UDC: 631.445. 631.67
Original scientific paper

EFFECTS OF A GENOTYPE x SOWING DENSITY INTERACTION ON MAIZE YIELDING ON IRRIGATED CHERNOZEM

Branka KRESOVIĆ , Vesna DRAGIĆEVIĆ, Milena SIMIĆ, Živorad VIDENOVIĆ, Igor SPASOJEVIĆ, Milan BRANKOV

Maize Research Institute, Zemun Polje, Slobodana Bajića 1, 11185 Belgrade
[1]Scholar of the Ministry of Science and Technological Development of the Republic of Serbia

Kresović Branka, Vesna Dragićević, Milena Simić, Živorad Videnović, Igor Spasojević, Milan Brankov (2011): *Effects of a genotype x sowing density interaction on maize yielding on irrigated chernozem*. Zemljište i biljka, Vol. 60, No.3, 137-146, Belgrade

The aim of these studies was to determine the number of plants per hectare that would provide the maximum utilisation of the genetic yielding potential of maize hybrids belonging to different FAO maturity groups and would also contribute to a rational use of seeds. The two-factorial trial was performed on irrigated chernozem in the period 2006-2008, according to the split-plot method with four replicates. Hybrids ZP 578 (FAO 500) and ZP 735 (FAO 700) observed in the combination with seven sowing densities (G_1 – 40,816 plants ha^{-1}, G_2 – 50,125 plants ha^{-1}, G_3 – 59,524 plants ha^{-1}, G_4 – 69,686 plants ha^{-1}, G_5 – 79,365 plants ha^{-1}, G_6 – 86,286 plants ha^{-1} and G_7 – 98,522 plants ha^{-1}). Gained results show that statistically very significant differences in maize grain yields were obtained between the studied hybrids and the sowing densities. The lowest yields were recorded for all studied hybrids at the lowest sowing density (40,861 plants ha^{-1}). The yield projection shows that the maximum grain yield of the hybrid ZP 578, i.e. hybrid ZP 735 can be expected at the level of 13.53 t ha^{-1}, i.e. 12.86 t ha^{-1} at the sowing density of 84,000 plants ha^{-1}, i.e. 72,000 ZP plants ha^{-1}, respectively. In accordance

Corresponding author: e-mail: bkresovic@mrizp.rs

with the rational use of seeds, high yields are obtained by sowing that provides 60,000 plants of ZP 578 ha^{-1} and 50,000 plants of ZP 735 ha^{-1}.

*Key words***:** densities, grain yield, maize, chernozem, irrigation

INTRODUCTION

Unstable yields with varying seed quality are obtained under rainfed conditions. This fact which is a result of unfulfilled plant requirements during a growing season. Numerous studies suggest that the lack of soil moisture over certain pheno-stages of maize development is a cause of an insufficient utilisation of genetic yielding potential (GROZA e*t al.*, 1991; DRAGOVIĆ e*t al.*, 2001; DAGDELEN e*t al.*, 2006; DI MARCO e*t al.*, 2007; KARA and BIBER, 2008). Irrigation is an efficient measure that provide soil moisture sufficient to supply crops with necessary water amount, and therefore undisturbed uptake of soil nutrients (VASIĆ e*t al.*, 1997; MILIVOJEVIĆ e*t al.*, 1997; BOŠNJAK, 2001; KRESOVIĆ, 2003). Under conditions of obvious climatic changes, which will be a greatest problem in the production of all crops, irrigation with a today's status of the additional land improvement measure, will be replaced with the status of a regular measure.

When cost-effectiveness is an imperative in the crop production, then it is necessary to have access to scientific information about results of effects of key factors that will in any way contribute to a greater production with lower investments. High investments and costs of irrigation system exploitation exclude the possibility of a yield reduction, and therefore the consistency of all measure in cropping practices is very important. Considering that sowing is a measure with a crucial role in achievement of high yielding, densities, as a factor that dictates a size of a growing space and therefore affects plant growing and development, were the objective in this study.

