UNIVERZITET U BEOGRADU
UNIVERSITY OF BELGRADE

Poljoprivredni fakultet
Faculty of Agriculture
Institut za ratarstvo i povrtarstvo
Institute for Crop and Vegetable Sciences

VI S I M P O Z I J U M
sa međunarodnim učešćem

INOVACIJE U RATARSKOJ I POVRTARSKOJ PROIZVODNJI

VI SYMPOSIUM
with international participation
INNOVATIONS
in Crop and Vegetable Production

Beograd, 17-18 oktobar 2013.

U N I V E R Z I T E T U B E O G R A D U
UNIVERSITY OF BELGRADE

Poljoprivredni fakultet, Beograd - Zemun
Faculty of Agriculture, Belgrade - Zemun

VI SIMPOZIJUM sa međunarodnim učešćem

INOVACIJE U RATARSKOJ I POVRTARSKOJ PROIZVODNJI

- zbornik izvoda -

VI SYMPOSIUM with international Participation

Innovations in Crop and Vegetable Production

- book of abstracts -

Beograd, 17 – 18. oktobar 2013.

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VI SYMPOSIUM with international participation „***Innovations in Crop and Vegetable Production***“

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"Inovacije u ratarskoj i povrtarskoj proizvodnji"
PROGRAMME OF THE V SYMPOSIUM with international participation

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ČETVRTAK, 17. oktobar 2013 / *Thursday, October 17, 2013*	
09.00 - 10.00	Registracija i postavljanje postera / *Registration and posters mounting*
10.00 - 10.30	Otvaranje Simpozijuma / *Symposium opening*
Predsedništvo / Chairpersons	
Prof. dr Dušan Kovačević (Poljoprivredni fakultet, Beograd) Prof. dr Tomislav Živanović (Poljoprivredni fakultet, Beograd) Prof. dr Franc Bavec (Faculty of Agriculture and Life Sciences, Maribor) Prof. dr Vlado Kovačević (Poljoprivredni fakultet, Osijek)	
UVODNA PREDAVANJA	
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10.30 –10.50	**TrendklimatskihpromjenasastanovištaproizvodnjekukuruzauHrvatskoj, Srbiji, MađarskojiBosniiHercegovini** *VladoKovačević, DušanKovačević, PeterPepo, MihajloMarković*
10.50 –11.10	**Istraživanjeproizvodnih sistema, plodoreda iobrade zemljišta u regionuPodravlja(Slovenija)** *FrancBavec*
11.10 –11.30	**Značaj racionalne tehnologije gajenja i sorte u proizvodnji ozime pšenice** *Dušan Kovačević, Nebojša Momirović, Snežana Oljača, Željko Dolijanović, Života Jovanović, Vesna Milić*
11.30 – 11.50	**Kafe pauza / *Coffee break***
11.50 –12.10	**Efekti primene đubriva na sadržaj makrohraniva u sistemu zemljište-biljka u dugotrajnoj monokulturi kukuruza** *VesnaDragičević, MilenaSimić, DušanKovačević, ŽivotaJovanović*
12.10 – 12.30	**Uticaj gena za nespecifičnu otpornost pšenice prema obligatnom na fakultativne parazite** *Zoran Jerković, Željana Prijić, Mirjana Lalošević*
12.30 – 12.45	**Diskusija/Discussion**
SAOPŠTAVANJE RADOVA / *ORAL PRESENTATIONS*	
Predsedništvo / Chairpersons	
Prof. dr Đorđe Glamočlija (Poljoprivredni fakultet, Beograd) Prof. dr Slaven Prodanović (Poljoprivredni fakultet, Beograd) Dr Milena Simić (Institut za kukuruz, Zemun Polje)	
12.45 - 13.00	**Zakorovljenost i prinos crvenog kukuruza u združenom usevu crvenog kukuruza i crne soje** *Snežana Oljača, Željko Dolijanović, Milena Simić, Mićo Oljača*

13.00 - 13.15	**Nova uloga stajnjaka obogaćenog zeolitom za đubrenje pašnjaka** *Aleksandar Simić, Željko Dželetović, Nevenka Rajić, Vesna Rakić, Tore Krogstad, Ivan Milutinović*
13.15 – 13.30	**Promene visine biljaka i prinosa zrna kukuruza u zavisnosti od sistema gajenja** *Igor Spasojević, Milena Simić, Dušan Kovačević, Željko Dolijanović, Vesna Dragičević, Milan Brankov*
13.30 - 13.45	**Selekcija za sadržaj fitinske kiseline i antioksidanasa kod hlebne pšenice** *Gordana Branković, Vesna Dragičević, Dejan Dodig, Miroslav Zorić, Desimir Knežević, Gordana Šurlan-Momirović, Nenad Đurić*
13.45 - 14.00	**Stare vrste žita kao značajan genetički resurs za organsku proizvodnju** *Svetlana Roljević, Marijana Jovanović*
14.00 - 14.15	**Diskusija / Discussion**
14.15 - 15.30	**Ručak/Lunch**
Predsedništvo / Chairpersons	
Prof. dr Zora Dajić Stevanović (Poljoprivredni fakultet, Beograd) *Dr Života Jovanović (Institut za kukuruz, Zemun Polje)* *Prof. dr Slavoljub Lekić (Poljoprivredni fakultet, Beograd)*	
15.30-15.45	**Produktivnost heljde (*Fagopyrum esculentum* Moench) u zavisnosti od lokaliteta gajenja** *Željko Dolijanović, Snežana Oljača, Dušan Kovačević, Srđan Šeremešić, Zoran Jovović*
15.45-16.00	**Kvalitet zrna žitarica iz organske proizvodnje** *Vesna Dragičević, Igor Spasojević, Milovan Stojiljković, Milena Simić, Milan Brankov*
16.00-16.15	**Uticaj spoljne sredine na prinos zrna kvinoje (*Chenopodium quinoa* Willd.)** *Slobodan Dražić, Branka Žarković, Đorđe Glamočlija, Đuro Zagorac, Vesna Radovanović, Ljubiša Kolarić, Milena Dražić, Ljubiša Živanović*
16.15-16.30	**Efekat gustine useva na prinos semena i sadržaj proteina suncokreta** *Igor Balalić, Jovan Crnobarac, Vladimir Miklič, Velimir Radić*
16.30-16.45	**Kafe pauza / *Coffee break***
Predsedništvo / Chairpersons	
Dr Janko Červenski (Institut za ratarstvo i povrtarstvo, Novi Sad) *Prof. dr Marina Mačukanović-Jocić (Poljoprivredni fakultet, Beograd)* *Dr Igor Balalić (Institut za ratarstvo i povrtarstvo, Novi Sad)*	
16.45-17.00	**Mogućnosti fitoekstrakcije teških metala iz kontaminiranog zemljišta** *Milena Dražić*
17.00-17.15	**Okućnice-nedovoljno korišćena blaga južnog oboda Panonskog basena** *Janko Červenski, Mirjana Vasić, Jelica Gvozdanović-Varga, Anamarija Petrović, Adam Takač, Aleksandra Savić*
17.15-17.30	**Indeks pleva ploda krupnika (*Triticum spelta* L.)** *Vladan Ugrenović, Đorđe Glamočlija, Jovana Vučković, Violeta Mickovski Stefanović*
17.30-17.45	**Diskusija / Discussion**
17.45-18.00	**Kafe pauza / *Coffee break***
18.00-19.00	**Okrugli sto** **Tema: ZDRAVSTVENO BEZBEDNA HRANA**
Predsedništvo / Chairpersons	
Akademik Kosana Konstantinov (Akademija inženjerskih nauka Srbije) *Akademik Branka Lazić (Akademija inženjerskih nauka Srbije)* *Akademik Dušan Kovačević (Poljoprivredni fakultet, Beograd, AINS)* *Prof. dr Dragoslava Radin (Poljoprivredni fakultet, Beograd)*	
19.00	**Večera / *Dinner***

Petak, 18. oktobar 2013 / *Friday, October 18, 2013*	
Predsedništvo / Chairpersons	
Prof. dr Dubravka Savić (Poljoprivredni fakultet, Beograd) *Dr Slobodan Dražić (Institut za proučavanje lekovitog bilja ''dr Josif Pančić'')* *Doc. dr Ana Vujošević (Poljoprivredni fakultet, Beograd)*	
11.00-11.15	**Ocena populacija paradajza kao donora poželjnih alela za poboljšanje kvantitativnih osobina elitnog hibrida** *Tomislav Živanović, Gordana Šurlan Momirović, Slaven Prodanović*
11.15-11.30	**Uticaj prihranjivanja na razvijenost rasada krastavca** *Đorđe Moravčević, Dubravka Savić, Damir Beatović, Slavica Jelačić, Goran Radovanović, Miloš Stojanović*
11.30-11.45	**Ocena dekorativne vrednosti genotipova bosiljka klaster analizom** *Damir Beatović, Slavica Jelačić, Nada Lakić, Slaven Prodanović, Dijana Krstić-Milošević, Nebojša Menković, Đorđe Moravčević*
11.45-12.00	**Održivi razvoj gajenja belog sleza u cilju obezbeđenja sirovine i očuvanja prirodnih resursa** *Slobodan Dražić, Snežana Pavlović, Milorad Rajić, Slavoljub Lekić, Željka Stojaković, Srboljub Dekić, Milena Dražić*
12.00-12.15	**Kalkulacija proizvodnje ploda i etarskog ulja anisa pri đubrenju organskim i konvencionalnim đubrivima** *Milica Aćimović, Snežana Oljača, Dušan Kovačević, Vladimir Filipović, Slavoljub Tasić, Vele Tešević*
12.15-12.30	**Uticaj skladištenja na nutritivna svojstva semena ovsa (*Avena sativa*)** *Sveto Rakić, Snežana Janković, Jela Ikanović, Rade Jovanović, Janja Kuzevski*
12.30-12.45	**Kafe pauza / *Coffee break***
12.45-13.00	**Razgledanje postera**
Predsedništvo-moderatori / Chairpersons-moderators	
Doc. dr Dragana Rančić (Poljoprivredni fakultet, Beograd) *Doc. dr Ljubiša Živanović (Poljoprivredni fakultet, Beograd)* *Dr Damir Beatović (Poljoprivredni fakultet, Beograd)*	
13.00-13.20	**Diskusija o poster sekciji**
13.20-13.30	**Dodela nagrada za najbolji poster**
13.30-14.00	**Diskusija i zaključak Simpozijuma/*Discussion and symposium conclusions***
14.00	**Ručak/Lunch**

POSTER PREZENTACIJA / POSTER PRESENTATIONS	
1.	**Biološka aktivnost auksina izolovanog iz vrste *Bacillus subtilis* i njegov pozitivan uticaj na rast semena pšenice (*Triticum aestivum* L.)** *Dragana Stanojević, Snežana Đorđević, Željko Dolijanović, Snežana Oljača*
2.	**Uticaj klimatskih faktora na sadržaj beta karotena kod durum pšenice** *Gordana Branković, Slađana Žilić, Vesna Dragičević, Dejan Dodig, Miroslav Zorić, Desimir Knežević, Gordana Šurlan-Momirović, Borislav Kobiljski*
3.	**Definisanje analitičkih metoda i parametara za određivanje kvalitetakorena belog sleza (*Althaea officin L.)** *Helena Majstorović, Slobodan Dražić, Maja Sudimac*
4.	**Razvoj perikarpa paradajza u različitim tretmanima navodnjavanja** *Ilinka Pećinar, Dragana Rančić, Sofija Pekić Quarrie, Radmila Stikić, Radenko Radošević, Slaviša Đorđević*
5.	**Varijabilnosti morfoloških osobina miskantusa *(Miscanthus giganteus)* u zavisnosti od primenjene gustine sadnje** *Jela Ikanović, Snežana Janković, Vera Popović, Sveto Rakić, Đorđe Glamočlija, Gordana Dražić, Tatjana Veljović*
6.	**Prinos i kvalitet zrna kukuruza u zavisnosti od tipa zemljišta, količine azota i hibrida** *Ljubiša Živanović, Života Jovanović, Jela Ikanović, Vera Popović, Ljubiša Kolarić*
7.	**Morfološke karakteristike polenovih zrna jorgovana (*Syringa vulgaris*L., Oleaceae)** *Marina Mačukanović-Jocić, Dragana Rančić, Mića Mladenović*
8.	**Novi klonovi belog sleza (*Althaea officinalis* L.)** *Slobodan Dražić*
9.	**Uticaj lokacija navariranje sadržajarutinaulistovimaheljde (*Fagopyrumesculentum*, Moench.)** *SlobodanDražić, MihailoRistić, Branka Žarković, Željko Dolijanović, Đorđe Glamočlija, Helena Majstorović*
10.	**Uticaj kukuruznog glutena na brojnost korova u kukuruzu i soji** *Srđan Šeremešić, Ljiljana Nikolić, Dragiša Milošev, Milena Simić,Milorad Živanov, Željko Dolijanović*
11.	**Značaj plantažne proizvodnje sirovina u sektoru lekovitog i aromatičnog bilja u Srbiji** *Svetlana Turudija Živanović, Tomislav Živanović*
12.	***In vitro* umnožavanje južnoafričke ljubičice (*Saintpaulia ionantha* L.) iz dijelova lista** *Svjetlana Zeljković*
13.	**Uticaj agroekoloških faktora na produktivnost heljde** *Vera Popović, Vladimir Sikora, Janoš Berenji, Đorđe Glamočlija, Jela Ikanović, Željko Dolijanović*
14.	**Uticaj agroekoloških uslova gajenja na osobine lukovica proljećnog bijelog luka** *Vida Todorović, Jelica Gvozdanović-Varga, Mirjana Vasić, Ivana Kecman, Nataša Kleut*
15.	**Hajdučka trava (*Achillea millefolium*L.) kao biljka višegodišnjih ″eko-koridora″** *Vladimir Filipović, Đorđe Glamočlija, Vera Popović, Goran Jaćimović, Snežana Dimitrijević, Tatjana Marković, Dragoja Radanović*
16.	**Komponente varijanse i heritabilnost sadržaja fitinske kiseline kod hlebne i durum pšenice** *Gordana Branković, Vesna Dragičević, Dejan Dodig, Miroslav Zorić, Desimir Knežević, Gordana Šurlan-Momirović, Srbislav Denčić*
17.	**Sadržaj aminokiselina u zrnu genotipova jarog ječma (*Hordeum vulgare* L.)** *Desimir Knežević, Aleksandra Yu. Dragovič, Veselinka Zečević, Gordana Branković*

UVODNI REFERATI
PRELIMINARY REPORTS

TREND KLIMATSKIH PROMJENA SA STANOVIŠTA PROIZVODNJE KUKURUZA U HRVATSKOJ, SRBIJI, MAĐARSKOJ I BOSNI I HERCEGOVINI

Vlado Kovačević[1], Dušan Kovačević[2], Peter Pepo[3], Mihajlo Marković[4]

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[2]Univerzitet u Beogradu, Poljoprivredni fakultet, Beograd-Zemun, Srbija
[3]Fakultet za poljoprivredu, prehranu i ekologiju, Univerzitet u Debrecinu, Mađarska
[4]Poljoprivredni fakultet, Univerzitet u Banja Luci, R.S., Bosna i Hercegovina

Kukuruz je glavna ratarska kultura na oranicama Hrvatske i susjednih zemalja. U razdoblju 2006-2010. se kukuruz gajio u Mađarskoj prosječno na 1.149.410 ha ili 25 % oranica, u Srbiji na 1.216.786 ha ili 37 % oranica, Hrvatskoj na 298.697 ha ili 34 % oranica, a u Bosni i Hercegovini (BiH) na 189.613 ha ili 19 % oranica. Oko 75% požnjevene površine pod kukuruzom u BiH otpada na Republiku Srpsku, a ostvareni prinosi kukuruza u posmatranom periodu su u tom entitetu neznatno veći (4,60 t ha^{-1}) nego u Federaciji (4,46 t ha^{-1}). Na ovim prostorima se kukuruz prosječno uzgaja na oko 30% oranica. Prosječni prinosi zrna kukuruza u analiziranom periodu bili su 6,17 t ha^{-1} (Mađarska), 4,86 t ha^{-1} (Srbija), 6,76 t ha^{-1} (Hrvatska), odnosno 4,56 t ha^{-1} (BiH). Također, u periodu 2006-2010. evidentna su značajna variranja prosječnih prinosa kukuruza po godinama: od 3,6 do 7,5 t ha^{-1} (Mađarska), od 3,2 do 5,9 t ha^{-1} (Srbija), od 4,9 do 8,0 t ha^{-1} (Hrvatska), odnosno od 3,2 do 5,1 t ha^{-1} (BiH). Najmanji prosječni prinosi ostvareni su u navedenim državama 2007. godine.

Trend klimatskih promjena sa stanovišta količine i rasporeda padavina i temperature vazduha, glavni su faktori velikih variranja prinosa kukuruza po godinama. Po pravilu, ispod prosječne količine oborina i iznad prosječne temperature vazduha tokom ljeta, osobito u julu i avgustu, u tesnoj su vezi s ispod prosječnim prinosima kukuruza.

Cilj ovoga rada je komentar vegetacije kukuruza 2012. sa stanovišta globalnih klimatskih promjena. Godina 2012. nije bila povoljna za gajenje kukuruza uslijed suše i visokih temperatura vazduha, naročito u avgustu, a dodatni problem bile su skromne zalihe vode u zemljištu u predsjetvenom periodu. Gruba procjena ostvarenog prinosa kukuruza 2012. u Hrvatskoj (4,2 t ha^{-1}), Mađarskoj (4,05 t ha^{-1}) i Srbiji (3,12 t ha^{-1}) ukazuje na 40%, 37% odnosno 44% manji prinos od onoga ostvarenog u povoljnoj 2010. godini.

Ključne riječi: kukuruz, padavine, temperature vazduha, prinos zrna

CLIMATE CHANGE TREND WITH ASPECT OF MAIZE GROWING IN CROATIA, SERBIA, HUNGARY AND BOSNIA AND HERZEGOVINA

Vlado Kovacevic[1], Dusan Kovacevic[2], Peter Pepo[3], Mihajlo Markovic[4]

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[4]Faculty of Agriculture, University of Banja Luka, R.S, Bosnia & Herzegovina

Maize is main field crop on arable land of Croatia, Serbia and neghbouring countries. In the period 2006-2010 maize was grown in Hungary on 1.149.410 ha (25% of arable land), Serbia 1.216.786 ha (37%), Croatia 298.697 ha (34%) and Bosnia and Herzegovina (B&H) on 189.613 ha (19%). Republic of Srpska participating with 75% of maize harvested area of B&H and maize yields in this enthity are something higher (4.60 t ha^{-1}) than in remaining enthity (4.46 t ha^{-1}) of the country (Federation of B&H). In general, maize participating with about 30% of arable land in area covering the mentioned countries. Average yields of maize in the tested period were 6.17 t ha^{-1} (Hungary), 4.86 t ha^{-1} (Serbia), 6.76 t ha^{-1} (Croatia) and B&H (4.56 t ha^{-1}), respectively. Also, in the 2006-2010 period were found considerable variations of annual maize yields as follows: from 3.6 to 7.5 t ha^{-1} (Hungary), from 3.2 to 5.9 t ha^{-1} (Serbia), from 4.9 to 8.0 t ha^{-1} (Croatia) and from 3.2 to 5.1 t ha^{-1} (B&H).

