GREEN ROOM SESSIONS 2018

Book of Proceedings

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FOREWORD

Green Room Sessions International Conference aims to be platform for international scientific discussion on agriculture in general as well as agriculture in conjunction with economics and ecology, food and nutrition science and technology, rural development, environment and forestry. Green Room Sessions brings together and is connecting research, industry, social concepts and practices. The scientific core is based on applying Eco-Eco (ecological-economical) concepts and principles to optimize interactions between natural, social and built components of the rural environments: plants, animals, soil, water, air, humans and man-made structures. In addition, Green Room Sessions placed social issues at the centre of solutions for a sustainable and fair food system. Green Room Sessions are targeting to multiple benefits to society and the environment, by bringing people together and providing them the opportunity to sit together and exchange ideas and connect the business.

In November 2018, the 1st Green Room Sessions International Conference provided an opportunity for sharing experiences and builds the evidence base on agriculture, forestry, human interactions and built environment, as well as reaching a consensus on the priorities for achieving more sustainable food systems. It also endorsed Institutional roles of National services, Regional and International organisations in supporting further implementation and promotion of Eco-Eco (ecological-economical) concepts and principles.

Dialogue between the participants targeted:

- Enhancing smallholder and family farmers' adaptation and resilience to the impacts of climate change;
- Improving nutrition including through more diversified diets;
- Protecting and enhancing agro-biodiversity in support of ecosystem services;
- Improving livelihoods in rural areas;
- National Food Wealth, the holy trinity: agriculture, economics and ecology (a x e^2);
- Mutual interconnections and how to deal with them and how this mix influence National Food Wealth and National Health.

achieving a transformative change in agricultural practices towards sustainable development.

The Green Room Sessions International Conference synthesized and build on the outcomes of the regional meetings, and provided an opportunity to share and discussed policies that can help scale-up and scale-out agriculture, rural development, agroecology, nutrition in order to achieve the Sustainable Development Goals.

The Symposium also moved the topic of agriculture and rural development from dialogue to activities at the regional and country level by complementing on-going initiatives to integrate biodiversity and ecosystem services in agriculture, identifying opportunities for synergies with National Strategic Programmes and Regional Initiatives, and facilitating regional and International cooperation between the scientists and business.

Green Room Sessions International Conference as a final goal is looking forward to assist people from the rural areas, related business, agriculture and allied sectors to take the advantage of:

- Natural resources, secure access to land and water, and improved natural resource management and conservation practices;
- Improved agricultural technologies and effective production services;
- Linking the interested parties with financial services;
- Transparent and competitive markets for agricultural inputs;
- Opportunities for rural off-farm employment and enterprise development;
- Local and national policy and programming.

We launch this with the aim of unlocking innovative, integrated, multidisciplinary science and technology with activation of all dimensions of sustainable development goals for all the participants.

In this Book of Proceedings we published part of the original scientific full papers presented at the Conference. The other part is provided for publication at the journal Agriculture and Forestry (ISSN 0554-5579, Printed; ISSN 1800-9492, Online), all based on the requests of the authors who participated at the Conference.

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PREDGOVOR

Međunarodna konferencija Green Room Sessions imala je za cilj da bude platforma međunarodne naučne diskusije o poljoprivredi uopšte, poljoprivredi vezano sa pitanjima ekonomije i ekologije, nauci o tehnologiji hrane i prehrane, ruralnim razvojem, životnom sredinom i šumarstvom. Green Room Sessions okupila je i povezivala nauku, istraživanje, industriju, društvene koncepte i prakse.

Naučni principi zasnovani su na primjeni Eko-Eko (ekološko-ekonomskih) koncepata za optimizaciju interakcije između prirodnih, socijalnih i komponenti ruralnih sredina: biljka, životinja, zemljište, voda, vazduh, kao i strukture koje su nastale kao plod rada ljudi. Pored toga, Green Room Sessions je težila da postavi društvena pitanja u centar rješenja održivog i fer sistema proizvodnje hrane. Brojni sastanci održani su tokom Konferencije sa ciljem da imaju višestruke koristi za društvo i sredinu koja nas okružuje, približavajući tokom ovih komunikacija ljude jedne drugima, pružajući im priliku da međusobno komuniciraju na jednom mjestu, razmenjuju ideje i povezuju poslovanja.

U novembru 2018. godine, Green Room Sessions International Conference pružila je mogućnost razmjene iskustava potvrđenih praksi u poljoprivredi, šumarstvu, interakcijama čovjeka i njegovog okruženja, struktura koje su nastale kao plod rada ljudi. Ovo je postignuto organizovanjem susreta naučnika i stručnjaka iz ove oblasti, te razmjenom iskustava, doprinoseći unapređenju održivijeg sistema proizvodnje i prerade. Iskustva drugih koji su gostovali istakli su značaj institucionalne uloge nacionalnih službi, regionalnih i međunarodnih organizacija u podršci i daljoj promociji eko-eko (ekološko-ekonomskih) koncepata i principa.