Previous studies indicate that a genotype, soil conditions and water supply during the growing period are of a special importance for the adequate choice of a sowing density and refer to certain general rules. According to the literature, a greater sowing density corresponds to hybrids of a shorter growing season, due to a smaller habitat, then to maize growing on fertile solids, as well as, to growing under conditions of sufficient maize moisture (NEDIĆ, 1986; FARNHAM, 2001; ŽIVANOVIĆ e*t al.*, 2006; NENADIĆ e*t al.*, 2007). However, maize hybrids of more recent generations do not respond identically to the increase of the sowing density. Therefore, considering a rational use of seeds, the determination of the optimum sowing density of each maize hybrid for certain climatic-soil conditions is the only reliable solution of this problem. LIEBMAN e*t al.* (2001) stated that the optimum crop density was a density at which a further increase of seed price would not economically justify the expected yield increase.

The aim of these studies was to determine the effect of genotype x sowing density interaction on yielding of maize grown on irrigated chernozem, in order to determine the optimum number of plants that would provide the maximum utilisation of the genetic yielding potential. The importance of studies is in the fact that obtained results are concrete solutions to high yields with a smaller participation of sowing in the structure of production costs under agroecological conditions of southeastern Srem. Moreover, results are a theoretical contribution to the improvement of the technological process of maize growing under irrigation conditions, but at the same time, these results also arise questions related to further studies directed to the determination of the adequate irrigation regime from the aspect of high yields, rationalisation of irrigation water and preservation of chernozem fertility.

MATERIALS AND METHODS

The trials were carried out on calcareous silty loam chernozem, formed on loess (Zemun loess terrace), in the 2006-2008 period. The soil bulk density, density of soil and total porosity over the depth of soil profile (0-100 cm), which had relatively favourable water and air properties, ranged from 1.17 to 1.41 g cm^{-3}, 2.35 to 2.60 g cm^{-3} and from 54.65 to 46.15%, respectively. The chemical reaction (pH), according to Thun's classification (DŽAMIĆ e*t al.*, 1996), was medium alkaline and the values insignificantly increased with the depth (Table 1).

Based on data for the $CaCO_3$ content, the surface layer (0–20 cm) of the humus horizon was slightly calcareous, then the subsurface layer (20–40 cm) was moderately calcareous, while deeper layers (40–100 cm) of the soil profiles were considerably calcareous, PELIŠEK (1964). The humus content of approximately 3% at the depth of 0-40 cm, classified this soil into moderate humus soils, while low values in deep layers indicated that this soil also belonged to slightly humus soils (classification by Gračanin). The soil was well supplied with the total nitrogen at the depth of 0-40 cm (according to Wohltman), as well as, accessible phosphorus and potassium. The greater soil depth was the lesser nutrients were in the soil.

The two-factorial trial was set up according to the split-plot method with four replicates and the elementary plot size of 19.6 m^2. Two maize hybrids ZP 578 (FAO 500) and ZP 735 (FAO 700) were observed at seven sowing densities (G_1 – 40,816 plants ha^{-1}, G_2 – 50,125 plants ha^{-1}, G_3 – 59,524 plants ha^{-1}, G_4 – 69,686 plants ha^{-1}, G_5 – 79,365 plants ha^{-1}, G_6 – 86,286 plants ha^{-1} and G_7 – 98,522 plants ha^{-1}).

Standard cropping practices were applied at optimal dates. Wheat was a preceding crop. Mineral fertilisers were applied at the rate of 150 kg N ha^{-1}, 60 kg P_2O_5 ha^{-1} and 60 kg K_2O ha^{-1}. A pre-watering soil moisture amounted to approximately 70-75% of the filed water capacity (0.3 FWC). The soil moisture content was determined by the thermogravimetric method.

