Manuscript received:
Accepted:

Journal of Agriculture and Plant Sciences, JAPS
Vol 22, No. 2, pp. -- - -- (2024)
In print: ISSN 2545-4447
On line: ISSN 2545-4455
doi: ----------
Original scientific paper

YIELD AND YIELD COMPONENTS IN SOME WHEAT VARIETIES (*Triticum aestivum* L.) GROWN IN KOCANI REGION

Ivan Minov[1*], Verica Ilieva[1], Natalija Markova Ruzdik[1]

[1]*Faculty of Agriculture, Goce Delcev University, Krste Misirkov bb, 2000 Stip, Republic of North Macedonia*

**Corresponding author: ivan.209133@student.ugd.edu.mk*

Abstract

The purpose of this research was to study the yield and yield components in seven wheat varieties grown under the soil-climatic conditions of Kochani region. As an experimental material were used six introduced varieties (Rajna, Igra, Epoha, Falado, Grivna and Pobeda) and one domestic variety (Mila). The field trial was conducted in 2022/23 growing season, in randomized block design with three replications. The grain yield, plant height, spike length, number of spikelets per spike, number of grains per spike, grains weight per spike, weight of 1000 grains, number of spikes per m^2 and the biological yield were analyzed. Analysis of variance showed high genetic variability and significant differences between the examined varieties for all studied properties. The highest average grain yield was obtained by Falado variety (0,68 kg/m^2). Also, this variety showed the highest average value for the grains weight per spike (2,49 g), weight of 1000 grains (43,0 g) and biological yield (3,1 kg/m^2). The variety Falado was followed by Grivna variety which had the highest value for number of spikes per m^2 (1380 spike per m^2) and number of grains per spike (64,86).

High values of genotypic and phenotypic coefficients of variation (GCV and PCV) were noted for grain yield, biological yield, grains weight per spike, number of grains per spike, spike length, which indicate high variability between tested genotypes. All examined traits showed high heritability. The grain yield was in positive significant correlation with grains weight per spike (r=0,928) and number of grains per spike (r=0,793).

Key words: *wheat, variability, PCV, GCV, heritability, correlation*

INTRODUCTION

The soft wheat is used for feeding people, domestic animals and for industrial processing. Through wheat processing, products for feeding the larger part of the population are made (Gagro, 1997). Wheat grain is mostly used for high-quality bread and pastry production. With wheat grain processing we get pastry, starch, cookies etc. From all cereal crops, grain wheat has the highest protein quality, suitable composition of mineral matter and vitamins. Besides, the ability to form specific highly-elastic protein complex – gluten and easily digestible starch and proteins, the wheat represents the most important plant food in the world (Peña, 2002).

Today, according to statistics data, 70% of world population consume wheat bread (Vasilevski, 2004). Wheat has a large industrial and economic importance, because the bread made from wheat flour is far better than others by its quality, nutritional and energetic value (Ilievski, 2018).

Wheat has a wide range of distribution, it can be grown in all continents, except for Antarctica. According to FAOSTAT data (2021), the wheat in 2019 was sown on more than 216 million hectares, with average grain yield of 3,5 tons by hectare.

The used of high-yielding varieties and sowing quality seed material are one of the most important factors for reaching high wheat yields (Ilievski, 2015).

The variety as an autonomous genetic, biological and agricultural entity represents one of the crucial factors both in quantity and quality level of production (Dencic et al., 2010). The grain yield growth primarily depends on the variety grown, environmental conditions and the applied technology for growing. The increase of genetic yield potential of new varieties, as well as improvement of other agricultural and technological properties, enables the increased genetic yield potential in reaching higher production by area unit (Mladenov et al., 2007).

Variety choice for specific agro-ecological conditions is a key factor in realizing high yields. According to Jevtić (1992) the grain yield is influenced by variety about 40%, by applied agro-techniques about 31-40%, and environmental conditions about 20-29%. That means that the variety and the applied agro-technique are nearly equal factors in realizing the wheat yield. High and stable wheat grain yield can be provided by applying the variety technology (Protić et al., 2003).