Climate change trend with aspect of quantity and distribution of precipitation and air-temperatures are main factors of considerable maize yield variations among years. In general, the lower precipitation and the higher air-temperatures in summer, especially in July and August, than usual are in close connection with the lower yields of maize.

Aim of this study was comment of the 2012 growing season for maize with aspect of global climatic changes. The growing season 2012 was unfavorable for maize growing because of extreme drought and high air-temperatures, especially in August. Modere supplies of soil water in the presowing period was additional unfavorable factor. According estimation, maize yields in 2012 are as follows: 4.2 t ha^{-1} (Croatia), 4.05 t ha^{-1} (Hungary) and 3.12 t ha^{-1} (Serbia) and they are lower than in especially favorable growing season 2010 for 40%, 37% and 44% respectively.

Key words: maize, precipitation, air-temperature, grain yield

ISTRAŽIVANJE PROIZVODNIH SISTEMA, PLODOREDA I OBRADE ZEMLJIŠTA U REGIONU PODRAVLJA (SLOVENIJA)

FrancBavec

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Analizirajući četiri projekta u istočnom dijelu Slovenije utvrdili smo, da je u slučaju poredjenja prinosa zrna kukuruza između konvencionalne obrade zemljišta uključujući setvu i direktnu setvu u pokrovne useve, prinosi se nisu razlikovali kod preduseva *Trifolium incarnartum*, ali u slučaju *Lolliumm ultiflorum* prinosi su bili niži na šljunkovitim zemljištima. Na kosoj padini njive s glinenim zemljištima poredjenja između konvencionalne obrade zemljišta i sjetve u pokrovne usjeve erodirano je bilo do 3,5t zemljišta po ha^{-1}. Na dva tipa zemljišta između konvencionalne i konzervacijske obrade zemljišta uključujući i podrivanje značajne razlike u prinosima (plodoredu kukuruz, pšenica i uljana repica) nije bilo, ali su prinosi smanjeni direktnom setvom. Nema značajne razlike ni u sadržaju humusa, a emisija CO_2 se razlikovala tek posle obrade. Najveći ekološki otisak "foot print" izračunat je u primjeru konvencionalne obrade zemljišta, a najmanji konzervacijske obrade zemljišta zavisno, uglavnom, od korišćenja goriva. Posle tri godine primene različitih sistema obrade zemljišta još nije konstatovan utjecaj na sadržaj humusa, ali se razlikuje broj i masa živih organizama i "foot print". Prinosi njivskih usjeva i povrća statistički značajno se razlikuju između proizvodnih sistema (konvencionalni, integralni, organski i biodinamički). Međutim, posle 7-godina plodoreda u različitim sistemima proizvodnje rezultati su obećavajući s obzirom na osobine zemljišta i prinos. Buduća istraživanja sistema obrade zemljišta treba da budu usmjerena više interdisciplinarno, pogotovo na održivu organsku proizvodnju.

Ključneriječi: plodored, proizvodni sistem, obrada zemljišta

RESEARCH OF PRODUCTION SYSTEMS, CROP ROTATION AND SOIL TILLAGE IN PODRAVJE REGION (SLOVENIA)

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Analysing 4 projects in Eastern part of Slovenia we found that in case of comparison of grain maize yield between conventional tillage incl. sowing and direct sowing into cover crops the yields were not different in the case of use *Trifolium incarnartum*, but in the case of *Lollium multiflorum* the yields were lower on sandy soils. On the slope field with clay soils comparisons between conventional tillage and sowing in cover crops resulted up to 3.5 t ha^{-1} of eroded soils. In two soil types between conventional and conservation tillage incl. ripping were not significant differences in crop rotation yields (maize, winter wheat and oilseed rape), but the yields decreased in direct sowing treatment. No significant differences were among content of humus, but CO_2 emissions differed just after tillage. The highest Ecological Foot Print was calculated in case of conventional tillage, and the lowest in case of conservation tillage and depending mainly on use of fuel. After 3 years trials no impacts were on the content of humus in the soil regards different tillage systems, but number and mass of living organisms and ecological foot print of crop and vegetable production differed significantly among production systems (conventional, integrated, organic and biodynamic). However, after 7-years crop rotation in different production systems show promising results about soil characteristics and yields. For those further research of tillage systems needs to be focused more interdisciplinary, especially on sustainable i.e. organic production systems.

Key words: crop rotation, production system, tillage systems

ZNAČAJ RACIONALNE TEHNOLOGIJE GAJENJA I SORTE U PROIZVODNJI OZIME PŠENICE

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Održiva poljoprivreda je kompleks pronalaženja novih puteva praćen brojnim rizicima. Tu su rizici koji mogu biti praćeni smanjenjem prinosa i brojnim nepoznanicama u zaštiti bilja od bolesti i štetočina, ali i nekim drugim. Investiranje i uvođenje tih promena mora biti u savršenom jedinstvu. Proizvođači polažu nadu u održivu poljoprivredu jer taj koncept preko stvaranja novih sorata za ovaj vid proizvodnje može značajno smanjiti troškove.

Prelazak sa konvencionalnih sistema gajenja na racionalne zahteva brojne promene u tehnologiji gajenja. Tehnologije nižih ulaganja u proizvodnji ozime pšenice, uopšteno gledajući, zahtevaju adaptaciju najvažnijih mera i sastoje se od: redukovanih sistema obrade zemljišta, nižih normi đubrenja mineralnim đubrivima, upotrebe mikrobioloških đubriva, veće diversifikacije useva u plodoredu itd.

Nove tehnologije podrazumevaju veću fleksibilnost u primeni pojedinih agrotehničkih mera (obrade zemljišta, đubrenja, zaštita od bolesti, štetočina i korova, plodoredi) sa pažljivo odabranim sortama za te uslove. Racionalne tehnologije gajenja u proizvodnji ozime pšenice mogu značajno doprineti smanjenju zemljišne erozije, značajnom smanjenju troškova, odnosno većoj ekonomskoj efikasnosti, i to bez većeg smanjenja prinosa.

Na osnovu naših rezultata istraživanja sprovedenih putem poljskog ogleda na esperimentalnoj stanici Poljoprivrednog fakulteta u Zemunu ″Radmilovac″ cilj ovog rada je bio da ukaže na značaj racionalne tehnologije gajenja u pogledu uticaja na prinos zrna različitih sorata ozime pšenice.

Ključne reči: održiva poljoprivreda, obrada zemljišta, korovi, plodored, ozima pšenica

Ova istraživanja finansira Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije (TR 31066).

IMPORTANCE OF LOW-INPUT TECHNOLOGY AND CULTIVAR IN WINTER WHEAT PRODUCTION

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Sustainable agriculture is a complex of innovations, the turn over to sustainable bears risk on many teerrains. There is economic risk of cut backs in yields and there are problems with pest and disease risk management. Principal of the new doctrine consists of process of changing which includes usage and conservation of natural reusable and un-reusable resources could be a direction of future technological development. Investments and institutionalization of change must be in perfect harmony. Agricultural producers invested their hopes in the development of sustainable agriculture, a concept that should rely on the breeding of low-input cultivars and cutbacks in production costs.

Conversion from high conventional to low-input sustainable systems requires changes in management practices. Low-input tecnology for winter wheat for more sustainable production generally consist from reduces in tillage systems, lower levels of applied chemical fertilizers and pesticides use, more diverse crop rotations etc.

New technologies comprehend higher flexibility of cultural practices (soil tillage, crop rotation, fertilization, integrated pest management) with proper choose of wheat cultivars adapted on these conditions.

Rational technology for winter wheat with all these elements, can protect soil from erosion, more effective and significantly decrease production expenses with no decrease of yield quality and quantity.

On the basis our investigation the objectives were to examine influence conventional vs low-iput tecnology on some weed control and grain yield of different cultivars of winter wheat. This investigation were situated on Radmilovac - Experimental fields Faculty of Agriculture – Zemun.

Key words: sustainable agriculture, tillage, weeds, crop rotation, winter wheat

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EFEKTI PRIMENE ĐUBRIVA NA SADRŽAJ MAKROHRANIVA U SISTEMU ZEMLJIŠTE-BILJKA U DUGOTRAJNOJ MONOKULTURI KUKURUZA

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Gajenje kukuruza u monokulturi je još uvek prisutno u Srbiji i najčešće utiče na povećanje zakorovljenosti i prisustvo patogena uz smanjenje prinosa useva. Monokultura može, takođe, da pogorša fizičko-hemijske i biološke osobine zemljišta. Cilj ovog istraživanja bio je da se ispita efekat đubrenja u dugotrajnoj monkulturi kukuruza na status N, P i K u zemljištu i zrnu kukuruza.

Ogled je zasnovan u Institutu za kukuruz “Zemun Polje” 1972. godine i od tada je kasnostasni hibrid kukuruza gajen u kontinuitetu, uz primenu stajnjaka svake pete godine. Žetveni ostaci su zaoravani u celini na prvoj trećini polja, u polovini količine na drugoj, ili su iznošeni sa trećeg dela polja. Upotreba mineralnih đubriva se sastojala od: varijante bez đubrenja, primene NPK đubriva u jesen i N u proleće, kao i upotrebe samo N đubriva u proleće. Sadržaj pristupačnog N, P i K i organske materije u zemljištu je meren na početku i na kraju vegetacionog perioda kukuruza, tokom 2011 i 2012 godine. Posle žetve, sadržaj N, P i K je određen u zrnu kukuruza, a prinos izmeren i obračunat sa 14% vlage.

Unošenje žetvenih ostataka je povećalo sadržaj N, P, K i organske materije u zemljištu, naročito u varijanti bez unosa stajnjaka. Sadržaj N u zrnu kukuruza se povećao uz primenu NPK i unošenje žetvenih ostataka. Tokom obe godine, najviši prinos kukuruza je ostvaren u varijanti sa stajnjakom i unosom cele količine žetvenih ostataka uz primenu N đubriva u proleće. Bez obzira na visok potencijal rodnosti kasnostasnog hibrida i visok nivo đubrenja u monokulturi kukuruza, ostvareni prinos nije premašio 10,4 t ha^{-1}, čime se ističe značaj primene svih mera (plodored) i njihove interakcije na produktivnost sistema gajenja kukuruza.

Ključne reči: monokultura, đubrenje, osobine zemljišta, kvalitet zrna, kukuruz

IMPORTANCE AND MANAGEMENT OF MACRONUTRIENTS IN PLANT-SOIL SYSTEM IN LONG TERM CONTINOUS CROPPING OF MAIZE

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Maize monoculture is still present in Serbia and usually increased weed and pest infestation and decreased yield. Maize monoculture can, also, deteriorate physico-chemical and biological characteristics of soil. The objective of the study was to indicate effects of fertilizer system application in long-lasting maize monoculture on status of N, P, K in soil and maize grain.

Experiment started in MRI Zemun Polje in 1972 and since then, the late maturing maize hybrid was grown continuously at the same field with application of cattle manure each fifth year. The crop residues were ploughed in the whole and half of the amount, and they were removed from the third part of the experimental plot. Mineral fertilizer application included three variants: without mineral fertilizers, application of NPK fertilizer in autumn and N in spring, and only application of N fertilizer in spring. The content of available N, P and K and organic matter in soil was evaluated twice per vegetation season-at the beginning and at the harvest time, during two last seasons – 2011 and 2012. After harvest, N, P and K content was also determined in maize grain. Maize grain yield was evaluated and calculated with 14% of moisture.

Crop residues increased the N, P, K and organic matter content in the soil especially at the variant without application of cattle manure. The NPK fertilizer application increased N content in maize grain, particularly in variants with crop residue incorporation. In both years, the highest average maize yield was achieved with application of cattle manure, whole amount of crop residues, and N fertiliser distributed on soil surface at the beginning of growing period. Nevertheless of the late maturing hybrid potential and high level of fertiliser application in the maize monoculture, the highest yield did not rich more than 10.4 t ha^{-1}. This underlined the importance of all cropping practices (crop rotation), their interaction and integrated effects on maize production.

Key words: continous cropping, fertilisers, soil characteristics, grain quality, maize

UTICAJ GENA ZA NESPECIFIČNU OTPORNOST PŠENICE PREMA OBLIGATNOM NA FAKULTATIVNE PARAZITE

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Analizom karaktera otpornosti prema prouzrokovaču lisne rđe u stadijumu sejanaca, reakcionog tipa (RT), latentnog perioda (LP), broja simptoma (SN) karaktera koreliranog s odnosom rasta listova (LGR) koreliranog sa regionalnim potencijalom za prinos zrna u potomstvu F2 generacije s akumulacijom gena Lr14a, Lr2a i Lr34 prenetih iz izogenih linija (NIL) otkrivena je nova grupa gena na 2D hromozomu od neznatnog uticaja na sniženje SN. LP produžavajući, SN i LGR povišavajući je bio Lr 2a (klaster 1), SN i LGR redukujući i LP produžavajući Lr 34 (2), a srednje SN i LGR redukujući Lr 14a (3). Najjače SN snižavajući je bio Lr 22b (4). U poljskom ogledu u semiaridnom regionu s godišnjim padavinama oko 600 mm kod 34 Lr linije 06.06.2013. ocenjeni su intenziteti zaraze *Septhoria tritici* (St), *Pyrenophora tritici repentis* (Ptr) i *Puccinia triticina*. Kombinacije Lr gena u NIL određene su preko rasta stabla (SAGR). Poređenjem s osnovnom sortom Tačer na kojoj se zaraza zadržala na inicijalnom nivou ustanovljeno je da geni iz svih klastera pri višim termperaturama imalju efekat na umanjenje pega od fakultativnih parazita, bržu fruktifikciju te češće simptome na gornjim listovima. Akumulacijom gena iz novog i onih iz klastera 2 (LR 34 NIL) pege od St su bile nešto manje a širenje samo do srednjih listova. Pri kombinaciji s trećom grupom period do fruktifikacije Stbio jeskraćen na osnovu širenja na jedan sprat više isto kao kad su akumulirani geni iz klastera 1 i 4 dok je za prenos Ptr na list zastavičar vidljiv 12.06. praćen povišenim intenzitetom na srednjem lišću treća grupa bila neophodna. Posledica gena iz prve grupe bila je degradacija glutena u listovima i umanjena fotosintetska aktivnost a uticaj na fakultativne parasite kao kod Lr 34 NIL. Rezultati ukazuju da su manjak šećera (Ptr) ili slobodne vode (St) bili ključni za transfer u reproduktivnu fazu.

Ključne reči: paraziti pšenice, Lr geni

INFLUENCE OF WHEAT GENES FOR NONSPECIFIC RESISTANCE TO OBLIGATE ON FACULTATIVE PARASITES

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Across F2 progeny from the cross of homozygous genotypes with accumulated Lr14a, Lr2a and Lr 34 Thatcher back grounded (NIL) estimated according to resistance characters as symptom number (SN) latency period (LP) and reaction type to *Puccinia triticina* at seedling stage on 2D chromosome new cluster slight SN decreasing was determined. SN and LGR increasing, LP prolonging was Lr 2a (cluster 1), low SN and LGR reducing but minute LP prolonging Lr 34 (2) while medium SN and LGR reducing Lr 14a (3). The most SN decreasing was Lr 22b (4). In field trial in semiarid region with annual rainfall of around 600 mm at 34 Lr NILs on June, 6th 2013 infection severities of *Septhoria tritici* (St), *Pyrenophora tritici repentis* (Ptr) and *Puccinia triticina* were estimated. Combinations of Lr genes in NILs were defined across stem growth parameter (SAGR). By comparison with basic variety Thatcher when infection was stopped on initial level it was determined that genes from all clusters at higher temperatures had influence on spots or blotches size decrease accelerated fructification and more frequent symptoms at higher leafs. By the accumulation of genes from new one and those from cluster 2 (Lr 34 NIL) blotches of St were slightly decreased while spreading was only below middle leafs. When combined with 3th cluster period until fructification of facultative parasites was shortened concluded across spreading on one flat higher same as was when were accumulated genes from clusters 1 and 4 but for transfer of Ptr on flag leafs on June 6th 3rd group was necessary. Genes from 1th group degraded gluten in leafs and decreased photosynthetic activity while influence on facultative parasites was as of Lr 34 NIL. According to the results, luck of sucrose (Ptr) or mostly viable water (St) were crucial for transfer to reproductive phase.

Key words: wheat parasites, Lr genes

USMENA SAOPŠTENJA
ORAL PRESENTATION

ZAKOROVLJENOST I PRINOS CRVENOG KUKURUZA U ZDRUŽENOM USEVU CRVENOG KUKURUZA I CRNE SOJE

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U ovom radu su prikazani rezultati uticaja različitog načina združivanja i đubrenja na zakorovljenost i prinos crvenog kukuruza u dvogodišnjem periodu (2011-2012). Poljski ogled je izveden na zemljištu tipa černozem u Institutu za kukuruz u Zemun Polju. U ogled su bili uključeni crveni kukuruz sorte ZP Rumenka (FAO 700 grupe zrenja) i crna soja sorte Dukat (0 grupe zrenja). Varijante združivanja su formirane prema metodi zamenjujućih serija. Primenjena su dva načina združivanja: setva kukuruza i soje u trake i alternativne redove, kao i varijanta čistih useva. Tretman đubrenja je obuhvatao sledeće varijante: kontrolu bez đubrenja, mineralno đubrivo AN, organsko đubrivo pod komercijanim imenom "Royal Bio-Humus Offert" i mikrobiološko đubrivo Uniker.

Rezultati dobijeni tokom dvogodišnjih ispitivanja pokazuju da je prosečna sveža i suva biomasa korova značajno manja u varijantama združenih useva nego u čistim usevima kukuruza i soje u svim varijantama đubrenja. Varijante sa altrenativnim redovima, kao i trake su uticale na produkciju biomase korova u zavisnosti od vrste đubriva. Značajno manja zakorovljenost u združenom usevu je rezultat povećanog broja gajenih biljaka po jedinici površine i samim tim povećane kompetitivne sposobnosti useva. Primena mikrobiološkog đubriva je uticala na skoro dvostruko povećanje sveže biomase korova u odnosu na druge varijante đubrenja u obe varijante združivanja.

Rezultati, takođe, pokazuju veći prinos crvenog kukuruza u prvoj godini istraživanja zahvaljujući povoljnijim meteorološkim uslovima. Poredeći prinos zrna između različitih varijanata združivanja, može se primetiti da je značajno najveći prinos dobijen u varijanti sa alternativnim redovima kukuruza i soje u obe godine istraživanja, a najmanji u varijanti čistog kukuruza. Posmatrajući pojedinačne kombinacije svih ispitivanih faktora, najveći prinos je zabeležen u varijanti alternativnih redova sa organskim i mikrobiološkim đubrivima u povoljnijoj 2011. godini.

