



Green Room and University of Montenegro



GREEN ROOM SESSIONS 2018

**International GEA (Geo Eco-Eco Agro) Conference
1-3 Novembar 2018, Podgorica, Montenegro**

**Plant production, Plant protection & Food safety, Genetic resources
Phytochemistry and Medicinal Plants, Animal husbandry and Dairy production
Rural development and agro-economy, Rural Environments and Architecture
Environment protection and natural resources management, Forestry**

GREEN ROOM SESSIONS 2018

Book of Proceedings



Podgorica, Montenegro, 2018

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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 e²);
- 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, razmjenjuju 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, pospešujući 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 prosljeđen za objavljivanje časopisu Poljoprivreda i šumarstvo (ISSN 0554-5579, print; ISSN 1800-9492, online), sve na osnovu zahtjeva autora koji su učestvovali na Konferenciji.

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Kourednik
U ime Naučnog i Organizacionog odbora

Radovan PEJANOVIĆ
Član uredništva
U ime Naučnog i Počasnog odbora

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Original Scientific paper

Study on Dimensions of the Sunflower Seeds of the Latest NS Confectionary Hybrids

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Abstract

The confectionary/non-oil seed of sunflower hybrids is characterized by a higher content of the hull, which is thicker than the oil seed hybrids of sunflower. These seeds can be of different size and shape, with a hull not completely black. The aim of this study is to examine the dimensions of confectionary seeds of the latest NS sunflower hybrids. The results of the analyzed seed samples of the latest hybrids of second filial (F2) generation (NS-H-6792, NS-H-6489, NS-H-6311) are compared with the results of already-used hybrid seeds (Cepko). Equivalent diameter and linear dimensions of seed are characterized by Malik and Saini, 2016. The highest specific value of the equivalent diameter was 8.25 ± 0.60 mm (NS-H-6792) and the smallest was 7.90 ± 0.30 mm (NS-H-6311). Only 24.33% of the measured seeds were between 15.00 and 15.99 mm long, which is the most frequent length interval. The average seed width is from 7.00 to 7.99 mm (44.33%), while the average seed thickness is from 4 to 4.99 mm, which was measured in 46.67% of examined seeds. From the above results of the linear dimensions it can be concluded that the seeds are the most different in length, while the distribution of the results by width and thickness is less.

Keywords: sunflower, non-oil hybrids, size and shape, length, distribution

Introduction

The creation of new hybrids of sunflower expands the assortment of its application. Sunflower breeding in the direction of increasing the protein content leads to the application of this type of sunflower for purposes other than the production of oil, but the production of protein products as well as the consumption kernels. Such hybrids have larger seeds with a thicker hull, most commonly colored (black and white). Hull represents 40-45% of the total seed mass, it is poorly attached to the kernel and is easily removed (Jovanović, 2001; Gonzales-Perez & Vereijken 2007). This seed contains less oil, mostly about 30% (Kaya *et al.* 2008; Hladni *et al.* 2011).

The aim of this study is to examine the seed dimensions of the latest sunflower confectionary/non-oil hybrids. The obtained results are compared with the dimensions of the seeds of the confectionary/non-oil hybrid Cepko, which is already in use.

Materials and Methods

Material: Hybrid seeds are a secondary filial (F2) generation. They 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 2018.

Methods: Length (L), width (W) and seed thickness (T) were measured using a vernier caliper per 100 individual seeds. Equivalent diameter (De), Surface area (S), Seed volume (V) and Sphericity (ϕ) are calculated according to the following equations (Malik and Saini, 2016):

