2 i 8 x 10^2 CFU/mL (G2) do kraja pokusa. Čak je i skupina G3 sadržavala vijabilne laktobacile do 0,6 x 10^4 CFU/mL. Hranidba pastrva hranom obogaćenom *L. rhamnosus* promijenila je rezidentnu enteralnu mikrofloru iz pretežito *Vibrio fluvials, Aeromonas hydrophila* i *Serratia fonticola* prije pokusa, u *V. fluvialis*, *Burkholderia cepacia,* nefermentore, i *Pasteurellaceae* do kraja pokusa, uz povratak na *V. fluvialis, Pseudomonas aeruginosa* i *A. hydrophila* tri tjedna nakon završetka pokusa. Za postizanje balansa između probiotičkih bakterija i rezidentne crijevne mikroflore pastrva potrebna je dugotrajna hranidba obogaćenom hranom.

Ključne riječi: probiotici, *Lactobacillus rhamnosus*, kalifornijska pastrva

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Dietary probiotic supplementation as a modulator of enteral microbiota in rainbow trout (*Oncorhynchus mykiss*)

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Abstract

The need for sustainable aquaculture has prompted extensive research regarding the use of probiotics on aquatic organisms. Bacterium *Lactobacillus rhamnosus* was mixed in the trout diet with peptone water to attain two diet groups with concentrations of 10^7 CFU (G1) and 10^8 CFU (G2), respectively. The G3 feed group consisted of feed sprayed only with peptone water. First runway in line was stocked with the control group fed only the basal diet, second runway was stocked with G1, following with G2, and G3. They were fed for a period of six weeks and sampled at the beginning and end of the trial, and three weeks after the feeding trial. Before the trial, fish had no detectable lactic acid bacteria (LAB) in the intestines nor in the fecal contents. The numbers of viable lactobacilli recovered from fecal contents increased in G1 and G2 groups from below detection limits (<10 CFU/mL) at the start of the trial to levels between 2×10^2 and 4×10^5 CFU/mL (G1), between 4.2×10^2 and 8×10^2 CFU/mL (G2) by the end of the trial. Even G3 group demonstrated viable lactobacilli between neglectable to 0.6×10^4 CFU/mL. The feeding with supplemented probiont apparently changed the resident microbiota in fish from mostly *Vibrio fluvials, Aeromonas hydrophila* and *Serratia fonticola* before the trial, to *V. fluvialis*, *Burkholderia cepacia,* non-fermenter species, and *Pasteurellaceae* by the end of the trial, to *V. fluvialis, Pseudomonas aeruginosa, A. hydrophila* three weeks after the end of the trial.

Key words: probiotics, *Lactobacillus rhamnosus*, rainbow trout

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Interakcija ribolovnog napora (CPUE) i sastava riblje zajednice Erdutskog dunavca

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Sažetak

Ulov po jedinici ribolovnog napora (CPUE) se najčešće koristi kao ekološka mjera procjene sastava i gustoće riblje zajednice u nekoj ribolovnoj vodi. Za CPUE se pretpostavlja kako je proporcionalan abundanci riba te se stoga koristi kao relativni indeks gustoće populacije. Svoju primjenu ima i kod određivanja mjera gospodarenja ribolovnim vodama, poput godišnjih izlovnih kvota ribe te prilikom procjene financijske valorizacije pojedine ribolovne vode. Rad obrađuje podatke istraživanja primjenjivosti CPUE kao alata za utvrđivanje stabilnosti sastava riblje zajednice Erdutskog dunavca u razdoblju od 2011. do 2014. godine. Inventarska uzorkovanja riblje populacije obavljena su ribolovnim mrežama visine 6 metara, dužine 120 metara, veličine oka od 5 do 12 cm te mrežama za uzorkovanje koje su predložene od strane EIFAAC-a (European Inland Fisheries and Aquaculture Advisory Commission). Ribolovni napor prikazan je kao mreža· sat. Ukupno je utvrđeno 20 vrsta riba, od čega je 14 vrsta ulovljeno standardnim ribolovnim mrežama a 17 vrsta je ulovljeno mrežama za uzorkovanje EIFAAC. Prosječni ulov po jedinici napora u razdoblju 2011. – 2014. iznosio je 3,902 ± 2,261 kg·mreža·sat^{-1}, s minimumom u 2013. godini (2,257 kg·mreža·sat^{-1}) i maksimumom u 2011. (7,112 kg·mreža·sat^{-1}). Najveći prosječni ulov po jedinici napora kod standardnih ribolovnih alata utvrđen je sivog tolstolobika (*Hypophthalmichthys molitrix*) 1,314 ± 1,080 kg·mreža·sat^{-1}, potom kod deverike (*Abramis brama*) 1,027 ± 0,880 kg·mreža·sat^{-1}.

Ključne riječi: gospodarenje ribolovnom vodom, abundanca, status ihtiopopulacije

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The interaction of fishing effort (CPUE) and the fish population in sidearm Erdutski dunavac

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Abstract

The catch per unit of fishing effort (CPUE) is commonly used as a measure of ecological assessment of the composition and abundance of the fish population in fishing water. The main assumption for CPUE is that it is proportional to abundance of fish and is therefore used as an index of the relative abundance of the fish population. CPUE has its application in determining management measures for fishing waters, such as the annual catch quota and assessing financial valorization of individual fishing waters. This paper presents CPUE data from sidearm Erdutski dunavac in the period from 2011 to 2014 and applicability as tools for determining the stability of fish population. Survey sampling of fish populations were done with standard fishing nets (6 m height, 120 meters long with mesh size from 5-12 cm) and with survey fishing nets proposed by EIFAAC (European Inland Fisheries and Aquaculture Advisory Commission). Fishing effort is shown as net·hour. During survey sampling 20 fish species were caught, 14 species were caught using standard fishing nets and 17 species were caught with survey fishing nets. Average catch per unit of fishing effort in period from 2011 – 2014 was 3.902 ± 2.261 kg·net·hour^{-1}, with minimum catch in 2013 (2.257 kg·net·hour^{-1}) and maximum catch in 2011 (7.112 kg·net·hour^{-1}). The highest average catch per unit of fishing effort with standard fishing nets was found for bighead carp (*Hypophthalmichthys molitrix*) 1.314 ± 1.080 kg·net·hour^{-1}, then for bream (*Abramis brama*) 1.027 ± 0.880 kg·net·hour^{-1}.

Key words: fishery management, abundance, status of ichthyophauna

sa2015_a0606

Ecosystem-based approach to the fisheries management of the Black Sea turbot (*Psetta maxima maeotica* Tortonese, 1971)

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Abstract

The paper refers to the context in which the case study on the ecosystem approach in the assessment and management of the Black Sea turbot was proposed within the FP7 project MareFrame: Co-creating Ecosystem-based Fisheries Management Solutions, Grant Agreement no. 13571.

This case study is a Romanian initiative which very much relies on the ecosystem-based approach to the fisheries management (EAFM), taking into account that Black Sea ecosystem is seriously affected by dynamic changes directly related to fishing, climate change and pollution. Fishery is the most affected sector by the changes of the Black Sea ecosystem. In the same time, fishing activities contribute themselves to the worsening of the ecological situation and for the depletion of the fish stocks.

The paper presents some aspects such as: biological and ethological characterization of turbot in current environmental conditions, actual state of the Black Sea environment in general and especially in the western part of the sea, evolution of the turbot fishery at regional and national level, state of the turbot stock, motivation of the choice of two ecosystem models: GADGET (Globally applicable Area Dis-aggregated General Ecosystem Toolbox) and EwE (Ecopath with Ecosim).

Both GADGET and EwE will increase the knowledge about the Black Sea ecosystem functioning and thereby serve to provide advice on the rebuilding of the turbot stock. Further this will provide input to the development of a management plan.

Key words: turbot, Black Sea, depleted stocks, ecosystem-based approach to the fisheries management (EAFM)

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Procjena šteta od jelenske divljači u šumskim sastojinama lovišta VII/15 „Zapadna Garjevica“

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Sažetak

Štete od jelenske divljači (*Cervus el aphus*) na drveću unutar šumskih sastojina veliki su i stalni problem prisutan u mnogim europskim državama, pa i u Hrvatskoj. Istraživanja ovog problema bila su sporadična i bez sustavnog praćenja intenziteta šteta u šumskim sastojinama. Procjena šteta urađena je tijekom 2012. godine u lovištu VII/15 “Zapadna Garjevica”, smještenom u središnjem dijelu Moslavačke Gore. Visinski raspon iznosi od 120 do 489 m nadmorske visine; lovište je mješovitog nizinskog i gorskog tipa. Ukupna lovno-produktivna površina iznosi 23.759 ha, od čega su 19 650 ha ili 83 % šume, a 4.095 ha (17%) poljoprivredno zemljište. Šumska vegetacija raspoređena je u dva visinska pojasa: brežuljkasti (100-250 m) u kojem su razvijene šume hrasta kitnjaka i običnoga graba; gorski (250-489 m) s prevladavajućim bukovim šumama. Terenska istraživanja urađena su na odabranim odsjecima (ukupne površine od 584 ha); od čega je 31 odsjek (500,27 ha) u Gospodarskoj jedinici Garjevica-Garešnica“, a 12 odsjeka (83,78 ha) u Gospodarskoj jedinici „Dišnica-Zobikovac-Petkovača“. U svakom odsjeku utvrđivani su dendrološka pripadnost i broj drveća, prsni promjer i starost stabla. Pojavnost i intenzitet šteta na drveću svih dobnih razreda procijenjena je vizualnim opažanjem. Oštećena stabla podijeljena su u kategorije: mala, srednja i visoka oštećenost. Ukupno je izmjereno i pregledano 196 031 stabala, od kojih je 58.255 (30 %) bilo oštećeno, dok je 137.776 stabala (70 %) bilo neoštećeno. Prema vrstama drveća, najoštećenija su bila stabla smreke, *Picea abies* (74 %), zatim običnog graba, *Carpinus betulus* (63 %) i bukve, *Fagus sylvatica* (20 %). Uspješna strategija upravljanja štetama u lovištu treba sadržavati sljedeće: pouzdano utvrđivanje stvarne gustoće i trenda populacije jelenske divljači u lovištu; oblikovanje novih i povećanje postojećih površina pogodnih za ispašu, te osiguravanje dostatne i kvalitetne prihrane jelenskoj divljači.

Ključne riječi: štete, šuma, jelen obični, lovište

sa2015_a0608

Assessment of damages by red deer game to forest stands in the hunting ground VII/15 „Zapadna Garjevica“

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Abstract

Damages caused by red deer (*Cervus elaphus*) game on trees in forest stands makes permanent and big problem as well as in many European countries, as well in Croatia. Researches on this topic were done occasionally, without systematic monitoring of damage intensity in forest stands. An assessment of damages was done during 2012 in the hunting ground VII/15 “Zapadna Garjevica”, located in the middle part of Moslavačka Gora Mountain. The altitudinal range is from 120 to 489 m above sea level, and hunting ground is of combined lowland and mountain type. Total surface available for hunting activities is 23 759 ha, of which 19 650 ha (83%) makes forests, while 4 095 ha (17%) is agricultural land. Forest vegetation is distributed within two altitudinal belts; the hills (100-250 m) are characterized by forests of sessile oak and hornbeam, while the beech forests prevail in the montane belt (250-489 m). Field surveys were performed within selected plots, covering total surface of 584 ha; 31 plots in the forest management unit “Garjevica-Garešnica” (500.27 ha) and 12 plots in „Dišnica-Zobikovac-Petkovača“(83.78 ha). The composition of dendroflora, number of trees, diameter breast high and tree age were determined in each plot. Occurrence and intensity of damage on trees in all age classes was assessed by ocular inspection and damaged trees were classified into categories of small, medium and high damaged. Total of 196 031 trees has been measured, of which 58 255 (30%) was damaged, and 137 776 (70%) undamaged. According to tree species, the most damaged was the Norway spruce, *Picea abies* (74%), followed by the common hornbeam, *Carpinus betulus* (63%) and common beach, *Fagus sylvatica* (20%). Successful damage management strategy in the hunting ground should include accurate estimation of current population density and population trends of red deer, creation and enlargement of land areas suitable for pasture and insurance of sufficient and quality food and feeding sources to red deer.

Key words: damage, red deer, forest, hunting ground

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Preliminarna istraživanja krpeljivosti divljih svinja (*Sus scrofa* L.) na području Republike Hrvatske

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Sažetak

Cilj istraživanja je utvrditi koje vrste krpelja parazitiraju na divljim svinjama, njihovu spolnu strukturu, intenzitet invazije te odabir mjesta prihvaćanja na tijelu. Istraživanjem su obuhvaćeni sporadično dostavljeni uzorci krpelja s 15 divljih svinja odstrijeljenih 2009., 2010., 2011. i 2012. godine, u različitim lovištima na području Spačve, Voćina, Nove Gradiške i Rugvice. Sustavno istraživanje i prikupljanje uzoraka provedeno je tijekom 2013. i 2014. godine na području otvorenog državnog lovišta IV/16 „Eugen Kvaternik" Slunj. Ukupno je pregledano 145 divljih svinja. Prisutnost krpelja je utvrđena na 18 divljih svinja. Analizom ukupno prikupljenih 118 krpelja utvrđeno je da 107 ili 90,68% pripada vrsti *Dermacentor reticulatus*, 8 ili 6,78% vrsti *Ixodes ricinus* i 3 ili 2,54% vrsti *Ixodes hexagonus*. Prosječni intenzitet invazije iznosio je 6,6 krpelja po jedinki. U 96,61% slučajeva utvrđena je prisutnost odraslih jedinki, dok se u 3,39% slučajeva radilo o razvojnom stadiju nimfe. Zastupljenost odraslih krpelja iznosila je 100% kod vrste *Dermacentor reticulatus,* 87,5% kod vrste *Ixodes ricinus*, dok je kod vrste *Ixodes hexagonus* utvrđena nazočnost isključivo razvojnog stadija nimfe. Analizom krpelja prema spolu utvrđena je neznatno veća zastupljenost odraslih ženki u odnosu na mužjake (95% ženki bilo je nasisano krvlju različitim intenzitetom). Najveći broj pronađenih krpelja bio je u svibnju, dok je najveći stupanj invadiranosti utvrđen u ožujku. Svi su bili krpelji prihvaćeni na unutrašnjem području prednjih nogu i bedara.