The genetic potential can be increased in many ways such as: better usage of genetic variability, better usage of solar energy, increasing the number and grains weight per spike, increasing of the total biomass by plant, using the heterosis as a hybrid wheat (Dencic et al., 2010). The selection of suitable location i.e. varieties regionalization will contribute lower variability of grain yields and towards reaching better average results (Madić et al., 2010; Hristov et al., 2012).

Martinčić et al. (1999) have reported that grain yield can be reached by increasing the grains weight with identical number of grains per spike or increasing the number of grains per spike. The grain yield level is determined by three basic components: number of spikes per area, number of grains per spike and the weight of 1000 grains.

The number of grains per spike in an inherent property, but highly influenced by environmental factors. This property often is in negative correlation with the number of spikes per area, which means increasing the density of the crop reduces the number of grains per spike, but not grain weight. The larger number of grains per spike lowers the grain weight and vice versa (Ilieva, 2011).

The weight of grains is also an inherent property little influenced by the environment conditions. According to Martinčić & Kozumplik (1996) the number of grains per spike positive correlated with the variability of grains weight.

The main aim of this research was to determinate the yield and yield components in seven wheat varieties grown in Kocani region.

MATERIAL AND METHODS

Plant material

Seven varieties of winter wheat were used as an experimental material in this study. Five of them were newly created Serbian varieties (Igra, Epoha, Rajna, Falado, and Grivna) under the authority of the ,,Institute of field and vegetable crops" in Novi Sad, Republic of Serbia. One of the tested varieties was with Macedonia origin (Mila, created under the authorship of the Faculty of Agriculture at "Goce Delchev" University, Stip) and one older Serbian variety Pobeda, used as a standard variety. Pobeda variety was created by the Institute of Field and Vegetable Crops in Novi Sad, Republic of Serbia and it is one of the most dominant varieties in Macedonia, covering significantly larger crop areas compared to other varieties. Pobeda variety had great stability throughout the years regarding its quality and quantity and therefore it is considered as a standard variety in Macedonia, serves as an example in comparative analyses and registration procedures of new wheat varieties.

Field experiment desing

The field experiment was set up during 2022/2023 vegetative season, on the plot area with cordinate (41°54'06.0"N 22°21'58.4"E) in village Trkanje, near Kocani, Republic of North Macedonia. The tested varieties were set up in a randomized block design in three repetitions and each of them was placed on an area of 6,25 m^2 (length 5 m and width 1,25 m). On each plot 3750 seeds were sown. The distance between rows was 12 cm and 2 cm inside the row. Certified seed from first generation F_1 was used. The seedling was done my hand in November in 2022.

The soil and agro-technical measurements were applied, i.e. plowing 35 cm deep as a principal processing and harrowing as a pre seeding processing. Before the field experiment was done, the plot area of 130m^2 was fertilized with 9 kg mineral fertilizer in combination with 15N – 15P – 15K – 10S (9kg/ 0,013ha). For weeds protection, a treatment with ,,DMA" herbicide (active ingredient: 2,4 D) was done in the phenophase tillering with a dose of 50 ml/10l of water (in accordance with https://eos.com/crop-management-guide/wheat-growth-stages/).

Before the harvest, measurements of plants' height were made on a random sample of 30 plants for each variety (10 plants of each repetition and variety from the central rows of the plots). The harvest was done in July by hand and from each plot, the samples were taken from 1 m^2 to determinate the grain yield, the total biomass, number of productive spikes in 1m^2, spike length, number of grains per spike, number of spikelets per spike, grains weight per spike and the weight of 1000 grains.

Statistical analysis

All data were statistically processed by descriptive statistics. The analysis of variance (ANOVA) was estimated by SSSP statistical softer (2010). The significant differences between the average values of the tested varieties were scored by LSD (Least Significant Difference) test (Williams, 2010). Heritability (H), phenotypic and genotypic coefficients of variation (PCV and GCV), as well as the linear correlation were calculated by Johnson et al. (1955), Singh & Chaudhary (1977) and Borojević (1986), subsequently.