Ključne reči: crveni kukuruz, crna soja, združeni usevi, zakorovljenost, prinos

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WEED INFESTATION AND YIELD OF RED MAIZE IN RED MAIZE/BLACK SOYABEAN INTERCROPPING SYSTEM

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This paper deals with results of the effects of different intercropping pattern and fertilizers on weed infestationand red maize grain yield in two-year period (2011-2012). Trial was set up on chernozem soil type in the experimental field ofMaize Research Institute in Zemun Polje, Serbia. Red maize ZP Rumenka cultivar (FAO 700 group of maturity) and black soyabean, cultivar Dukat (maturity group 0) were included in the experiment. The intercrops were created according to the method of replacement series. Two different spatial designs were applied: the sowing of maize and soybean in strips or alternate rows and sole crops. The treatments of fertilization consisted of following variants: control, mineral fertilizer AN, organic fertilizer under the trade name "Royal Bio-Humus Offert" and microbiological fertilizer Uniker.

According to results from the two years study, the fresh and dry biomass of weeds were lower in intercrops than in maize and soybean monocrops in average and for each fertilizer treatment. Alternate rows, as well as, strips influenced the weed biomass production in dependence of type of fertilization. Significanly lower weed biomass was recorded in intercrop variant due to increased number of crops per unit area and therefore increased competitive ability of crops. In both, alternate rows and strips, application of microbial fertilizer increased the fresh biomass of weeds almost twice in comparison with other treatments.

The results shows that yield of red maize were higher in first year of study with better meteorological conditions. When comparing grain yields between intercrop variant we can see that significantly the highest yield is obtained in variant alternated row of maize and soyabean in both years of trial and the lowest was in sole maize. Individually observed, the highest yield was achieved in the interaction intercrop alternated rows with organic and microbiological fertilizer in more favorable 2011.

Key words: red maize, black soyabean, intercropping, weed infestation,yield

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NOVA ULOGA STAJNJAKA OBOGAĆENOG ZEOLITOM ZA ĐUBRENJE PAŠNJAKA

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Kako aktuelni propisi o proizvodnji stočne hrane zabranjuju korišćenje mineralnog đubriva koja sadrže azot (European Union Council Regulation No 834/2007), korišćenje tradicionalnih organskih đubriva kao što je goveđi stajnjak, dobija na značaju. Goveđi stajnjak kao đubrivo za pašnjake je pristupačan izvor amonijačnog jona. Međutim, gubici amonijaka kroz ispiranje i isparavanje značajno smanjuju efikasnost stajnjaka kao đubriva u proizvodnji useva. Zbog toga je potreban nosač koji može da očuva rezerve azota.

U prethodnim istraživanjima smo ispitivali efikasnost prirodnog alumosilikatnog minerala zeolitnog tipa – klinoptilolita sa najvećeg depozita u Srbiji (Zlatokop) kao nosača koji umanjuje gubitke amonijaka iz svežeg goveđeg stajnjaka. Naši rezultati pokazuju da dodatak 10% zeolitskog tufa (koji sadrži 70 % klinoptilolita) u sveži stajnjak povećava vezivanje amonijaka za 90% u odnosu na sistem bez zeolita.

Cilj ovog istraživanja je bio da se ispitaju i nađu održivi izvori amonijaka za pašnjake u Srbiji, koji se baziraju na prirodnom tipu zeolita – klinoptilolitu i goveđem stajnjaku. Eksperimenti su vršeni na prirodnim pašnjacima 2012/13 i obuhvatala su četiri različita tretmana: čisti fermentisani stajnjak (30 t ha^{-1}); stajnjak + zeolit (30 t ha^{-1}+10 wt.% zeolita); mineralno đubrivo koje sadrže azot (50 kg ha^{-1} N) i kontrolu. Ogledi su izvedeni primenom RCB modela (parcele 5 × 2m) sa četiri ponavljanja. Đubrenje je izvršeno u decembru 2012, osim u slučaju mineralnog đubriva koje je primenjeno u proleće 2013. Parcele su pokošene u maju 2013 i procenjena je količina suve materije. Osim toga, urađena je analiza botaničkog sastava, kao i hemijska analiza dobijene krme.

Uopšteno, rezultati pokazuju da dodatak klinoptilolita svežem stajnjaku doprinosi očuvanju azota, na taj način utičući na količinu suve materije, botanički sastav i ukupni sadržaj proteina.

Ključne reči: klinoptilolit, pašnjak, stajnjak

NEW ROLE OF MANURE ENRICHED WITH CLINOPTILOLITE FOR PASTURE FERTILIZATION

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Since actual legislation prohibits the use of mineral nitrogen-based fertilizers for the required forage production (European Union Council Regulation No 834/2007), the use of traditional organic fertilizers (such is cattle manure) is gaining in importance. Cattle manure as a fertilizer offers available NH^{4+} for pastures; however, ammonia losses through leaching or evaporation significantly reduce its fertilization efficiency in crop production. Therefore, there is a need for a binding agent, which can preserve nitrogen reserves.

In our previous contributions we investigated the efficacy of natural alumosilicate mineral of zeolite type – clinoptilolite from the largest deposit in Serbia (Zlatokop) as a binding agent to mitigate ammonia loss from fresh cattle manure. Our results show that the addition of 10 wt.% zeolite tuff (70 % wt. of clinoptilolite) to fresh cattle manure increases retention of realized ammonia by 90% in comparison to the system without zeolite.

The intention of present study is to investigation and launch the sustainable ammonia source for pastures in Serbia, which is based on natural type of zeolite - clinoptilolite and cattle manure. The experiments were carried out on natural pastures in 2012/13 and included four different treatments: pure fermented manure (30 t ha^{-1}); manure+zeolite (30 t ha^{-1}+10 wt.% zeolite); nitrogen-containing mineral fertilizer (50 kg ha^{-1} N) and control. The trials were established by RCB design of plots (5 × 2m) with 4 replications;the fertilizers were applied in December 2012, except mineral fertilizer which was applied in Spring 2013. The plots were harvested in May 2013 and the dry matter (DM) contents were estimated. Besides, the botanical analysis and the chemical analysis of forage have been done.

Generally, the results show that the addition of clinoptilolite to the fresh cattle manure contributes to a preservation of nitrogen, thus influencing dry matter amount, botanical composition and total protein content.

Key words: clinoptilolite, manure, pasture

PROMENE VISINE BILJAKA I PRINOSA ZRNA KUKURUZA U ZAVISNOSTI OD SISTEMA GAJENJA

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Ispitivan je uticaj različitih sistema gajenja na visinu biljaka i prinos zrna kukuruza. Od sistema gajenja primenjivani su monokultura kukuruza (MM), kao stari sistem i plodosmena kukuruz-soja-pšenica (MSW) kao novi sistem gajenja. Oba tipa plodosmene imala su podtretmane sa (kontrola-C) i bez prisustva korova (ručno uklanjanje-R). Ogled je postavljen 2009. godine na oglednom polju Instituta za kukuruz „Zemun Polje. Nakon završetka prve plodosmene kukuruza, soje i pšenice u tropoljnom plodoredu, upoređivane su visine i prinos zrna kukuruza u monokulturi i plodosmeni kukuruz-soja-pšenica.

U 2009. godini postignute visine i prinosi zrna kukuruza imale su približno jednake vrednosti. U 2012. kukuruz je imao veću visinu u plodosmeni kukuruz-soja-pšenica za 16,3 cm (R) i 23,6 cm (C) u odnosu na monokulturu. Pored visine biljaka i prinos kukuruza je bio veći u plodosmeni kukuruz-soja-pšenica nego u monokulturi. U plodosmeni, u varijanti sa korovima (C) prinos zrna je bio veći za 1,53 t/ha, a u tretmanu bez korova (R) za 1,49 t/ha u odnosu na monokulturu. Na osnovu LSD testa, sve ove razlike su bile značajne sem razlike u prinosu zrna između monokulture (MM) i plodosmene kukuruz-soja-pšenica (MSW) u varijanti bez korova (R).

Na osnovu iznetih rezultata, može se zaključiti da plodosmena kukuruz-soja-pšenica utiče na povećanje prinosa zrna i visine biljaka kukuruza, u odnosu na gajenje u monokulturi.
Ključne reči: kukuruz, monokultura, plodosmena, korovi i prinos.

ALTERATION OF MAIZE HEIGHT AND GRAIN YIELD IN DIFFERENT CROPPING SYSTEMS

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The effect of two crop sequences: maize monoculture (MM), as old cropping system and maize-soybean-wheat crop sequence (MSW), as newer cropping system, was examined on plant height and maize grain yield. Both sequences had weed treatments: weed removal (R) and weedy check (C). Experiment was set up 2009 on experimental field of Maize Research Institute on calcareous chernozem soil type. After finishing first crop sequence (maize, soybean and wheat) maize height and grain yield were compared in monoculture and maize-soybean-wheat crop sequence.

In 2009, plant height and achieved grain yield had equal values in all treatments, as it was expected. In 2012, plants were higher in three crop rotation, for 16.3 cm (R) and 23.6 cm (C), then in monoculture. Maize grain yield was also higher in three crop rotation than in monoculture: in weedy check (C) grain yield was higher 1.53 t/ha and in treatment with weed removal (R) 1.49 t/ha. Based on LSD test, all these differences were significant except difference in yield between monoculture (MM) and three crop rotation (MSW) in treatment with weed removal (R).

With respect to obtained results, it can be concluded that three crop rotation affected much more maize height and grain yield then it was present in monoculture.

Key words: maize, monoculture, three crop rotation, weeds and yield

SELEKCIJA ZA SADRŽAJ FITINSKE KISELINE I ANTIOKSIDANASA KOD HLEBNE PŠENICE

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Pšenica se tradicionalno odabira na osnovu prinosa i pekarskog kvaliteta dok je malo pažnje posvećivano nutritivnoj vrednosti zrna i njenom poboljšanju kroz oplemenjivačke programe. Nutritivne vrednosti pšenice se razlikuju na osnovu nutritivnog sadržaja i svarljivosti. Variranje nutritivnog sadržaja je pod kontrolom genetičkih i sredinskih činilaca. U poslednjih 10 godina dosta pažnje se posvećuje fitonutrijentima pšenice i antioksidansima kao što su: fenoli, beta-karoten, proteinske SH grupe zbog pozitivnih učinaka na zdravlje ljudi. Istraživanje je bilo sprovedeno u toku 2010-2011 i 2011-2012 godine na tri lokaliteta: Rimski Šančevi, Zemun Polje i Padinska Skela. Ispitivani sortiment je sačinjavalo 15 genotipova hlebne pšenice (*Triticum aestivum ssp. vulgare* L.). Eksperiment je bio postavljen po potpuno slučajnom blok sistemu u 4 ponavljanja. Sledeće metode su korišćene za analizu: fitinska kiselina (Latta and Eskin (1980) modifikovana po Sredojević i Dragičević (2009)); ukupni fenoli (Prussian Blue prema Prais-u (Budini et al. (1980) modifikovana prema Simić i sar. (2004)); proteinske SH grupe (PSH) (De Kook et al. (1981)); solubilni proteini (Lowry et al. (1951)); beta karoten (AACC (1995) 14–50); ukupni neorganski fosfor (Pi) (Pollman (1991)). Primenjen je model (Yan and Rajcan 2002) za genotip po osobinama (GT) biplot. GT biplot pomaže u razumevanju odnosa između osobina (ciljeva oplemenjivanja), identifikovanju pozitivno ili negativno korelisanih osobina i ukazuje na mogućnost indirektne selekcije za osobinu od interesa. Pomaže u vizualizaciji profila osobina genotipova (snaga i slabost), što je važno za pravilan odabir roditelja i poređenje strategija selekcije. Utvrđene su grupe genotipova hlebne pšenice sa sličnim profilima osobina iz kojih je moguće vršiti pravilan odbor roditelja za niži sadržaj fitinske kiseline i viši sadržaj antioksidanasa.

Ključne reči: hlebna pšenica, fitinska kiselina, antioksidansi, GT biplot, selekcija

SELECTION FOR PHYTIC ACID CONTENT AND ANTIOXIDANTS IN BREAD WHEAT

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Wheat is a traditionally being selected based on yield and baking quality, while little attention has been paid to the nutritional value of grain and its improvement through breeding programs. Nutritive value of wheat differs in nutrient content and digestibility. A variation in nutritional content is controlled by genetic and environmental factors. In the last 10 years a lot of attention is paid to wheat phytonutrients and antioxidants such as phenols, beta-carotene, and the protein sulphydryl groups (PSH) due to the positive effects on human health. The research was conducted during 2010-2011 and 2011-2012 years at three sites: Rimski Sancevi, Zemun Polje and Padinska Skela. The tested accessions consisted of 15 genotypes of bread wheat (*Triticum aestivum ssp. vulgare* L.). The experiment was set up in a randomized complete block design with four replications. The following methods were used for analysis: phytic acid (Latta and Eskin (1980) modified by Sredojevic and Dragicevic (2009)), total phenols (Prussian Blue by Prais-in (Buddha et al. (1980) modified by Simic et al. (2004)), protein sulphydryl groups (PSH) (De Kook et al. (1981)), soluble proteins (Lowry et al. (1951)), beta carotene (AACC (1995) 14-50), total inorganic phosphorus (Pi) (Pollman (1991)).The model (Yan and Rajcan 2002) for the genotype by trait (GT) biplot was applied. GT biplot helps in understanding the relationship between traits (breeding objectives), identify positively or negatively correlated traits, and indicates the possibility of indirect selection for the trait of interest. It helps to visualize genotype traits profiles (strengths and weaknesses of a genotype), which is important for the proper selection of parents and comparison of selection strategies. The groups of bread wheat genotypes with similar profiles of traits were identified, from which it is possible to properly cull parents for low phytic acid and high content of antioxidants breeding.
Keywords: bread wheat, phytic acid, antioxidants, GT biplot, selection

STARE VRSTE ŽITA KAO ZNAČAJAN GENETIČKI RESURS ZA ORGANSKU PROIZVODNJU

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Iako se organska poljoprivreda još uvek oslanja na sortiment useva stvoren za konvencionalnu proizvodnju, postoji potreba za stvaranjem novih sorti selekcionisanih na drugačijim osnovama koje bi imale osobine pogodne za *low input* uslove gajenja. Indentifikacijom odgovarajućih genetičkih resursa među starim sortama i lokalnim populacijama, bilo u cilju njihove direktne upotrebe ili kao potencijalne roditeljske linije u programima oplemenjivanja za bolju adaptaciju postojećih modernih sorti, može se doprineti većoj produktivnost i stabilnost organske proizvodnje. Eksploatacija ove banke gena može biti korisna u oplemenjivanju osobina veoma važnih u organskoj proizvodnji žita kao što su tolerantnost na smanjenu dostupnost nutrijenata, veći sadržaj proteina u zrnu, tolerantnost na zakorovljenost ili otpornost na bolesti. Kod većine modernih sorti ove osobine su nestale tokom procesa oplemenjivanja kako bi se dobili visokoprinosni varijeteti.

Iz socijalnih, kulturnih ili jednostavno ekonomskih razloga poslednjih nekoliko godina stare vrste i lokalne populacije sve više dobijaju na značaju na šta ukazuju i procene da ovi genotipovi čine 44% od ukupnog broja uzoraka biljaka za hranu i poljoprivredu koji se čuvaju u genbankama širom sveta. Zato što nemaju svakidašnju upotrebu, ali i zbog toga što mogu služiti kao alternativni izvor dijetetskih vlakana i proteina, stare vrste žita nazivaju se i *alternativnim* ili *nedovoljno korišćenim*. Obzirom da se ne odlikuju osobinama karakterističnim za *high input* uslove proizvodnje najčešće se povezuju sa alternativnim poljoprivredim sistemima kakav je organska proizvodnja.

U radu je dat prikaz stanja genetičkih resursa žita na globalnom nivou i u Republici Srbiji. Osim toga, ukazano je na neke od najznačajnijih zapostavljenih vrsta žita koje dobijaju sve veću vrednost kroz upotrebu u organskoj poljoprivrednoj proizvodnji.

Ključne reči: organska poljoprivreda, stare vrste žita, genetički resursi

OLD SORTS OF GRAIN AS SIGNIFICANT GENETIC RESOURCE FOR ORGANIC PRODUCTION

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Although organic agriculture still leans on crops assortment for a conventional production, there is a need for creating new sorts, selected on different basis, which would have features favourable for *low input* growing conditions. By identifying the specific genetic resources among old sorts and local population, whether for their direct use or as potential parental lines in improvement programs for better adjustment of the existing modern sorts, can be responsible for higher productivity and stability of organic production. Exploitation of this gene bank can be useful in features improvement, very important in organic production of grain, like a tolerance to decreased availability of nutrients, higher content of proteins in corns, tolerance to a weed infestation or resistance to diseases. In most of modern sorts, these features have disappeared during the improvement process, in order to get high-yield variety.

In social, cultural and simply economic reasons, in last several years, the old sorts and the local populations have their increasing significance, to which also point out the assessments that these genotypes make 44% of the total samples number of plants for food and agriculture, which preserve in gene-banks all over the world. Due to a fact that they have no daily use, but also because they can be an alternative resources of dietetic fibres and proteins, the old grain sorts are also called the *alternative or insufficiently used.* In regard that they have no features for *high input* production condition, the most often are connected to the alternative agricultural systems, such as the organic production.

In the paper was given a review of the grain genetic resources status, globally and in the Republic of Serbia. Besides, there was paid attention to some of the most important underprivileged sorts of grains, which get their increasing significance by their use in the organic agricultural production.

Key words: organic production, old types of grain, genetic resources.

PRODUKTIVNOST HELJDE (*Fagopyrum esculentum* Moench) U ZAVISNOSTI OD LOKALITETA GAJENJA

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U ovom radu ispitivana je produktivnost heljde u zavisnosti od lokaliteta gajenja, prvenstveno nadmorske visine, pošto ova vrsta nema visoke zahteve prema zemljištu. Najviše joj odgovaraju lakša zemljišta, neutralne do blago kisele reakcije, na težim i vlažnijim parcelama može doći do poleganja. Heljda najbolje uspeva u područjima gde nema naglih promena toplotnih uslova (nagla zahlađenja ili velike žege) i režima prirodne vlažnosti (suše ili suviše vlažni periodi). Nagle promene posebno negativno utiču na biljke kada su u generativnoj fazi. Osetljiva je i prema visokim temperaturama, naročito iznad 25 °C.

Ogledi su izvedeni tokom 2010. godine na dva lokaliteta: u lokalitetu Valjeva (selo Jovanja 300 m nadmorska visina), i lokalitetu Nova Varoš (selo Radijevići 1065 m nadmorske visine). Zemljište na oglednim parcelama u oba lokaliteta je bilo kisele hemijske reakcije, sa 3-5% humusa, slabo obezbeđeno pristupačnim fosforom i dobro obezbeđeno kalijumom. U okviru cilja ispitivanja, u četiri ponavljanja, na ispitivanim lokalitetima primenjena su mikrobiološka đubriva baktofil i slavol neposredno pred setvu, samostalno ili u kombinaciji sa oplemenjivačima zemljišta (hidrogel i zeolit). Polovina svake elementarne parcele bila je prihranjena folijarno, mikrobiološkim đubrivom, slavolom u koncentraciji 50 ml na 10 l vode. U odnosu na kontrolnu varijantu, (bez primene đubriva), u svim varijantama đubrenja u oba lokaliteta su dobijeni veći prinosi zrna. Značajno veći prinosi zrna heljde su dobijeni na drugom lokalitetu, posebno kombinovana primena slavola i oplemenjivača zemljišta hidrogel.