Ključne riječi: divlja svinja, *Sus scrofa* L., krpelj, *Dermacentor reticulatus*

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Preliminary research tick infestation in wild boars (*Sus scrofa* L.) in Croatia

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Abstract

The purpose of the research is to determine which species of ticks parasite on wild boars, their sex structure and as well as the preference of body parts they attach to. The survey covers randomly submitted samples of ticks from 15 wild boars hunted down during 2009, 2010, 2011 and 2012 seasons in different hunting areas around Spačva, Voćin, Nova Gradiška and Rugvica. Systematic research and sampling was conducted from 2013 and 2014 in the state-owned open hunting area „Eugen Kvaternik" Slunj. Overall study examined a total of 145 wild boars. Ticks were found in 18 wild boars. By analyzing the total of collected 118 ticks it was found that 107 or 90.68% belong to the species *Dermacentor reticulatus*, 8 or 6.78% to species *Ixodes ricinus* and 3 or 2.54% to species *Ixodes hexagonus*. The average intensity of invasion was 6.6 ticks per animal. In 96.61 % the presence of adult specimen's cases was identified, while in only 3.39% of the cases the developmental stage nymphs were detected. The presence of adult ticks was 100% in the species *Dermacentor reticulatus*, 87.5% in the species *Ixodes ricinus*, while the species *Ixodes hexagonus* showed presence of exclusively developmental stage nymphs. The analysis of ticks by sex identified slightly higher prevalence of adult females compared to males, of which the total number of females (95% of them were engorged by blood in varying intensity). The highest number of ticks was found in May, while the highest degree of infestation was determined in March. All found ticks were attached to the inner area of the front legs and thighs.

Key words: wild boar, *Sus scrofa* L, tick, *Dermacentor reticulatus*

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Divljač kao bioindikator onečišćenja okoliša teškim metalima

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Sažetak

Emisije teških metala iz antropogenih izvora štetno utječu na okoliš. Teški metali su vrlo postojani u okolišu i zbog svojstva akumuliranja u ekosustavima opasni za žive organizme. Negativni učinak na organizam očituje se u sposobnosti za interakcije sa staničnim bjelančevinama i molekulom DNA, što uzrokuje propadanje bioloških makromolekula. Kroz hranidbene lance u ekosustavu teški metali se prenose s niže na višu hranidbenu razinu sve do krajnjih konzumenata. Stoga su divlji sisavci, među kojima i vrste koje pripadaju lovnoj divljači, pogodni bioindikatori onečišćenja okoliša teškim metalima. Posljednjih je godina u Hrvatskoj primijećeno da meso divljači iz lovišta sadržava i teške metale u određenim koncentracijama.

Provedenim istraživanjima analizirana je prisutnost teških metala u primjercima divlje svinje, jazavca i divljih pataka, sakupljenih u odabranim lovištima u Hrvatskoj. Primjenom atomske apsorpcijske spektrofotometrije utvrđivani su prisutnost i mjerene koncentracije arsena, kadmija, olova i žive u tkivima mišića, jetre i bubrega.

Dobiveni rezultati potvrdili su da divljač, zbog svojih prehrambenih navika i raznolikosti stanišnih i ekoloških uvjeta u lovištima u kojima obitava, može biti bioindikator onečišćenja okoliša teškim metalima. Zabilježene su pojedinačno više koncentracije kadmija i žive u parenhimskim organima pojedinih primjeraka divlje svinje, jazavca i divljih pataka. Budući da se meso divljači konzumira u prehrani, postoji potencijalni rizik od unosa teških metala u organizam čovjeka. Prosječna godišnja konzumacija mesa divljači u Hrvatskoj je vrlo niska (0,3 kg po članu domaćinstva) pa ne postoji značajna opasnost po ljudsko zdravlje. Ipak, preporučljivo je izbjegavanje ili umjerena konzumacija parenhimskih organa divljači.

Ključne riječi: divljač, lovište, teški metali, konzumacija mesa

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Game animals as bio-indicators of the environmental pollution by heavy metals

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Abstract

Emissions of heavy metals from anthropogenic sources harmfully affect the environment. Heavy metals are very persistent in the environment and due to accumulation ability threatens living organisms. Negative effect on organism is evident in potential for interaction with proteins and DNA molecule inside the cell, and causing degradation of biological macromolecules. Heavy metals are being transferred in the ecosystems throughout food-web, from lower to higher trophy level, up to final consumers. Therefore, wild mammals, including species belonging into game animals, are suitable bio-indicators of the environmental pollution by heavy metals. In the last years it was observed that game meat from the hunting grounds in Croatia contain heavy metals in certain concentrations.

Within the carried-out researches, presence of heavy metals was analyzed in samples from wild boar, badger and wild ducks, collected in the selected hunting grounds in Croatia. Concentrations of arsenic, cadmium, lead and mercury were measured by the procedure of atomic absorption spectrophotometry in tissues of muscle, liver and kidney.

The results obtained confirmed that game animals, due to its diet habits and diversity of habitats and ecological conditions in the hunting grounds, can be used as bio-indicators of environmental pollution by heavy metals. Individually higher content of cadmium and mercury was recorded in parenchymal organs in several samples of wild boar, badger and wild ducks. Knowing that game meat is consumed in human nutrition, there is a potential risk of intake of heavy metals in population. Average annual game meat consumption in Croatia is very low (0.3 kg per member of household), and it is not a considerable threat to human health. However, the avoidance or moderate consumption of parenchymal organs of game animals is recommended.

Key words: game animal, hunting ground, heavy metals, meat consumption

sa2015_a0610

Primjena insekticida u ratarskoj proizvodnji na području općine Tovarnik u 2013. godini i zabilježeni gubitci pčelinjih zajednica

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Sažetak

Kako bi se smanjili potencijalno negativni učinci na pčele, Europska komisija je Uredbom 485/2013 zabranila uporabu nekih djelatnih tvari insekticida iz skupine neonikotinoida (u primjeni od 30. 11. 2013.). U sklopu istraživanja koje ima za cilj istražiti odnos između primjene insekticida u ratarskoj proizvodnji i mogućih gubitaka pčelinjih zajednica anketirani su poljoprivredni proizvođači, ratari i pčelari u općini Tovarnik u 2013. godini, prije nego je Uredba stupila na snagu. Anketni upitnik za ratare sadržavao je pitanja o obrađivanim površinama, zasijanim kulturama, te vrsti i dozi korištenih insekticida. Anketni upitnik za pčelare sadržavao je pitanja o broju košnica, ispašama i o gubitcima pčelinjih zajednica u sezoni i tijekom prezimljenja. Ukupno je anketirano 14 proizvođača koji obrađuju 72% obradivih ratarskih površina u općini Tovarnik. U strukturi sjetve prevladavale su strne žitarice (32,5%) i šećerna repa (25,8%). U sezoni provedbe ankete 100% sjemena šećerne repe i 74% sjemena suncokreta bilo je tretirano neonikotinoidima. Insekticidima su folijarno tretirani pšenica na 95,3% i šećerna repa na 98% zasijanih površina. Anketiranjem sedam pčelara čije košnice predstavljaju 84% svih pčelinjih zajednica na području općine Tovarnik nisu utvrđeni gubitci pčelinjih zajednica tijekom vegetacije, a u prezimljenju je izgubljeno 6% zajednica. U istraživanom se području primjena insekticida iz skupine neonikotinoida teško može povezati s gubitcima pčelinjih zajednica.

Ključne riječi: anketa, gubitci pčela, insekticidi, neonikotinoidi, ratarska proizvodnja

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The use of insecticides in field crop production in 2013 and observed decline of honey bee colonies in the region of Tovarnik

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Abstract

To minimize potential adverse effects on bees, the European Commission Regulation 485/2013 banned the use of certain active substances from the group of neonicotinoids insecticides (effective from 30 November 2013). As part of a study - aiming to explore the relationship between the application of insecticides in farming and potential losses of honey bee colonies - farmers, beekeepers and agricultural producers of the municipal Tovarnik were surveyed in 2013, before the regulation entered into force. Questionnaire for farmers contained questions on cultivated land, crops sown, and the type and dose of insecticide used. Questionnaire for beekeepers contained questions on the number of hives, and the grazing losses of honey bee colonies in the season and during overwintering. The poll was conducted on 14 agricultural producers covering 72% of the arable crop area in the municipality Tovarnik. Cereals (32.5%) and sugar beet (25.8%) made the majority of sown seeds. In the season when the survey was conducted, 100% of sugar beet seeds and 74% sunflower seeds were treated with neonicotinoids while 95.3% of wheat and 98% of sugar beet - sown areas were treated with foliar insecticides. The polling of seven beekeepers, whose hives represent 84% of all bee colonies in the area of Tovarnik, revealed that there were no colony losses during the growing season and that overwintering resulted in loss of 6% of communities. In the investigated area the application of insecticides from the group of neonicotinoids is difficult to be connected with losses of honey bee colonies.

Key words: survey, the losses of bees, insecticides, neonicotinoids, crop production

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Sudjelovanje Hrvatske u testnom međunarodnom genetskom vrednovanju za proizvodna svojstva za Holstein i simentalsku pasminu

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Sažetak

Međunarodni centar za genetsko vrednovanje bikova (Interbull) je neprofitna organizacija odgovorna za usporedbu uzgojnih vrijednosti (UV) bikova iz zemalja članica koristeći tzv. MACE proceduru (Multiple(-trait) Across Country Evaluation – Višestruku procjenu između država) sa svrhom rangiranja bikova u svakoj od država članica. Genetske korelacije između država su potrebne za procjenu međunarodne UV bikova kao pokazatelj interakcije genotipa i okoliša. Cilj ovog rada bio je izračunati genetske korelacije između država članica za proizvodna svojstva (količina mlijeka, mliječne masti i bjelančevina) bikova Holstein i simentalske pasmine. Interbull koristi genetske korelacije i međunarodnu matricu srodstva bikova, te ju kombinira s UV bikova iz nacionalnog genetskog vrednovanja iz 32 države članice. Rezultat su UV svih bikova u vrednovanju izraženi na skali svake države. Genetske korelacije između Hrvatske i drugih država članica slične su onima kada se uspoređuju ostale članice međusobno. Genetske korelacije za proizvodna svojstva su bile u rasponu od 0,76 do 0,87 kod obje pasmine. Nadalje, UV su bile dostupne za sve bikove u procjeni. Hrvatska je poslala na Interbull UV proizvodnih svojstava za 556 Holstein i 692 simentalskih bikova hrvatskog porijekla. Povratno, Hrvatska je dobila UV za 137258 bikova Holstein i 29670 bikova simentalske pasmine iz svih država koje sudjeluju u međunarodnom genetskom vrednovanju izražene na hrvatskoj skali. Hrvatska je uspješno prošla testiranje genetskog trenda za navedena svojstva i obje pasmine čime je stekla pravo sudjelovanja u rutinskom međunarodnom genetskom vrednovanju temeljem MACE UV.

Ključne riječi: Interbull, MACE, proizvodna svojstva, korelacije, uzgojne vrijednosti

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Participation of Croatia in Interbull test-run for production traits in Holstein and Simmental breeds

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Abstract

International Bull Evaluation Service (Interbull) is a non-profit organization responsible to combine bulls breeding values (BVs) from the member countries to generate rankings of bulls in each country using the method known as Multiple (-trait) Across Country Evaluation (MACE). Genetic correlations across country are needed to estimate international bulls BVs as an indicator of the magnitude of genotype by environment interactions. The objective of this study was to calculate across country genetic correlations of production traits (milk, fat, and protein yield) for Holstein and Simmental bulls. The Interbull uses genetic correlations and international bull relationship matrix which combines with the bulls' evaluation data from 32 member countries. Results are BVs of all bulls in the evaluation on the country respective scale. Genetic correlations between Croatia and other countries, compared well with those amongst the other countries. Genetic correlations for yield traits were in range from 0.76 to 0.87 in both breeds. Furthermore, BVs were available for all bulls in the evaluation. BVs for production traits for 556 Holstein and 692 Simmental bulls with Croatian origin have been sent to the Interbull. In return, Croatia received results for 137,258 Holstein and 29,670 Simmental bulls from all countries participating in evaluation, expressed on the Croatian scale. Trend validation tests were successful for all traits and breeds. Croatia can now participate in routine Interbull evaluations to obtain MACE BVs.

