**Biblid**: 1821-4487 (2012) 16; 1; p. 41-43
**UDK**: 581.48:582.736.3

Original Scientific Paper
Originalni naučni rad

# SEED QUALITY OF NEW SOYBEAN VARIETIES PRODUCED IN SOUTH BAČKA IN 2011 YEAR
# KVALITET SEMENA NOVIH SORTI SOJE PROIZVEDENIH U JUŽNOJ BAČKOJ U 2011. GODINI

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## ABSTRACT

*Newly developed soybean varieties differ from each other in morphological characteristics, requirements for growing conditions and technological quality of seed. The mentioned differences affect quality of seed and its viability. The aim of this paper was to determine seed quality of new soybean varieties differing in protein and oil content, and in maturity groups. Testing of seed quality was carried out on new soybean varieties developed in the Institute of field and vegetable crops in Novi Sad (NS Zenit, NS Virtus, Galina, Valjevka, Diva, NS Maximus, Sava, Balkan, Idila, Rubin, Trijumf and Vojvođanka) in the Laboratory of agricultural expert service in Novi Sad. The following seed quality traits were determined: seed moisture content, bulk density and germination of seed. Seed moisture content determined immediately after harvest ranged from 8.5% to 12.5%, and hectoliter weight from 65.5 kg/hl to 71.3 kg/hl. Statistically significant differences were found among studied varieties. The lowest values of germination were obtained in Sava (78%) and Vojvođanka (79%), and the highest in Rubin (96%) variety, while the seed germination determined by applied cold test was slightly lower.*

***Key words**: soybean, seed germination, seed vigour.*

## REZIME

*Novostvorene sorte soje međusobno se razlikuju po morfološkim karakteristikama, zahtevima prema uslovima gajenja i tehnološkom kvalitetu zrna. Navedene razlike utiču na kvalitet semena i njegovu životnu sposobnost. Cilj rada je bio da se utvrdi kvalitet semena novih sorti soje koje se razlikuju u sadržaju proteina i ulja, kao i grupama zrenja. Ispitivanja semenskog kvaliteta izvršeno je na novim sortama soje stvorenim u Institutu za ratarstvo i povrtarstvo, Novi Sad (NS Zenit, NS Virtus, Galina, Valjevka, Diva, NS Maximus, Sava, Balkan, Idila, Rubin, Trijumf i Vojvođanka) u Laboratoriji poljoprivredne stručne službe u Novom Sadu. Od semenskih kvaliteta utvrđen je sadržaj vlage u semenu, nasipna masa i klijavost semena. Sadržaj vlage u semenu, neposredno posle žetve, se kretao od 8,5% do 12,5%, a hektolitarsta masa 65,5 kg/hl do71,3 kg/hl. Između ispitivanih sorata javile su se statistički značajne razlike i statistički najniže vrednosti klijavosti dobijene su kod sorata Sava (78%) i Vojvođanka (79%), a najviše vrednosti kod sorte Rubin (96%), dok je klijavost semena dobijena primenom hladnog testa bila nešto manja.*

***Ključne reči**: soja, klijavost semena, vigor semena.*

## INTRODUCTION

Soybean (*Glicine* max. L. Merr.) is considered as an important plant species both for human and animal consumption. Wide range of products obtained from soybean seed originates from the presence of protein (aprox. 40%), and oil (approx. 20%) in seed. Due to that fact, in breeding programs the great attention is paid to development of new varieties with altered seed chemical composition. In varieties developed at the Institute of field and vegetable crops in Novi Sad the protein content ranges from 32 to 49%, and oil content from 15 to 25% (*Đorđević et al., 2012*). Percentage of protein and oil in seed depends on genotypes and environmental conditions. Changes in seed chemical compositions may affect its quality. Determination of connections between seed longevity and total seed composition (proteins, lipids, starch) show that the seed rich in lipids has shortened life cycle (*Lekić, 2003 to Pristley, 1986*). Determination of seed viability, i.e. seed vigour determines the seed longevity with no adverse effects (*ISTA, 2011*). Surfaces under soybean in Serbia during the last several years vary between 140.000 ha and 150.000 ha (*Vidić et al., 2010-a*), and enough seed of good quality should be provided for these surfaces. The aim of this paper was to determine seed quality of new soybean varieties differing in protein and oil content, and in maturity groups.