Ključne reči: đubriva, heljda, nadmorska visina, oplemenjivači zemljišta, prinos

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PRODUCTIVITY OF BUCKWHEAT (*Fagopyrum esculentum* Moench) DEPENDING ON GROWING LOCALITIES

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In this study investigated the productivity of buckwheat according to growing regions, especially above altitude, since this species does not have high requirements of land. Most of her suit lighter soil, neutral to slightly acid reaction, the heavier and wetter plots may be flattening. Buckwheat thrives best in areas where there are no abrupt changes in thermal conditions (sudden drop in temperature or high heat) and natural moisture regime (dry or too wet periods). Sudden changes in a particularly negative impact on the plants when they are in the reproductive stage. Sensitive to the high temperatures, especially above 25 °C.

The experiments were conducted during 2010th at two locality: the locality of Valjevo (village Jovanja 300 m altitude), and the locality of Nova Varos (village Radijevići 1065 m altitude). Land on experimental plots in both localities was acidic chemical reaction, with 3-5% humus, weakly secured available phosphorus and potassium, secured well. In the cause of research, with four replications, in organic cropping system three combinations of microbiological fertilizer (Bactofil- the first locality and Slavol- the second locality) with zeolite and hydrogel were used prior to sowing. Different combinations of the microbiological fertilizer and the soil additives gave positive results especially in the second locality of the trial. Half of each elementary plot was recharged foliar, microbial fertilizer, Slavol concentrating 50 ml per 10 liters of water. Compared to the control variant (without fertilizers), all variants of fertilization in both localities were obtained higher yields. The best combination in organic cropping system was Slavol+hydrogel with foliar application of the microbiological fertilizer in second locality, which resulted in the greatest yield of buckwheat and this treatment can be recommended to producers.

Key words: fertilizers, buckwheat, altitude, soil additive, yield

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KVALITET ZRNA ŽITARICA IZ ORGANSKE PROIZVODNJE

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Organska poljoprivreda se zasniva na korišćenju potencijala gajenh biljaka (tolerantnost na stres, štetočine i bolesti, optimalno korišćenje prisutnih uslova sredine), uz održanje kvaliteta zemljišta. Cilj ogleda je bio da se ispita kvalitet zrna spelte (sorta Nirvana), kao i uticaj različitih đubriva na kvalitet zrna kukuruza (sorta Rumenka) tokom 2012 godine. U ogledu sa kukuruzom su bili sledeći tretmani: DCM EKO-MIX 1 (N:P:K=9:3:3, 65% organske materije - NPK1) i DIX 10 N (N:P:K=10:3:3, 72.5% organske materije - NPK2) u količini od 500 kg ha^{-1}, kontrola (bez đubrenja) i konvencionala proizvodnja (163 kg uree ha^{-1}, uz standardnu upotrebu pesticida).

Prinos kukuruza je bio značajno veći u organskoj, u odnosu na konvencionalnu proizvodnju, ali nije bilo razlike između tretmana, dok je spelta ostvarila skoro duplo veći prinos u odnosu na kukuruz. Zrno spelte se pokazalo kao daleko superiornije po sadržaju minerala, uz višestruko veću koncentraciju Ca, Mg, Fe, Mn, Zn, K i P u odnosu na kukuruz. Zanimljivo je istaći da je kod ove kulture bilo oko 30% više ukupnih proteina u odnosu na kukuruz, kao i niži nivo fitinskog fosfora, što bi uz povoljniji odnos fitinskog i neorganskog fosfora moglo označavati bolje iskorištavanje hranljivih elemenata iz zrna spelte, u odnosu na kukuruz gajen u organskoj proizvodnji, a posebno kukuruz gajen na kohnvencionalni način. NPK1 tretman je kod kukuruza uticao na povećanje sadržaja P i ukupnih proteina, dok je NPK2 povećao udeo Mn i K. Za razliku od spelte, u zrnu kukuruza ima više fenola, glutationa i β-karotena, što ga čini boljim izvorom antioksidanata. Takođe, više β-karotena je zabeleženo u zrnu kukuruza iz konvencionalne proizvodnje, dok je kukuruz iz organske proizvodnje imao više glutationa. Tretman NPK1 je bolji za povećanje udela β-karotena, dok je NPK2 uticao na povećanje glutationa, dok su oba đubriva uticala na smanjenje sadržaja fenola.

Ključne reči: mineralni sastav, antioksidanti, kukuruz, spelta, organska proizvodnja

THE GRAIN QUALITY OF CEREALS FROM ORGANIC PRODUCTION

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The organic agriculture is based on the utilization of crop potentials (tolerance to stress, pests, optimal usage of environment), with soil quality maintaining. The aim of experiment was to examine grain quality of spelt (Nirvana variety), as well as the influence of different fertilizers on maize grain quality (Rumenka variety) during 2012. Treatments in maize experiment were: DCM EKO-MIX 1 (N:P:K=9:3:3, 65% organic matter - NPK1) and DIX 10 N (N:P:K=10:3:3, 72.5% organic matter - NPK2) in amount of 500 kg ha^{-1}, control (without fertilization) and conventional production (163 kg urea ha^{-1}, with standard pesticide application).

The maize yield was significantly higher in organic than in conventional production, with negligible differences between treatments. Spelt was achieved almost double higher yield than maize. The spelt grain was superior in mineral content, with several times higher concentration of Ca, Mg, Fe, Mn, Zn, K and P, in relation to maize. It was interesting to underline thatin this culture was increased content of total proteins about 30% and lower content of phytic phosphorus than in maize, what together with favourable relation between phytic and inorganic phosphorus could signify better absorption of minerals from spelt grain, in relation to organic grown maize and particularly to conventionally grown maize. NPK1 treatment increased P content in maize grain, while the NPK2 increased Mn and K content. Opposite than spelt, in maize grain was higher content of phenolics, glutathione and β-carotene, giving it advantage as source of antioxidants. Higher β-carotene content was determined in maize grain from conventional production, while higher glutathione was in maize grain from organic production. NPK1 treatment was better for increasing of β-carotene content, and the NPK2 induced glutathione increase, while the both fertilizers decreased content of phenolics.
Key words: mineral composition, antioxidants, maize, spelt, organic production

UTICAJ SPOLJNE SREDINE NA PRINOS ZRNA KVINOJE (*Chenopodium quinoa* Willd.)

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Korišćenje alternativnih žita u ishrani zahteva uvođenje novih biljnih vrsta u proizvodnju kao što su kvinoja, amarantus i druge. Kvinoja (*Chenopodium quinoa* Wild.) se gaji radi zrna, koje je po nutritivnoj vrednosti slično zrnu žita, ali ne sadrži protein gluten. Tokom 2010, 2011. i 2012. godine izvođeni su ogledi sa introdukovanom vrstom kvinoja (*Chenopodium quinoa* Willd.). Ogledi su izvedeni u Novoj Pazovi na zemljištu tipa karbonatni černozem sa dva genotipa (KVL 52 i KVL 37). Setva je obavljena u aprilu i žetva u avgustu. Prosečne temperature vazduha u periodu vegetacije (april-septembar) su rasle od prve prema trećoj godini izvođenja ogleda, a količine padavina su značajno opadale. U 2010. ostvaren je prinos od 1360 kg/ha, a u 2011. godini 1467 kg/ha. U 2012. godini nastupile su veoma visoke temeperature (31-38,4^{o}C) u trajanju od 70 dana i suša u periodu juni-septembar. Ovo je uticalo na veoma značajno smanjenje prinosa zrna, koji je u proseku iznosio 382 kg/ha. Sorta KVL 52 je bila prinosnija u odnosu na KVL 37.

Ključne reči: kvinoja, padavine, prinos zrna, suša, temperature.

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EFFECT OF ENVIRONMENTAL FACTOR ON QUINOA GRAIN YIELD (*Chenopodium quinoa* Willd.)

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Application of alternative cereals in nutrition requires introduction of new plant species in agricutural production, such as quinoa, amarantus, etc. Quinoa (*Chenopodium quinoa* Willd.) is cutivated for its grain, wich has similar nutrition value like cereal grain, but it,s gluten free. In 2010, 2011. and in 2012. we performed experiments with introduced species of quinoa. Experiments were conducted on location in Nova Pazova on the calcareous chernozem using two genotypes (KVL 52 and KVL 37). Sowing was done in April and harvest in August. The average air temperature during the growing season (April-September) rose from the first to the third year of experiments, and rainfall were significantly decreased. In 2010. the yield was 1360 kg/ha, and in 2011. it amounted 1467 kg/ha. During 2012. very high temperatures (31 to 38,4 °C) lasted 70 days and drought occured in the period June-September. This resulted in a very significant reduction in grain yield, which averaged 382 kg/ha. Variety KVL 52 had higher yield compared to the KVL 37.

Key words: quinoa, precipitation, grain yield, drought, temperature

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EFEKAT GUSTINE USEVA NA PRINOS SEMENA I SADRŽAJ PROTEINA SUNCOKRETA

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Cilj rada je bio da se ispita uticaj gustine useva na prinos semena i sadržaj proteina u semenu suncokreta. U ogledu postavljenom tokom 2012. godine na lokalitetu Rimski šančevi, ispitivano je pet konzumnih hibrida suncokreta (NS Goliat, NS Slatki, NS Gricko, Vranac i Cepko) i jedan za ishranu ptica (NS-H-6485). Hibridi su posejani u šest gustina (od 20.000 do 70.000 biljaka ha^{-1}, sa korakom od 10.000 biljaka ha^{-1}). Ogled je postavljen po slučajnom blok sistemu u četiri ponavljanja. Rezultati ANOVA-e pokazali su visoku značajnost svih izvora varijacije za obe ispitivane osobine. Najveći doprinos prinosu semena, pokazali su hibridi (50,07%), dok su gustina useva (22,50%) i interakcija hibrid × gustina useva (27,43%) imali skoro jednak doprinos prinosu.Najviši prinos semena u proseku za sve gustine imali su hibridi NS-H-6485 (4,77 t ha^{-1}) i NS Gricko (4,43 t ha^{-1}). U proseku za sve hibride prinos semena u 2012. godini značajno raste do 50.000 biljaka ha^{-1}, kada dostiže vrednost od 4,50 t ha^{-1}, a zatim opada.Najveći doprinos sadržaju proteina u 2012. godini na lokalitetu Rimski šančevi imali su hibridi (70,07%), zatim gustina useva (18,74%), dok je najmanji udeo pokazala interakcija hibrid × gustina useva (5,19%). Značajno najviši sadržaj proteina pokazao je hibrid Cepko (16,94%), uzimajući u obzir sve gustine. Iznad opšteg proseka sadržaj proteina postigao je i hibrid Vranac (16,11%). Ostali hibridi su imali značajno niži sadržaj proteina u odnosu na opšti prosek, koji je iznosio 15,02%. Najveći sadržaj proteina, u proseku za sva šest hibrida, bio je pri najmanjoj gustini useva (20.000 biljaka ha^{-1}), a zatim opada do gustine od 40.000 biljaka ha^{-1}.Između poslednje tri gustine useva (50.000, 60.000, 70.000 biljaka ha^{-1}) nije bilo značajnih razlika u sadržaju proteina, ali je on bio značajno niži u odnosu na opšti prosek.

***Ključne reči**:* hibrid, gustina useva, konzumni suncokret, prinos semena, sadržaj proteina

EFFECT OF CROP DENSITY ON SEED YIELD AND PROTEIN CONTENT IN SUNFLOWER

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The aim ofthis study was toinvestigate the effect of crop density onseed yield and seed protein content in sunflower.The experiment was carried out at the location of Rimski šancevi with five confectionary hybrids (NS Goliat, NS Slatki, NS Gricko, Vranac and Cepko) and one hybrid for feeding of birds (NS-H-6485) in 2012. Hybrids were sown in six densities (20.000 to 70.000 plants ha^{-1}, with increasing step of 10.000). The experimental design was a randomized complete block design with four replications. The results of ANOVA showed highly significant differences for all sources of variation for both examined traits. The largest contribution toseed yield, showed hybrids (50.07%), while crop density (22.50%) and hybrid×crop density interaction (27.43%) had nearly equal contribution to seed yield. The highest average seed yield for all densities were achieved by NS-H-6485 (4.77 tha^{-1}) and NSGricko (4.43 t ha^{-1}). The average seed yield of all hybrids significantly increased up to 50.000 plants ha^{-1}, when it reached value of 4.50 t ha^{-1}, and then decreased. The largest contribution to protein contentat the location of Rimski šancevi showed hybrids (70.07%), and after that crop densities (18.74%), while the lowest contribution achieved hybrid× crop density interaction (5.19%). Significantly highest protein content, taking into account all densities, had hybrid Cepko(16.94%). Protein content over general average mean also achieved hybrid Vranac (16.11%). Other hybrids had significantly lower protein content compared to the over all average, which was 15.02%. The highest protein content in average for all six hybrids was at the lowest density (20,000 plants ha^{-1}) and then decreases to a density of 40000 plants ha^{-1}. Between the last three densities (50.000, 60.000, 70.000 plants ha^{-1}) there were no significant differences in protein content, but it was significantly lower than the over all average.

***Keywords*:** hybrid, crop density, confectionery sunflower, seed yield, protein content

MOGUĆNOSTI FITOEKSTRAKCIJE TEŠKIH METALA IZ KONTAMINIRANOG ZEMLJIŠTA

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Predmet ovog rada je fitoekstrakcija, kao za sada najbolja in situ fitoremedijaciona tehnika za tretman zemljišta zagađenih teškim metalima.Primena biljaka, njihovih rizosfernih mikroorganizama i metaboličkih procesa koji se u njima odvijaju, pokazala se ekološki uspešnom i ekonomski isplativom u uklanjanju različitih teških metala iz kontaminiranog zemljišta. Obzirom da se ova ''zelena'' tehnologija još uvek nalazi u fazi istraživanja i razvijanja, u ovom radu je, pored principa metode i biljnih vrsta koje se koriste, sagledana i perspektiva fitoekstrakcije u pogledu komercijalne primene.

Ključne reči: biljke, fitoekstrakcija, hiperakumulatori, teški metali, zagađeno/ kontaminirano zemljište

POSIBILITIES OF HEAVY METAL PHYTOEXTRACTION FROM CONTAMINATED SOIL

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This paper analyzes phytoextraction, as for now the best in situ phytoremediation technique for treatment of heavy metal polluted soils. Application of metabolic processes in plants and their rhizospheric microorganisms, proved to be environmental friendly and economically successful in removing different heavy metals from a contaminated soil. Since this ‘’green’’ technologiy is still in the stage of research and development, aside from the operating principle and plant species that are being used, this paper also perceives perspective in phytoextraction’s commercial application.

Key words:plants, phytoextraction, hyperacumulators, heavy metals, polluted/contaminated soil

OKUĆNICE-NEDOVOLJNO KORIŠĆENA BLAGA JUŽNOG OBODA PANONSKOG BASENA

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Obradivo zemljište izuzetnog kvaliteta je zaštitni znak ruralnih delova i Srbije i Mađarske.Visoka stopa nezaposlenosti, ostarelo stanovništvo i neregulisani uslovi tržišta vode u konstantne migracije u gradove ostavljajući sela da izumru. Posledica ovoga je trend da se deo obradivog zemljište, pa I okućnice i bašte, neobrađuju ili obrađuju na neadekvatan način.Ova pojava svakako postaje sve više socijalni, ekonomski i ekološki problem za zajdnice koje su njime pogođene. U okviru mađarsko-srpskog IPA programa prekogranične saradnje (Farmaddinc), započet je jednogodišnji projekat Odeljenja za povrtarstvo Instituta za ratarstvo i povrtarstvo iz Novog Sada i Više poljoprivredne škole u Kečkemetu. Projekat se obraća nezaposlenim vlasnicima okućnica površine od 500 do 1000m^2 u seoskim pograničnim oblastima kako bi ponovo pokrenuli ili pak unapredili proizvodnju povrća na svojim gazdinstvima na produktiivniji, efikasniji i tržišno isplativiji način. Ciljevi koji se žele ostvariti projektom se mogu kategorisati u dva pravca: (i) jasno definisane lako primenljivog metoda kojim bi se unapredila proizvodnja na okućnicama i obezbedio dodatni prihod ovih gazdinstava, i (ii) promovisanje rezultata istraživanja u okviru projekata putem internet stranice (www.farmaddinc.eu) i povezivanje i udruživanje proizvođača.

Učesnici projekta bi želeli ukazati da sa izborom određenog načina proizvodnje (otvoreno polje ili zaštićen prostor) uz obavezno navodnjavanje, dobro odabranim i organizovanim vremenom izvođenja radova i potrebnim inputima, lokalno stanovništvo mnogo toga može proizvesti na svom imanju, ali i prodati na zelenim pijacama. Cilj je pomoći lokalnom stanovništvu u odluci kako i šta gajiti, kako koristiti zemljište, koje useve proizvoditi i kako na zajedničkoj osnovi povezati proizvođače da svoje proizvode zajednički plasiraju. Predviđeno je da se model ovog specifičnog načina proizvodnje razvije istraživajima u okviru dva demonstraciona polja (po jedan u svakoj zemlji učesnici projekta) koja će uključivati 200 m^2 proizvodnje povrća na otvorenom polju i 300 m^2 proizvodnje povrća u zaštićenom prostoru (plastenik). Rezultate će nadopunjavati adekvatne ekonomske analize prikupljenh podataka i biće stavljeni na uvid javnosti putem elektronske platforme i serije radionica u Srbiji i Mađarskoj. Obezbeđujući proizvođače i nosioce odlučivanja ključnim informacijama i statističim podacima, projekat nudi optimalne tehnologije proizvodnje povrća neophodne za pokretanje i uspešno vođenje proizvodnje na okućnicama.

Ključne reči: povrće, okućnice, samozapošljavanje, edukacija, IPA Hung-Sr

INFIELDS- UNEXPLOITED TREASURES OF THE SOUTHERN RIM OF THE PANNONIAN BASIN

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Arable land of exceptional quality is a brand of rural areas in both Serbia and Hungary. High unemployment rate, elderly households and unregulated market lead to constant migration to citiesleaving rural areas deserted.Consequently, arable land, infields, gardens and backyards stay uncultivated or cultivatedimproperly. The problem is of social, economic and environmental concern for the overall community. As a part of Hungary-Serbia IPA Cross-border Co-operation Programme, Vegetable Department of Institute of Field and Vegetable Crops in Novi Sad, Serbia and Collage of Kecskemét in Hungary started a "Farmaddinc" project. The projectaddresses to unemployed owners of infields, backyards or gardens (500-1000 m^2 per household) in rural settlements in cross-border area to establish or improve their infield farms to be more productive, cost-effectiveand competitive on the market. The objectives of the project are twofold: (i) to clearly define comprehensiblemethod that will improve the production and insure additional income to infield-farms, and (ii) via website (www.farmaddinc.eu) to promote the results and connect the farmers and small markets, shops and malls to co-operate. The farming model will be developed through research in two demonstration fields (one in each country) that comprise of 200m^2 of open field production and 300m^2 of production in protected environment (greenhouse). The results will be complemented with economic analysis and presented publicly through e-platform and a set of workshops in Serbia and Hungary.Providing farmers and decision makers with important information and statistics, the project offers optimal production technologies for the establishment and successful running of infield enterprises. "Farmaddinc" project providing skills and knowledge encouraging farmers on both sides of the border to cultivate their infield properly to be self-sufficient.