Key words: Interbull, MACE, production traits, correlations, breeding values

sa2015_a0701

Genetska povezanost unutar populacije Crne slavonske svinje

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Sažetak

Plodnost crne slavonske pasmine svinja je skromna te je za njeno poboljšanje navedeno svojstvo potrebno uključiti u uzgojni cilj. Genetska povezanost između usporednih grupa (stada ili uzgojnih organizacija) preduvjet je pouzdane usporedbe procijenjenih uzgojnih vrijednosti između životinja iz različitih stada ili organizacija pomoću metode mješovitog modela. Cilj rada bio je utvrditi genetsku povezanost između uzgojnih organizacija crne slavonske svinje. U istraživanje je bilo uključeno 8 uzgojnih organizacija s područja Republike Hrvatske. Set podataka sadržavao je 4 734 zapisa o prasenjima 1 657 krmača u razdoblju od 2000. do 2010. godine. Veličina legla bila je definirana kao broj živooprasene prasadi. Genetska povezanost utvrđena je pomoću „connectedness rating" metode, koja je definirana kao korelacija između procjena utjecaja usporednih grupa. Prosječne vrijednosti dobivene metodom bile su između 61 i 82 %. Za pouzdanu procjenu uzgojnih vrijednosti, preporuča se da za svojstva veličine legla vrijednosti ocjene genetske povezanosti budu veće od 1,5%. S obzirom na veličinu populacije te ciljano sparivanje kako bi se izbjegao visok uzgoj u srodstvu, stupanj genetske povezanosti između uzgojnih organizacija je visok. Usporedba procijenjenih uzgojnih vrijednosti između uzgojnih organizacija stoga se može smatrati pouzdanom.

Ključne riječi: svinje, genetska povezanost, crna slavonska pasmina

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Connectedness within population of Black Slavonian pig

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Abstract

Prolificacy of Black Slavonian pig is low and in order to improve this trait, it should be included into breeding goal. Sufficient level of connectedness between contemporary groups (herd, organisations) ensures reliable comparison of breeding values between contemporary groups. The aim of the study was to determine connectedness between breeding organizations of Black Slavonian pig. The study covered eight breeding organisations. The data set contained 4 734 farrowing records of 1657 sows from period between 2000 and 2010. Litter size was defined as number of piglets born alive. The level of connectedness was assessed using „connectedness rating" method. The connectedness rating between contemporary groups is defined as a correlation between estimates for contemporary group effect, obtained from solving the mixed model equation. Average connectedness rating between breeding organisations was between 61 and 82 %. To ensure reliable comparison of estimated breeding values, is it recommended that connectedness rating should be higher than 1,5% for litter size. Small population and organised mating in order to avoid inbreeding resulted in high level of connectedness between breeding organisations. Comparison of genetic evaluation between breeding organisations thus can be considered as reliable.

Key words: pigs, connectedness, Black Slavonian pig

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The effect of Thyme extract in low protein diet on ileal nutrients digestibility and intestinal morphometery of broiler chickens

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Abstract

To evaluate whether Thymus kotschyanus, a local herb, extract could affect on growth performance, intestinal morphometry and ileal nutrients digestibility of broilers on low protein diet, the study was carried out by employing a completely randomized design with a factorial arrangement of 2×3. A total of 384 day old Ross 308 broiler chicks were assigned to a commercial or a low protein diet (10% lower than required level) supplemented with 0, 0.05 or 0.15% of the extract. During the starter period (0-21d), the birds fed low protein diet had lower feed intake (FI) and higher weight gain (WG) ($P<0.001$), while those fed the diet supplemented with 0.05% extract had improved WG and feed conversion rate (FCR) ($P<0.05$). Supplementation of low protein diet with 0.05% extract improved WG and FCR of the chickens ($P<0.05$). Increased FI and no effect on WG and FCR by low protein diet ($P<0.05$) as well as adverse effect on performance of birds by adding extract to the diet were detected at finisher (21-42d) and entire feeding periods (0-42d). Low protein diet and adding 0.05% extract to the diets declined villus height and crypt depth and increased thickness of muscular layer of jejunum ($P<0.05$). The highest villus surface area ($P<0.05$) and the deepest crypts ($P<0.001$) were observed by recommended protein diet supplemented with 0.05% extract, while the thickest muscle layer of jejunum was detected by low protein diet supplemented by 0.15% extract ($P<0.01$). Relative weight of breast increased by adding either 0.05% or 0.15% extract to the diet ($P<0.05$). Ileal digestibility of protein and ash decreased by low protein diet ($P\leq0.05$) and increased by 0.15% extract supplementation to the diets ($P<0.05$). It can be concluded that the effect of Thymus kotschyanus extract in broiler's diet depends on bird's age and the extract level. The beneficial effect on bird performance was only detected at starter period and low level of total Cholesterol was observed by the extract supplementation. Furthermore, decreasing protein level of diet to 10% has no adverse effect on growth performance of the birds.

Key words: Thyme extract, low protein, nutrients digestibility, morphometry, broiler chickens

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Effect of two feeding standards on growth performance, nutrients digestibility and carcass traits of Ross 308 strain of broiler chickens

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Abstract

The experiment was conducted to survey the influence of two feeding standards recommended by NRC and Ross on growth performance, carcass traits, nutrients consumption to 1 kg of live weight gain and nutrients digestibility in Ross 308 strain of broiler chickens. A total of 300 day old mixed sex chicks were assigned to two standards feeding program with five replicate and 30 birds in each. The diets formulated by NRC recommended were fed during 1-21 days and 22-42 days, while the diets as Ross recommendation were fed in three time periods of 1-10, 11-24 and 25-42 day. Feed intake and body weight gain were measured at the end of every feeding period. Fecal nutrients digestibility was determined following feeding diets containing 0.3% Cr2O3 from 39 days of age and excreta collection. At the end of the experimental period, two birds (one male and one female) from ach replicate were slaughtered and their carcass different parts were separated and weighed. At 1-21 days, feeding Ross recommended diet increased the birds feed intake and improved their feed conversion ratio ($P<0.05$). During 22-42 days and also whole experimental period none of birds' performance parameters were significantly influenced by dietary treatments. The chickens on Ross recommended diet ate more metabolisable energy, crude protein, lysine and total sulfur amino acids per kg of weight gain at 1-21 days of age ($P<0.05$), while during 22-42 days and entire period of the experiment only consumption of total sulfur amino acids was higher ($P<0.05$). There were no significant differences between birds' relative weights of carcass, breast, thighs and abdominal fat as the effect of dietary treatments. The experimental diets had similar digestibility, cost per kg of weight gain and European efficiency index. Based on the results, due to non-significance of differences between birds' performance, carcass traits and economic efficiency, feeding Ross 308 chickens by NRC recommended diets is suggested because of fewer phases of feeding periods and lower work load.

Key words: phase feeding, amino acid consumption, apparent metabolizable energy, economic efficiency, broilers

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Morfologija i zdravlje vimena ovaca

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Sažetak

Zbog jednostrane selekcije na povećanje mliječnosti ovaca, dolazi do narušavanja morfologije vimena uslijed povećanog pritiska mase vimena na njegov suspenzorni sustav, što rezultira vješanjem vimena te horizontalnim pomicanjem sisa što se negativno odražava na zdravlje vimena. Cilj rada bio je utvrditi povezanost morfologije i zdravlja vimena u muznih ovaca, uključujući 111 paških ovaca, 93 istarske ovce i 80 istočnofrizijskih ovaca, od druge do četvrte laktacije, bez vidljivih znakova mastitisa. Tri puta u laktaciji (svakih 60 dana), iz svake mliječne žlijezde u svrhu mikrobiološke pretrage i određivanja broja somatskih stanica (BSS) uzet je po jedan uzorak mlijeka, pri čemu je aseptično prikupljeno 1590 uzoraka. Tri puta tijekom laktacije provedeno je i mjerenje morfoloških odlika vimena. U paških ovaca većeg opsega vimena početkom razdoblja mužnje, utvrđena je manja pojavnost (P=0,05) subkliničkog mastitisa tijekom preostalog dijela laktacije, negoli u ovaca manjeg opsega vimena. U istarskih i istočnofrizijskih ovaca u kojih su početkom muznog razdoblja utvrđena vimena s visokom mliječnom cisternom i horizontalno postavljenim sisama, utvrđena je veća pojavnost (P<0,001) subkliničkog mastitisa tijekom laktacije. Na osnovu korelacija između morfoloških odlika vimena i BSS u mlijeku može se zaključiti kako su, sa stanovišta zdravlja, poželjna široka vimena, čvrsto vezana za trbušni zid, s okomito položenim sisama smještenim na najdonjem dijelu vimena.

Ključne riječi: ovčje mlijeko, pasmina, mliječna žlijezda, somatske stanice, mastitis

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Morphology and udder health of ewes

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Abstract

Due to one-sided selection for increasing milk yield of ewes, distortion of udder morphology often occurs caused by increased pressure of the udder weight on its suspensory system, resulting in hanging of the udder and the horizontal movement of teats that negatively affects the udder health. The aim of this paper was to determine the relationship between morphology and udder health of milking ewes, including 111 Pag ewes, 93 Istrian ewes and 80 East Friesian ewes, from second to fourth lactation, with no visible signs of mastitis. Three times per lactation (every 60 days), one sample of half udder milk was taken with the purpose of bacterial and somatic cell count (SCC) tests, so totally 1590 samples were aseptically collected. Measuring of udder morphology traits was also performed three times per lactation. In Pag ewes that had larger udder circumference during the beginning of the milking period, the smaller incidence (P=0.05) of subclinical mastitis during the remainder of lactation was determined than in Pag ewes with smaller udder circumference. In Istrian and East Friesian ewes with high implanted and horizontally placed teats during the beginning of milking period, a higher (P<0.001) incidence of subclinical mastitis was determined during the remainder of lactation. Based on the established correlations between udder morphology traits and SCC it can be concluded that, from the viewpoint of health, wide udders firmly attached to the abdominal wall, with a vertically placed teats placed on the lowest part of the udder are preferred.

Key words: sheep milk, breed, mammary gland, somatic cells, mastitis

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Utjecaj različitih udjela prerađenog animalnog proteina u hrani na karakteristike mesa brojlera

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Sažetak

Životinjski nusproizvodi nastali tijekom klaoničke obrade ne koriste se za ljudsku konzumaciju, ali se mogu iskoristiti za proizvodnju hrane za životinje, organskih gnojiva i poboljšivača tla te u razne tehničke svrhe. Jedan od takvih proizvoda su i prerađeni animalni proteini (PAP) koji se dobivaju standardno sterilizacijom pod tlakom, a porijeklom su od nusproizvoda životinja koje su prikladne za prehranu ljudi. PAP imaju veću proteinsku vrijednost od krmiva biljnog porijekla i jeftiniji su pa su isplativa alternativa. Međutim, trenutno je na snazi zabrana upotrebe PAP-a porijeklom od sisavaca radi sprječavanja prijenosa transmisivnih spongiformnih encefalopatija. Također, sve su prisutnije inicijative za djelomično ukidanje zabrane i omogućavanje hranidbe peradi i svinja s PAP-om svinja i peradi, ali uz sprečavanje hranidbe proteinom iste vrste. Stoga je cilj ovog rada bio istražiti utjecaj dodatka PAP-a od svinja u hrani na pH vrijednosti, boju i pokazatelje vezanja vode u mesu brojlera. U tu svrhu pilići su hranjeni komercijalnim smjesama bez dodatka i uz dodatak 5 i 10 % PAP-a. Istraživanjem je utvrđeno značajno manja pH vrijednost mjerena 1 sat nakon klanja te značajno veća svjetlina mesa (L*) mjerena 24 sata nakon klanja te gubitak mase tijekom kuhanja kod skupine brojlera hranjenih s 10 % PAP-a. Nisu utvrđene značajne razlike u gubitku mesnog soka cijeđenjem između skupina, ali je uočljiv trend porasta s povećanjem udjela PAP-a u hrani. Temeljem dobivenih rezultata možemo zaključiti da je u hranu brojlera opravdan dodatak PAP-a do 5%.

Ključne riječi: prerađeni animalni protein, brojleri, kakvoća mesa

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The effect of different share of processed animal protein in feed on broiler meat characteristics

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Abstract

Animal by-products obtained during slaughtering process are not used for human consumption, but it could be used for production of animal feed, organic fertilisers and soil improvers and in different technical purposes. One of these products are also processed animal protein (PAP) produced by sterilisation under pressure from the by-products of animals which are fit for human consumption. PAP has higher protein value then plant feed ingredients and is cheaper so it is cost-effective alternative. However, feed ban on using PAP from mammals is currently in force in order to prevent the transmission of transmissible spongiform encephalopathies. Likewise, there are constantly present initiatives for partly suspension of the ban, and allowing the feeding of poultry and swine with PAP from swine and poultry, but with prevention of intra-species recycling. Therefore, the aim of this paper was to investigate the effect of addition of PAP from swine on pH value, colour and water holding capacity of broiler meat. For that purpose chickens were fed on commercial mixtures without PAP and with 5 and 10 % of PAP. Significantly lower pH value measured 1 hour after slaughter and significantly higher lightness (L*) measured 24 hours after slaughter and cooking loss were found in meat of broilers fed with 10 % of PAP. There were no significant differences in drip loss between groups, but rising trend with increased proportion of PAP in feed was observed. Based on these results, it can be concluded that addition of 5 % of PAP in feed mixture could be appropriate.