The lowest mean air temperature (18.7°C) and the highest precipitation sum (438 mm) during the maize growing period were recorded in 2006 (RHMZ). Irrigation was not applied in 2006 because the sum and the distribution of precipitation were sufficient to maintain soil moisture above the predicted level. The same period during the succeeding year, 2007, was warmer (20.0°C), with a significantly smaller precipitation sum (275 mm) and therefore the plot was irrigated with the watering amount of 90 mm, which was implemented through two watering cycles (third decade of July and the first decade of August). In 2008, the mean air temperature amounted to 19.3°C, the precipitation sum during the maize growing period was the lowest (247 mm), hence the watering amount of 140 mm was applied (three watering cycles: the third decade of June, the second decade of July and the first decade of August).

The results of maize grain yield (14% moisture) were statistically processed by the analysis of variance with the application of the LSD test. The dependence of yields on sowing densities and the defined plant stand for maximal values of yields was estimated by the regression analysis.

RESULTS AND DISCUSSION

Gained results indicate that the sowing density and environmental conditions very significantly affected the grain yield in observed maize hybrids.

Table 1. - Chemical properties of soil in the experimental field

Depth	$CaCO_3$	pH		Humus	Nitrogen	Easy available P_2O_5	Easy available K_2O
(cm)	(%)	H_2O	NKcl	(%)	(%)	(mg/100g)	
00-20	4.3	7.73	7.39	2.99	0.230	35.0	25.0
20-40	5.6	7.77	7.47	2.92	0.205	33.0	20.0
40-60	22.7	7.92	7.71	1.57	0.147	9.0	8.0
60-80	24.6	8.03	7.70	1.26	0.118	8.0	7.0
80-100	26.1	8.02	7.82	0.78	0.075	4.0	6.0

Very statistically significant differences in grain yields (Table 2) under effects of different sowing densities were obtained in the maize hybrid ZP 578 (F - 13.2067, $P < 0.01$, C_v – 7.61 %); also significant differences in grain yield were obtained under effects of conditions during the growing period of 2006, 2007 and 2008 (F - 5.0669, $0.01 < P < 0.05$, C_v – 7.61%). However, their interacting did not affect the differences in this hybrid (F-1.2028, $P > 0.05$, C_v–7.61%).

The density factor resulted in higher yields without a significant mutual difference in densities of and above 60,000 plants ha^{-1}, and the highest average value (13.46 t ha^{-1}) was achieved at the sowing density of 100,000 plants ha^{-1}. Sowing density of 50,000 and 40,000 plants ha^{-1} resulted in very significantly lower average yields (11.99 and 10.68 t ha^{-1}, respectively). Significant differences in grain yields of the hybrid ZP 578 attained over years of investigation point out to the best results gained in 2008 (13.72 t ha^{-1}), without a significant difference in relation to 2006 (12.64 t ha^{-1}) and with a significant difference in relation to the average yield gained in 2007 (11.75 t ha^{-1}). There were no statistically significant differences in 2006 and 2007 yields.

Table 2. – Average yields of the hybrid ZP 578 obtained under irrigation conditions and at different sowing densities (t ha^{-1})

Density	2006	2007	2008	Average
G1	10.58	10.13	11.33	10.68
G2	12.12	11.10	12.76	11.99
G3	12.33	13.30	13.89	13.17
G4	13.17	12.05	14.44	13.22
G5	13.55	11.81	14.48	13.28
G6	13.27	11.58	14.68	13.18
G7	13.48	12.29	14.53	13.43
Mean	12.64	11.75	13.73	12.71

Analysis of variance - Yields of ZP 578

Source of variation (Cv-7.61)	F value	Prob.	0.05	0.01
Years	5.0669	0.0336 *	1.402	2.014
Densities	13.2067	0.0000**	0.7919	1.055
Years x Densities	1.2028	0.3053ns	-	-

The sowing density (F-5.9169, $P < 0.01$, C_v – 8.14%), environmental conditions (F-37.3502, $P < 0.01$, C_v – 8.14%) and their interaction (F-2.6829, $P < 0.01$, C_v – 8.14%) very significantly affected the yield formation of the hybrid ZP 735 (Table 3).