Dijalog između učesnika bio je usmjeren na:

- Prilagođavanje malih proizvođača i porodičnih farmera i jačanje njihove otpornosti na uticaj klimatskih promjena;
- Zaštitu i unapređenje agro-biodiverziteta, podrške održivosti ekosistema;
- Poboljšanje životnih uslova, životnog standarda u ruralnim područjima;
- „Sveto trojstvo": poljoprivreda, ekonomija i ekologija ($a \times e^2$), njihove međusobne veze i kako se baviti njima, te kako ovaj miks međusobnih relacija utiče na proizvodnju domaće hrane i zdravlje nacije;

- Postizanje tranzicionih promjena u poljoprivrednim praksama u skladu sa principima održivog razvoja.

Konferencija je dijelom uradila sintezu i nadograđivala rezultate regionalnih sastanaka i pružiti priliku da podijeli svoja iskustva sa učesnicima, diskutuje o politikama koje mogu pomoći u povećanju poljoprivredne proizvodnje, ruralnog razvoja, agroekologije, ishrane kako bi se postigli ciljevi održivog razvoja.

Konferencija je takođe inicirala pomjeranje teme poljoprivrede i ruralnog razvoja od dijaloga ka konkretnim aktivnostima na lokalnom i regionalnom nivou, tražeći rješenja očuvanja biodiverziteta u poljoprivredi, identifikujući mogućnosti za sinergiju sa nacionalnim strateškim programima i regionalnim inicijativama, pospješujući regionalnu i međunarodnu saradnju između naučnika i biznisa.

Učesnici na Konferenciji tražili su načine da se pruži pomoć ljudima iz ruralnih područja, njihovim malim biznisima, poljoprivredi i srodnim sektorima da iskoriste prednosti:

- Prirodnih resursa, bezbjednog pristupa zemljištu i vodama, poboljšavajući prakse upravljanja prirodnim resursima i pristupe konzervacije;
- Poboljšane poljoprivredne tehnologije i efikasnijih proizvodnih usluga;
- Povezivanje zainteresovanih strana sa finansijskim servisima;
- Mogućnosti za zapošljavanje i razvoj preduzeća u ruralnim područjima;
- Lokalnih i nacionalnih politika i programiranja.

Ovo inicijativa je pokrenuta sa ciljem otvaranja i susreta sa inovativnom, integrisanom, multidisciplinarnom naukom i tehnologijom uz aktiviranje svih dimenzija ciljeva održivog razvoja za sve učesnike.

U ovom Zborniku radova objavili smo dio originalnih naučnih radova (*Full papers*) predstavljenih na Konferenciji. Drugi dio je proslijeđen za objavljivanje časopisu Poljoprivreda i šumarstvo (ISSN 0554-5579, print; ISSN 1800-9492, online), sve na osnovu zahtjeva autora koji su učestvovali na Konferenciji.

Velibor SPALEVIĆ
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CONTENT

Plant production, Plant protection and food safety, Genetic resources

Environment protection, natural resources management, Rural development and Forestry

Original Scientific paper

Composition Investigation of the Sunflower Seed of the Latest NS Confectionary Hybrids

Ranko ROMANIĆ[1], Tanja LUŽAIĆ[1,*], Nada GRAHOVAC[2], Nada HLADNI[2], Snežana KRAVIĆ[2] and Zorica STOJANOVIĆ [1]

[1] Faculty of Technology Novi Sad, University of Novi Sad, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia; tanja.luzaic@tf.uns.ac.rs; rankor@uns.ac.rs; sne@uns.ac.rs; zorica.stojanovic@uns.ac.rs

[2] Institute of Field and Vegetable Crops, Maksima Gorkog 30, 21000 Novi Sad, Serbia; nada.grahovac@nsseme.com; nada.hladni@ifvcns. ns.ac.rs