Key words: processed animal protein, broilers, meat quality

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Komparacija metoda procjene emisije metana iz fermentacije u probavnom sustavu mliječnih krava

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Sažetak

Fermentacija hrane u probavnom traktu mliječnih krava dio je prirodnog procesa probave u kojem anaerobni mikroorganizmi buraga iz dostupne hrane stvaraju spojeve pogodne za apsorpciju. U tom procesu nastaju međuprodukti od kojih je jedan i metan. Metan je nakon ugljik dioksida drugi najvažniji stakleнički plin, odgovoran za globalno zatopljenje, s 25 puta jačim toplinskim učinkom od ugljik dioksida. Međunarodno prihvaćene smjernice za izračunavanje emisije metana *„IPCC Guidelines for National Greenhouse Gas Inventories"* preporučuju da se emisija metana iz probavnog sustava mliječnih krava izračunava pomoću tri metode (Tier 1, 2 i 3). Metoda Tier 1 uključuje jednostavno množenje broja životinja s odgovarajućim emisijskim faktorom, dok se metodama Tier 2 i 3 u procjeni stvorenog metana koristimo specifičnostima proizvodnje i osobinama hrane koju životinje jedu. Na osnovi prikupljenih podataka o broju mliječnih krava, korištenjem baze Hrvatske poljoprivredne agencije, te ostalih potrebnih parametara, metodama Tier 1, 2 i 3 procijenjena je emisija metana iz fermentacije u probavilu mliječnih krava, te je izvršena statistička analiza dobivenih podataka. Navedenim metodama dobivene su različite vrijednosti tvorbe metana, čime se stvara potreba za daljnjim istraživanjima i stvaranja jedinstvenih, nacionalnih faktora za procjenu emisije metana iz fermentacije u probavnom sustavu mliječnih krava.

Ključne riječi: emisija metana, fermentacija u probavilu, mliječne krave

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A comparison of methods for estimating methane emissions from enteric fermentation in dairy cows

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Abstract

The fermentation of feeds in the digestive tract of dairy cows is a natural part of the digestive process in which anaerobic microorganisms, from the rumen available feedstuffs, form compounds suitable for absorption. This microbial fermentation process produces methane as a by-product. Methane is, after carbon dioxide, second most important greenhouse gas responsible for global warming with 25 time stronger thermal input than carbon dioxide. The internationally accepted guidelines for the estimation of methane emissions "IPCC Guidelines for National Greenhouse Gas Inventories" recommend that the methane emission from the enteric fermentation in dairy cows should be calculated using three methods (Tier 1, 2 and 3). Method Tier 1 includes simple multiplication number of animals with the appropriate emission factor, while the methods Tier 2 and 3 in estimating generated methane use the specifics of the production and properties of feed that animals eat. Based on data collected on the number of dairy cows, using Croatian Agricultural Agency database, and other necessary parameters, by Tier 1, 2 and 3 methods, methane emissions from enteric fermentation in dairy cows was estimated, and statistical analysis performed. Those methods obtained different values of methane emission, creating a need for further research and making of unique, national factors for estimation of methane emissions from enteric fermentation in dairy cows.

Key words: methane emission, enteric fermentation, dairy cows

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Zaštićeni mesni proizvodi Hrvatske - svojstva sirovine i finalnog proizvoda

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Sažetak

U Republici Hrvatskoj (RH) postoji niz prepoznatljivih regionalnih mesnih proizvoda koji se po svojim organoleptičkim svojstvima, kvaliteti i povijesno-kulturološkom značaju izdvajaju od ostalih. Neki od tih proizvoda već su zaštićeni na nacionalnoj razini oznakom zemljopisnog podrijetla ili izvornosti, a u tijeku su i postupci njihove jednakopravne zaštite u Europskoj Uniji. To su slavonski i baranjski kulen koji se proizvode u tradicionalno svinjogojskom području istočne Hrvatske, te istarski, drniški, krčki i dalmatinski pršut iz pojasa priobalja i zaleđa, koji poput sličnih područja Mediterana baštini dugu tradiciju soljenja i sušenja mesa. Cilj rada bio je dati kratki kronološki pregled tijeka zaštite i svojstava sirovine i finalnog proizvoda zaštićenih mesnih proizvoda RH, s posebnim osvrtom na specifične zahtjeve glede dobi/završne mase, genotipa i/ili hranidbe svinja za potrebe njihove proizvodnje i pri tome moguću ulogu domaćeg svinjogojstva. Glede potonjeg, utvrđeno je da se proizvodnja slavonskog kulena/kulina i istarskog pršuta temelji isključivo na domaćoj sirovini dok se u proizvodnji ostalih proizvoda može koristiti domaća i/ili uvozna sirovina. Zaključeno je da bi veće uključivanje domaćih proizvođača u širenje sirovinske baze za proizvodnju zaštićenih mesnih proizvoda nedvojbeno polučilo pozitivne učinke na kakvoću i imidž proizvoda te konkurentnost domaćeg svinjogojstva, ali da realne mogućnosti ovakve sinergije uvelike ovise o uvjetima na tržištu svinjskog mesa u zemlji i okruženju.

Ključne riječi: zaštićeni mesni proizvodi, Republika Hrvatska, kulen, pršut, zemljopisno podrijetlo

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Protected Croatian meat products – characteristics of raw material and final product

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Abstract

In the Republic of Croatia there are a number of regional meat products which are recognizable by their organoleptic traits, quality and cultural significance and history. Some of these products already have protected geographical indication or designation of origin at the national level and equal protection at the European Union are in progress. These are Slavonski and Baranjski kulen (dry sausages) that are produced in the traditional pig production regions of eastern Croatia, and Istarski, Drniški, Krčki and Dalmatinski pršut (dry-cured ham) produced in the coastline and its hinterland, which like similar Mediterranean areas has a long tradition of meat salting and drying. In this work a brief overview of protection history along with raw materials and final features of protected Croatian meat products was given. In addition, specific requests regarding the pig production and the possible role of domestic pig farming are emphasised. It was found that the production of Slavonski kulen/kulin and Istarski pršut are solely based on domestic raw material while in the manufacture of other products a domestic and/or imported pork can be used. It is concluded that greater involvement of local producers in the production of pork for protected meat products would undoubtedly created a positive impact on the product quality image and competitiveness of the domestic pig breeding, but that the real possibilities of this synergy largely depend on the conditions at the pork market.

Key words: Republic of Croatia, protected meat products, dry-cured ham, kulen, geographic origin

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Problematika sustava krava-tele u stadima PP Orahovica d.d.

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Sažetak

Sustav krava-tele je proizvodni sustav iz kojeg se dobiva telad za tov. Osnovu ovog sustava čine krave mesnih i kombiniranih pasmina Charolaisa, Angusa i Limuosina. Istraživanje je provedeno tijekom 4 godine u sustavu koji obuhvaća 520 krava s pripadajućim podmlatkom i dvadesetak rasplodnih bikova na 3 farme (Vereš Majur, Krivaja, Đuričić). Sustav krava-tele smješten je na području 360 ha pašnjačkih površina bez nadstrešnica. Životinje borave na pašnjacima od početka svibnja i ovisno o vremenskim prilikama do kraja studenog. U ljetnim sušnim mjesecima životinje na pašnjacima po potrebi dodatno se prihranjuju sjenažom djetelinsko-travnih smjesa i lucerne te svježim repinim rezancima. Tijekom zimskog perioda životinje se drže u stajama na dubokoj stelji gdje se hrane silažom kukuruza od čitave stabljike, svježim repinim rezancima, sijenom, slamom, stočnom kredom te mineralima i solima u obliku cigli za lizanje. U istraživanju smo primjenjivali sljedeće metode: klinički pregled, serološka pretraga, koprološka pretraga, razudba uginule ili eutanazirane životinje te pregledi organa i trupova na liniji klanja. Cilj ovog istraživanja bio je utvrditi prisutnost uzročnika parazitarnih i zaraznih bolesti u stadima te pojavnost bolesti koje oni uzrokuju. Zbog prirodnog pripusta u sustavu krava-tele najveću pažnju smo usmjerili na leptospirozu bikova. U periodu od 2010. godine do 2014. godine pretraženo je 84 uzorka krvi rasplodnih bikova metodom mikroskopske aglutinacije pri čemu je 19 uzoraka dalo pozitivnu reakciju na leptospiru. Utvrđeni su sljedeći serovarovi i razrjeđenja seruma: sv. Sejroe od 1:100 do 1:500, sv. Saxkoebing od 1:100 do 1:500, sv. Hardjo od 1:100 do 1:500, sv. Hardjo-bovis od 1:100 do 1:400. Istraživanja će se nastaviti i iduće godine kako bi se dobili potpuniji rezultati.

Ključne riječi: sustav krava-tele, parazitarne bolesti, zarazne bolesti, leptospiroza bikova

sa2015_a0709

Problems of the cow-calf herds in the PP Orahovica d.d.

Dalibor ĐUD

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Abstract

Cow-calf system is a production system from which it gets calves for fattening. The basis of this system consist beef breeds of cows and dual-purpose breeds Charolais, Angus and Limousine. The study was conducted over four years in a system that includes 520 cows and twenty breeding bulls on three farms (Vereš Majur, Krivaja, Đuričić). Cow-calf system is located in the area of 360 ha of pastures without eaves. Animals live on pasture from the beginning of May, and depending on weather conditions until the end of November. In the summer drought months grazing animals if necessary to recharge hylage clover-grass mixtures and alfalfa and fresh sugar beet pulp. During the winter the animals are kept in stables on deep litter where they are fed corn silage from whole stems, fresh sugar beet pulp, hay, straw, fodder chalk and minerals and salts in the form of bricks for licking. In this research, we applied the following methods: clinical examination, serological tests, coprological examination, necropsy of dead or euthanized animals and views organs and carcasses on the slaughter line. The aim of this study was to determinate the presence of pathogens and parasitic infectious diseases in herds and incidence of diseases that they cause. Because of natural mating in the cow-calf system our most attention is focused on bulls leptospirosis. In the period from 2010 to 2014 there were searched 84 blood samples of breeding bulls with methods of microscopic agglutination where 19 samples gave a positive reaction to Leptospira. The following serotypes and serum dilutions are identified: st. Sejroe from 1:100 to 1:500, st. Saxkoebing from 1: 100 to 1:500, st. Hardjo from 1:100 to 1:500, st. Hardjo-bovis from 1:100 to 1:400. Research will continue next year in order to get more complete data.

Key words: cow-calf system, parasitic diseases, infectious diseases, bulls leptospirosis

sa2015_a0709

Utjecaj konjugirane linolne kiseline u hranidbi svinja na odlaganje masti i masno-kiselinski profil masnog tkiva svinja

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Sažetak

Mast i masne kiseline imaju središnju ulogu u hranidbenoj vrijednosti mesa i različitim aspektima njegove kvalitete. Intramuskularna mast (IMM) pozitivno djeluje na senzorna svojstva svinjskog mesa, na okus, nježnost i sočnost. Razine IMM-a su kod konvencionalnih pasmina niske, a kreću se od 2,2% do 2,5%, dok su te razine kod autohtonih pasmina znatno više i u rasponu od 6% i više. Pojam konjugirane linolne kiseline (CLA) odnosi se na geometrijske i pozicijske izomere linoleinske kiseline (cis–9, cis–12 18:2). Ona posjeduje dvostruke veze odvojene jednom vezom između dva ugljika. Djelovanje CLA u organizmu je višestruko. Ona kod ljudi dovodi do smanjivanja tjelesne mase, smanjuje aktivnost gena za steroil CaA desaturazu te katalitičku aktivnost u adipoznom tkivu, inhibira lipogenezu te potiče oksidaciju masnih kiselina u adipoznom tkivu. Izvori CLA su bilja ulja, mliječna mast i mesni proizvodi. Djelovanje CLA u tijelu svinja očituje se u smanjivanju debljine leđne slanine te povećavanja udjela mišićnog tkiva, povećavanja stope rasta i konverzije hrane. Dovodi do povećavanja zasićenih masnih kiselina te smanjivanja monozasićenih masnih kiselina u mišićnom i potkožnom tkivu. Hranidbom svinja s obrocima koji imaju dodatak CLA može se utjecati na povećavanje vrijednosti polovica te proizvodnju gotovih proizvoda veće kvalitete. CLA je u visokom postotku deponirana u tkivima nepreživača, a posljedično tome i u svinjskom mesu te proizvodima.

Ključne riječi: konjugirana linolna kiselina (CLA), intramuskularna mast (IMM), hranidba svinja, kvaliteta masnog tkiva

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Effect of conjugated linoleic acids in swine nutrition on fat deposition and fatty acid profile of fat

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Abstract

Fat and fatty acids have a central role in meat nutritional value and different aspects of meat quality. Intramuscular fat (IMF) content have positive influence on sensory quality traits, including flavor, juiciness and tenderness of meat. IMF levels are between 2,2% and 2,5% in conventional pig breeds, while indigenous have much higher level of IMF in the range of 6% and more. Term of conjugated linoleic acid (CLA) refers to the geometric and positional isomers of linoleic acid (cis–9, cis–12 18:2). It possesses double bonds separated with one single bond between 2 carbons. CLA has various effects in the body. In human body it leads to the reduction of body weight, reduces activity steroil CoA desaturase gene and catalytic activity in adipose tissue, inhibits lypogenesis and stimulates fatty acid oxidation in adipose tissue. Sources of the CLA are vegetable oils, milk fat and meat products. The effect of CLA in pig body is manifested in reduced of backfat depth and increase the lean content, increase the growth rate and feed conversion. It leads to increase of saturated fatty acids and reduction of monosaturated fatty acids in loin and subcutaneous tissue. Feeding the pigs with CLA enriched meals is possible to increase carcass value and produce the product with higher quality. CLA is in high percentage deposited in body tissues of monogastric animals and consequently in pork and meat products.