RESULTS AND DISCUSSION

The data from the tested traits and varieties are given in Table 1. According to the results from the research conducted during and after the harvest of the field experiment, between the examined varieties and the standard variety Pobeda, there were significant morphological-productive differences which is also confirmed by the LSD test and the analysis of the variance. The variety with highest grain yield compared to all tested varieties was Falado (0,68 kg/m^2), followed by variety Grivna (0,66 kg/m^2) and the standard variety Pobeda (0,64 kg/m^2). From all tested varieties Epoha showed the lowest value for grain yield (0,51 kg/m^2). Statistically significant differences were determined between the varieties Epoha, Igra and Falado at level $p<0,05$ and $p<0,01$, whereas the varieties Rajna and Grivna significantly differ only at the level $p<0,05$. From all tested varieties, Rajna variety had the longest stem (91,7cm) while the shortest showed Grivna variety (74,6 cm). From all tested varieties, Macedonian variety Mila had the highest value for spike length (12,08 cm), followed by standard variety Pobeda (10,93 cm) and Falado (10,58 cm). Epoha was the variety with the shortest spike (9,13 cm). For the property spike length, a significant statistical difference at both levels of significances were determined at varieties Epoha, Grivna, Igra and Mila. Variety with the biggest number of spikelets per spike was Mila variety (22,9) whereas the lowest number of spikelets per spike was obtained for Epoha variety (19,73). The variety Grivna had the biggest average value for the number of grains per spike (64,86) which represents significant statistical difference compared to the standard variety at both levels of significance. Also, Falado had high value for number of grains per spike (59,1) and statistically differ compare to all tested varieties. Variety Epoha showed the lowest average value for the number of grains per spike (47,26). Regarding the trait grains weight per spike, statistically significant difference was determined at Epoha variety at both levels of significant. For the same property, the biggest average value was made by Falado variety (2,49 g), whereas the lowest average had the

variety Epoha (1,51 g). The highest average value for the property weight of 1000 grains was noticed at Falado variety (43,0 g), followed by standard variety Pobeda (42,66 g). Grivna variety showed the smallest average value for this trait (38,33 g). Regarding the number of spikes per m^2, the highest average had the variety Grivna (1380 spike per m^2), followed by the varieties Epoha (1323,33 spike per m^2) and Igra (1310 spike per m^2). Variety with lowest number of spikes per m^2 was Mila variety (1050 spike per m^2). Similar results have been reported by Areevan at al. (2016), Đurić & Trkulja (2014), Pavkić (2021), Karaman at al. (2022). Only Falado variety had biological yield over 3 kg/m^2 (3,1 kg/m^2), while the lowest average value was received by Igra variety (2,4 kg/m^2).

Grain yield showed high values for the coefficient of phenotype and genotype variability (GCV 44,29 % and PCV 44,41 %) which means that the largest contribution in the total phenotype variability has the genotype i.e. the genetic base of wheat variety. High values for GCV and PCV were calculated also for the properties: grains weight per spike (GCV 25,59 % and PCV 29,18 %), number of grains per spike (GCV 23,33 % and PCV 24,42 %), spike length (GCV 19,42 % and PCV 20,03 %) and biological yield (GCV 30,75 % and PCV 31,5 %). The high GCV and PCV indicate of wide genetic variability between the examined wheat varieties. High values for GCV and PCV have been reported by Kalimullah et al. (2012), Demelash et al. (2013), Nukasani et al. (2013), Singh & Upadhyay (2013), Choudhary et al. (2020).

Heritability as an inheritance measure of quantitative properties showed high values in most of the examined properties (tab.1). The highest percentage of heritability was noticed for grain yield (99,43 %), but also high values were noticed for the properties: biological yield (95,1 %), spike length (94 %), number of grains per spike (91,27 %), weight of 1000 grains (87,57 %) and number of spikes per m^2 (86,10 %) which indicate high level of inheritance in the examined properties in all wheat varieties. The high percentage of heritability indicate that the properties were less influenced by the environment. The similar results were also found by Petrović at al. (2007), Bhushan at al. (2013) and Kumar at al. (2014).