The highest average grain yield (13.17 t ha^{-1}) was achieved at the sowing density of 70,000 plants ha^{-1}, but without a statistically significant difference in relation to yields obtained in variants with 80,000 and 60,000 plants ha^{-1} (12.65 and 12.44 t ha^{-1}, respectively). Similar to the hybrid ZP 578 the highest yields were obtained in 2008 (13.41 t ha^{-1}), without a significant difference in relation to 2006 (12.91 t ha^{-1}), and with a significant difference in relation to the average yield obtained in 2007 (10.20 t ha^{-1}). The year x density interaction shows that the highest yields were obtained at densities of 90,000 plants ha^{-1} (14.61 t ha^{-1}), 80,000 plants ha^{-1} (14.56 t ha^{-1}) in 2008 and at the density of 70,000 plants ha^{-1} (14,57 t ha^{-1}) in 2006.

Table 3 – Average yields of the hybrid ZP 735 obtained under irrigation conditions and at different sowing densities (t ha^{-1})

Density	2006	2007	2008	Average
G1	11,49	9,95	11,60	11,01
G2	13,33	10,62	12,72	12,22
G3	13,30	11,10	12,93	12,44
G4	14,57	10,81	14,12	13,17
G5	12,78	10,61	14,56	12,65
G6	12,31	8,98	14,61	11,96
G7	12,57	9,26	13,25	11,69
Mean	12,91	10,19	13,40	12,16

Analysis of variance - Yields of ZP 735

Source of variation (Cv-7.61)	F value	Prob.	0.05	0.01
Years	37.3502	0.0000**	0.9043	1.299
Densities	5.9169	0.0001**	0.8107	1.080
Years x Densities	2.6829	0.0066**	1.404	1.870

Significant varying of yields of maize hybrids observed over years of investigation was a result of impacts of meteorological conditions during the growing season. As already stated, 2008 was the most favourable year for maize growth and the irrigation was not applied. Namely, the air temperature regime and the precipitation distribution were in compliance with maize plants requirements in certain stage of their growth and development, and therefore the genetic yielding potential of hybrids was mostly utilised during that year. Favourable conditions for maize growth were provided in 2006 by irrigation and obtained yields were similar to yields achieved under rainfed conditions in 2008. Maize, depending on hybrid properties and soil types, yields up to 15 t ha^{-1} under conditions of our country when high-tech cropping practices are applied and when soil moisture is optimal (DRAGOVIĆ e*t al.*, 2006*;* GLAMOČLIJA*,* 2006; VIDENOVIĆ e*t al.*, 2007).

Irrigation in 2007, could not prevent a significant yield reduction, due to extremely high daily air temperatures in the second half of July and at the beginning of August (above 30°C), during the stage of maize flowering. Due to an earlier flowering stage in maize hybrids of a shorter growing season a yield reduction is smaller than in maize hybrids of a longer growing season. In relation to 2008, the average yields of hybrids ZP 578 and ZP 735 were reduced by about 14.4% and almost by 24%, respectively. A high percentage of the yield reduction in the hybrid ZP 735 due to effects of environmental factors points out to lesser resistance to arid conditions in relation to the hybrid ZP 578 and at the same time to the fact that it jeopardised adaptability of applied irrigation regime to requirements of maize of a longer growing season.

The three-year results indicate that the functional dependence of the sowing density and the yield is parabolic (Figure 1). The increase in a plant number per hectare will, to some extent, result in the increase of maize grain yields and then it will decrease. The maximal grain yield of the hybrid ZP 578 under conditions of irrigated chernozem can be expected at the level of 13.53 t ha^{-1} at the sowing density of 84,000 plants ha^{-1}. The corresponding values of the grain yield of the hybrid ZP 735 was 12.86 t ha^{-1} at the sowing density of 72,000 plants ha^{-1}. Previous studies carried out in the same locations, showed that ZP hybrids of different FAO maturity groups had a same tendency of dependence of yields and sowing densities (VIDENOVIĆ e*t al.*, 2003; KRESOVIĆ e*t al.*, 2004, SIMIĆ and STEFANOVIĆ, 2007).