Key words: conjugated linoleic acid (CLA), intramuscular fat (IMF), pig feeding, adipose tissue quality

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Viticulture and Enology

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Vinogradarstvo i vinarstvo

Status Fe, Zn i Mn u listu cv. Malvazije istarske (*Vitis vinifera* L.) s četiri terroira pri različitoj gnojidbi

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Sažetak

Analiza biljnog materijala osnova je utvrđivanja statusa hraniva te planiranja kontrolirane ishrane vinove loze. Cilj ovog rada bio je utvrditi status Fe, Zn i Mn u listu cv.Malvazije istarske, kao izrazito značajnih mikroelemenata, kako za rast i razvoj same biljke, tako i za kvalitetu vina. Istraživanja su provedena u četiri vinograda podignuta na četiri tipa tla (terroira), podtipa vitisola: crvenici, smeđem tlu na laporu, te na dvije rendzine na laporu s različitom količinom CaO. Primijenjena su četiri gnojidbena tretmana (Ø; NPK; NPK+Drin+HasconM10+ Oligogreen te NPK+Greenplant). Za utvrđivanje statusa Fe, Zn i Mn uzeti su cijeli listovi (peteljka+plojka) dvaput kroz vegetaciju, u fenofazi cvatnje i šare tijekom 2013. i 2014. godine. Vrijednosti Fe u listu u fenofazi cvatnje kretale su se od 66.36 do 87.00 mg kg^{-1}, a u šari 66.59-111.53 mg kg^{-1}. Status Zn kretao se u rasponu 21.62-29.98 mg kg^{-1} u cvatnji te 17.94-46.13 mg kg^{-1} u šari. Vrijednosti Mn u cvatnji iznosile su 58.37-369.87 mg kg^{-1}, a u šari 91.07-545.98 mg kg^{-1}. Općenito, najbolji rezultat svih istraživanih mikroelemenata utvrđen je pri gnojidbi NPK+Drin+Hascon M10+Oligogreen. Međutim, sve vrijednosti Fe i Zn, neovisno o gnojidbi i terroiru, su na donjoj granici optimalnog, dok je opskrba Mn dostatna. Gnojidbeni tretmani različito su djelovali na pojedinim terroirima, što upućuje na potrebu prilagodbe gnojidbe svakom terroiru.

Ključne riječi: mikroelementi, vinova loza, gnojidba, terroir

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Status of Fe, Zn and Mn in cv. Istrian Malvasia (*Vitis vinifera* L.) leaf from four terroirs under different fertilization treatments

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Abstract

Analysis of plant material is the basis for determining nutrient status and planning controlled grapevine nutrition. The aim of this study was to determine the status of Fe, Zn and Mn in cv. Istrian Malvasia leaf as important microelements for both the growth and development of the plant, but also for wine quality. The experiment was set up in four vineyards (terroirs) on four soil types, subtypes vitisols: red soil, brown soil on marl, and the two rendzinas on marl with different amounts of CaO. Four different fertilization treatments were applied (Ø; NPK; NPK+Drin+HasconM10+Oligogreen and NPK+Greenplant). To determine the status of Fe, Zn and Mn, whole leaves (petiole+blade) were taken twice through the vegetation, in the stage of bloom and veraison during 2013 and 2014. Determined Fe values ranged from 66.36 to 87.00 mg kg^{-1} in bloom stage, while from 66.59 to 111.53 mg kg^{-1} in veraison. Zn ranged from 21.62 to 29.98 mg kg^{-1} in bloom, and from 17.94 to 46.13 mg kg^{-1} in veraison. Determined Mn ranged in bloom from 58.37 to 369.87 mg kg^{-1}, while in veraison from 91.07 to 545.98 mg kg^{-1}. Generally, the best results of all studied microelements were obtained with the use of NPK+Drin+Hascon M10+Oligogreen treatment. However, Fe and Zn values were within minimal for grapevine needs, while Mn values were sufficient. Fertilization treatments had a different effect on each terroir, suggesting the need of a personalized fertilization for every terroir.

Key words: microelements, grapevine, fertilization, terroir

sa2015_a0801

Utjecaj izbora oprašivača na mehanički sastav i kakvoću grožđa sorte Grk bijeli (*Vitis vinifera* L.) u 2012. godini

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Sažetak

Sorta Grk bijeli (Vitis vinifera L.) je autohtona sorta vinove loze otoka Korčule. Sorta posjeduje funkcionalno ženski cvijet pa ne dolazi do samooplodnje već joj je potrebna sorta oprašivač. Iako se u nasadima kao oprašivač koristi sorta Plavac mali postotak oplodnje jako varira. Osim normalno oplođenih bobica u grozdu se također javlja i veliki broj malih neoplođenih bobica. Cilj istraživanja bio je utvrditi utjecaj sorte oprašivača na mehanički i kemijski sastav grožđa i vina.U pokus su kao oprašivači bile uključene tri sorte vinove loze: Plavac mali, Pošip bijeli i Chardonnay. Najveća masa grozda (193,22 g), broj oplođenih bobica u grozdu (65,5) kao i njihova ukupna masa (138,9 g) dobivena je oprašivanjem sortom Pošip bijeli. Kod sorte Plavac mali dobivena je najveća masa peteljke te prosječno najveći broj sjemenki u 100 bobica (133,81 g). U sadržaju šećera, ukupnih kiselina te pH mošteva dobivenih iz oplođenih i neoplođenih bobica nije utvrđena signifikantna razlika. Navedeni rezultati pokazuju da izbor oprašivača ima značajan utjecaj na mehanički sastav grozda dok na kemijski sastav nema utjecaja. Pritom su najbolji rezultati dobiveni oprašivanjem sortom Pošip bijeli a najlošiji sortom Chardonnay.

Ključne riječi: vinova loza, oprašivač, oplodnja, mehanički sastav, kemijski sastav

sa2015_a0802

Impact of pollinator variety on mechanical composition and quality of Grk bijeli (*Vitis vinifera* L.) variety in the year 2012

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Abstract

Variety Grk bijeli (Vitis vinifera L.) is an indigenous variety of the island of Korčula. Variety has a functionally female flower and as such it fails in self-pollination. Due to this, a pollinator variety is needed. Although the pollinator variety of Plavac mali is used in vineyard production the percentage of fertilization varies greatly. In addition to the normal berries in a cluster there is also a significant number of small unfertilized berries. The aim of this study is to determine the effect of a variety of pollinators to the mechanical and chemical composition of grapes and wine. Three varieties of pollinators were used in this study: Plavac mali, Pošip bijeli and Chardonnay. The largest cluster mass (193.22 g), number of fertilized berries in a cluster (65.5) and their total weight (138.9 g) was obtained by pollinating with Pošip bijeli. Plavac mali obtained the highest stem mass and the highest number of seeds per 100 berries (133.81 g) on average. Sugar content, total acidity and pH value of musts in both fertilized and unfertilized berries, did not constitute a significant difference. The results indicate that the choice of pollinators has a significant influence on the mechanical composition of the cluster while it bears no influence on the chemical composition. The best results are obtained by using Pošip bijeli as a pollinator and poorest using Chardonnay as pollinator.

Key words: grapevine, pollinator, fertilization, mechanical composition, chemical composition

sa2015_a0802

Usporedba referentne i FT-IR metode za određivanje hlapive kiselosti

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Sažetak

FT-IR tehnika (infracrvena spektroskopija s Fourier-ovom transformacijom) služi za brzu analizu vina, bez posebne pripreme uzorka ili korištenja organskih otapala. FT-IR metoda se zasniva na mjerenju količine svjetla u srednjem IR području koju apsorbiraju molekule uzorka koje sadrže kovalentne veze. Metoda je indirektna, podaci se prvo pretvaraju u matematički model (kemometrijska procedura), a onda tumače kao očekivani rezultat. Cilj ovog rada bio je usporediti rezultate hlapive kiselosti dobivene referentnom metodom – RM (izvor: OIV, destilacija vodenom parom i titracija) i FT-IR metodom u uzorcima mirnih vina. Prije mjerenja FT-IR-om uzorci vina su filtrirani radi odstranjivanja čestica onečišćenja i CO_2. Rezultat dobiven FT-IR metodom predstavlja prosječnu vrijednost tri ponavljanja. Rezultati dobiveni RM i FT-IR metodama su unakrsno statistički analizirani. Definirani su minimum, maksimum, srednja vrijednost te standardna devijacija. Usporedba rezultata dobivenih RM i FT-IR metodama pokazuje visoku razinu linearnosti za istraživano područje u rasponu od 0,20 do 0,86 g L^{-1} hlapive kiselosti što dokazuje da je prethodna kalibracija sustava dobro provedena. Temeljem dobivenih rezultata dokazano je da je FT-IR metoda primjenjiva u rutinskoj analizi vina zbog sljedećih prednosti: brzina analize, jednostavno rukovanje, niski troškovi održavanja, te stoga što su u metodi primjeni principi zelene kemije.

Ključne riječi: vino, FT-IR, referentna metoda, hlapiva kiselost

sa2015_a0803

Comparison of the reference and the FT-IR method for determination of volatile acidity

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Abstract

FT-IR technique (infrared spectroscopy with Fourier's transformation) is used for the rapid wine analysis, without special sample preparation or using of organic solvents. FT-IR method is based on measuring the amount of light in the middle of IR spectrum which is absorbed by the sample molecules containing covalent bonds. The method is indirect, the data should be firstly converted into a mathematical model (chemometric procedures) and then interpreted as predicted result. The aim of this study was to compare the results of volatile acidity obtained by the reference method - RM (source: OIV, steam distillation and titration) and FT-IR method in still wines samples. Before FT-IR measuring, wine samples were filtered to remove any particles of pollution and CO_2. Results obtained by FT-IR represent average value of three replicates. Results obtained by RM and FT-IR methods have been crosschecked and statistically analyzed. Minimum, maximum, mean and standard deviations were defined. Comparison of results obtained by RM and FT-IR methods showed a high level of linearity for the investigated area, ranging from 0.20 to 0.86 g L^{-1} of volatile acidity, which proves that previous calibration system performed well. On the basis of results it is proved, that FT-IR method is applicable for routine wine analysis because of its advantages: short time of analysis, easy to operate, low maintenance costs, and because the method is based on the principles of green chemistry.

Key words: wine, FT-IR, reference method, volatile acidity

sa2015_a0803

Sadržaj nekih teških metala u vinima Graševine (*Vitis vinifera* L.)

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Sažetak

Makro i mikroelementi su važni za kakvoću vina; sudjeluju u alkoholnoj fermentaciji, u regulaciji katalitičkih i oksidoredukcijskih procesa, u procesima stabilizacije vina te u spontanom otkiseljavanju vina taloženjem tartarata. Primjer negativnog učinka su oksidativne promjene vina i pojava zamućenja. Sadržaj makro i mikroelemenata u grožđu i vinu, posebice teških metala, ovisi o brojnim faktorima. Najvažniji su tip tla, klimatski uvjeti, agrotehničke mjere, ampelotehnički zahvati, te postupci tijekom prerade grožđa i proizvodnje vina. Prirodni je sadržaj teških metala u vinu u netoksičnim koncentracijama, no neki se mogu pojaviti u višim koncentracijama, najčešće zbog nepravilnog korištenja mineralnih gnojiva, pesticida ili loše podrumske opreme. Cilj ovog istraživanja bio je utvrditi sadržaj aluminija, bakra, olova i cinka u vinima sorte Graševina, iz različitih vinogorja, unutar vinogradarskih zona B i CI. Analizirano je 15 vina Graševine, berbe 2011. Ispitivanja sadržaja navedenih elemenata provedena su tehnikom spektrometrije optičke emisije induktivno spregnute plazme (ICP-OES). Koncentracije svih istraživanih mikroelemenata bile su ispod maksimalno dopuštenih granica utvrđenih zakonodavstvom Republike Hrvatske i Europske unije. Dobivene koncentracije aluminija, bakra i cinka ukazuju na poštivanje pravilne primjene mineralnih gnojiva i enoloških sredstava u proizvodnji. Sadržaj olova ukazuje na vrlo niski stupanj onečišćenja iz okoliša.

Ključne riječi: vino, teški metali, onečišćenje, ICP-OES

sa2015_a0804

Content of some heavy metals in Graševina (*Vitis vinifera* L.) wines

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Abstract

Macro and microelements are important for wine quality; they participate in alcoholic fermentation, in regulation of catalytic and oxidoreduction processes and wine stabilization processes. They participate in spontaneous deacidification of wine by tartrate precipitation. Examples of negative effects are oxidative wine changes and blurring appearance. Grape and wine macro- and microelements and especially heavy metals content depend on numerous factors. The most important are soil type, climate conditions, viticultural practices, grape and wine production processes. Natural heavy metals content of wine is in nontoxic concentration levels but some of them can appear in higher concentration levels because of improper fertilizers and pesticides usage or bad cellar equipment. The object of this study was to investigate the levels of aluminum, copper, lead and zinc in Graševina wines from different wine-growing regions. Fifteen samples of Graševina wines, vintage 2011, were analyzed. The measurements of selected elements concentration were performed by inductively coupled plasma optical emission spectrometry (ICP-OES) technique. The concentrations of all studied elements were below the maximum acceptable limits defined by the Croatian and the European Union legislation. The obtained concentrations of aluminum, copper and zinc are showing proper usage of fertilizers and enological products in production. The content of lead indicates very low level of environmental contamination.

Key words: wine, heavy metals, contamination, ICP-OES

sa2015_a0804

Ampelographic, molecular and analytical characterization of Varieties derived from `Catawba´ and `Concord´

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Abstract

North American *Vitis labrusca* vines carry properties such as disease resistances, morphological cluster and berry traits or flavors which make the species interesting for grapevine breeding. Using it as a source for resistance breeding, undesired metabolic properties like off-flavors will also be inherited. On the other side, organoleptic analysis revealed also interesting flavor expressions. This study aimed at characterizing genetically and morphologically 21 *V. labrusca* hybrid accessions available in the germplasm collection at Geilweilerhof as well as defining their relations. Genetic fingerprinting was conducted by SSR marker analysis. For phenotypic characterization, mainly leaf and bunch morphology were considered. Furthermore total anthocyanin and phenol content of the berry skins were analyzed. The juices were examined concerning quality determining parameters. Amongst others, data of the sugars, acids and aroma compounds were obtained. Additionally, sensory evaluations were performed by an experienced test panel. Data for 18 of the accessions from Geilweilerhof are also available in the USDA database at Geneva, United States. Both sets of data were compared in terms of genetic fingerprint and morphology. This comparison elucidated some inconsistencies suggesting misnaming of some accessions in the germplasm collection of the Institute for Grapevine Breeding Geilweilerhof. But also formerly supposed ancestries were confirmed to be incorrect as the pedigree `Concord´ x `Catawba´ for the variety `Caco´. These findings enrich our knowledge about genetic resources of *V. labrusca* and put it closer to be used in grapevine resistance breeding.