Table 1. Average values for yield and yield components, genotype and phenotype variability, heritability and least significant differences for tested wheat varieties

Vriety/trait	Grain yield (kg/m^2)	Plant height (cm)	Spike length (cm)	Number of spikelets per spike	Number of grains per spike	Grains weight per spike (g)	Weight per 1000 grains (g)	Number of spikes per m^2	Biological yield (kg/m^2)
Pobeda	0,64	87,1	10,93	21,56	50,73	2,13	42,66	1160	2,73
Rajna	0,61 *	91,7	10,13*	20,1 *	53,5	2,18	41,66	1176,66	2,83 *
Epoha	0,51 **	89,5	9,13**	19,73 **	47,26	1,51 **	41 *	1323,33**	2,7
Grivna	0,66 *	74,6 **	9,98**	21,83	64,86 **	2,43	38,33 **	1380**	2,61
Igra	0,53 **	79,86 *	10,01**	21,23	49,66	1,94	40 **	1310**	2,4
Falado	0,68 **	85,53	10,58	20,9	59,1 **	2,49 *	43	1226,66*	3,1**
Mila	0,63	84,36	12,08**	22,9 *	56,56 *	2,34	42	1050**	2,46
Average	0,60	84,66	10,40	21,17	54,52	2,14	41,23	1232,37	2,69
$LSD_{0.05}$	0,02	6,72	0,6	1,17	4,58	0,36	1,4	62,79	0,29
$LSD_{0.01}$	0,03	9,4	0,84	1,63	6,41	0,5	1,96	87,85	0,41
GCV (%)	44,29	9,94	19,42	7,12	23,33	25,59	7,72	17,63	30,75
PCV (%)	44,41	12,05	20,03	8,73	24,42	29,18	8,25	19	31,5
H (%)	99,43	68,07	94,0	66,86	91,27	76,92	87,57	86,10	95,1

LSD - Least Significant Difference; GCV - genotype coefficient variability; PCV - phenotype coefficient variability; H – heritability, *statistical significance of differences at p<0,05; **statistical significance of differences at p<0,01

Bhushan at al. (2013) evaluated the grain yield and yield components, as well as genetic variability and heritability using thirty wheat genotypes as an experimental material. According to those authors the highest values of PCV was obtained for the number of grains

per plant, followed by harvest index. The lowest values for PCV were reported for the number of spikelets per spike. Highest heritability was revealed for all yield components traits.

In Table 2 are presented the results from analysis of variance (ANOVA). Analysis of variance for all tested properties and wheat varieties confirms that the experiment was set up correctly on a measured surface, and between the examined varieties there was a wide genetic variability, i.e. the varieties were significantly different. Similar findings were also reported by Kumar at al. (2014).

Table 2. Analysis of variance (ANOVA) for yield and yield components in wheat tested varieties

Properties	*SS*	*Df*	*MS*	*F*	*P-value*
Grain yield (kg/m^2)	0.0748	6	0.0124	15.68385	1.73
Plant height (cm)	611.91	6	101.985	18.20895	7.02
Spike length (cm)	15.44	6	2.573	30.13469	1.01
Number of spikelets per spike	20.63	6	3.4383	10.34036	5.44
Number of grains per spike	671.29	6	111.8816	11.57154	3.93
Grains weight per spike (g)	2.05	6	0.3416	17.5645	2.38
Weight per 1000 grains (g)	47.81	6	7.9683	4.290598	0.011631
Number of spikes per m^2	233181	6	38863.49	14.62605	2.6
Biological yield (kg/m^2)	0.989762	6	0.16496	1.034852	0.443643

SS – sum of squares; df - degrees of freedom; MS -mean squares; F -F test; P – critical value

The degree and the intensity of the intercorrelation between tested properties was presented by using linear correlation (Tab. 3).

Grain yield showed high and positive correlation with the weight of grains per spike (r=0,928) and the number of grains per spike (r=0,793), at both level of significance. These results are in accordance with the researchers conducted by Kumar at al. (2014) and Dabi at al. (2016). Significant positive correlation was obtained between spike length and number of grains per spike (r=0,820), but in the same time spike length was negative correlated with number of spikes per m^2 (r=-0,851). The property number of grains per spike was in significant positive correlation with the grains weight per spike (r=0,852), at level of significance p<0,01.