Results also show that high yields of observed maize hybrids were achieved within a broad interval of a necessary number of plants per hectare. High yields of the hybrid ZP 578, without statistically significant mutual differences, were achieved with sowing densities ranging from 60,000 to 100,000 plants ha^{-1}. On the other hand, the highest yields of the hybrid ZP 735 were obtained at densities varying from 50,000 to 80,000 plants ha^{-1}. Considering rationalisation of the sowing process, the studies indicate that 50,000 plants of the hybrid ZP 735 per hectare and 60,000 plants of the hybrid ZP 578 per hectare of irrigated chernozem provide conditions for the maximal utilisation of the genetic yielding potential.

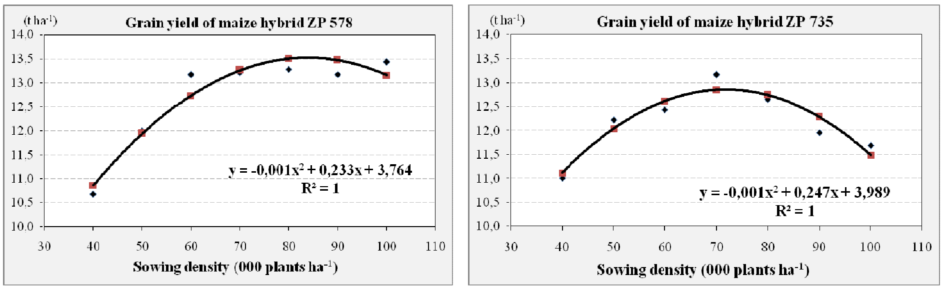

Figure 1 - Dependence of the yield (y) of maize hybrids ZP 578 and ZP 735 on the sowing density (x)

In relation to hybrids of same FAO maturity groups (ZP 580 and ZP 704), observed previously in the same irrigated location (KRESOVIĆ e*t al.*, 2004), hybrids ZP 578 and ZP 735 can be grown with a smaller plant stand per area unit, smaller even by 20,000 plants ha^{-1}. One should bear in mind that the maize yield is conditioned by soil moisture, hence it is very important to apply an adequate irrigation regime *(*VASIĆ e*t al.*, 1995; PEJIĆ, e*t al.*, 2007; PAOLO and RINALDI, 2008). In such a way, questions related to further studies of maize hybrids of different FAO maturity groups directed to the determination of the most adequate irrigation regime from the aspect of high yields, rationalisation of irrigation water and preservation of chernozem fertility were arisen.

CONCLUSION

Obtained results indicate that the sowing density and environmental conditions very significantly affected the formation of the grain yield of the observed maize hybrids.

The density factor in the hybrid ZP 578 (FAO 500) resulted into high yields (13.17- 13.43 t ha^{-1}), without a significant mutual difference in densities even over 60,000 plants ha^{-1}, while sowing with 50,000 and 40,000 plants ha^{-1} resulted in very significantly lower average yields (11.99 t ha^{-1} and 10.68 t ha^{-1}, respectively). The highest grain yield (12.22-13.17 t ha^{-1}) was achieved in the hybrid ZP 735 (FAO 700) at sowing densities ranging from 50,000 to 80.000 plants ha^{-1} and in relation to remaining variants, obtained differences were statistically very significant.

The regression analysis shows that the functional dependence of the sowing density and the yield was parabolic and that the maximal grain yield of the hybrid ZP 578, i.e. ZP 735 under irrigation of chernozem can be expected at the level of 13.53, i.e. 12.86 t ha^{-1} at the sowing density of 84,000, i.e. 72,000 plants ha^{-1}, respectively.

Extremely arid 2008 affected the yield reduction in both hybrids. In relation to 2007, the grain yield of the hybrid ZP 578 was reduced by approximately 14.4%, and almost by 24% of the hybrid ZP 735. A high percentage of the yield reduction of the hybrid ZP 735, due to environmental factors, points out to lower resistance to arid conditions in relation to the hybrid ZP 578, but at the same time to the fact that it jeopardised adaptability of the applied irrigation regime to requirements of maize hybrids of a longer growing season.

REFERENCES

BOŠNJAK, Đ. (2001): Rainfall regimen, its relationship with yield, and needs for irrigation and drainage in the Vojvodina province. Acta biologica Iugoslavica - serija A: Zemljište i biljka, 50 (1), 73-76.