Key words: *V. labrusca*, ampelography, Simple Sequence Repeats, wine analytics, organoleptics

sa2015_a0805

Utjecaj folijarne gnojidbe dušikom na status dušika u listu sorte Graševina (*Vitis vinfera* L.)

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Sažetak

Dušična gnojidba redoviti je agrotehnički zahvat kojim se utječe na vegetativni rast i prinos te na udio dušika u grožđu i moštu. Također ima utjecaj i na tijek alkoholne fermentacije. Uobičajena vinogradarska praksa uključuje aplikaciju gnojiva u tlo.

Cilj ovog istraživanja bio je utvrditi utjecaj folijarne aplikacije tri različita oblika dušika na opskrbljenost vinove loze dušikom, prikazanu kao status dušika u listu. Istraživanje je provedeno na sorti Graševina (klon ISV-1) cijepljenoj na podlogu SO4. Postavljen je 2012. i 2013.godine na pokušalištu Jazbina Agronomskog fakulteta u Zagrebu prema shemi latinski kvadrat. Pokus je uključivao 5 tretmana: K (bez gnojidbe), NPK (250 kg/ha zimskom aplikacijom u tlo), Drin (NPK u tlo+0,25%-tni Drin folijarno), UR (NPK u tlo+1%-tna urea folijarno) i AN (NPK u tlo+0,25%-tni amonij nitrat folijarno). Folijarna aplikacija ponovila se u 4 fenofaze: 8 odvojenih listova, pred cvatnju, bobica veličine graška te nakon berbe (prema modificiranom E-L sistemu). Prije svakog tretiranja uzeti su uzorci lišća u kojima se određivao ukupni dušik metodom po Kjeldahlu. Folijarna gnojidba dušikom pozitivno je utjecala na status dušika u listu, ali njen utjecaj ovisio je o obliku dušika u primijenjenom gnojivu. Najbolje rezultate pokazao je UR tretman koji je imao značajno viši ukupni N u listu u odnosu na K i NPK tretman.

Dobiveni rezultati ukazuju na pozitivan efekt primjene folijarne gnojidbe dušikom u svrhu bolje opskrbljenosti vinove loze dušikom.

Ključne riječi: folijarna gnojidba, dušik u listu, fenofaze, Graševina

sa2015_a0806

Effect of foliar nitrogen fertilization on leaf nitrogen status of cv. Graševina (*Vitis vinifera* L.)

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Abstract

Nitrogen fertilization is a regular agricultural practice as it affects vine growth and yield as well as grape and must nitrogen content. It also has an impact on the fermentation rate. Common viticultural practice includes soil application.

The aim of this study was to determine the effect of foliar application of three different nitrogen forms on grapevine nitrogen supply, indicated by leaf nitrogen status. Study was conducted on cv. Graševina (clone ISV-1) grafted on SO4 rootstock. It was carried out in 2012 and 2013 on Jazbina trial field of the Faculty of Agriculture in Zagreb (Zagreb winegrowing region) using latin square design. The trial consisted of five treatments: K (no fertilization), NPK (250 kg/ha winter soil application), Drin (NPK soil+foliar 0,25% Drin), UR (NPK soil+foliar 1% urea) and AN (NPK soil+foliar 0,25% ammonium nitrate). Foliar fertilization was repeated in four growth stages: 8 leaves separated, before flowering, berries pea-size and after harvest (according to modified E-L system). Prior to every treatment, leaf samples were taken and leaf total N was determined according to Kjeldahl method. Foliar N fertilization positively affected the leaf N status, but its effect depended on N form applied. The highest result was obtained by UR treatment, which significantly increased total leaf N compared to K and NPK treatment.

Obtained results indicate positive effect of foliar N application in order to improve grapevine N supply.

Key words: foliar fertilization, leaf nitrogen, growth stages, Graševina

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Odnos dušika i fosfora u lišću, peteljkovini i tropu vinove loze (*Vitis vinifera* L.) na različitim tlima

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Sažetak

Odnos dušika i fosfora u lišću, peteljkovini i tropu vinove loze (*Vitis vinifera* L.) istraživan je na sorti Sauvignon bijeli tijekom 2013. godine na području Plešivičkog vinogorja. Istraživanje je provedeno na tri podtipa vitisola: distričnom kambisolu (pH_{KCl} 3,76), pseudogleju (pH_{KCl} 4,77) i rendzini na laporu (pH_{KCl} 7,27). Za utvrđivanje dinamike dušika i fosfora te njihov odnos, uzorci lišća uzimani su tri puta tijekom vegetacije: u fazi cvatnje, fazi šare i u berbi, a osim u lišću navedeni parametri određeni su i u peteljkovini grozda i tropu. U sva tri uzorkovanja lišća značajno veće koncentracije dušika utvrđene su na alkalnom tlu, a trend smanjenja koncentracije dušika u lišću loze prema kraju vegetacije utvrđen je na svim tlima. Manji porast koncentracije fosfora na alkalnom tlu u odnosu na kisela tla utvrđen je u svim uzorkovanjima lišća vinove loze. U peteljkovini i tropu veće koncentracije dušika utvrđene su na alkalnom tlu u odnosu na kisela tla, dok je koncentracija fosfora bila ujednačena neovisno o tlu. Koncentracije pojedinog elementa odrazile su se i na njihov odnos - širi N/P odnos u lišću vinove loze u sva tri uzorkovanja utvrđen je na karbonatnom tlu (6,66-13,49) u odnosu na kisela tla (3,53-11,12). Slično kao u lišću, u peteljkovini i tropu širi N/P odnos utvrđen je na alkalnom tlu u odnosu na kisela tla.

Ključne riječi: dušik, fosfor, fenofaze vinove loze, reakcija tla

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Nitrogen and phosphorus ratio in grapevine (*Vitis vinifera* L.) leaves, grape stems and pomace on various soils

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Abstract

Nitrogen and phosphorus ratio in grapevine leaves, grape stems and pomace was investigated on the varieties Sauvignon Blanc during 2013. in the Plešivica vine-growing region. Investigation was conducted on three vitisol subtypes: dystric cambisol (pH_{KCl} 3.76), pseudogley (pH_{KCl} 4.77) and rendzina on marl (pH_{KCl} 7.27). To determine the dynamics of nitrogen and phosphorus and their ratio, leaf samples were taken three times during the growing period: at the flowering, verasion stage and at the vintage. In adition, nitrogen and phosphorus concentrations were determined in grape stalks and pomace. In all three leaves samplings significantly higher concentrations of nitrogen and moderately increase in the phosphorus concentration were determined on alkaline soil compared to acid soils. Higher concentration of nitrogen was determined in grape stems and pomace on alkaline soil compared to acidic soils, while the phosphorus concentration was equable regardless of the soil. The concentrations of each element were reflected in their mutual relations - wider N/P ratio in all samplings of grapevine leaves was determined on calcareous soil (6.66-13.49) compared to acid soils (3.53-11.12). Similarly as in the leaves, wider N/P ratio in grape stems and pomace were determined on alkaline soil compared to acid soils.

Key words: nitrogen, phosphorus, grapevine growing stages, soil reaction

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Utjecaj produljene maceracije masulja na parametre kvalitete bijelog i crnog vina

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Sažetak

U cilju istraživanja utjecaja produljene maceracije na parametre kakvoće vina, dva uzorka masulja sorte bijelog grožđa Malvazija istarska i uzorak masulja sorte crnog grožđa Teran podvrgnuti su tretmanima maceracije u trajanju od dva (2M), četiri (4M) i šest mjeseci (6M). Proizvedena vina uspoređena su s kontrolnim standardnim vinima (K). Smanjenje koncentracija ukupnih kiselina, vinske, jabučne i limunske kiseline, kao i povećanje pH, hlapljive kiselosti, mliječne kiseline, te pepela bili su proporcionalni duljini trajanja maceracije. Najveći porast glicerola i metanola zabilježen je u 2M vinima. U vinima Malvazije ukupni fenoli bili su u porastu, te su 6M vina sadržavala četverostruko, odnosno dvostruko više koncentracije u odnosu na K vina. Obrazac uočen kod Terana bio je drugačiji, s oštrim padom (oko 30%) u 2M vinu, nakon čega je uslijedio porast. U nekim uzorcima primijećeno je linearno povećanje razine katehina i proantocijanidina s trajanjem maceracije. Razina antocijana pretrpjela je prilično oštar pad u vinima Terana 2M i 4M. S obzirom na strukturu tanina, indeks želatine koji predstavlja astringentne tanine bio je najviši u 4M vinu Terana. Opadanje vrijednosti indeksa ionizacije (obojenih antocijanina) bilo je značajno u 6M, dok je HCl indeks (kondenzirani tanini) bio najviši u 4M, a najniži u 6M Teranu. Etanolni indeks, koji ukazuje na makromolekularne komplekse vezane uz mekoću i punoću vina, iznenađujuće je umanjen u 2M i 4M u odnosu na K vino Terana.

Ključne riječi: produljena maceracija, trajanje, Malvazija Istarska, Teran, fenolni indeksi

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The effect of the duration of prolonged mash maceration on the quality parameters of white and red wine

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Abstract

To investigate the effect of prolonged maceration on wine quality parameters, two samples of Malvazija istarska white grape mash and a red grape Teran mash were subjected to maceration for two (2M), four (4M), and six months (6M). Produced wines were compared to control standard wines (K). The decrease of total acidity, tartaric, malic and citric acid, and the increase of pH, volatile acidity, lactic acid, and ash were quite proportional to maceration duration. The highest increase of glycerol and methanol was observed in 2M wines. In Malvazija wines, the total phenol content generally increased, with the level in 6M in relation to K wines being approximately four and two times higher, respectively. The pattern observed for Teran was different, with a sharp drop (cca. 30%) in 2M, followed by a constant rise. A linear increase of proanthocyanidins and catechins with maceration duration was noticed in some samples. The level of anthocyanins suffered a rather sharp drop in Teran 2M and 4M wines. With respect to the structure of tannins, Gelatin index representing astringent tannins was the highest in Teran 4M wines. Ionisation index (coloured anthocyanins) showed a major drop in Teran 6M wines. HCl index (condensed tannins) had a maximum in 4M, and a minimum in Teran 6M wine. Ethanol index values, indicating macromolecular associations related to softness and fullness of wine, surprisingly decreased in 2M and 4M in relation to K Teran wines.

Key words: prolonged maceration, duration, Malvazija istarska, Teran, phenol indices

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Autentična vina

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Sažetak

Autentičnost vina predstavlja važno pitanje u smislu zaštite potrošača, a temelji se na identifikaciji i eliminaciji prevara na tržištu vina. Pristupanjem Europskoj uniji, Republika Hrvatska sukladno članku 88., stavka 1., Uredbe Komisije 555/2008 (EZ) preuzela je obvezu proizvodnje 30 autentičnih vina, s ciljem nadogradnje postojeće banke podataka vina Europske unije sa hrvatskim vinima. Za dokazivanje autentičnosti vina razvijene su sofisticirane metode koje su bazirane na parametrima karakterističnim za podrijetlo, koji ne podliježu promjenama tijekom prerade, a istodobno je nemoguće mijenjati ih na bilo koji način. Tehnikom nuklearne magnetske rezonancije (^{2}H-SNIF®-NMR) određuje se izotopni omjer specifično vezanog deuterija (D/H) etanola. Masnom spektrometrijom (IRMS) određuju se izotopni omjeri ^{13}C/^{12}C etanola i ^{18}O/^{16}O vode. Ovo su službene metode u Europskoj uniji za dokazivanje patvorenja vina dodatkom šećera i vode. Osim izotopnih tehnika u dokazivanju autentičnosti primjenjuju se i kromatografske tehnike kao što je plinska (GC-FID, GC-MS) i tekućinska visoke učinkovitosti (HPLC). Ovim tehnikama određuju se nehlapivi i hlapivi spojevi grožđa i vina, koji mogu poslužiti za dokazivanje sorte, geografskog podrijetla vina i godine berbe, patvorenje vina dodatkom glicerola, aroma i drugih spojeva koji nisu dozvoljeni u proizvodnji vina. Cilj ovoga rada je dati pregled tehnika koje služe za dokazivanje autentičnosti vina i primjer njihove implementacije na uspostavljanju analitičke banke podataka za hrvatska vina.