Key words: vegetables, infields, self-employment, education, IPA Hung-Srb

INDEKS PLEVA PLODA KRUPNIKA (*Triticum spelta* L.)

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Krupnik (*Triticum spelta* L.) pripada heksaploidnoj grupi gajenih vrsta roda *Triticum* sa lomljivim vretenom klasa i plevičastim plodom. Pri žetvi klas krupnika se raspada na klasiće u kojima se nalaze najčešće dva, a ponekad i tri zrna (*caryopsis*). Zrna su čvrsto obavijena plevama i plevicama, a kod neselekcionisanih populacija krupnika one se teško uklanjaju. Plevičasti plod je nepodesan za korišćenje u ishrani ljudi pa ga je pre upotrebe potrebno mašinski oljuštiti. Seme, odnosno zrno pravih žita, ima oko stotinak osobina, od njih 20% ima značaj za tržište, dok se 10-15% zvanično ispituje. Uvođenje u proizvodnju krupnika i sve veća zastupljenost na tržištu proizvoda od zrna ove pšenice, nameće potrebu za određivanjem udela zrna u masi plevičastih plodova. Ova osobina može se izraziti indeksom pleva (IP) koji predstavlja odnos između mase oljuštenog zrna sa plevičastim, a može se izračunati po obrascu:

$$IP = \frac{Poz}{Ppz} \times 100$$

IP – indeks pleva; *Poz* – prinos oljuštenog zrna; *Ppz* – prinos plevičastog zrna.

Prema podacima koje navode brojni autori, udeo plevi i plevica u ukupnoj masi klasa je 21%-32% i on zavisi od sorte, a slične vrednosti imaju i domaće populacije - 22,7%-28,3%. Trogodišnja istraživanja ukazuju na nešto veće vrednosti indeksa pleva (29,30%-31,54%), a u uslovima povoljnijeg vodnog i toplotnog režima biljke u celini imaju manji indeks pleva nego u sušnoj godini.

Ključne reči: krupnik, plevičast plod, indeks pleva

Ovaj rad je podržan u okviru projekata III46005 i 46006, Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije.

HULL INDEX OF SPELTA WHEAT GRAIN (*Triticum spelta* L.)

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Spelta wheat (*Triticum spelta* L.) belongs to a hexaploid group of cultivated species of the genus *Triticum* with fragile brittle rachis and hulled grain. In the harvest period, spelta wheat spikes decompose to spikelet with two, or sometimes three, grains (*caryopsis*). Those grains are firmly wrapped in hulls, and in the unselected populations of spelta wheat are very difficult to remove. Hulled grain is unsuitable for human diet and it is necessary to peel it by machine before using.

The seed, *i.e*. the seed of real wheat, has about one hundred properties, among which 20% is important for the market, while only 10-15% is officially tested. The introduction of the spelta wheat production and its growing presence in the market imposes the need for determining the share of this grain in the hulled grain weight. This characteristic can be expressed as a hull index (IP), which is a ratio between the weight of dehulled grain with the weight of hulled grain, and can be calculated by the formula:

$$IP = \frac{Poz}{Ppz} \times 100$$

IP – hull index; *Poz* – yield of dehulled grain; *Ppz* – yield of hulled grain.

According to many authors data, the hull share in the total spike weight is 21% -32%, and it depends on the variety, whereas similar data can be found in domestic populations 22.7%-28,3%. A three-year study points to somewhat higher hull index (29.30% -31.54%); until in the favorable conditions of water and heat regime plants in general have a lower hull index than in a dry year.

Key words: spelta wheat, hulled grain, hull index

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OCENA POPULACIJA PARADAJZA KAO DONORA POŽELJNIH ALELA ZA POBOLJŠANJE KVANTITATIVNIH OSOBINA ELITNOG HIBRIDA

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Cilj istraživanja je identifikuja populacija koje mogu biti korišćene kao donori poželjnih alela za poboljšanje kvantitativnih osobina elitnog hibrida paradajza. Izučavane su sledeće osobine: dužina ploda, prečnik ploda, broj plodova po biljci, masa ploda i masa ploda po biljci. Komponente prinosa šest populacija (SO, MZ, AL, ZA, RU i NS) i njihovih hibrida koji su dobijeni po *m x n* sistemu su izučavane na bazi poljskih ogleda u tri ponavljanja (2012. godine) po slučajnom blok sistemu.

Populacija RU je pokazala pozitivne ili negativne i značajne μG vrednosti za sve osobine. Ova populacija, RU, je ispoljila najviše i najznačajne vrednosti ovog parametra za broj plodova po biljci i masu ploda. Populacija je srodnija sa NS roditeljem elitnog hibrida. Poboljšanje ovih osobina zajedno može biti izvedeno povratnim ukrštranjem hibrida SO x NS sa P_2 (NS) ili donorima (MZ, AL, ZA i RU).

Ovi rezultati ukazuju da populacije mogu biti korišćene kao donori poželjnih alelela za poboljšanje kvantitativnih osobina elitnog hibrida. Na bazi rezultata pronađeni su najbolji potencijalni donori za poboljšanje elitnog hibrida SO x NS.

Ključne reči: paradajz, populacije, donori, komponente prinosa

THE EVALUATION OF TOMATO OF POPULATIONS AS DONORS OF FAVORABLE ALLELES FOR THE IMPROVEMENT OF QUANTITATIVE TRAITS OF AN ELITE HYBRID

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The aim of this study is to identify which of different populations may be useful as donor of favorable alleles in the improvement of the yield components of the elite single cross hybrid. Fruit length, fruit diameter, number of fruit per plant, fruit weight and weight fruit per plant were investigate. Yield components in six populations and their hybrids were determined on the basis of field trials set up in three replications (2012. year) in a randomized block design.

Population, RU showed positive or negative and significant μG values of all traits. This population, RU, expressed the highest significant value of this parameter for number of fruit per plant and fruit weight and could be useful in the improvement of these traits. This population was more closely related to the parent of the elite hybrid Au-09. Improvement of these traits should be carried out together by backcrossing the hybrid SO x NS to the P_2 (NS) or the donors (MZ, AL, ZA and RU).

These results suggest that lines could be used as donor of favorable alleles for improvement of the quantitative traits of an elite hybrid. On the bases of results were found to be the best potential donor for improvement of the elite hybrid B-99 x Au-09.

***Key words*:** tomato, populations, donors, yield components.

UTICAJ PRIHRANJIVANJA NA RAZVIJENOST RASADA KRASTAVCA

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Ogled je sproveden na Poljoprivrednom fakultetu Univerziteta u Beogradu. Biljke ispitivanog krastavca rasle su pod veštačkim osvetljenjem (MH 600W). Pored svetlosti kontrolisana je i temperatura, kao i vlažnost vazduha. Ispitivanja su obavljena na hibridnom krastavcu Caman RZ. Biljke su odgajane u saksijama prečnika 10,5cm, koje su bile napunjene supstratom Terracult TC 10. Ogled se sastojao iz tri varijante (3x30 saksija). U prvoj varijanti (kontrola) biljke su rasle bez prihranjivanja. Biljke iz druge i treće varijate su prihranjivane zalivanjem i to đubrivima Fitofert kristal (10:40:10), odnosno Fitofert humistart. Tokom rasadnog perioda, na nedeljnom nivou, praćena je razvijenost ispitivanih biljaka. Rasadni period (setva-rasađivanje) je trajao 35 dana. U radu su prikazani visina biljke (cm), broj listova po biljci, relativni sadržaj hlorofila (SPAD), masa cele biljke (g), masa stabla (g) i masa lista (g). Prihranjivanje je značajno uticalo na razvijenost rasada krastavca. Biljke iz varijanata sa prihranjivanjem u svim parametrima su se značajno razlikovale od kontrole. Te razlike su bivale izraženije sa starenjem biljaka. U okviru varijanti sa prihranom, biljke zalivane Fitofert humistartom imale su značajno veće vrednosti posmatranih parametara.

***Ključne reči*:** krastavac, prihranjivanje, rasad, visina biljke, broj listova, masa cele biljke

Ovaj rad je podržan u okviru projekta TR 31030 Ministarstva prosvete, nauke i tehnološkog razvoja Republike Srbije.

EFFECT OF FERTILIZATION ON THE DEVELOPMENT OF CUCUMBER SEEDLINGS

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The experiment has been made at the Faculty of Agriculture – University of Belgrade. Plants of the examined cucumber grown under artificial lighting (MH 600W). In addition to the lighting, temperature was also controlled, as well as air humidity. Examinations were carried out on a hybrid cucumber Caman RZ. The plants were grown in 10.5cm radius pots, filled by a substrate Terracult TC 10. The experiment included three variants (3x30 pots). In the first variant (control) the plants grown without a fertilization. The second and the third phase plants were top dressed by watering using particularly fertilizers Fitofert kristal (10:40:10), i.e. Fitofert humistart. Planting out period (sowing – planting out) took up 35 days. The paper indicates the plant height (cm), number of leaves per plant, relative chlorophyll content (SPAD), whole-plant weight (g), stem weight (g) and leaf weight (g). Fertilization considerably influenced development of the cucumber seedlings. Plants falling within fertilization variants considerably differed from the controlled ones in all parameters. These differences were all the more prominent as the plants grew old. Within the fertilization variant, observed parameters in the plants watered using Fitofert humistart were considerably higher.
Key words:cucumber,fertilization,seedlings, plant height, number of leaves, whole-plant weight

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OCENA DEKORATIVNE VREDNOSTI GENOTIPOVA BOSILJKAKLASTER ANALIZOM

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Ocena dekorativne vrednosti ispitivanih genotipova bosiljka izvršena je na osnovu morfoloških karakteristika stabljike, lista i cvasti (visina biljke, širina biljke i boje stabljike, lista i cvasti).

Bliskost analiziranih genotipova bosiljka prema ispitivanim karakteristikama određena je modelom hijerarhijske klaster analize, zasnovanim na Euklidskim distancama i metodu kompletnog povezivanja.

Primenom klaster analize dobijen je dendrogram dekorativne vrednosti koji ukazuje da: prvu grupu čine tri genotipa ocenjena kao atraktivni:*Compact, Siam queen i Lattuga*. Oni su povezani na 13 jedinica distance. Drugu grupu čini pet genotipova ocenjnih kao dekorativni: *Purple opal, Purple ruffles Osmin, Holy red* i *Lime*. Oni su povezani na 18 jedinica distance. Treću grupu čine dva genotipa ocenjna kao srednje dekorativni: *Cinnamon* i *Blu spice*. Oni su povezani na 8 jedinica distance. Četvrtu grupu čine tri genotipa ocenjena kao malo dekorativni: *Fino verde*, *Holanđanin* i *Genovese*. Oni su povezani na 10 jedinica distance.

Na sledećem hijerarhijskom nivou spojeni su genotipovi ocenjeni kao srednje i malo dekorativni. Pre grupisanja svih genotipova u jednu klasu udruženi su genotipovi iz grupe označenih kao atraktivni i dekorativni. što je i logično, ali i potvrda validnosti primenjenog modela klasterizacije.

Ključne reči: bosiljak, genotipovi, dekorativna vrednost, klaster analiza

ASSESSMENT OF BASIL GENOTYPE DECORATIVE VALUE BY MEANS OF A CLUSTER ANALYSIS

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Decorative value of basil genotypes has been assessed based on morphological properties of a stalk, a leaf and a flower (plant height, plant width and the colour of a stalk, a leaf and a flower).

Familiarity of the analyzed basil genotipes, according to the assessed properties, has been determined through the model of the Hierarchical Cluster Analysis, established upon Euclidian distances and the Complete Binding Method.

Cluster analysis produces a decorative value dendogram which indicates that: the first group is made of three genotypes assessed as attractive ones: *Compact, Siam queen* and *Lattuga*. They are bound to 13 distance units. The second group is composed of five genotypes assessed as decorative ones: *Purple opal, Purple ruffles Osmin, Holy red* and *Lime*. They are bound to 18 distance units. The third group consists of two genotypes assessed as moderately deocorative ones: *Cinnamon* and *Blu spice*. They are bound to 8 distance units. Finally, the fourth group consists of three genotypes assessed as fairly decorative ones: *Fino verde*, *Hollander* and *Genovese*. They are bound to 10 distance units.

Genotypes bound together on the following hierarchical level have been assessed as moderately and fairly decorative ones. Prior to the grouping of all genotypes into a single class, genotypes falling within the group of attractive and decorative have been bound together, which is a logical thing to do, as well as the validity confirmation of the clustering model applied.

Key words: basil, genotypes, decorative value, cluser analysis

ODRŽIVI RAZVOJ GAJENJA BELOG SLEZA U CILJU OBEZBEĐENJA SIROVINE I OČUVANJA PRIRODNIH RESURSA

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Eksploatacija belog sleza dovela je do nestajanja njegovih prirodnih staništa, što ga svrstava u ugrožene vrste. Unapređenje tehnologije gajenja na principima održive poljoprivrede, trebalo bi da obezbedi stabilnu proizvodnju i zaštitu prirodnih resursa. Rezultati trogodišnjih istraživanja su ukazali da načini (seme, rasad) i rokovi (proleće, jesen) zasnivanja useva imaju uticaj na ostvarene prinose i ekonomičnost proizvodnje. Primena postupaka u doradi semena (peletiranje, primena Bacillus Q3) uticala je na poboljšanje njegove setvene vrednosti. Rasad proizveden u kontejnerima je dao viši postotak ukorenjenih biljaka u oba roka sadnje. Primenom direktne setve semena skratio se proces proizvodnje, a postignuta su i druga poboljšanja u gajenju i doradi. Ovo je uticalo na smanjenje troškova proizvodnje, što predstavlja značajan faktor u daljoj primeni ovakvog načina zasnivanja useva. Transfer definisanih postupaka u gajenju trebalo bi da obezbedi stabilniju proizvodnju i očuvanje prirodnih resursa.
Ključne reči: beli slez, ekonomičnost, održiva poljoprivreda, prirodni resursi, prinos, transfer postupaka

SUSTAINABLE DEVELOPMENT OF GROWING MARSHMALLOW IN ORDER TO PROVIDE RAW MATERIAL AND CONSERVATION OF NATURAL RESOURCES

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Exploitation of marshmallow led to the disappearance of its natural habitats, making it one of the endangered species. Improvement of growing technology based on the principles of sustainable agriculture should provide stable production and protection of natural resources. The results of three years of research have shown that methods (seeds, seedlings) and time (spring and autumn) of crop establishment impacted on yields and cost-effectiveness of production. Application of procedures in seed processing (pelleting, application of Bacillus Q3) resulted in the improvement of its planting value. Seedlings produced in containers gave higher percentage of rooted plants in both planting dates. Application of direct seed sowing shortens the production process, and achieves other improvements in growing and processing. This resulted in the reduction of production costs, which represents an important factor in further application of this crop establishing method. Transfer of defined procedures in the cultivation should ensure stable production and conservation of natural resources.
Keywords: marshmallow, cost-effectiveness, sustainable agriculture, natural resources, yield, transfer procedures

KALKULACIJA PROIZVODNJE PLODA I ETARSKOG ULJA ANISA PRI ĐUBRENJU ORGANSKIM I KONVENCIONALNIM ĐUBRIVIMA

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Anis je jednogodišnja biljka iz fam Apiaceae poreklom iz Egipta, Grčke, Krita i Male Azije, koja se gaji još od antičkog vremena. Tokom srednjeg veka, gajenje ove biljke je prošireno na Evropski kontinent, čak do Velike Britanije. Međutim, u severnijim delovima gde nema dovoljno sunčanih sati i sume efektivnih temperatura, ova biljka ne može da donese plod. U našoj zemlji, tokom 2011/12 godine, evidentirani su optimalni uslovi za rast i razvoj ove biljke (više od 1000 sunčanih sati i suma efektivnih temperatura preko 2000°C), što je rezultiralo prosečno visokim prinosom ploda (prosečno 1551 kg/ha) i sadržajem etarskog ulja (3,72%).

U ogledima izvedenim na tri lokacije u Vojvodini (Mošorin, Veliki Radinci i Ostojićevo) ispitivano je gajenje anisa pri primeni četiri vrste đubriva dozvoljenih pri proizvodnji u sistemu organske poljorivrede (Slavol, Bactofil B-10, Royal Ofert biohumusa i glistenjaka), ali i đubrivu koje se primenjuje u konvencionalnom sistemu proizvodnje (NPK đubrivo u formulaciji 15:15:15). Kao kontrolna varijanta korišćene su parcele bez primene đubriva.

Kalkulacijom proizvodnje anisa može se zaključiti da se najveći prihod od ploda anisa (*Anisi fructus*) pri komercijalnoj otkupnoj ceni od 270 din/kg ostvaruje pri primeni mineralno sintetičkog NPK đubriva, a od organskih pri primeni biofertilizatora Bactofil B-10 i Slavola. Međutim, ako imamo u vidu da organski proizvedene biljke postižu oko 20% veću cenu, primena biofertilizatora je u potpunosti isplativa za ovaj vid proizvodnje.

Kada je u pitanju etarsko ulje anisa (*Anisi aethroleum*) može se reći da se ono retko dobija destilacijom plodova anisa (*Pimpinella anisum*), već se uglavnom dobija semisintetskim putem, od zvezdastog anisa (*Illicum verum*), drveta poreklom iz Indokine čiji su plodovi takođe bogati anetolom. Kako organski proizvodi imaju sve veću tražnju, naročito u prehrambenoj industriji, organski proizvedeno etarsko ulje anisa bi moglo imati veliki potencijal za prihod, pri čemu kao najisplativija takođe figurira primena biofertilizatora.

Ključne reči: anisi fructus, anisi aethroleum, biofertilizatori, prinos, cena

CALCULATION OF COST PRICE FOR PRODUCTION OF ANISE FRUIT AND ANISE ESSENTIAL OIL BY APPLICATION OF FERTILIZERS USED IN ORGANIC AND CONVENTIONAL GROWING SYSTEMS

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Anise is an annual plant from family Apiaceae, originating from Egypt, Greece, Crete and Asia Minor, that has been cultivated since ancient times. During the Middle Ages its cultivation spread throughout Europe, all the way to Great Britain. However, in the northern parts of Europe, due to insufficient hours of sunshine and sum of effective temperature, this plant cannot bear fruit. In Serbia, the years 2011/12 recorded optimal conditions for growth and development of this plant (more than 1000 hours of sunshine and a sum of effective temperatures over 2000°C), which resulted in an average high fruit yield (average 1551 kg/ha) and contents of essential oil (3.72%).

The experiments conducted on three locations in Vojvodina Province (Mošorin, Veliki Radinci and Ostojićevo) tested the growth of anise with implementation of four types of fertilizers approved for organic production system (Slavol, Bactofil B-10, Royal Ofert biohumus and vermicompost), as well as the growth of anise with implementation of fertilizers used in conventional agriculture (NPK in formulation 15:15:15). Plots where no fertilizer was applied were used for control purposes.