Equivalent diameter:

$$De = (LWT)^{\frac{1}{3}} \quad (1)$$

Surface area (McCabe *et al.* 1986):

$$S = \pi De^2 \quad (2)$$

Seed volume (Özarslan, 2002):

$$V = \frac{1}{3}\pi De^3 \quad (3)$$

Sphericity (Mohsenin, 1970):

$$\phi = \frac{De}{L} \quad (4)$$

Results and Discussion

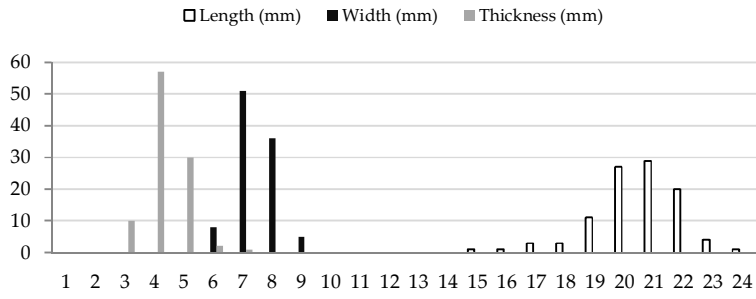
The values of the length, width and thickness of the seeds of the tested hybrids are shown in Table 1. The seeds of hybrid NS-H-6792 are the longest of the tested hybrids, with the average value of 20.68 ± 1.29 mm, while the shortest seeds are of hybrid NS-H-6489 with an average length of 14.79 ± 0.43 mm. The seeds of this hybrid have the highest value of the width, which is on average 7.99 ± 1.07 mm, while the smallest average width of the seed is measured in the sample NS-H-6792 and is 7.01 ± 0.62 mm. The seed of this hybrid is the thinner with an average thickness of 3.91 ± 0.60 mm, while the NS-H-6489 hybrid seeds have the largest measured average thickness of 4.39 ± 1.00 mm. The NS-H-6311 hybrid seeds have dimensions between these values. Measured dimensions of the seeds of hybrid Cepko are the smallest compared to the latest hybrids and amounts: length 10.65 ± 0.47 mm, width 5.79 ± 0.81 mm and thickness 3.33 ± 0.87 mm.

Table 1. Dimensions of the sunflower seeds of different hybrids

Hybrid	Length (L) (mm)	Width (W) (mm)	Thickness (T) (mm)
NS-H-6792	20.68 ± 1.29	7.01 ± 0.62	3.91 ± 0.60
NS-H-6489	14.79 ± 0.43	7.99 ± 1.07	4.39 ± 1.00
NS-H-6311	16.15 ± 0.83	7.24 ± 0.23	4.24 ± 0.35
Cepko	10.65 ± 0.47	5.79 ± 0.81	3.33 ± 0.87

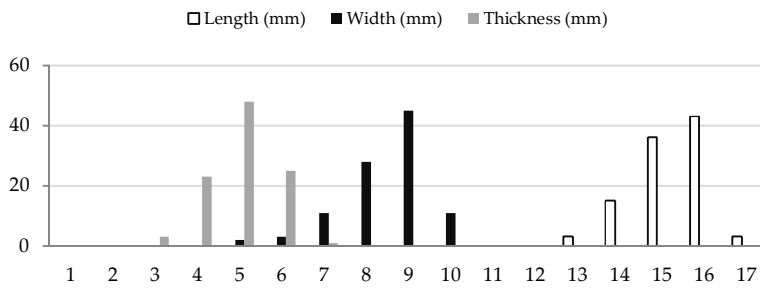
If we observe the distribution of the seed dimensions shown in Figures 1. (a), (b) and 1 (c), it can be seen that the most frequent distribution of the length is in the interval from 15 to 15,99 mm and amounts to 24.33%. 44.33% of the seeds width of all hybrids is in the interval of 7.00 to 7.99 mm, while the most frequent interval of seed thickness is 4.00 to 4.99 mm and amounts to 46.67%. The seeds of hybrid Cepko are significantly different. The most frequent interval of seeds length is in the range of 10.00 to 10.99 mm and amounts to 57%. 45% of the seeds width is between 5.00 and 5,99 mm, while 45% of the measured seeds thickness is in the range of 3.00 to 3.99 mm (Figure 1. (d)).