***** Correspondence: tanja.luzaic@tf.uns.ac.rs; Tel.: +381-21-485-3710

Abstract

Because of the favorable amino acid composition of sunflower protein and low content of antinutritive components, the confectionary/non-oil sunflower seed is increasingly gaining in importance. This is why there is a need for increasing the number of this type of hybrids. Breeding new hybrids of different characteristics are obtained. In order to investigate the composition of the seed, three samples of the latest NS hybrids of second filial (F2) generation (NS-H-6792, NS-H-6489, NS-H-6311) were analyzed and compared with the results of the hybrid seed already-used (Cepko). The content of moisture was determined according to SRPS EN ISO 665, 2008, the content of the oil according to SRPS EN ISO 659, 2011, while the mass of 1000 seeds and the content of hull and kernels were made according to Karlović & Andrić, 1996. The moisture content ranged from 5.75±0.00% in the sample NS-H-6792 to 6.57±0.03%, in the sample NS-H-6489. The oil content was in the range of 25.62±0.22%, found in the sample NS-H-6311 to 23.12±0.16%, found in the sample NS-H-6489. The highest content of the hull was found in the NS-H-6792 sample, 46.74±0.80%, while the smallest content of the hull was found in the sample NS-H-6311 and amounted to 41.91±0.71%.

Keywords: non-oil hybrids, oil content, mass of 1000 seeds, hull/kernel ratio, hull/seed ratio

Introduction

Sunflower seed may be a significant source of protein, i.e. significant raw material for protein production (Food Outlook, 2018). Compared to other plant species that represent significant protein sources (eg soybean seed), sunflower seed contains small amounts of antinutritive compounds (eg protease inhibitors, cyanogen, lectins, etc.) (Gassmann, 1983; González-Pérez & Arellano, 2009; González-Pérez, 2015). The amino acid composition of sunflower seed protein, with the exception of a small amount of lysine, is in accordance with the requirements of the FAO/WHO for human nutrition (Gassmann, 1983; Raymond *et al.* 1991). Oil yield, the primary indicator of sunflower productivity, depends on seed yield and seed oil content. High and stable oil yield is a very desirable attribute of sunflower (*Helianthus annuus* L.) hybrids (Škorić et al., 2005; Živanović et al., 2017; Ikanovic et al., 2018).

These are the reasons for hybridization in the direction of increasing the protein content in the seed and the growing presence of confectionary hybrids. Confectionary sunflower hybrid seeds are characterized by a high hull content (from 40 to 50%), a high mass of 1000 seeds (more than 100 g) and an oil content of less than 30% (Jovanović, 2001; Kaya *et al*. 2008; Hladni *et al*. 2011). Although the primary purpose of these hybrids is not the production of oil, since the oil content of the seed is significant, and they could represent a potential raw material for the oil production.

The aim of this study is to characterize sunflower seeds of the latest confectionary NS hybrids by determining the content of oil and moisture in the seed, the weight of 1000 seeds, the content of the hull and the kernels in the seed, and the hull/kernel and hull/seed ratio. The obtained results are compared with the results obtained by the analysis of the seed of confectionary sunflower hybrid (Cepko) that is already in use.

Materials and Methods

Material

Hybrid seeds are a secondary filial (F2) generation. Samples NS-H-6792, NS-H-6489 and NS-H-6311 were grown under conditions of small-plot trials in 2017. The seed was cleaned and 6 months after the harvest, the seed dimensions were examined. The seed of hybrid Cepko is from commercial cultivation in 2017.

Methods

The moisture content was determined according to SRPS EN ISO 665, 2008, the content of oil according to SRPS EN ISO 659, 2011, while the weight of 1000 seeds and the contents of the hull and kernels were made according to Karlović & Andrić, 1996.

Results and Discussion

The highest moisture content was found in the NS-H-6489 sample and amounted to 6.57±0.03% while the smallest content was found in the NS-H-6792 sample and amounted to 5.75±0.00%. The content of the oil in the tested samples ranged from 23.12±0.16%, as found in the NS-H-6489 sample to 25.62±0.22% in the NS-H-6311 sample. The seed of hybrid Cepko has a significantly higher oil content of 40.46±1.84%, while the specific moisture content in this sample was 5.69±0.06% as can be seen in Table 1.

Table 1. Moisture and oil content of the confectionary sunflower hybrid seeds.

Hybrid	Moisture content (%)	Oil content (%)
NS-H-6792	5.75±0.00	23.83±0.31
NS-H-6489	6.57±0.03	23.12±0.16
NS-H-6311	6.15±0.03	25.62±0.22
Cepko	5.69±0.06	40.46±1.84

The content of the hull and kernels in confectionary sunflower hybrid seed is shown in Table 2. The highest content of the hull is determined in the NS-H-6792 sample and amount to 46.74%. The kernels content in this hybrid is 53.26±0.80%. The obtained hull/kernel and hull/seed ratio is the highest in this sample and amounts to 0.88±0.03 and 0.47±0.01, respectively.

The smallest content of the hull of 41.91±0.71% has a hybrid NS-H-6311, the kernel content of this hybrid is 58.09±0.71%. The hull/kernel and hull/seed ratio in this sample is the smallest and is 0.45±0.00 and 0.31±0.01, respectively.