Cost price calculations for cultivation of anise, with commercial price of 2.5 €/kg for anise fruit (*Anisi fructus*), show that the highest income from anise fruit (*Anisi fructus*) is achieved by implementation of either a synthetic NPK fertilizer, or biofertilizers Bactofil B-10 and Slavol. However, having in mind that organically produced plants achieve around 20% higher price, the application of bio fertilizers is fully cost-effective for this type of production.

As for the anise essential oil (*Anisi aethroleum*), it is rarely obtained by distillation of anise fruits (*Pimpinella anisum*), but through a semisynthetic procedure using star anise (*Illicum verum*), wood originating from Indochina whose fruits are also rich in anethole. Since the demand for organic products is increasing, especially in the food industry, essential oil from an organically produced anise could have great income potential, in which case the application of bio fertilizers is the most profitable form of production.

Key words: anisi fructus, anisi aethroleum, bio fertilizer, yield, price

UTICAJ SKLADIŠTENJA NA NUTRITIVNA SVOJSTVA SEMENA OVSA (*Avena sativa*)

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Ispitivan je efekat skladištenja na nutritivna svojstva semena tri sorte ovsa (Dunav, Vrbas i NS Tara) koje su selekcionisane u Srbiji. Sveže požnjeveno zrno ovsa je uskladišteno na 25±2 °C za 12 i 24 meseci. Sadržaj vlage zrna ovsa opao je za 30.9% nakon 12 meseci odnosno za 41.35 % nakon 24 meseca skladištenja. Sadržaj ukupnog pepela povećao se za 8.89 % nakon 12 meseci odnosno za 14.41 % nakon 24 meseca skladištenja. Sadržaj ukupnih proteina smanjen je za 3.64 i 12.35 % na 12 i 24 meseca respektivno, dok je pad lipida bio 3.57 % na 12 odnosno 6.6 % na 24 meseca skladištenja. Sadržaj sirove celuloze je opao za 2.61 % na 12 odnosno 10.13 % na 24 meseca. Sadržaj skroba u odnosu na sveže sakupljeno zrno ovsa je opao i to za 1.96% na 12 odnosno 4.37% na 24 meseca. Nutritivna svojstva zrna ovsa su se menjala tokom skladištenja na testiranim uslovima, ali su zadržali adekvatan nivo.Svarljivost organske materije zrna ovsa se blago menjala, ali se zadržala na nivou iznad 70%.

Ključne reči: ovas, skladištenje, nutritivne promene, svarljivost

EFFECT OF STORAGE ON NUTRITIONAL PROPERTIES OF OATGRAINS (*Avena sativa*)

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Three oat cultivars (Dunav, Vrbas and NS Tara) selected in Serbia were studied to investigate the effect of storage on nutritional properties of oat grains. Freshly harvested grains were stored at 25±2 °C for 12 and 24 months. Moisture content in grains decreased by 30.9% after 12 months, that is, by 41.35% after 24 months of storage. Total ash content increased by 8.89% after 12 months and 14.41% after 24 months, respectively. Total protein content decreased by 3.64% and 12.35% after 12 and 24 months respectively, while lipid content decreased by 3.57% after 12 and 6.6% after 24 months of storage. Crude cellulose decreased by 2.61% after 12 and 10.13% after 24 months. Compared to freshly harvested oats, the starch content decreased by 1.96% and 4.37% after 12 and 24 months, respectively. Nutritional properties were changing during storage, but remained at a certain level.Organic matter digestibility of oats was slightly changing, yet remained above 70%. However, no significant nutritional changes occurred during 12-month storage of oat grains.

Keywords: grains oat, storage effect, nutritional changes, digestibility

POSTER SEKCIJA
POSTER SECTION

BIOLOŠKA AKTIVNOST AUKSINA IZOLOVANOG IZ VRSTE *Bacillus subtilis* I NJEGOV POZITIVAN UTICAJ NA RAST SEMENA PŠENICE (*Triticum aestivum* L.)

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Cilj ovog rada je bio da se testira biološka aktivnost izolovanog bakterijskog hormona auksina. *Bacillus subtilis* je testiran na prisustvo ovog hormona. Testirana vrsta je rasla u hranjivoj podlozi na 28 ± 2^0C /48 h. Optička gustina je prilagođena vrednostima od 0, 5 (10^{-6} – 10^{-7} CFU). Kvalitativno auksin je određen korišćenjem Salkowski reagensa (0.5 M $FeCl_3$ + 35% $HClO_4$). 1 ml supernatanta je kombinovan sa 2 ml Salkowski reagensa i inkubiran 30 min. na sobnoj temperaturi. Prisustvo crvene boje je bio indikator postojanja auksina. Avena test ravnog rasta po metodi Nitsch i Nitsch je korišćen za potvrdu biološke aktivnosti izolovanog hormona. Seme ovsa (*Avena sativa* L.) 5 mm dužine (starosti 3 dana) su korišćeni u ovom testu. Nakon 24 h rasta koleoptila u mraku na Rocker šejkeru (20 rpm) porast je zabeležen u mm. Standardna kriva sintetičke IAA (od 0, 01 do 25μg/ml) je napravljena kao kontrola. Koncentracija auksina je izračunata preko standardne krive kontrole. Za *B. subtilis* vrednost je iznosila 4, 36 (μg/ ml).

Sertifikovana semena pšenice (*Triticum aestivum* L.) su dezinfekovana u 2 % NaClO i potom inokulisana sa bakterijskom suspenzijom prilagođene optičke gustine (10^{-6} CFU). Semena su klijala 8 dana na 20°C. Test klijanja je izveden u četiri ponavljanja od 100 semena, metodom Između papira, po procedure koju preporučuje ISTA. Seme tretirano sterilnom vodom, kao i semena tretirana komercijalnim fungicidom Mankogalom S služili su kao kontrola.Svi dobijeni podaci su tumačeni ANOVA testom u SPSS 14 programu. Semena pšenice inokulisana *B. subtilis* imali su statistički značajniji porast stabla i korena kao i procenat klijavosti u odnosu na obe kontrole. Dobijeni rezultati su pokazali da inokulacija semena auksinom iz *Bacillus subtilis* vrste dovode do porasta stabla i korena kao što pospešuju i klijavost. Ovi podaci bi eventualno mogli biti iskorišteni u budućoj poljoprivrednoj proizvodnji.

***Ključne reči*:** *Bacillus subtilis*; Auksin; Avena test; seme pšenice

BIOLOGICAL ACTIVITY OF ISOLATED HORMONE AUXIN FROM *Bacillus subtilis* AND ITS GROWTH PROMOTION OF WHEAT SEEDS (*Triticum aestivum* L.)

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Aim of this work was to investigate biological activity of isolated bacterial hormone auxin. *Bacillus subtilis* was tested on presence of hormon auxin. Test organism was grown in nutrient broth at 28 ± 2^0C /48 h. OD was adjusted to 0, 5 (10^-6 – 10^-7 CFU). Qualitatively auxin was determined using Salkowski reagent (0.5 M $FeCl_3$ and 35% $HClO_4$) (1). 1 ml of supernatant was combined with 2 ml of Salkowski reagent and incubated 30 min. at room temperature. Presence of red color was indicator of auxin. Avena coleoptile straight growth test, developed by Nitsch and Nitsch (2) was used as bioassay to determine biological activity of isolated hormone. Oat coleoptiles (*Avena sativa* L.) 5 mm length (3 days old) were used in this test (3). After 24 h growth in the dark on the Rocker shaker (20 rpm) was recorded (in mm). Standard curve of synthetic IAA (from 0, 01 to 25µg/ml) was developed as a control. Concentration of auxin was calculated by interpolation on the curve of control. For *B. subtilis* it was 4, 36 (µg/ ml).

Certified wheat seeds (*Triticum aestivum* L.) were disinfected with 2 % NaClO and then inoculated with bacterial suspension adjusted to the optical density (10^-6 CFU). Seeds were germinated 8 days at 20°C. Germination test was conducted in four replications of 100 seeds each by adopting between paper method as described by ISTA procedures. Water treated seeds and seeds treated with commercial fungicide Mankogal S were used as control.

The data were subjected to analysis of variance using software SPSS 14 program. Mean values showed higher increase in shoot height and root length as well as germination percentage in wheat seeds inoculated with *B. subtilis* over controls.

These results showed that seed inoculation with auxin from *Bacillus subtilis* triggered the change in shoot height and root length, what can be used in future agricultural practices.
Key words: *Bacillus subtilis*; Auxin; Avena test; wheat seeds

UTICAJ KLIMATSKIH FAKTORA NA SADRŽAJ BETA KAROTENAKOD DURUM PŠENICE

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Žuta boja endosperma zrna durum pšenice jedan od glavnih faktora koji utiču na kvalitet proizvoda od durum pšenice, a uslovljena je koncentracijom žutog pigmenta i među njima naročito beta karotenom. Beta karoten je antioksidans, deluje kao konzervans i prekursor je vitamina A. Istraživanje je bilo sprovedeno u toku 2010-2011 i 2011-2012 godine na tri lokaliteta: Rimski Šančevi, Zemun Polje i Padinska Skela. Ispitivani sortiment je sačinjavalo 15 genotipova durum pšenice (*Triticum durum* Desf.). Eksperiment je bio postavljen po potpuno slučajnom blok sistemu u 4 ponavljanja. Sadržaj beta karotena u brašnu celog zrna ispitivanih genotipova je određena referentnom metodom AACC (1995) 14–50 (American Association of Cereal Chemistry, USA). Primenjen je model višestruke faktorijalne stepwise regresije (Denis, 1988; van Eeuwijk et al, 1996), koji je interakciju genotip × sredina za sadržaj beta karotena objasnio diferencijalnom osetljivošću genotipova prema klimatskim varijablama, i hipoteze su bile statistički testirane. Klimatske varijable su merene na lokalitetima-prosečna mesečna maksimalna temperatura (mxt);prosečna mesečna minimalna temperatura (mnt);prosečna mesečna srednja temperatura (mt); suma padavina za mesec (pr);prosečna mesečna relativna vlažnost vazduha (rh);suma trajanja insolacije za mesec (sh); zimske rezerve vlage (zrv) (suma dnevnih padavina za period novembar-februar); prosečne srednje dnevne temperature za period novembar-februar (Tsr4). Dobijen je model koji su činile mt u maju (35,1); mt u aprilu (25,6); zrv (17,6); mt u martu (16,9) i koji je objasnio ukupno 95,3% sume kvadrata interakcije. Kada su analizirane varijable po tipu i po mesecima vegetacionog perioda najveći procenat objašnjenosti interakcije je postignut modelom prosečnih mesečnih minimalnih temperature (85,9%) i modelom dejstva klimatskih varijabli u martu (95,3%).

Ključne reči: durum pšenica, beta karoten, faktorijalna regresija, klimatske varijable

IMPACT OF CLIMATE FACTORS TO THE BETA CAROTENE CONTENT IN DURUM WHEAT

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The yellow endosperm in durum wheat's is one of the main factors affecting durum wheat product quality and is caused by the concentration of yellow pigment and most notably beta carotene. Beta carotene is an antioxidant, acts as a preservative and is a precursor of vitamin A. The research was conducted during 2010-2011 and 2011-2012 years at three sites: Rimski Sancevi, Zemun Polje and Padinska Skela. The tested accessions consisted of 15 genotypes of durum wheat (*Triticum durum* Desf.). The experiment was set up in a randomized complete block design with four replications. The content of beta-carotene in grain flour of investigated genotypes was determined by the reference method AACC (1995) 14-50 (American Association of Cereal Chemistry, USA). The multiple factorial regression models following stepwise procedure (Denis, 1988; van Eeuwijk et al, 1996) were applied. Model explained genotype x environment interaction for beta carotene content by differential sensitivity of genotypes to climate variables, and hypotheses were tested statistically. Climatic variables were measured at all locations-average monthly maximum temperature (mxt), average monthly minimum temperature (mnt), average monthly mean temperature (mt), total precipitation for the month (pr), average monthly relative humidity (rh), sum of the duration of sunshine for the month (sh); winter moisture reserves (zrv) (sum of daily rainfall for November-February), average daily mean temperature for November-February (Tsr4). The obtained model consisted of mt in May (35.1), mt in April (25.6), zrv (17.6), mt in March (16.9) and explained 95.3% of the interaction sum of squares. When variables were analyzed by type and by month of the growing season, the highest percentage of the explanations of the interaction was achieved by the model of average monthly minimum temperature (85.9%) and by model of climate variables effects in March (95.3%).

Key words: durum wheat, beta carotene, factorial regression, climate variables

DEFINISANJE ANALITIČKIH METODA I PARAMETARA ZA ODREĐIVANJE KVALITETA KORENA BELOG SLEZA (*Althaea officinalis* L.*)*

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Identifikacija biljnih droga vršena je uglavnom na osnovu podataka iz famakopejskih monografija te je stoga bilo neophodno utvrditi analitičke metode ispitivanja sastava lekovitog bilja. Neke od postojećih metoda definisane su u opštem delu farmakopeje pri čemu u slučaju belog sleza metode ispitivanja su ograničene na utvrđivanje sadržaja stranih primesa, broja bubrenja, gubitka sušenjem i ukupnog pepela.

Međutim, imajući u vidu da hemijska karakterizacija doprinosi standardizaciji parametara kvaliteta biljnih sastojaka i omogućava definisanje tačnih (potrebnih) doza sastojaka neophodnih za postizanje poboljšanja u smislu optimalnog fiziološkog efekta, posebna pažnja je posvećena definisanju analitičkih metoda neophodnih za dalju karakterizaciju belog sleza. Takođe budući da je za sve primenjene analitičke metode je zajedničko da u okviru definisanja predmeta i područja njihove primene nije predviđena primenljivost na matriksu lekovitog bilja, neophodno je bilo potvrditi njihovu primenljivost i ovoj oblasti tj. na belom slezu kao matrixu.

Ključne reči: Beli slez (*Althaea officinalis L.),* analitičke metode

DEFINITION OF ANALYTICAL METHODS AND PARAMETERS FOR PURPOSES OF DETERMINING MARSHMALLOW ROOT QUALITY (*Althaea officinalis* L.*)*

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Identification of herbal (drugs) substances was performed mostly on reading data from pharmacopoeia monographs thus it was important to establish analytical methods for testing medicinal plants content.

Some of the existing methods are defined in the general part of the pharmacopoeia whereby in a case of marshmallow, examination methods are limited only on determining other substances, swelling number, reduction after drying and total amount of ash.

However, taking into account that chemical characterization contributes to standardization of medicinal plant quality parameters and allows definition of correct (required) dozes of ingredients essential in attaining improvements in terms of optimal physiological effects, special attention was paid to the definition of analytical methods essential for further marshmallow characterization. Furthermore, since all the applied analytical methods have in common the fact that in the definition of the scope of their application, applicability on the medicinal plants matrix was not taken into consideration, it was also important to verify their applicability in this area, that is on marshmallow as the matrix.

Key words: Marshmallow (*Althaea officinalis L.), analytical methods*

RAZVOJ PERIKARPA PARADAJZA U RAZLIČITIM TRETMANIMA NAVODNJAVANJA

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Kod paradajza, kao i kod ostalih gajenih vrsta, veličina ploda je ključna osobina koja određuje prinos. Mnoge gajene vrste biljaka u uslovima optimalne količine vode u zemljištu obično obrazuju veće plodove, uglavnom zahvaljujući intenzivnijem rastu ćelija nego povećanju broja ćelija. Cilj ovog istraživanja je bila anatomska analiza perikarpa ploda paradajza gajenog u uslovima različitog sadržaja vode u zemljištu.

Divlji tip paradajza, Ailsa Craig, gajen je u kontrolisanim uslovima u sledećim tretmanima zalivanja: FI (optimalno zalivanje), PRD (delimično sušenje zone korenovog sistema) and DI (regulisani deficit zalivanja). Debljina i broj slojeva ćelija u perikarpu, egzokarpu i mezokarpu ploda su mereni od faze 3 dana nakon cvetanja (daa) do faze zrelog ploda. Preparati za svetlosnu mikroskopiju su pripremljeni po standardnoj parafinskoj proceduri i preseci perikarpa ploda su posmatrani Leica DMLS mikroskopom.Fotografije su snimljene digitalnom kamerom Leica DC300, a merenja su vršena pomoću softvera Leica IM 1000.

Perikarp se razvija od zida plodnika nakon oplođenja i predstavlja najzastupljenije tkivo u plodu paradajza. 3 daa debljina perikarpa je bila slična u svim tretmanima navodnjavanja. Debljina perikarpa od 10 do 39 daa (tj. od kraja faze deobe ćelija do sredine faze rasta ćelija) linearno raste, a statističke značajnosti između tretmana zabeležene su malo pre i tokom perioda zrenja. Od 39 daa do faze zrenja debljina perikarpa ploda se ne menja značajno. Od 3 do 12 daa debljina perikarpa raste oko 12 puta u FI, što je više u poređenju sa PRD i DI tretmanom gde to povećanje iznosi 9 odnosno 10 puta. Debljina perikarpa je značajno veća kod biljaka gajenih u uslovima optimalnog navodnjavanja nego u oba tretmana redukovanog zalivanja.

Ključne reči: anatomija ploda, vodni deficit

DEVELOPMENT OF TOMATO PERICARP IN DIFFERENT IRRIGATION PRACTICES

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In tomato, as well as in other crops, size of the fruit is the key factor determining yield. It is well known, for horticultural crops, that increasing water availability in soil increases the final fruit size with greater impact on cell expansion rather than cell division phase. The aim of this study was analyzing response of tomato pericarp anatomy to different soil water content.

Tomato wild type Ailsa Craig was grown in chamber conditions in following irrigation treatments: FI (optimal irrigation), PRD (partial root zone drying) and DI (regulated deficit irrigation). Thickness and number of cell layers in fruit pericarp, exocarp and mesocarp were measured from 3 daa to ripe fruit phase. Slides for light microscopy were made according to standard paraffin procedure and pericarp sections were observed with a Leica DMLS microscope. Images were acquired by a Leica DC300 digital camera and measurements were performed by Leica IM 1000 software.

Pericarp develops from the carpel wall after fertilization and is the most abundant tissue in tomato fruit. 3 days after anthesis (daa) pericarp thickness was similar in all treatments. Pericarp thickness from 10 daa to 39 daa (from the end of cell division phase to the middle of cell expansion period) linearly increase and significant differences between the treatments at the period just before and during the ripening. From 39 daa to ripe phase pericarp thickness stay constant. From 3 to 12 daa pericarp thickness increase about 12 folds in FI comparing to PRD and DI (9 and 10 fold, respectively). In summary, increase in pericarp thickness was higher in optimal irrigation treatments than in both water deficit treatments.

Key words: fruit anatomy, water deficit

VARIJABILNOSTI MORFOLOŠKIH OSOBINA MISKANTUSA *(Miscanthus giganteus)* U ZAVISNOSTI OD PRIMENJENE GUSTINE SADNJE

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Intenzivan tehnološki razvoj počiva, između ostolog, i na stalnom podmirivanju rastućih potreba u hrani i energentima. Iscrpljivanje izvora fosilnih goriva, kao i rast njihovih cena, uzrokovali su sprovođenje niza istraživanja, koja imaju za cilj iznalaženje alternativnih energetskih izvora. Jedna od njih je miskantus višegodišnja biljka, predstavnik porodice trava (*Poaceae*), poreklom iz Kine. Tokom vegetacione sezone daje veliki prinos nadzemne biomase podesne za proizvodnju toplotne energije.