Table 3. Linear correlation coefficient between yield and yield components

Trait	Grain Yield (kg/m^2)	Plant height (cm)	Spike length (cm)	Number of spikelets per spike	Number of grains per spike	Grains weight per spike (g)	Weight per 1000 grains (g)	Number of spikes per m^2	Biological yield (kg/m^2)
Grain yield (kg/m^2)	1								
Plant height (cm)	-0,209	1							
Spike length (cm)	**0,554***	-0,030	1						
Number of spikelets per spike	**0,480***	**-0,566***	**0,820****	1					
Number of grains per spike	**0,793****	**-0,603****	0,273	**0,481***	1				
Grains weight per spike (g)	**0,928****	-0,381	**0,606****	**0,594****	**0,852****	1			
Weight per 1000 grains (g)	0,250	**0,732****	**0,468***	-0,067	-0,310	0,098	1		
Number of spikes per m^2	-0,320	**-0,486***	**-0,851***	-0,426	0,101	-0,303	**-0,739****	1	
Biological yield (kg/m^2)	**0,476***	**0,455***	-0,149	**-0,480***	0,188	0,274	**0,543***	-0,028	1

*statistical significance of differences at p<0,05; **statistical significance of differences at p<0,01

CONCLUDING REMARKS

Based on the results obtained from this research can be concluded that the varieties Falado and Grivna were the most suitable varieties regarding grain yield and yield components compared to standard variety, grown under agro-ecological condition in Kocani. Falado variety had the highest value for grain yield (0,68 kg/m^2), followed by Grivna variety (0,66 kg/m^2), which is by 0,2 kg/m^2 i,e, 0,4 kg/m^2 larger grain yield from the standard variety Pobeda (0,64 kg/m^2). Also, Falado variety showed the highest values for grains weight per spike (2,49 g), weight of 1000 grains (43,0 g) and biological yield (3,1 kg/m^2), while Grivna variety has the largest average values for number of grains per spike (64,86) as well as number of spikes per m^2 (1380 spike per m^2). Analysis of variance and LSD test showed statistically significant differences between tested varieties and examined properties. Grain yield was in a significantly positive correlation with the number of grains per spike (r=0,793) and grains weight per spike (r=0,928), while highly significant positive correlation was also determined between the other yield components such as: number of spikelets per spike and spike length (r=0,820), the weight of 1000 grains and the plant height (r=0,732), number of grains per spike and grains weight per spike (r=0,852).

REFERENCES

Areevan Jalil SHARIF, Erdal ÇAÇAN. (2016). *Bingöl Koşullarında Bazı Buğday Çeşitlerinin Verim ve Kalite Özelliklerinin Belirlenmesi*. 73-82

Bhushan, B., Gaurav, S. S., Kumar, R., Pal, R., Panday, M., Kumar, A., & Rahul, V. P. (2013). Genetic variability, heritability and genetic advance in bread wheat (*Triticum aestivum* L.). *Environment & Ecology*, 31(2), 405-407.

Borojević, K. (1986). *Geni i populacija*. Forum, Novi Sad.

Choudhary, L., Goyal, V. K., Pandey, S., Moitra, P. K., & Shukla, R. S. (2020). Assessment of genetic variability in advance breeding lines of wheat. *The Pharma Innovation Journal*, *9*(5), 239-244.

Dabi, A., Mekbib, F., & Desalegn, T. (2016). Estimation of genetic and phenotypic correlation coefficients and path analysis of yield and yield contributing traits of bread wheat (*Triticum aestivum* L.) genotypes. *International Journal of Natural Resource Ecology and Management*, *12*(6), 145-154.

Demelash, A. L., Desalegn, T., & Alemayehu, G. (2013). Genetic variation of bread wheat (*Triticum aestivum* L.) genotypes based on number of phonological and morphological traits at Marwold Kebele, Womberma Woreda, West Gojam. *Wudpecker Journal of Agricultural Research*, *2*(6), 160-166.