Ključne riječi: vino, autentičnost, geografsko podrijetlo, analiza stabilnih izotopa

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Authentic wines

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Abstract

Wine authenticity is an important issue in a sense of consumers' protection, based on identification and elimination of adulteration at the wine market. Accessing to EU, the Republic of Croatia, according to article 88, paragraph 1, Commission regulation (EU) No 555/2008, undertook obligation to produce 30 authentic wines with aim to upgrade existing databank of EU wines with the Croatian wines. For the purpose to prove wine authenticity, sophisticated methods were developed that are based on parameters characteristic for origin, which do not undergo changes during production, and at the same time it is impossible to change them in any way. Isotope ration of specifically bounded deuterium (D/H) of ethanol can be determined by technique of nuclear magnetic resonance (^{2}H-SNIF®-NMR). Isotope ratio of ^{13}C/^{12}C ethanol and ^{18}O/^{16}O water is determined by mass spectrometry (IRMS). These are EU official methods that can prove wine adulteration by adding sugar or water. Besides isotopic techniques, to prove authenticity it can be applied also chromatographic techniques such as gas chromatography (GC-FID, GC-MS) and high-performance liquid chromatography (HPLC). These techniques are used for determination of grape and wine non-volatile and volatile compounds that can be used for variety identification, to identify wine geographical origin and vintage, to prove wine adulteration by glycerol, aromas and other compounds that are not allowed in wine production. The aim of this paper is to present overview of techniques that are used to prove wine authenticity and example of their implementation in establishment of databank for Croatian wines.

Key words: wine, authenticity, geographical origin, stable isotope analysis

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Voćarstvo

Poboljšanje kvalitete sadnog materijala višnje Maraske zdravstvenom selekcijom i genetičkom evaluacijom

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Sažetak

Preduvjet za proizvodnju certificiranog sadnog materijala voćnih vrsta je provođenje zdravstvene i genetičke selekcije. Istraživanje zdravstvenog stanja višnje Maraske provedeno je u plantaži Vlačine, najvećoj plantaži višnje Maraske u Hrvatskoj u vlasništvu tvrtke Maraska d.d. Za provjeru zdravstvenog stanja odabrano je 200 stabala (50 elitnih, 100 prosječnih, 50 ispodprosječnih) koja su metodom ELISA testirana na 11 virusa: virus klorotične pjegavosti lista jabuke (ACLSV), virus mozaika jabuke (ApMV), virus mozaika gušarke (ArMV), virus zvjezdastog mozaika petunije (PAMV), virus uvijenosti lista trešnje (CLRV), virus kržljavosti šljive (PDV), virus nekrotične prstenaste pjegavosti trešnje (PNRSV), latentni virus prstenaste pjegavosti jagode (SLRSV), virus crnih prstenova rajčice (TBRV), virus prstenaste pjegavosti maline (RpRSV) te virus šarke šljive (PPV). Istraživanjem je potvrđena prisutnost slijedećih virusa: PDV (0,5%), PNRSV (4,5%), SLRSV (2%). Na temelju simptoma i laboratorijskih analiza biljnog materijala zaraženog gljivama detektirana je kozičavost lista trešnje i višnje (*Blumerriela jaapii* (Rehm) Arx), dok su na plodovima sa simptomima truleži utvrđene vrste roda *Alternaria*. Elitna stabla bez virusa analizirana su korištenjem mikrosatelitskih (SSR) DNA biljega kako bi se potvrdila pripadnost sorti. U radu će biti prikazani rezultati usporedbe genetičkog profila Maraske sa ostalim sortama višnje koje se uzgajaju u Hrvatskoj.

Ključne riječi: virusi, gljive, ELISA, mikrosateliti, genetička identifikacija

sa2015_a0901

Improving the quality of sour cherry cv. Maraska planting material by sanitary selection and genetic evaluation

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Abstract

A prerequisite for the production of certified planting material of fruit species is implementation of sanitary and genetic selection. Research of sanitary status of sour cherry cv. Maraska was conducted in the Vlačine orchard, the largest sour cherry orchard in Croatia owned by Maraska Inc. To check the sanitary status 200 trees (50 elite, 100 average, 50 below average) were selected and tested by ELISA on 11 viruses: Apple chlorotic leaf spot virus (ACLSV), Apple mosaic virus (ApMV), Arabis mosaic virus (ArMV), Petunia asteroid mosaic virus (PAMV) Cherry leaf roll virus (CLRV), Prune dwarf virus (PDV), Prunus necrotic ringspot virus (PNRSV), Strawberry latent ringspot virus (SLRSV), Tomato black ring virus (TBRV), Raspberry ringspot virus (RpRSV) and Plum pox virus (PPV). The survey confirmed the presence of following viruses: PDV (0.5%), PNRSV (4.5%), SLRSV (2%). Based on symptoms and laboratory analysis of plant material infected with fungi presence of cherry leaf spot (*Blumeriella jaapii* (Rehm) Arx) was detected, while on fruits with rot symptoms *Alternaria* species were determined. Elite trees free of viruses were analyzed using microsatellite (SSR) DNA markers to check their true-to type status. In this work comparison of cv. Maraska genetic profile with profiles of other sour cherry varieties grown in Croatia will be presented.

Key words: viruses, fungi, ELISA, microsatellites, genetic fingerprinting

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Influence of plant growth regulators on apple fruit ripening

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Abstract

Plant growth regulators (PGRs) are used in the production of apples at different stages during the growing season. They are used for chemical thinning, fruit drop control, fruits elongation, to promote the formation of fruiting buds and other purposes. This paper provides an overview of the results obtained by applying naphthaleneacetic acid (NAA), benzyladenine (BA), gibberellins (GA_{3+7}) and aminoethoxyvinylglycine (AVG), applied at different growth stages over several years in different trials at the Faculty of Agriculture in Novi Sad. The level of maturity at the time of harvest was determined by starch iodine (SI) test, fruit firmness, soluble solids content and total acids. The results show that NAA treated fruits have lower firmness and higher SI index, especially if NAA is applied to prevent fruit drop. In contrast, AVG treated fruits have a higher firmness and lower SI index. BA and GA also affect these traits at the time of harvest, however not showing such pronounced and clear effects like NAA and AVG. The effects of growth regulators on total acids and soluble solids are generally not significant. The results show that PGRs applied in various phases during the growing season influence ripening process which must be taken into account when determining harvesting date and storage potential of fruits.

Key words: apple, plant growth regulators, firmness, maturity

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Nisko pesticidna integrirana proizvodnja u održivom i sigurnom uzgoju voća: LIFE+ SU.SA.FRUIT projekt

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Sažetak

Europska poljoprivredna politika zahtijeva implementaciju integrirane zaštite bilja, kako bi se promovirala održiva uporaba pesticida koja bi se prilagodila regionalnim uvjetima rasta. Države članice Europske unije trenutačno uvode nacionalne akcijske planove za smanjenje uporabe pesticida gdje god je moguće. Zbog opasnog učinka agrokemikalija na čovjeka i okoliš, postoji rastući trend upravljanja ekološkim interakcijama u poljoprivrednim ekosustavima. Integrirana zaštita bilja postala je općeprihvaćena strategija zaštite bilja u EU i važno sredstvo za održavanje sigurnosti hrane, koje ujedno povećava i zaštitu okoliša.U projektu sudjeluje 6 partnera iz triju država. Projekt je sufinanciran od strane Life+ programa sa ukupnim iznosom od preko 2 milijuna €. Vrijeme implementacije projekta je 42 mjeseca. LIFE+ SU.SA.FRUIT projekt ima za cilj smanjenje uporabe pesticida u hrvatskom i talijanskom lancu proizvodnje voća, kako u uzgoju tako i u postupcima nakon berbe. Alternativne nepesticidne metode borbe protiv štetnika i patogena ocjenjivati će se na12 demonstracijskih voćnjaka. Za bolesti voća nakon berbe, fizikalne metode, uključujući tretmane toplom vodom, vrednovati će se u četiri komercijalne hladnjače.

Glavna očekivana postignuća:

- Smanjenje opterećenja voća kemikalijama
- Smanjenje poljoprivrednih troškova
- Smanjenje gubitaka
- Povećanje konkurentnosti europske hortikulture

Ključne riječi: integrirana zaštita, jabukov savijač, breskvin savijač, mreže, tretman toplom vodom

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Low pesticide IPM in sustainable and safe fruit production: a LIFE+ SU.SA.FRUIT project

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Abstract

European agricultural policy requires the implementation of integrated pest management (IPM) to promote sustainable use of pesticides adapted to regional growing conditions. European Member States are implementing National Action Plans to reduce the use of pesticides wherever possible. Due to the hazardous effects of agrochemicals both on humans and the environment, there is a growing trend towards the management of ecological interactions in agro-ecosystems. IPM has become the mainstream strategy for plant protection in the EU, as it is an important tool to maintain food security, while increasing the environment protection.In project are involved six partners from three different countries. With contribution from EU, project cost is almost 2 million €. The LIFE+ SU.SA.FRUIT project aims at reducing the use of pesticides to implement IPM in the Croatian and Italian fruit production chain, both in field and in postharvest. Alternative practices to pesticides will be evaluated in twelve demonstration fields against pests and pathogens. For postharvest fruit diseases, physical methods, including hot water treatments, will be evaluated in four commercial packinghouses.

Main expected achievements:

- Reduction of chemical pressure
- Reduction of agricultural costs
- Reduction of fruit losses
- Increase in competitiveness of European horticulture

The Project "Life+SU.Sa.FRUIT" is realized with the contribution of the LIFE financial instrument of the European Union (Contract No LIFE13 ENV/HR/000580).

Key words: IPM, Cydia pomonella, Cydia molesta, exclusion nets, hot water

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Uloga pektina u pojavi ozljeda plodova nektarine od niskih temperatura tijekom čuvanja

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Sažetak

Istraživano je djelovanje toplinskih tretmana na sadržaj frakcija pektina (pektini topljivi u vodi, pektini topljivi u amonijevom oksalatu i pektini topljivi u natrijevoj lužini), pojavu ozljeda od niskih temperatura i senzorna svojstva nektarine sorata 'Diamond Ray' i 'Venus' čuvanih 2 i 4 tjedna na 0 **°C u normalnoj atmosferi i 5 dana života na polici**. Primijenjeni toplinski tretmani bili su potapanje u vruću vodu temperature 48 °C u trajanju 6 i 12 minuta (HWD 48 °C 6' i HWD 48 °C 12'), potapanje u vruću vodu temperature 52 °C u trajanju 2 minute (HWD 52 °C 2') i tretman vrućim zrakom temperature 45 °C u trajanju od 60 minuta uz podizanjem temperature za 24 °C svakih 60 minuta sve dok temperatura mezokarpa kraj koštice ne dostigne 45 °C (HAT 45 °C/24). Kod sorte 'Diamond Ray' tretman vrućim zrakom nije smanjio ozljede od niske temperature, ali ih nije ni povećao, dok su vodeni tretmani (HWD 48 °C 6', HWD 48 °C 12' i HWD 52 °C 2') povećali udio plodova s ozljedama od niskih temperatura. Sorta 'Venus nije pokazala simptome ozljeda od niskih temperatura. Utjecaj toplinskih tretmana na udjele frakcija pektina je različit ovisno o sorti i duljini čuvanja plodova. Pektini topljivi u amonijevom oksalatu imaju važnu ulogu kod ozljeda od niskih temperatura. Plodovi s većim udjelom pektina topljivih u amonijevom oksalatu imali su niži udio plodova s ozljedama od niskih temperatura. Utvrđena povezanost omjera pektina topljivih u vodi i pektina topljivih u amonijevom oksalatu s intenzitetom ozljeda od niskih temperatura, što ukazuje da bi taj omjer mogao biti dobar pokazatelj ozljeda od niskih temperatura. Toplinski tretmani ne narušavaju kakvoću ploda nektarine, ali utječu na senzorna svojstva plodova nakon čuvanja 2 i 4 tjedna na 0 **°C** i 5 dana života na polici.

Ključne riječi: *Prunus persica* var. *nectarina*, toplinski tretmani, pektini, senzorna svojstva, ozljede od niskih temperatura, kakvoća ploda, čuvanje

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Pectin role in nectarine fruit chilling injuries

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Abstract

The effect of heat treatment on the ratio of the pectin fractions (water soluble pectin, ammonium oxalate soluble pectin and sodium hydroxide soluble pectin), the occurrence of chilling injury and sensory properties nectarine cultivars 'Diamond Ray' and 'Venus' stored 2 and 4 weeks at 0 °C in normal atmosphere and 5 days of shelf life was studied. Heat treatments that were applied were hot water dip treatment at temperature 48 ° C for 6 and 12 minutes (HWD 48 °C 6' and HWD 48 °C 12', respectively), at temperature 52 °C for 2 minutes (HWD 52 °C 2 ') and treatment with hot air at temperature of 45 °C for 60 minutes, followed by raising the temperature to 24° C every 60 minutes until the temperature of the mesocarp at stones reaches 45 °C (HAT 45 °C/24). Treatment of hot air did not reduce development of chilling injury of nectarine 'Diamond Ray', but also did not increase, while water treatments (HWD 48 °C 6', HWD 48 °C 12' and HWD 52 °C 2') showed an increase in chilling injury development. Nectarine 'Venus' had no symptoms of chilling injuries. Heat treatment had different effect on the ratio of the different fractions of pectin depending on cultivar and storage. Ammonium oxalate soluble pectin fraction play an important role in chilling injury development. Fruit with higher ratio of ammonium oxalate soluble pectin had lower ratio of chilling injured fruit. It was found good relationship between the ratio of water-soluble pectin and ammonium oxalate soluble pectin with intensity of chilling injuries which shows that this ratio could be a good indicator of chilling injury. Heat treatments do not impair the quality of the nectarine fruit, but affects the sensory properties of fruit after 2 and 4weeks of storage at 0 ° C and 5 days of life on the shelf.