DAGDELEN, N., YILMAZ, E., SEZGIN, F., GURBUZ, T. (2006): Water-yield relation and water use efficiency of cotton (*Gossypium hirsutum* L.) and second crop corn (*Zea mays* L.) in western Turkey. Agric. Water Manage, 82 (1-2), 63-85.

DI MARCO, O.N., AELLO, M.S., CHICATÚN, A. (2007): Effect of irrigation on corn plant dry matter yield, morphological components and ruminal degradibility of leaves and stems. Journal of animal and veterinary advances, 6 (1), 8-11.

DRAGOVIĆ, S. (2001): Potrebe i efekti navodnjavanja na povećanje i stabilizaciju prinosa u poljoprivrednim područjima Srbije. Zbornik radova Instituta za ratarstvo i povrtarstvo, Novi Sad, 35, 445-456.

DRAGOVIĆ, S., MAKSIMOVIĆ, L., RADOJEVIĆ, V., CICMIL, M. (2006): Navodnjavanje u biljnoj proizvodnji. Partenon, Beograd.

DŽAMIĆ, R., STEVANOVIĆ D., JAKOVLJEVIĆ M. (1996): Praktikum agrohemije. Nauka, Poljoprivredni fakultet, Beograd.

FARNHAM, D. E. (2001): Row spacing, plant density and hybrid effects on corn grain yield and moisture. Agron. J., 93, 1049-1053.

GLAMOČLIJA, Đ. (2006): Specijalno ratarstvo. Poljoprivredni fakultet, Beograd.

GROZA, N., PETRESCU, E., IONESAU, S. (1991): Implication of irrigation for same crops in the irrigated chernozem area of Oltenia. Caracal. Romania, 13 (3-4), 113-127.

KARA, T., BIBER, C. (2008): Irrigation frequencies and corn (Zea mazs L.) yield relation in northern Turkey. Pakistan Journal of biological sciences, 11 (1), 123–126.

PEJIĆ, B., MAKSIMOVIĆ, L., MILIĆ, S. (2007): Effect of irrigation on yield of corn hybrids from diferent maturity groups. Acta biologica Iugoslavica - serija A: Zemljište i biljka, 56 (2), 59-66.

KRESOVIĆ, B. (2003): Uticaj navodnjavanja i sistema obrade zemljišta na proizvodnju kukuruza. Doktorska disertacija, Poljoprivredni fakultet, Zemun, Univerzitet u Beogradu.

KRESOVIĆ, B., Ž. VIDENOVIĆ, M. TOLIMIR (2004): Genotype and enviromental interaction effect on heterosis expression in maize. Genetics, 36 (2), 171-180.

LIEBMAN, M., C. L. MOHLER, C.P. STAVER (2001): Enhancing the competitive ability of crops. Ecological management of agricultural weeds, Cambridge University press, 269-321.

MILIVOJEVIĆ, M., VASIĆ, G., KRESOVIĆ, B., DRINIĆ, G., TOLIMIR, M. (1997): Effects of drought and irrigation on the yield of maize hybrid components. Proceedings 2, Drought and Plant Production, Agricultural Research Institute "Serbia", Belgrade, 227-232.

NEDIĆ, M. (1986): Setva kukuruza. Agrotehnika kukuruza, Sarajevo.

NENADIĆ, N., NEDIĆ M., ŽIVANOVIĆ LJ., KOLARIĆ LJ. (2007): Produktivnost hibrida kukuruza u zavisnosti od vremena setve i gustine useva. Zbornik naučnih radova Instituta PKB Agroekonomik, 13 (1-2), 45-52.

PAOLO, E. D., RINALDI, M. (2008): Yield response of corn to irrigation and nitrogen fertilization in a Mediterranean environment. Field Crops Research, 105, 202–210.

PELIŠEK, J. (1964): Lesnické Pudoznalstvi. Praha.

RHMZ, Republički hidrometeorološki zavod Srbije.