Dencic, S., Kobiljski, B., Mladenovic, G., Jestrovic, Z., Statkic, S., Pavlovic, M., & Orbovic, B. (2010). Sorta kao faktor proizvodnje psenice. *Ratarstvo i Povrtatarstvo*, 47(1), 317-324.

Đurić, N., & Trkulja, V. (2014). Sorte ozime pšenice Instituta PKB Agroekonomik i njihove produktivne mogućnosti u makroogledima 2012 i 2013 godine u Bugarskoj. *Zbornik naučnih radova Instituta PKB Agroekonomik*, *20*(1-4), 27-31.

EOS Data Analytical https://eos.com/crop-management-guide/wheat-growth-stages/

FAOSTAT (2021). Food and Agriculture Organization of the United Nations, Rome, Italy. http://www.fao.org/faostat/en/#home

Gagro, M. (1997). Žitarice i zrnate mahunarke. *Hrvatsko agronomsko društvo, Zagreb*, *310*.

Hristov, N., Mladenov, N., Kondić-Špika, A., & Jocković, B. (2012). Novosadske sorte pšenice u agroekološkim uslovima Vojvodine [Srbija]. *Zbornik naučnih radova Instituta PKB Agroekonomik* 18(1-2), 21-28.

Ilieva, V. (2011). *Plant breeding*. Goce Delchev University, Faculty of Agriculture, Stip.

Ilievski, M. (2018). Cereal crops. Goce Delchev University, Faculty of Agriculture, Stip.

Ilievski, M., Spasova, D., Mihajlov, L., Markova Ruzdik, N., Ilieva, V., & Sofijanova, E. (2015). Production and balance among of cereal plants in Republic of Macedonia. *Yearbook-Faculty of Agriculture*, *13*(1), 129-138.

Jevtić, S. L. (1992). *Posebno ratarstvo*. Nauka. Belgard.
Johnson, H. W., Robinson, H. F., & Comstock, R. E. (1955). Estimates of genetic and environmental variability in soybeans.
Kalimullah, K., Khan, S. J., Irfaq, M., & Rahman, H. U. (2012). Gentetic variability, correlation and diversity studies in bread wheat (*Triticum aestivum* L.) germplasm. *Journal of Animal and Plant Science*, 22(2), 330-333.
Karaman, M., Kurt, F., Karadağ, Y., & Başaran, M. (2022). Investigation of bread wheat genotypes with different characteristics by physiological and quality traits. *Türk Doğa ve Fen Dergisi*, *11*(3),1-11.
Kumar, R., Bhushan, B., Pal, R., & Gaurav, S.S. (2014). Correlation and path coefficient analysis for quantitative traits in wheat (*Triticum aestivum* L.) under normal condition. *Annals of Agri-Bio Research*, *19*(3), 447-450.
Madić, M., Paunović, A., & Đurović, D. (2010). Prinos zrna sorti pšenice Centra za strna žita Kragujevac u različitim agroekološkim uslovima. *Prvi naučni simpozijum agronoma sa međunarodnim učešćem, Agrosym, Jahorina, BiH*, 371-376.
Martinčić, J., & Kozumplik, V. (1996). *Oplemenjivanje bilja*.
Martinčić, J., Bede, M., Guberac, V., & Marić, S. (1999). Grain yield of new winter wheat cultivars in correlation with different sowing rates. *Agriculturae Conspectus Scientificus*, *64*(1), 79-84.
Mladenov, N., Denčić, S., & Hristov, N. (2007). *Oplemenjivanje na prinos i komponente prinosa zrna pšenice*. *Zbornik radova Instituta za ratarstvo i povrtarstvo*, 43, 21-27.
Nukasani, V., Potdukhe, N. R., Bharad, S., Deshmukh, S., & Shinde, S. M. (2013). Genetic variability, correlation and path analysis in wheat. *Journal of Cereal Research*, *5*(2).
Pavkić, M. (2021). *Utjecaj sorte i agroekoloških uvjeta u vegetacijskoj sezoni 2020./2021. na prinos pšenice* (Doctoral dissertation, Josip Juraj Strossmayer University of Osijek. Faculty of Agrobiotechical Sciences Osijek. Department of Plant Production and Biotechnology).
Peña, R. J. (2002). Wheat for bread and other foods. *Bread wheat improvement and production. Food and Agriculture Organization of the United Nations. Rome*, 483-542.
Petrović, S., Dimitrijević, M., & Belić, M. (2007). Heritabilnost visine stabljike i parametara klasa pšenice na ritskoj crnici. *Letopis naučnih radova Poljoprivrednog fakulteta*, *1*, 146-152.
Protić, R., Rajković, S., & Janković, S. (2003). Važnije agrotehničke mere u tehnologiji proizvodnje ozime pšenice. *Zbornik naučnih radova, PKB-Agroekonomik*, *9*, 9-20.
Singh, B., & Upadhyay, P. K. (2013). Genetic variability, correlation and path analysis in wheat (*Triticum aestivum* L.). *Indian Research Journal of Genetics and Biotechnology*, *5*(3), 197-202.
Singh, R. K., & Chaudhary, B. D. (1977). Biometrical methods in quantitative genetic analysis. Kalyani Publishers, New Delhi.
Vasilevski, G. (2004). Zrnesti i klubenesti kulturi (Univerzitetski ucebnik). Univerzitet “Sv. Kiril i Metodij” Skopje, Fakultet za zemjodelski nauki i hrana Skopje, str. 269.
Williams, L. J. (2010). Abdi H. *Fisher’s least significant difference (LSD) test. Encycl Res Des*, *218*(4), 840-53.