Key words: *Prunus persica* var. *nectarina*, heat treatments, pectins, senzory properties, chilling injuries, fruit quality, storage

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Some fruit characteristics of rosa hip (*Rosa canina* L.) genotypes collected from high altitude of Central Anatolia (Kayseri province) - Turkey

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Abstract

Turkey is known with diverse genetic resources of rosa hip including various genotypes. Therefore, it is among the most common natural growing fruit crops of the country. It is commonly consumed due to its higher nutritious values especially high vitamin C content, flavonoids, anthocyanins, tannin and antioxidants. Generally, fruits are consumed as fresh. Recently, it has been used in agricultural industry as hot drink, juice, marmalade and jam. Selection of superior genotypes is an important goal because of natural aboundance and being used as raw material in agricultural industry.

The present study was conducted to select the superior genotypes for fruit characteristics. Fruit samples were collected from the down hills (around the zeniths of Gokdag mountain with 2000 – 2500 m range of altitude) of Erciyes Mountain, the highest mountain (3917 m altitude) of Central Anatolia (Kayseri province). Totally 13 genotypes were identified and sampled in the year 2011. Fruit weight, fruit length, fruit width, length/width index, flesh thickness, total soluble solid content (TSS), seed number, skin color, flesh color and fruit shape were considered as the fruit characteristics. Fruit weight, flesh thickness and total soluble solids (TSS) of genotypes ranged respectively between 2.31 g (GKD-KU-12) - 5.26 g (GKD-KU-5), 2.20 mm (GKD-KU-12) - 2.83 mm (GKD-KU-5), 32.60% (GKD-KU-9) - 42.00% (GKD-KU-12). Higher TSS contents were observed with increasing altitudes.

Key words: rose hip, Central Anatolia, Erciyes Mountain, Kayseri, pomology

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Analiza morfogeneze višegodišnjeg nosača rodnog drveta kruške

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Sažetak

Kod šest sorti krušaka ('Trevuška', 'Santa Maria', 'Williams', 'Abate Fetel', 'Pastorčica' i 'Krasanka') u cilju definiranja genotipskih specifičnosti organogeneze rodnih izbojaka obavili smo analizu prirasta koji prvi put nose vršni mješoviti pupoljak i dvogodišnju razgranatu granu. Na temelju obavljenih analiza utvrđeno je da se na temelju analize samo tih kategorija prirasta ne može pouzdano odrediti tip organogeneze rodnih izbojaka istraživanih sorti kruške, niti utvrditi genotipske specifičnosti rasta i razvoja pojedininih kategorija prirasta. Stoga je napravljena detaljna analiza morfogeneze višegodišnjeg nosača rodnog izbojka odabranih sorti kruške. Za svaku analiziranu granu je izrađena shema, a pojedine kategorije prirasta označene su slijedećim znakovima:

α	=	bočni vegetativni pupoljak
β	=	vršni vegetativni pupoljak nastao iz α,
β'	=	vršni vegetativni pupoljak nastao iz β,
β''	=	vršni vegetativni pupoljak nastao iz β'
γ	=	mješoviti pupoljak nastao iz α ,
γ'	=	mješoviti pupoljak nastao iz γ,
γ''	=	mješoviti pupoljak nastao iz γ',
ϕ	=	fruktifikacioni prirast (pršljenasto rodno drvo),
ϕ+	=	pršljenasto rodno drvo koje je donijelo plod ,
ϕ-	=	pršljenasto rodno drvo koje nije donijelo plod
->	=	nastaje

Pomoću navedenih znakova napravljeni su nizovi za po 30 petogodišnjih grana kod svake isptraživane sorte.

Dobiveni podaci grupirani su u pojedinačne nizove, a podaci o nizovima izraženi su numeričkim vrijednostima. Iz numeričkih nizova izračunati su slijedeći koeficijenti:

1. Koeficijent genotipskog potencijala vegetacijskih vrhova bočnih vegetativnih pupova za prelazak na generativni program diferencijacije,
2. Koeficijent genotipskog potencijala vegetacijskih vrhova vršnih vegetativnih pupova za prelazak na generativni program diferencijacije,
3. Koeficijent genotipskog potencijala svih vegetacijskih vrhova za prelazak na generativni program diferencijacije,
4. Koeficijent zametanja plodova na fruktifikacionim prirastima kruške,
5. Koeficijent genotipske specifičnosti u formiranju rodnih grančica na fruktifikacionim prirastima koji na sebi nose plodove.

Ključne riječi: kruška, genotip, pupoljak, koeficijent

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Analysis of the morphogenesis of several year old bearing wood of fruit-bearing pear tree

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Abstract

The analysis of the growths which bear the apical mixed buds for the first time and two- year-old outspread branches in six pear cultivars ('Trevuška', 'Santa Maria', 'Williams', 'Abate Fetel', 'Pastorčica' and 'Krasanka') have been performed in order to define genotype specificity of the organogenesis of the fruit-bearing tree. The obtained results demonstrate that analysis of these categories of growths is not enough to determine for sure the type of the organogenesis in the examined pear cultivars as well as the genotype specificity of the growth and development of individual categories of growths. Therefore, a detailed analysis of morphogenesis of several year old bearing wood of the fruit-bearing tree was decided to be made. A scheme was also made for each branch, while the individual categories of growths were marked with the following signs:

α	=	lateral vegetative bud,
β	=	apical vegetatative bud formed from α,
β'	=	apical vegetatative bud formed from β,
β''	=	apical vegetatative bud formed from β'
γ	=	mixed bud formed from α ,
γ'	=	mixed bud formed from γ,
γ''	=	mixed bud formed from γ',
ϕ	=	fruit-bearing growth,
ϕ+	=	fruit-bearing growth that produced the fruit,
ϕ-	=	fruit-bearing growth that did not produce the fruit,
->	=	becoming

By means of these signs, the rows for 30 five-year-old branches were created for each examined cultivar. The obtained data are grouped into individual rows and they are expressed in numerical values.

- The following coefficients were calculated:
- Genotypic coefficient potential of vegetative cones of lateral vegetative buds for the moving to the generative program of differentiation,
- Genotypic coefficient potential of vegetative cones of apical vegetative buds for the moving to the generative program of differentiation,
- Genotypic coefficient potential of all vegetative cones for the moving to the generative program of differentiation,
- Coefficient of fruit set potential in fruit-bearing pear growths, 5) Coefficient of genotypic specificity in formation of fruit-bearing twigs on fruit-bearing growths that produced fruits.

Key words: pear, genotype, bud, coefficient

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Cover crops for weed suppression in semi-dwarf apple orchards in Turkey

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Abstract

Agriculture in an important sector in Turkish economy and horticulture is a crucial component. Apple planted areas cover approximately 7% of total fruit planted area in Turkey. Apple orchard rank third after grape and hazelnut areas.

There are a lot of biotic and abiotic factors affecting yield in the apple orchards. Weeds are one of the most important yield limiting factors in the apple orchards. Alternative weed control methods are needed because of the various side effects of herbicides. Using cover crops for weed control in fruit orchards is one of the broadly applied alternative methods.

This study was conducted to determine weed suppressiveness of cover crops in apple orchards in the Kayseri in Turkey. *Trifolium repens* L., *Festuca rubra* subsp. *rubra* L., *Festuca arundinacea* Schreb., *Vicia villosa* Roth. and *Trifolium meneghinianum* Celm were used as cover crops in the experiment. Cover crop treatments have been arranged in a randomized complete block design with four replications, and all cover crops were grown on the same plot during the experimental periods. Control plots such as weedy control, herbicide control and mechanical control were added as reference plots. During the flowering periods of the cover crops, cover crop biomass and weed biomass were clipped from three 0.25 m^2 frames per plot and oven dried. Weed density was evaluated just before cutting the cover crops. The lowest weed dry biomass was obtained from *F. rubra rubra* plots, and there were no significant differences among all other perennial cover crop treatments. Regarding the effect of cover crops on hazelnut yields, the lowest yield was obtained from weedy control plots, while the highest yield was obtained from *T. repens* plots.

This research indicated that cover crops could be used as living mulch in integrated weed management programs to manage weeds in the hazelnut orchards.

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Key words: apple, cover crop, weed control

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Effects of different crop load levels on vegetative growth and fruit quality of apple trees

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Abstract

Apple cv. 'Red Chief' grafted on M26 and MM106 rootstock has been studied to determine effects of different crop load levels on some fruit quality characteristics, yield, and vegetative growth in Isparta in 2008. Treatments were crop load levels of 3, 5, and 7 fruit·cm^{-2} TCSA (trunk cross-sectional area), and control treatment which is hand thinning after June fruit drop. The effect of crop load levels on vegetative growth was found to be insignificant. Crop yield per unit area increased with increase in crop load levels. The highest total yield in marketable fruit quality class was determined at crop load level of 7 fruit·cm^{-2} TCSA. Fruit size was negatively correlated with crop load levels. The effects of crop load levels on fruit colour, water soluble dry matter, titrable acidity, and mineral content were found to be statistically insignificant. Fruit firmness of control treatment was higher than that of the other treatments. The effects of rootstocks on fruit size, water soluble dry matter and titrable acidity were not found to be statistically significant. It was determined that M26 rootstocks yielded better fruit size, better background fruit colour and higher concentration of K, Ca, Fe, B and Cu as compared to MM106 rootstock.

Key words: crop load, rootstock, M26, MM106

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Evaluation of *in vitro* antidiabetic and hypolipidaemic activities of extracts *Citrus limon* fruit

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Abstract

The aim of the present study was to evaluate the hypoglycemic activity and the hypolipidaemic effect of fruit from Algerian *Citrus limon*. The extracts from ethyl acetate and n-butanol were analyzed for their phytochemical content and tested for their inhibition potency on α-amylase and lipase enzymes. All extracts were subjected to enzyme inhibitory assay by using different concentrations of extracts. Each extract presented a significant α-amylase and lipase inhibition. Acetate ethyl extract was the most active in each *in vitro* assay with an IC_{50} = 21.6 ± 2.3 μg·mL^{-1} for α-amylase inhibition and an IC_{50} = 10.1 ± 2.4 μg·mL^{-1} for lipase inhibition. These results suggest that ethyl acetate extract of *Citrus limon* fruit possesses a potent inhibitor of a- amylase and lipase and shows clearly that the *Citrus limon* could be used in the treatment of diabetes and obesity.

Key words: *Citrus limon*, polyphenols, diabetes, hyperlipidemia

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Razlike u udjelu fenolnih komponenti i antioksidacijske aktivnosti soka od aronije tijekom različitih sezona uzgoja

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Sažetak

U radu su određivana fizikalno-kemijska svojstva, udjel fenolih komponenti te antioksidativna aktivnost sokova od aronije (*Aronija melanocarpa*) tijekom tri sezone. Analize su uključivale određivanje topljive suhe tvari, ukupne suhe tvari, pH vrijednosti i titracijske kiselosti. Udio ukupnih fenola, neflavonoida i flavonoida je određen spektrofotometrijski primjenom Folin-Ciocalteu reagensa, a udio ukupnih antocijana pH-diferencijalnom metodom. Antioksidacijska aktivnost je određena pomoću DPPH i FRAP metoda. Sokovi aronije su se razlikovali u udjelu topljive suhe tvari koja se kretala od 19,81 do 27,40° Brix te udjelu ukupne suhe tvari koja se kretala od 19,22 do 26,79 %. pH vrijednost iznosila je od 3,77 do 3,96. Titracijska kiselost je bila u rasponu od 0,854 do 1,015 % jabučne kiseline. Udio ukupnih fenola i ukupnih flavonoida u tri sezone uzgoja se kretao u rasponu od 8833,92 do 11092,82 mg GAE/L, odnosno 6993,63 do 9709,64 mg GAE/L. Među istraživanim sezonama uzgoja, sok aronije iz sezone 2012. imao je najveći udio ukupnih antocijana (2767,98 mg CGE/L). Svi sokovi aronije posjeduju veliku antioksidacijsku aktivnost (12,86 - 14,56 mmol TE/L; 128,22 – 166,65 mmol Fe^{2+}/L) te je prisutan visok stupanj korelacije između udjela fenolnih komponenti i antioksidacijske aktivnosti. Rezultati ovog istraživanja pokazuju da, premda se istraživani parametri značajno razlikuju obzirom na sezonu ($p<0,05$), sokovi aronije su dobar izvor bioaktivnih tvari u prehrani.

Ključne riječi: aronija, fenoli, antioksidacijska aktivnost, sezona uzgoja

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Seasonal variation of phenolic content and antioxidant capacity of chokeberry juices

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Abstract

Variations in physicochemical properties, content of phenolics and antioxidant activity of chokeberry juices (*Aronia melanocarpa*) were investigated. The physicochemical analyses included soluble solids, total solids, pH value and titratable acidity. The total phenolic content, nonflavonoid content and flavonoid content were determined spectrophotometrically using the Folin-Ciocalteu reagent while total anthocyanin content was determined using pH-differential method. Total antioxidant capacity was determined by DPPH and FRAP assay. Growing seasons differed in the content of soluble solids which ranged from 19,81 to 27,40 ° Brix and in total solids from 19,22 to 26,79 %. pH value ranged from 3,77 to 3,96 and titrable acidity from 0,854 to 1,015 % malic acid. Total phenolic content and total flavonoids in the three growing seasons ranged from 8833,92 to 11092,82 mg GAE/L and 6993,63 to 9709,64 mg GAE/L respectively. Among examined growing seasons the highest content of TA (2767,98 mg CGE/L) was found in growing season 2012. All chokeberry juices possess high antioxidant activity (12,856 – 14,560 mmol TE/L; 128,22 - 166,65 mmol Fe^{2+}/L), and all phenolics were highly correlated with total antioxidant capacity and reducing power. This study indicates that although examined properties vary considerably through the growing seasons ($p<0,05$), chokeberry juices can serve as a good source of bioactive phytochemicals in human diet.

Key words: chokeberry, phenols, antioxidant activity, growing seasons

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