SIMIĆ, M., L. STEFANOVIĆ (2007): Effect of maize density and sowing pattern on weed suppression and maize grain yield. Pestic Phytomed (Belgrade), 22, 93-103.

VASIĆ, G., KRESOVIĆ, B. i TOLIMIR, M. (1995): Stanje i mogućnosti navodnjavanja u proizvodnji kukuruza. Zbornik radova simpozijuma sa međunarodnim učešćem, Oplemenjavanje, proizvodnja i iskorišćavanje kukuruza, Beograd, 177-186.

VASIĆ, G. KRESOVIĆ, B. TOLIMIR, M. (1997): Effects of drought on maize production. Acta Biologica Jugoslavica, Zemljište i biljka, 46 (2): 117-125.

VIDENOVIĆ, Ž., B. KRESOVIĆ, M. TOLIMIR (2003): Effects of sowing densities on yields of ZP maize hybrids. J. Sci. Agric. Research, 64, 3-4: 23-31.

VIDENOVIĆ, Ž., STEFANOVIĆ, L., SIMIĆ, M., KRESOVIĆ, B. (2007): Trends in maize growing practices in Serbia. Herbologia, 8(2): 85-94.

ŽIVANOVIĆ, LJ., NENADIĆ, N., NEDIĆ, M., KOLARIĆ, LJ. (2006): Uticaj gustine useva na prinos zrna kukuruza različitih FAO grupa zrenja. Zbornik naučnih radova, Institut PKB Agroekonomik, 12(1-2): 39-46.

Received July 18, 2011
Accepted December 10, 2011

EFEKAT INTERAKCIJE GENOTIPA I GUSTINE SETVE NA RODNOST KUKURUZA NA NAVODNJAVANOM ČERNOZEMU

Branka KRESOVIĆ, Vesna DRAGIĆEVIĆ, Milena SIMIĆ, Živorad VIDENOVIĆ, Igor SPASOJEVIĆ, Milan BRANKOV[1]

Institut za kukuruz „Zemun Polje“, Slobodana Bajića 1, 11085 Beograd
[1]Stipendista Ministarstva za nauku i tehnološki razvoj Republike Srbije

I z v o d

Cilj proučavanja bio je da se utvrdi broj biljaka po hektaru koji stvara uslove za maksimalno korišćenje genetičkog potencijala rodnosti dva hibrida kukuruza različite FAO grupe zrenja i ujedno doprinosi racionalnoj upotrebi semena. Dvofaktorijalni ogled izveden je u periodu 2006-2008 na navodnjavanom černozemu, po metodi razdeljenih parcela u četiri ponavljanja. Isptitivani su hibridi ZP 578 (FAO 500) i ZP 735 (FAO 700) u kombinaciji setve sa sedam gustina (G_1 – 40,816 bilj. ha^{-1}, G_2 – 50,125 bilj. ha^{-1}, G_3 – 59,524 bilj. ha^{-1}, G_4 – 69,686 bilj. ha^{-1}, G_5 – 79,365 bilj. ha^{-1}, G_6 – 86,286 bilj. ha^{-1} and G_7 – 98,522 bilj. ha^{-1}). Dobijeni rezultati pokazuju da su izmedju ispitivanih hibrida i gustina setve ostvarene statistički veoma značajne razlike prinosa zrna kukuruza. Najniže prinose ispitivani hibridi su ostvarili pri najmanjoj gustini setve (40,816 bilj. ha^{-1}). Projekcija prinosa pokazuje da se maksimalan prinos zrna hibrida ZP 578 može očekivati na nivou 13,53 t ha^{-1} pri gustini setve 84.000 bilj. ha^{-1}, a 12,86 t ha^{-1} hibrida ZP 735 pri gustini 72.000 bilj ha^{-1}. U skladu sa racionalnom upotrebom semena, visoki prinosi hibrida ZP 578 obezbeđuju se sklopom sa 60.000 biljaka, a hibrida ZP 735 sa 50.000 biljaka po hektaru.

Primljeno 18. jula 2011.
Odobreno 10. decembra 2011.