ПРИНОС И КОМПОНЕНТИ НА ПРИНОС КАЈ НЕКОИ СОРТИ НА ПЧЕНИЦА (*Triticum aestivum* L,) ОДГЛЕДУВАНИ ВО КОЧАНСКО

Иван Минов[1*], Верица Илиева[1], Наталија Маркова Руждиќ[1]
[1]Земјоделски факултет, Универзитет „Гоце Делчев“, ул, „Крсте Мисирков“ бб, 2000 Штип, Република Северна Македонија

**Контакт автор: ivan,209133@student,ugd,edu,mk*

Резиме

Целта на ова истражување беше да се проучат приносот и компонентите на приносот кај седум сорти на пченица во почвено-климатски услови на кочанскиот регион. Анализирани се шест интродуирани сорти (Рајна, Игра, Епоха, Фаладо и Гривна) и една домашна сорта (Мила). Истражувањата се реализирани во производната 2022/23 година, во рандомизиран блок систем со три повторувања, Анализирани се приносот на зрно, висината на стеблото, должината на класот, бројот на клавчиња во класот, бројот на зрна во класот, тежината на зрната во класот, тежината на 1000 зрна, бројот на класови во m^2 и биолошкиот принос. Анализата на варијансата покажа широка генетска варијабилност и значајни разлики меѓу испитуваните сорти за сите испитувани својства. Највисок просечен принос на зрно е добиен од сортата Фаладо (0,68 kg/m^2). Оваа сорта покажа највисоки просечни вредности и за тежина на зрна по клас (2,49 g), маса на 1000 зрна (43,0 g) и биолошки принос (3,1 kg/m^2). Втора најприносна сорта е сортата Гривна, која покажа највисоки вредности и за број на класови на m^2 (1380) и број на зрна по клас (64,86).

Високи вредности на генотипскиот (GCV) и фенотипскиот коефициент на варијабилност (PCV) беа евидентирани за принос на зрно, биолошки принос, тежина на зрна по клас, број на зрна по клас и должина на клас, што укажува на висока варијабилност меѓу генотиповите. Сите испитувани својства покажаа висока херитабилност. Приносот на зрно покажа високо значајна позитивна поврзаност со број на зрна по клас (r=0,793) и тежина на зрна по клас (r=0,928).

Клучни зборови: *пченица*, *генотипска варијабилност*, *фенотипска варијабилност*, *херитабилност*, *корелација*