NS-H-6792



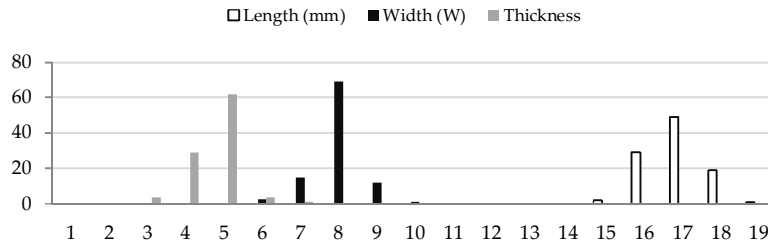
(a)

NS-H-6489



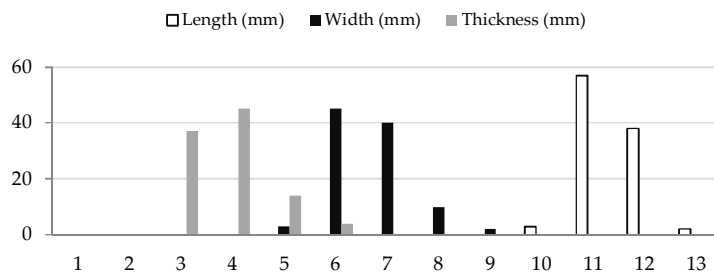
(b)

NS-H-6311



(c)

Cepko



(d)

Figure 1. Distribution of the dimensions of the seeds of hybrids: (a) NS-H-6792; (b) NS-H-6489; (c) NS-H-6311 and (d) Cepko

The calculated values of the equivalent diameter, surface area, volume and sphericity of the seed are shown in Table 2. The highest value of equivalent diameter, surface area and volume is determined in the NS-H-6792 hybrid seeds, while the lowest values of these parameters are determined in the NS-H-6311 hybrid seeds. The highest sphericity value is calculated for NS-H-6489 hybrid seeds, while the smallest is for NS-H-6792 hybrid seeds. In the seeds of hybrid Cepko, the calculated sphericity value is the highest, while the other values of the parameters are lower than the other examined hybrids.

Table 2. Equivalent diameter, Surface area, Seed volume and Sphericity of the seeds of the tested hybrids

Hybrid	Equivalent diameter D_e (mm)	Surface area S (mm^2)	Seed volume V (mm^3)	Sphericity θ (mm^3)
NS-H-6792	8.25±0.60	214.63±31.80	298.15±67.00	0.40±0.02
NS-H-6489	8.00±0.93	203.51±48.70	278.77±102.43	0.54±0.06
NS-H-6311	7.90±0.30	196.27±14.70	259.16±29.17	0.49±0.02
Cepko	5.86±0.77	109.76±29.41	111.01±45.39	0.55±0.06

Differences between seeds of examined hybrids can be clearly seen in Figure 2.



Figure 2. Seeds of hybrids: (a) NS-H-6792; (b) NS-H-6489; (c) NS-H-6311; (d) Cepko

Conclusions

Based on the measured and calculated values, it can be concluded that the highest variability of the seeds of the tested hybrids in the length of the seed of the latest NS hybrids is in the interval from 12.00 to 23.99 mm, while the hybrid Cepko length of the seeds is in the interval from 9.00 to 12.99 mm. The width and thickness of the seeds of all examined hybrids are in narrow intervals, ranging from 4.00 to 9.99 mm (width) and a thickness is in interval from 2.00 to 6.99 mm. The NS-H-6792 hybrid seeds are the longest with the lowest width and thickness of seeds, so the sphericity of these seeds is the lowest $0.40 \pm 0.02 \text{ mm}^3$, while NS-H-6489 hybrid seeds are the shortest with the highest values of width and thickness of the seeds, and the sphericity of these seeds compared with other examined hybrids is the largest and amounts $0.54 \pm 0.06 \text{ mm}^3$. Between seeds of the latest NS hybrids and hybrid Cepko, a significant difference in dimensions is observed. The dimensions of the hybrid Cepko seeds are smaller than the latest NS hybrids, while the sphericity of this seed is the largest and amounts $0.55 \pm 0.06 \text{ mm}^3$.

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

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