## MATERIAL AND METHOD

Seed used in this study was produced in the locality of Vajska in South Bačka district in 2011. year. Twelve genotypes of soybean belonging to different maturity groups: from maturity group 0 – Valjevka, Galina, NS – Zenit and NS - Virtus; maturity group I - Balkan, Sava, Diva, NS – Maximus, and group II - Vojvođanka, Rubin, Trijumf and Idila. Seed moisture content, bulk density and seed germination were determined in the laboratory of ``Agriculture station``. Seed moisture content (%) was determined acording to the Rule on quality of seed of agricultural plants (Official gazette 47/87). Grinded sample is dried for 17 ±1h at 103±2$^{o}$C. Testing is done in four replications. Soybean seed bulk density (kg/m$^{3}$) was determined by direct reading on Granomat, tip 1,0, produced by Pfeuffer, Germany. Seed germination was determined by application of Standard laboratory method and Cold test. The Standard laboratory test was applied to 4 x 100 seeds. Seed germinated between filter papers. After eight days of incubation at 25$^{o}$C the seed germination was determined (Rule on quality of seed of agricultural plants (Official gazette 47/87). Cold test was applied on 4 x 50 seeds. Mixture of soil and sand (2:1) was used as a medium. The seed was first submitted to temp. of 10$^{o}$C for seven days, and then to 20$^{o}$C for

six days (*Hampton and TeKrony, 1995*). After that period the seed germination was determined.

Obtained results were analyzed using one-dimensional analysis of variance according to the statistical package MSTAT, and were presented graphically.

## RESULTS AND DISCUSSION

Seed moisture content of both varieties tested ranged from 8.5% (Trijumf) to 12.5% (Idila) (Fig. 1). Moisture content of the varieties from maturity group 0 ranged from 10.7 to 11.4%. Moisture content of the varieties from maturity group I ranged from 9.1 to 11.4%, and differences among varieties from maturity group II were the highest and ranged from 8.5 – 12.5%. Varieties Trijumf (8.5% ), Diva (9.1%) and Vojvođanka (9.4%) had moisture content below 10%. Harvest of soybean with low moisture content is not desirable because the seed is very sensitive to mechanical damage, as the vital parts of the seed are found beneath a thin seed coat, which provides no sufficient protection. Mechanical damages occurring during harvest and handling are considered the major problem in soybean seed production (*Carvalho and Nakagawa, 2000*). From the other hand, high moisture content above 14% is also considered undesirable because the seed must be dried artificially, which makes production more expensive, and the seed with higher moisture content is susceptible to phyto-pathogenic fungi attack, which may have negative impact on seed quality.

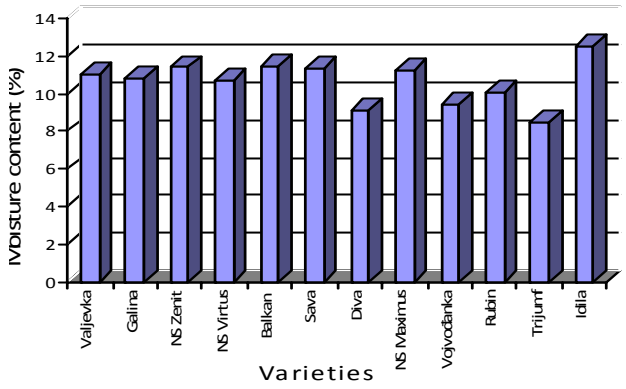


*Fig. 1. Moisture content of tested soybean varieties*

Bulk density (hectoliter mass) of soybean in tested samples ranged from 65.43 kg/hl (NS – Zenit) to 71.25 kg/hl (Rubin) (*Fig. 2*).

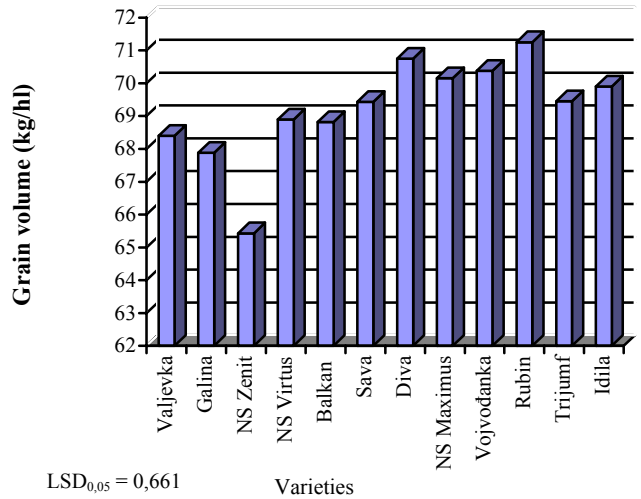


*Fig. 2. Grain volume weight of tested soybean varieties*

Soybean varieties from 0 maturity group (Valjevka, Galina, NS – Zenit and NS – Virtus) have statistically significantly lower values in comparison to varieties from II maturity group (Vojvođanka, Rubin, Trijumf and Idila).

Bulk density in agricultural practice for grain products is also known as mass or weight per hectoliter, which is wrong, because it does not refer to weight, and is expressed as weight of grain by volume. This physical property of seed is also called the bulk density (*Babić and Babić, 2000*).