Hybrid Cepko has a significantly lower content of the hull (31.20±0.72%), and therefore the hull/kernel and hull/seed ratio is lower and amount to 0.45 and 0.31, respectively.

Table 2. Hull and kernels content and hull/kernel and hull/seed ratio of the latest sunflower confectionary hybrid seeds.

Hybrid	Hull content (%)	Kernel content (%)	Hull/kernel ratio	Hull/seed ratio
NS-H-6792	46.74±0.80	53.26±0.80	0.88±0.03	0.47±0.01
NS-H-6489	45.38±0.12	54.62±0.12	0.83±0.00	0.45±0.00
NS-H-6311	41.91±0.71	58.09±0.71	0.72±0.02	0.42±0.01
Cepko	31.20±0.72	68.80±0.72	0.45±0.02	0.31±0.01

Table 3. Mass of 1000 seeds of the tested confectionary sunflower hybrids.

Hybrid	Mass of 1000 seeds(g)	Mass of 1000 seeds expressed on dry matter (g)
NS-H-6792	130.72±4.99	123.21±4.71
NS-H-6489	122.25±3.34	114.22±3.12
NS-H-6311	133.79±3.38	125.56±3.17
Cepko	60.80±0.95	57.35±0.90

Based on the data in Tables 1, 2 and 3, cluster analysis was performed in Figure 1. The results of clustering were obtained using the minimum variance method - Ward's method, and clustering is based on Euclidean Distances.

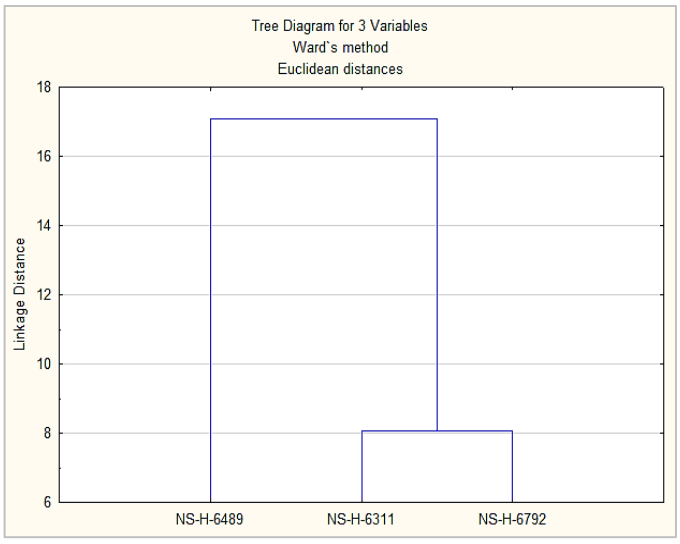

Figure 1. Dendrogram of the hierarchical cluster analysis of the tested samples

The values of the mass of 1000 seeds of the tested hybrids are shown in Table 3. The highest value of mass of 1000 seeds has NS-H-6311 hybrid seed and amounts to 125.56±3.17 g, while the lowest mass of 1000 seeds has NS-H-6489 hybrid seed and amounts to 114.22±3.12 g expressed on dry matter. A significantly lower mass of 1000 seeds of hybrid Cepko (57.35±0.90 g expressed on dry matter) indicats a lower volume of these seeds.

Figure 1 shows that the difference between samples NS-H-6311 and NS-H-6792 is lower and amounts to only 8.1 (expressed as Euclidean distance), while the diversity of NS-H-6311 and NS-H-6792 hybrids and hybrid NS-H-6489 is higher and amounts to 12.5 and 17.1, respectively, expressed as Euclid's distance.

Conclusions

On the basis of the presented results, it is concluded that the latest NS confectionary sunflower hybrids according to the tested parameters differ significantly from the confectionary hybrid Cepko that is already in use. The oil content of the Cepko hybrid seed is 40.46±1.84%, while in the latest hybrids the oil content ranges from 23.12±0.16% to 25.62±0.22%. The content of the hull in the Cepko hybrid seed is 31.20±0.72%, while the content of the hull in the latest hybrids ranges from 41.91±0.71% to 46.74±0.80%. Mass of 1000 seeds of the Cepko hybrid expressed on dry matter is 57.35±3.17 g while in the latest hybrids it moves in the interval from 114.22±3.12 g to 125.56±3.17 g. Diversity in the characteristics of seed of the latest hybrids in relation to the Cepko hybrid can lead to potential problems in further processing of the seed. Therefore, a detailed characterization of the latest hybrids is necessary.

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Conflicts of Interest: The authors declare no conflict of interest.

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