Predmet ove studije su dvogodišnja istraživanja (2010 i 2011) varijabilnosti morfoloških osobina miskantusa: visina biljaka, broj stabala, broj obrazovanih listova po stablu, dužina lista i širina lista u zavisnosti od primenjene gustine sadnje 2 i 3 rizoma po m^2. Rezultati su pokazali da je gustina sadnje rizoma ispoljila jak efekat na ispitivane osobine, posebno na broj obrazovanih listova po stablu,(7 listova kod sadnje 2 rizoma i 10 listova kod sadnje 3 rizoma)

Variranja u broju stabala po rizomu bila su evidentna u godini sadnje u odnosu na drugu godinu za oko 20% u obe ispitivane godine. Veća gustina sadnje rizoma imale jak efekat na povećanje broja izdanaka u narednoj godini za oko 20%. Klimatski faktori imali su odlučujuću ulogu u prezimljavanju rizoma Uz primenu adekvatnih agrotehničkih mera pogotovo u prvoj godini biljke miskantusa su u stanje da produkuju u narednim godinama značajnu nadzemnu biomasu i podzemnu rizome koji se kasnije mogu koristiti za reprodukciju ove biljne vrste koja je podesne za proizvodnju toplotne energije i zato se s pravom naziva "bioenergetski usev".

Key words: bioenergetski usev, miskantus, morfološke osobine, rizomi

VARIABILITY OF MORPHOLOGICAL PROPERTIES OF MISCANTHUS *(Miscanthus giganteus)*, DEPENDING ON PLANT DENSITY

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Intensive technological development lies, among other things, in meeting constantly growing needs for food and fuel. Depletion of fossil fuels and a rise in their price have led to a series of studies on finding alternative energy sources. One of these sources is the miscanthus, a perennial plant in the grass family *Poaceae*, originated from China. During vegetation, it gives a high yield of the above-ground biomass, suitable for heat production.

The subject-matter of this study is a two-year research (in 2010 and 2011) on variability of the following morphological properties of miscanthus: plant height, number of plants, number of leaves formed per plant, leaf length and leaf width, depending on plant density – two and three rhizomes per m^2. The results showed that the plant density of rhizomes expressed strong impact on the tested properties, especially on the number of leaves formed per plant (seven leaves in the density of two rhizomes per m^2 and ten leaves in in the density of three rhizomes per m^2).

Compared to the second year, a variation in the number of plants per rhizomes in the year of planting was significant, and accounted for 20%. The higher plant density had a strong effect on increasing the number of sprouts, about 20% in the second year. Climatic conditions played a major role in the overwintering of the rhizomes. After conducting adequate cropping practices, especially in the first year, the miscanthus can produce considerable amounts of above-ground biomass and underground rhizomes. Those can be later used for reproduction of this plant species, suitable for heat production and therefore rightfully called a "bioenergy" crop.

Key words: bioenergy crop, miscanthus, morphological properties, rhizomes

PRINOS I KVALITET ZRNA KUKURUZA U ZAVISNOSTI OD TIPA ZEMLJIŠTA, KOLIČINE AZOTA I HIBRIDA

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U trogodišnjem periodu (2005-2007. godine) vršeno je istraživanje uticaja tipa zemljišta, količine azota i hibrida različite dužine vegetacionog perioda na prinos zrna, sadržaj ugljenih hidrata i ukupnih proteina u zrnu kukuruza. Ispitivanja su obavljena putem poljskih mikroogleda u agroekolškim uslovima istočnog Srema i centralne Šumadije. Ogledi su izvedeni na zemljištu tipa černozem i gajnjača, metodom razdeljenih parcela (split plot) u četiri ponavljanja.

Dobijeni rezultati istraživanja pokazuju da su, u godinama istraživanja, između ispitivanih tipova zemljišta, količina azota i hibrida ostvarene statistički vrlo značajne razlike u prinosu i kvalitetu zrna.

Ključne reči: hibrida, količina azota, kukuruz, kvalitet zrna, tip zemljišta, prinos zrna

YIELD AND QUALITY OF MAIZE GRAIN DEPENDING ON SOIL TYPE, AMOUNT OF NITROGEN AND HYBRIDS

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The research on the effect of soil type, amount of nitrogen and hybrids of different length of growing season on grain yield, carbohydrate content and total proteins in maize grain was conducted during the three-year period (2005-2007).
The tests were carried out using field micro-tests in agro-ecological conditions of eastern Srem and central Šumadija. The tests were conducted on the soil types of chernozem and eutric cambisol, applying a split-plot design with four replications.

The obtained results show statistically very significant differences in yield and quality of maize grain among examined soil types, amount of nitrogen and hybrids during the studied period.

Key words: hybrid, amount of nitrogen, maize, grain quality, soil type, grain yield.

MORFOLOŠKE KARAKTERISTIKE POLENOVIH ZRNA JORGOVANA (*Syringa vulgaris*L., oleaceae)

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Syringa vulgaris L. (jorgovan) je listopadni žbun ili nisko drvo, visine od 2 do 7 metara. Jorgovan potiče sa područja *Balkanskog poluostrva, a u* Srbiji je rasprostranjen u brdskim i planinskim predelima do 1400 metara nadmorske visine, pretežno na krečnjaku. Kao ukrasna biljka gaji se po dvorištima, vrtovima i parkovima.*Cveta* sredinom proleća (april-maj), a ljubičasti ili beli cvetovi prijatnog mirisa su sakupljeni u krupne terminalne metličaste cvasti. Zahvaljujući polenskoj i u manjoj meri nektarskoj produkciji, cvetovi jorgovana su privlačni za insekte oprašivače uključujući i medonosnu pčelu.

Polenova zrna jorgovana su analizirana uz pomoć svetlosnog i skenirajućeg elektronskog mikroskopa, u cilju doprinosa palinomorfološkim proučavanjima apiflore Srbije. Istraživanje je obuhvatilo opisivanje i merenje osnovnih morfoloških karakteristika kao što su: veličina, oblik, ornamentacija, aperturacija, polarnost, simetrija, dužina polarne i ekvatorijalne ose, dužina kolpi, oblik i veličina lumina i debljina egzine.

Polenova zrna su srednje veličine, izopolarna i radijalno simetrična. U pogledu aperturacije su trikolporatna, sa 3 uzane meridionalno raspoređene ektokolpe (prosečne dužine 27,8 ± 1,5 μm) i 3 slabo uočljive endopore. Dužina polarne ose (P) iznosi 36,1 ± 2,3 μm, dok je dužina ekvatorijalne ose (E) 23,0 ± 1,0 μm. Odnos ove dve ose (P/E) je 1,6± 0,1, što ukazuje na prolatni oblik. Polarno posmatrano, polenova zrna su trorežnjevita, a ekvatorijalno posmatrano su eliptična sa zaravnjenim polovima. Ormanentacija egzine je retikulatna. Okca retikuluma (lumine) su poligonalna do okrugla sa jasno izraženim pregradnim zidovima (muri). Prosečan prečnik lumine je 2,2 ± 0,5 μm, a debljina muri prosečno iznosi 0,43 ± 0,07 μm. Debljina egzine iznosi 1,2 ± 0,2 μm.

Ključne reči: polen, LM, SEM

MORPHOLOGICALCHARACTERISTICS OF *Syringa vulgaris*L.(Oleaceae) POLLEN GRAINS

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Syringa vulgaris L. (lilac) is a deciduous shrub or small tree, growing from 2 to 7 metres high. It is a native to the Balkan Peninsula, growing in Serbia on rocky hills of limestone up to 1400 m altitude, and is also cultivated in parks andgardens. Pleasantly scented purple or white flowers, arranged in large terminal panicles, bloom in mid spring (April-May). Lilac flowers, producing pollen and to a lesserextent nectar, are attractive to insect pollinators, including honeybees.

The pollen grains of S. *vulgaris* were examined by both, light microscopy (LM) and scanning electron microscopy (SEM), in order to contribute to palynomorphological studies of Serbian apiflora. The following features describing pollen grains were examined: size, shape, ornamentation, apertures, polarity, symmetry, length of polar (P) and equatorial axis (E), length of colpi, *lumina* shape and size and exine thickness.

The pollen grains are medium sized, isopolar and radially symmetrical. Grains are tricolporate with 3 narrow ectocolpi arranged meridionally (mean length 27.8 ± 1.5 μm) and 3 endopores thatarepoorlyvisible. The *length* of the polar axis (P) is 36.1 ± 2.3 μm, and the equatorial diameter (E) is 23.0 ± 1.0 μm. The ratio of the length of the polar axis to the equatorial diameter is 1.6 ± 0.1 indicating prolate shape. In polar view, grains are triangular and in equatorial view are elliptic with obtuse apices. Exine ornamentation is reticulate. The lumina may be polygonal to rounded and muri are prominently defined. Lumina size averaged 2.2 ± 0.5 μm and muri width averaged 0.43 ± 0.07 μm. The exine thickness averaged 1.2 ± 0.2 μm.

Keywords: pollen, LM, SEM

NOVI KLONOVI BELOG SLEZA(*Althaea officinalis* L.)

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Cilj selekcije bio je stvaranje poboljšanog i homogenog genotipa, koji će doprineti stabilnosti i povećanju proizvodnje i očuvanju prirodnih resursa. Selekcioni materijal korišćen kao izvor varijabilnosti predstavljala je kolekcija (*ex situ)* germplazme belog sleza, sakupljena tokom inventarizacije njegovih staništa. Primenom metoda direktne selekcije (uz vegetativno razmnožavanje), stvoreno je 28 perspektivnih klonova. Kod odabranog potomstva i standarda („vojvođanski“) praćene su vrednosti sledećih svojstava: visina biljaka (cm), prinos naturalnog korena po biljci (g) i broj bubrenja. U trogodišnjim ispitivanjima, klonovi označeni brojevima 20, 25 i 26 su ostvarili pouzdano više prinose korena za 20-27% u odnosu na standard. Vrednosti za broj bubrenja bile su različite. Kako je zakonodavac isključio lekovito bilje iz postupka priznavanja sorti, MPNTR Republike Srbije je priznalo novostvorene klonske sorte, kao tehničko rešenje.

Ključne reči: beli slez, klonovi, prinos

NEW CLONES OF MARSHMALLOW (*Althaea officinalis* L.)

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Breeding goal was to create an improved and homogenous genotype, which will contribute to the stability and increased production, as well as conservation of natural resources. As a source of variability we used selection material which consisted of the collection (*ex situ*) of marshmallow germplasm, that has been collected during the inventory of its habitat. Using the method of direct selection (by vegetative propagation), we created 28 promising clones. Following traits were observed at the selected offspring and standard ("vojvođanski"): plant height (cm), yield of natural roots per plant (g) and number of swelling. During the three-year examinations, clones marked with numbers 20, 25 and 26 have achieved reliably higher root yields of 20-27% compared to the standard. The values for number of swelling were different. Since legislators excluded medicinal plants from the process for registration of varieties, Ministry of Education, Science and Technology Development of the Republic of Serbia has recognized the newly created clone variety, as a technical solution.
Keywords: marshmallow, clones, yield

UTICAJ LOKACIJA NA VARIRANJE SADRŽAJA RUTINA U LISTOVIMA HELJDE (*Fagopyrum esculentum*, Moench.)

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Tokom 2009. i 2010. godine postavljeni su ogledi na četiri lokacije u Srbiji: Valjevo, Kučevo, Nova Pazova i Surduk. Postavljena je radna hipoteza, da uslovi gajenja ne utiču na sadržaj rutina u lišću heljde.Sadržaj rutina u lišću heljde određivan jeHPLC/DAD tehnikom, primenom metoda eksternog standarda (ESD). Od osnovnih biometrijskih parametara računati su: srednja vrednost, varijansa i koeficijent varijacije. Rezultati su obrađeni primenom analize varijanse za faktorijalni ogled. Analiza varijanse je pokazala postojanje značajnih razlika za sadržaj rutina između lokacija, ali samo u prvoj godini ispitivanja. Prosečan sadržaj rutina u prvoj godini iznosio je 3,3%, a drugoj 2,61%, što u proseku iznosi: 2,82%. Varijaciona širina za sadržaj rutina bila je izraženija u drugoj godini ispitivanja (1,26-2,06).Prema pokazateljima varijabilnosti, varijansi i koeficijentima varijacije, variranje sadržaja rutina u prvoj godini je bilo niže (5,3-29%) u odnosu na drugu godinu (16,2-28,6%), gde su ove vrednosti bile više. Relativno manje rutina, bilo je u listovima heljde sa lokacija u ravničarskom području.
Ključne reči: heljda, lišće, lokacija, sadržaj rutina, variranje

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EFFECT OF LOCATION OF VARIABILITY OF THE RUTIN CONTENT IN LEAVES OF BUCKWHEAT (*Fagopyrum esculentum* Moench.)

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The experiments were conducted in four locations in Serbia: Valjevo, Kučevo, Nova Pazova and Surduk in 2009 and 2010. A working hypothesis that growing conditions would not affect to the rutin content in buckwheat leaves was set was. The content of rutin in leaves of buckwheat was determined by the HPLC/DAD technique, using the external standard method (ESD). Out of the basic biometric parameters, average value, variance, and the variation coefficient were estimated. Results were processed by the analysis of variance for the factorial experiment. The analysis of variance showed the existence of significant differences in the rutin content, over locations, but in the first year of testing only. The average content of rutin in the first, i.e. second year was 3.30%, i.e. 2.61%, respectively, and in both year of testing it amounted on the average to 2.82%. The variation in the rutin content was larger in the second year of testing. On the other hand, this variation was lower in the first year (5.3-29.0%) in comparison to the second year (16.2-28.6%). Relatively lower rutin contents were recorded in samples collected at lower-altitude locations.

Key words: buckwheat, leaves, location, rutin content, variability

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UTICAJ KUKURUZNOG GLUTENA NA BROJNOST KOROVA U KUKURUZU I SOJI

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Radi utvrđivanja mogućnosti primene kukuruznog glutena u održivoj proizvodnji kukuruza i soje postavljen je ogled u polukontrolisanim uslovima. Za izvođenje ogleda Mitscherlichovi sudovi su punjeni zemljištem predhodno korišćenim u gajenju kukuruza i soje. Ogled je postavljen u tri ponavljanja, a ispitivan je uticaj: biljne vrste - kukuruz i soja (Faktor A); doze primene kukuruznog glutena 0g, 10g, 20g i 30g po sudu (Faktor B) i vreme primene glutena - tokom setve i vegetacije (Faktor C). Setva je izvršena 20.maja, a tretiranje u vegetaciji kod kukuruza u fazi 3-5 listova, kod soje u fazi prve troliske. Najmanji prosečan broj korova je utvrđen primenom 30 g glutena po sudu posle setve i to 1,3 korovske individue po sudu kod kukuruza i 1 korovska individua po sudu kod soje. Suva masa korova u ogledu sa kukuruzom i sojom bila je najmanja na varijanti sa dodavanjem 20 g glutena tokom setve i iznosila je u proseku 0,15 g/sudukod kukuruza, odnosno prosečno 1,73 g/sudukod soje. Na osnovu dobijenih rezultata utvrđeno je pozitivno dejstvo kukuruznog glutena koji se primenjuje tokom setve u kontroli korova kod kukuruza.Primena kukuruznog glutena kod soje izazvala je u određenoj meri redukciju sklopa biljaka. U ogledu sa kukuruzom konstatovano je 13, dok u varijanti ogleda sa sojom je bilo 15 različitih korovskih vrsta. Travni korovi su pokazali indiferentnost na primenu kukuruznog glutena. Pored hebicidnog dejstva utvrđeno je da kukuruzni gluten ima značajan uticaj i na porast biljaka, jer sadrži azot pristupačan biljkama. Razradom tehnologije njegove primene i komercijalizacijom, kukuruzni gluten bi mogao postati značajan preparat u kontroli korova kod održivih sistema poljoprivrede.

Ključne reči: kukuruz, soja, kukuruzni gluten, suzbijanje korova, održiva poljoprivreda

THE EFFECTS OF MAIZE GLUTEN IN WEED CONTROL IN MAZE AND SOYBEAN PRODUCTION

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In order to determine the possibility of maize gluten application in the sustainable production of maize and soybean an experiment in semi-controlled conditions was conducted. For the experiment Mitscherlich pots were filled with soil previously used in growing maize and soybean. The experiment was performed in three replications and included 3 factors: the effect of plant species - maize and soybean (Factor A), doses of maize gluten 0g, 10g, 20g and 30g per pot (Factor B) and application time – at sowing and in vegetation (factor C). Sowing was done on 20 May and gluten application was conducted in 3-5 leaf stage of maize, and first trifoliate leaf of soybean. The lowest average weed number was determined with 30 g gluten per pot applied in sowing with average of 1.3 weeds per pot in maize and 1 weed per pot in soybean experiment. Dry weight of weeds in a trial with maize and soybean was the lowest with 20 g of gluten added in sowing, accounted for 0.15 g per pot in maize and 1.73 g per pot in soybean. On the basis of the obtained results a positive effect of maize gluten in weed control was determined with first application (sowing). Addition of maize gluten in soybeans caused a reduction in plant density. In the experiment with maize, a total of 13 different weeds were counted, while in experiments with soybean 15 different weed species were found. The grass weeds showed higher resistance to the application of maize gluten. In addition to herbicide effects, maize gluten has a significant effect on plant growth after the release of nitrogen. By analyzing its utilization and performance and further commercialization, maize gluten can become an important product for weed control in sustainable managed agricultural system.

Key words: maize, soybean, maize gluten, weed control, sustainable agriculture

ZNAČAJ PLANTAŽNE PROIZVODNJE SIROVINA U SEKTORU LEKOVITOG I AROMATIČNOG BILJA U SRBIJI

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Proizvodnja lekovitih biljnih sirovina uLAB sektoru za potrebe farmacije, kozmetike, hemijsku i prehrambenu industriju, odvija se kroz sakupljanje iz prirode i plantažnu proizvodnju (kultivaciju) lekovitog bilja.Osvajanjem tehnologije gajenja i semenske proizvodnje sve većeg broja vrsta, uključujući i samonikle, plantažna proizvodnja postaje sve važnija u proizvodnji lekovitih biljnih sirovina. Kultivacijom se postiže ujednačen kvalitet sirovine, sigurno snabdevanje tržišta i veće količine. Pored objektivnih ograničavajućih okolnosti kao što su: nedovoljno poznavanje agrobioloških osobina semena i uslova razmnožavanja i gajenja, nerazrađeni tehnološki postupci za mnoge vrste, relativno dug period uvođenja u proizvodnju, (ne)postojanje odgovarajućih biotičkih i abiotičkih uslova na određenoj lokaciji, nedovoljan interes tržišta itd., postoje i ograničenja koja se mogu jednostavnije otkloniti. Jačanjem institucionalne podrške razvoju ovog sektora, proizvodnjom za poznatog kupca, edukacijom proizvođača, moguće je povećati površine pod gajenim lekovitim biljem i promet sirovina iz plantažne proizvodnje u sektoru LAB u Srbiji.