Seed germination obtained by application of the Standard laboratory test was above 75% in tested varieties, which is considered as the minimum prescribed values for seed in order to be placed on the market (Official gazette 47/87). In tested varieties germination ranged from 79% (Vojvođanka) to 96% (Rubin) (Fig. 3). Variety Rubin had statistically significantly the highest value of the tested parameter. *Vidić et al*., (*2010b*) pointed out that Rubin had a desirable chemical seed composition, with well balanced protein and oil content, while *Đorđević et al*. (*2012*) classified it as having the highest protein content within the II maturity group (up to 41% of protein). Varieties NS – Zenit, NS – Maximus and Trijumf fall into group of high oily genotypes with oil content above 22% (*Đorđević et al., 2012*). In the above mentioned soybean genotypes germination ranged from 81% to 86% as in most other genotypes, revealing that increased oil content had no effect on seed germination.

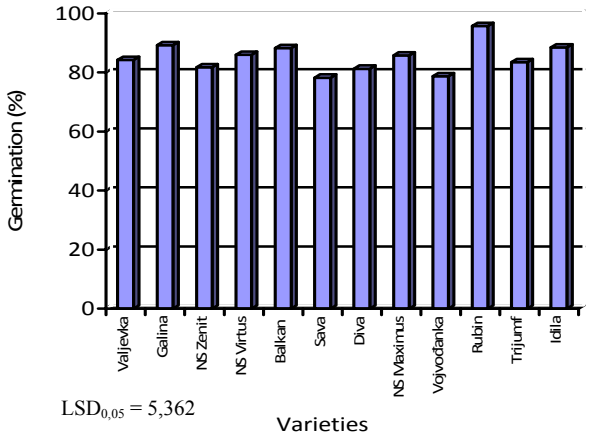


*Fig. 3. Seed germination of tested soybean varieties obtained by applied Standard laboratory test*

Seed germination obtained by application of Cold test ranged from 48 % (NS – Zenit) to 87% (Rubin) and was lower than the values obtained by application of Standard laboratory test (*Fig. 3*). Tested parameter in this test was not dependent on seed chemical composition. Statistically significantly the lowest values were obtained in varieties NS- Zenit (48% - oily genotype), Diva (52% - standard genotype) and Vojvođanka (54% - standard genotype), and statistically significantly the highest values were obtained in varieties Galina (82% - standard genotype), Balkan (86% - standard genotype), NS – Maximus (81% - standard genotype) and Rubin (87% - standard genotype).

Cold test proved to be reliable in estimation of viability of fresh seed and it showed positive correlation with field emergence (*Trawatha et al., 1995*). It was developed in North America for estimation of physiological potential of maize seed, by simulating unfavorable soil condition such as low temperature and presence of pathogens in the soil. Cold test can also be used for estimation of the efficacy of herbicide use, selection of variety and seed lot suitable for early sowing; estimation of physiological damages caused by prolonged storage under unfavorable

condition; damages caused by frost and drought; measurements of effects of mechanical damages on germination in cold and wet soils (*AOSA, 2002*).

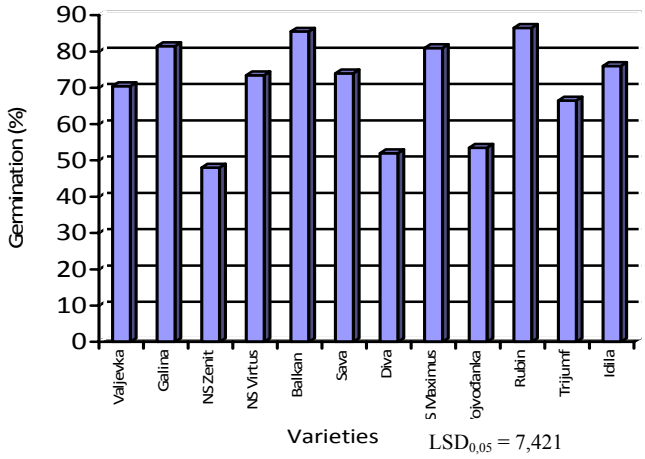


*Fig. 4. Seed germination of tested soybean varieties obtained by application of Cold test*

## CONCLUSION

Based on the obtained results the following conclusions can be made:

- Moisture content of seed produced in 2011 in the locality of Vajska ranged from 8.5% to 12.5%.

- Bulk density of soybean seed was statistically significantly lower in genotypes from 0 maturity group in comparison to genotypes from II maturity group.

- Seed germination of tested varieties was above the prescribed minimum and ranged from 79% to 96%. Seed germination depended neither on maturity group.

- Seed germination obtained by applied Cold test was lower than the values obtained by application of Standard laboratory test and it ranged from 48% to 87%.

*AKNOWLEDGEMENT: Research done on this issue was partly financed by the Ministry of science of Republic of Serbia through the project titled: An interdisciplinary approach to the creation of new soybean varieties and improve cropping and seed processing, No. TR 31022.*

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Received:01.03.2012. Accepted:28.03.2012