***Ključne reči**:* plantažna proizvodnja, sakupljanje, biljne sirovine, uslovi

IMPORTANCE OF PLANTATION PRODUCTION OF RAW MATERIALS IN THE MEDICAL AND AROMATIC PLANTS IN SERBIA

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Producing raw medical plants in MAP for needs of pharmacy, cosmetics, chemical and dietary industry, herbs could be found in natural environment or in plantations. As technology goes toward, we successfully grow many types of medical aromatic plants even the ones that in the past grew only in nature. With cultivation we are able to control quality, stable market supplying and more herbs which can be sold. Beside a lot of factors such as: insufficient knowledge of the seed characteristics and conditions of reproduction and cultivation, undeveloped production processes for many types, relatively long period that is needed to start with production, lack of adequate biotic and abiotic conditions at a particular location, insufficient market interest etc, there are limitations that can be easily removed. Increasing institutional support for this sector, production for a known buyer, better educating the grower, it is possible to increase the areaa under cultivated herbs and trading of raw materials from the plantation production into LAB sector in Serbia.

Key words: plantation production, collection, raw materials,conditions

IN VITRO UMNOŽAVANJE JUŽNOAFRIČKE LJUBIČICE (*Saintpaulia ionantha* L.) IZ DIJELOVA LISTA

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Južnoafrička ljubičica (*Saintpaulia ionantha* L.) uspješno se razmnožava vegetativnin načinom, odnosno lisnim reznicama. Međutim, u cilju bržeg umnožavanja i stvaranja geteske varijabilnosti, ova cvjetno dekorativna vrsta može se uspješno razmnožavati i mikropropagacijom.Uspjehin vitropropagacijeuslovljen je specifičnom opremomipreciznim tehnikamaumnožavanja, ali su vrlo važni i drugi faktori kao što su: tip eklspantata, fiziološkostanjematične biljke, regulatori rasta uhranjivom medijuiuslovima rasta i razvoja.

U ovom radu korišteni su dijelovi lista crvene i plave ljubičice. Matične biljke nisu prethodno uzgajane u in vitro uslovima nego su eksplantati uzeti sa komercijalnih biljaka. Sterilizacija biljnog materijala vršena je standardnom procedurom pomoću 70% alkohola i 1% natrijum hipohloirta. Segmenti lista postavljeni su na MS podlogu koja je od fitohormonasadržavala citokinin BAP (benzil-aminopurin) 0,5mg/l i auksini IBA (indol-3-buterna kiselina) 0,1 mg/l. Prvo kalusiranje uočeno je mjesec dana nakon uvođenja u kulturu. Formirane rozete ljubičice multiplicirane su na podlogu koja je sadržavala istu koncentraciju fitohormona kao pri uvođenju biljaka u kulturu. Ukorjenjavanje mladih biljaka vršeno je na podlozi samo sa auksinom IBA u koncentraciji 1 mg/l. Na kraju su biljke uspješno adaptirane u stakleniku i presađene u PVC posude promjera 9 cm.

Ključne riječi: mikropropagacija, *Saintpaulia ionantha* L.

IN VITRO PROPAGATION OF AFRICAN VIOLETS (*Saintpaulia ionantha* L.) FROM LEAF SEGMENT CULTURES

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South African violet *Saintpaulia ionantha* L. successfully propagated vegetative with leaf cuttings. However, in view of duplication and creating genetic variability, this decorative floral species can be successfully micropropagating. The success of in vitro propagation is governed by the specific equipment and precise techniques of reproduction, but they are very important, other factors such as the type of explants, physiological state of the mother plant, plant growth regulators in the culture medium and conditions for growth and development.

In this paper we used the leaf segment of red and blue violet. Stem explants were taken from commercial plants. Sterilization plant material was with standard procedure using 70% alcohol and 1% sodium hypochlorite. Leaf segments are placed on MS medium that contained the phytohormones cytokinin BAP (benzyl-aminopurine) 0.5 mg/l and auxins IBA (indole-3-butyric acid) 0.1 mg/l. First callus was observed one month after the introduction of the culture. Formed rosettes violet multiplied on medium containing the same concentration of phytohormones as the introduction of plants in culture. Rooting young plants was carried only with auxin IBA at a concentration 1 mg/l. At the end of the plants successfully adapted in a greenhouse and transplanted into plastic containers 9 cm in diameter.

Key words: micropropagating, *Saintpaulia ionantha* L.

UTICAJ AGROEKOLOŠKIH FAKTORA NA PRODUKTIVNOST HELJDE

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Heljda je jednogodišnja monokarpna biljka iz familije *Polygonaceae*, roda *Fagopypum*. Heljda, je veoma značajna namirnica u ishrani čoveka, posebno u zemljama u kojima se posebni akcenat stavlja na zdravstveno bezbednu hranu, proizvedenu u organskoj proizvodnji. U ishrani ljudi i stoke upotrebljava se zrno, odnosno plodova orašica. Zrno heljde po hranjivoj i nutritivnoj vrednosti slično je zrnu hlebnih žita.

Na parcelama Instituta za ratarstvo i povrtarstvo, u Bačkom Petrovcu, sprovedena su istraživanja u uslovima konvencionalnog sistema gajenja (2010-2011). U radu su prikazani rezultati ispitivanja četiri sorte heljde: Novosadska, Godijevo, Bamby i Češka. Analiza prosečnih prinosa pokazala je da je NS sorta heljde Novosadska ostvarila statistički značajno viši prinos (2626 kg/ha) u odnosu na ostale ispitivane sorte ($p < 0,05$). Genotip, godina i njihova interakcija pokazala je statističku značajnost ($p < 0.05$, $p < 0.01$).

Prosečni svetski prinosi heljde su 905 kg/ha.Ovaj podatak je izuzetno važan zbog saznanja da se heljda može vrlo uspešno proizvoditi kod nas.

Ključne reči: agroekološki faktori, heljda - *Fagopyrum esculentum*, NS sorte, prinos

INFLUENCE OF AGROECOLOGICAL FACTORS ON PRODUCTIVITY OF BUCKWHEAT

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Buckwheatis an annualmonocarpicplantof the *Polygonaceae* family, genus *Fagopypum*. Nowadays,it becomesa very importantfoodin the dietof humans, especially incountries wherespecialemphasis is put on the safe food, producedin organic production. Grain is in the usage for humans and domesticanimals nutrition (nut) and it is similar to the grain of bread wheat by.

On the field of the Institute of Field and Vegetable Crops, Backi Petrovac, conducted the research in terms of conventional growing system (2010-2011).The results of four buckwheat varieties: Novosadska, Godijevo, Bamby and Ceska are presented here. Analysis of the average yield showed that Novosadska buckwheat variety recorded significantly higher yield (2626 kg/ha) than the other tested varieties ($p < 0.05$). Genotype, year and their interaction showed statistical significance ($p < 0.05$, $p < 0.01$).

The averageworldyieldof buckwheatare905 kg/ ha. This information is extremely important in the knowledge that buckwheat can successfully produce in Serbia.

Keywords: agro-ecological factors, buckwheat - *Fagopyrum esculentum*, NS varieties, conventional sistem, yield

UTICAJ AGROEKOLOŠKIH USLOVA GAJENJA NA OSOBINE LUKOVICA PROLJEĆNOG BIJELOG LUKA

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Bijeli luk je vrsta koja jako reaguje na promjenu uslova uspijevanja. Te promjene se manifestuju promjenom morfoloških osobina, a time i promjenom proizvodnih osobina. Cilj ovog rada je bio utvrditi na koji način bijeli luk reaguje na promjene uslova sredine. Kao materijal korišćen je proljećni bijeli luk sorte Labud iz Vojvodine, te dva domaća genotipa porijeklom sa područja gdje su vršena istraživanja (Banja Luka, 210 m NV i Drinić, 655 m NV). Rezultati koji su dobijeni pokazuju da je promjena uslova uspijevanja imala značajan ili visoko značajan uticaj na ispitivane osobine lukovica i osobine čena. Promjena nadmorske visine dovela je do značajnog smanjenaj mase lukovice, pri čemu je masa lukovice sorte Labud na lokalitetu Banjaluke bila 24,59 g, a na lokalitetu Drinića 15,33g. Istovremeno na većoj nadmorskoj visini formirao se veći broj čenova koji je imao visoko značajno manju masu u odnosu na one na manjoj nadmorskoj visini. Sve je to rezultiralo postizanjem značajno većeg prinosa lukovice proljećnog bijelog luka na lokalitetu Banjaluke (7,37 t ha^{-1}) u odnosu na lokalitet Drinića (4,59 t ha^{-1}). Međutim, razlike kod ispitivanih osobina između sorte Labud i domaćih genotipova sa datog područja je na manjem nivou značajnosti.

***Ključne riječi**:* bijeli luk, morfološke promjene, uslovi uspijevanja, prinos

INFLUENCE OF AGROECOLOGICAL GROWING CONDITIONS ON THE PROPERTIES OF THE SPRING GARLIC BULBS

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Garlic is a species very responsive to changing conditions on growth. These changes are manifested by changes in morphological characteristics, and thus the change in production traits. The aim of this study was to identify how the garlic responds to changes in environmental conditions. As the material used is a spring garlic, sort Labud from Vojvodina and the two local genotype native to the area where the research was conducted (Banja Luka, 210 m ASL and Drinić, 655 m ASL). The obtained results show that a change in conditions on growth was significant or highly significant influence on the traits and characteristics bulb cloves. The change of altitude caused a significant reduction in weight bulbs, with a mass of bulbs varieties Labud at the site of Banja Luka was 24.59 g, and 15.33 g Drinić site. At the same time at a higher altitude formed a number of cloves which held a significant weight reduction compared to those at a lower altitude. All this resulted in achieving a significantly higher yield of the spring bulbs of garlic at the site of Banja Luka (7.37 t ha^{-1}) in relation to the site Drinić (4.59 t ha^{-1}). However, differences in the traits between sort Labud and local genotypes with a given area on the lower level of significance.

Keywords: garlic, morphological changes, the conditions on growth, yield

HAJDUČKA TRAVA (*Achillea millefolium* L.) KAO BILJKA VIŠEGODIŠNJIH ″EKO-KORIDORA″

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Poštovanje prirodnih procesa i uvođenje u poljoprivrednu proizvodnju novih metoda, zahteva promenu i inovativnost u pogledu odabira i pristupa pojedinim biljnim vrstama. Hajdučka trava (*Achillea millefolium* L.) kao lekovita biljna vrsta, pored upotrebe u medicini, farmaciji, parfimeriji i kozmetici, postaje sve značajnija u agronomiji, pre svega u organskoj proizvodnji.

Hajdučka trava se smatra posebno koristnom biljkom susedom, ne samo da odbija štetne insekte, već privlači korisne (npr. predatorske ose).Dobar je poboljšivač kvaliteta zemljišta. Ona privlači predatorske osice, koje koriste nektar, ali se hrane i različitim vrstama štetočina. Slično tome, ona privlači različite bubamare i osolike muve.

Nadezemna masa (*herba*) je dobro đubrivo, a koristan je aktivator za proces kompostiranja. Takođe je korisna i za druge biljke, pre svega za poboljšanje zdravlja bolesnih biljaka kada se uzgaja u blizini njih („alelopatski odnosi“).

U radu posebna pažnja data mogućem plantažnom gajenju hajdučke trave i njenoj ulozi u organskoj proizvodnji tj.razmatraće se njeno učešće u tkz. višegodišnjim ″eko-koridorima″.

Ključne reči: hajdučka trava, *Achillea millefolium*, „eko-koridori“, organska proizvodnja

YARROW (*Achillea millefolium* L.) AS A PLANT IN PERENNIAL „ECO-CORRIDORS“

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The respect for natural processes and the introduction of new methods in agricultural production requires changes and innovations in the selection and approach to individual plant species. Yarrow (*Achillea millefolium* L.), being a medicinal plant, apart from its use in medicine, pharmaceutics, perfume industry and cosmetics, is becoming increasingly important in agronomy – primarily in organic production.

Yarrow is considered an especially useful companion plant, not only repelling some bad insects while attracting good, predatory ones. It is good improver soil quality. It attracts predatory wasps, which drink the nectar and then use insect pests as food for their larvae. Similarly, it attracts ladybugs and hoverflies. Above ground (herba) thought to be good fertilizer, and a beneficial natural activator for composting process. It is also considered directly beneficial to other plants, improving the health of sick plants when grown near them ("allelopathic relationships").

The paper is focused on the potential plantation cultivation of yarrow and its role in organic production, i.e. it will examine the plant's participation in the so called perennial „eco-corridors“.

Key words: yarrow, *Achillea millefolium*, „eco-corridors“, organic production

KOMPONENTE VARIJANSE I HERITABILNOST SADRŽAJA FITINSKE KISELINE KOD HLEBNE I DURUM PŠENICE

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Rastući interes za istraživanja fitinske kiseline žitarica i leguminoza je rezultat njene uloge antinutritivnog faktora, koji kao polivalentni anjon stvara helate sa mineralnim elementima i proteinima onemogućavajući njihovo iskorišćanje, kao i zbog učešća u protoku fosfora kroz integrisane poljoprivredne produkcione sisteme. Istraživanje je bilo sprovedeno u toku 2010-2011 i 2011-2012 godine na tri lokaliteta: Rimski Šančevi, Zemun Polje i Padinska Skela. Ispitivani sortiment je sačinjavalo 15 genotipova hlebne pšenice (*Triticum aestivum ssp. vulgare* L.) i 15 genotipova durum pšenice (*Triticum durum* Desf.). Eksperiment je bio postavljen po potpuno slučajnom blok sistemu u 4 ponavljanja. Sadržaj fitinske kiseline u zrnu ispitivanih genotipova je određen po metodi Latta and Eskin (1980) modifikovanoj po Sredojević i Dragičević (2009). Na osnovu rezultata trofaktorijalne analize varijanse za sadržaj fitinske kiseline, izračunate su komponente varijanse, koeficijenti genotipske i fenotipske varijacije i koeficijent heritabilnosti u širem smislu. Najznačajnija komponenta varijanse u variranju sadržaja fitinske kiseline kod oba proučavana sortimenta pšenice je bila varijansa interakcije genotip × sredina. Najmanji uticaj na variranje sadržaja fitinske kiseline kod genotipova hlebne i genotipova durum pšenice je imala ekološka varijansa. Koeficijent genetičke varijacije (CV_g) za sadržaj fitinske kiseline za sortiment hlebne pšenice je iznosio 5,45%, dok je za sortiment durum pšenice iznosio 2,57%. Koeficijent fenotipske varijacije (CV_f) za sortiment hlebne pšenice je iznosio 6,17%, dok je za sortiment durum pšenice iznosio 3,62%. Koeficijent heritabilnosti (h^2) za genotipove hlebne pšenice je iznosio 77,78% i bio veći nego za genotipove durum pšenice za koje je iznosio 50,51%.

Ključne reči: pšenica, fitinska kiselina, komponente varijanse, heritabilnost

VARIANCE COMPONENTS AND HERITABILITY FOR PHYTIC ACID CONTENT IN BREAD AND DURUM WHEAT

Gordana Brankovic[1], Vesna Dragicevic[2], Dejan Dodig[2], Miroslav Zoric[3], Desimir Knezevic[4], Gordana Surlan-Momirovic[1], Srbislav Dencic[3]

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Growing interest in the study of phytic acid content in cereals and legumes is the result of its role as the anti-nutrient factor, which as the polyvalent anion creates chelates with mineral elements and proteins, preventing their utilization, as well as for its role in the flow of phosphorus through integrated agricultural production systems. The research was conducted during 2010-2011 and 2011-2012 years at three sites: Rimski Sancevi, Zemun Polje and Padinska Skela. The tested accessions consisted of 15 genotypes of bread wheat (*Triticum aestivumssp. Vulgare* L.) and of 15 genotypes of durum wheat (*Triticum durum* Desf.). The experiment was set up in a randomized complete block design with four replications. Phytic acid grain content was determined by the method of Latta and Eskin (1980) modified by Sredojevic and Dragicevic (2009). Based on the results of three-way analysis of variance for the phytic acid content, the following parameters were calculated: components of variance, coefficient of genotypic and phenotypic variation and heritability in the broad sense. The most significant component of the variance in varying phytic acid content in both studied groups of wheat accessions was the variance of genotype × environment interaction. The least influence on the phytic acid content variation in the bread and durum wheat genotypes had environmental variance. The coefficient of genetic variation (CV_g) for phytic acid content in bread wheat genotypes was 5.45%, while for the varieties of durum wheat it took value of 2.57%. The coefficient of phenotypic variation (CV_f) for bread wheat accessions was 6.17%, while for the durum wheat genotypes was 3.62 %. The coefficient of heritability (h^2) for bread wheat genotypes was 77.78% and was higher than 50.51% which was the value for durum wheat accessions.

Key words: wheat, phytic acid, components of variance, heritability

SADRŽAJ AMINOKISELINA U ZRNU GENOTIPOVA JAROG JEČMA (*HORDEUM VULGARE* L.)

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U radu je izučavana varijabilnost sadržaja proteina i sadržaja aminokiselina kod deset genotipova jarog ječma (G-3, G-10, G-13, G-14, G-15, G-18, G-105, G-112, G-20, Viktor). Analizirane linije ječma su gajene na eksperimentalnom polju uz primenu mineralne ishrane azotom sa dozom 60 kg ha^{-1}. Analiziran je i prinos zrna i ustanovljen je najveći prinos za genotip G-18 (4960 kg ha^{-1}) a najmanji prinos kod genotipa G-10 (3850 kg ha^{-1}). Za svaki genotip je identifikovan ukupan sadržaj aminokiselina, pri korišćenju kvantitativne metode za određivanje njihove koncentracije. Ukupna koncentracija slobodnih aminokiselina kod analiziranih sorti ječma bila je različita i varirala je između najveće vrednosti 10.4% (G-10) i najmanje vrednosti (8.2 %) kod genotipa G-20.

Ključne reči: ječam, genotip, prinos, protein, aminokiselina

AMINO ACID CONTENT IN GRAIN OF SPRING BARLEY GENOTYPES (*HORDEUM VULGARE* L.)

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The variability of grain protein and amino acid contents in spring barley genotypes (G-3, G-10, G-13, G-14, G-15, G-18, G-105, G-112, G-20, Viktor) were studied. The analyzed barley lines are grown on experimental field, under application of mineral nutrition by adding 60 kg ha^{-1} of nitrogen fertilizer rate. The grain yield of barley analyzed and the highest average grain yield established in G-18 (4960 kg ha^{-1}) and the lowest yield in G-10 (3850 kg ha^{-1}). The lowest content of proteins found at G-13 (8.6 %). For each genotypes was indentified total content of amino acid by use quantitative method to determine their concentration. The total concentration of free amino acids in the analyzed varieties of barley cultivars was different and varied among the highest 10.4% (G-10) and the lowest at the G-20 (8.2 %).
***Keywords*:** barley, genotype, yield, protein, amino acid

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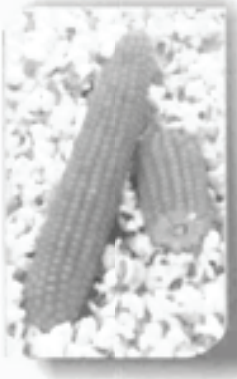
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