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Research and testing of some grain varieties from Croatia under the agroecological conditions of Kosovo

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Abstract

Yield and quality of winter wheat were of interest of a lot locally and abroad investigation. With that respect six Croatian winter wheat varieties, Silvia, Renata , Klasan, Vulcan, Galloper, Super zhitarka whereas the standard was taken from Pobeda. were tested in small-scale trials in Kosovo during cropping season (2016, 2017, 2018.) established in the two most important agro-production localities were was investigated number of plants (m^2), yield (kg/ha), 1000 gram weight (gr), plant height (cm), hectoliter weight (kg), protein content (%).

The results obtained have shown that there were statistically significant differences of different levels for the investigated traits to all cultivars included in trials compared to standard check (Pobeda) and within the localities.

Key words: Hectoliter mass, number of plants, protein content, stalk height**,** winter wheat, yield.

1. INTRODUCTION

Wheat (Triticum aestivum L.) is one of the most important crops in Kosovo, which is regularly grown on a surface of about 70000 - 90.000 ha per year with low oscillations. Grain yield per unit area is one of the most important elements affecting profitability and economy of production. Average yield of wheat in recent years in Kosovo's main production areas is very low and ranges from 3.6 - 4.0 t / ha. For the successful and stable production of wheat, the responsive high yield varieties (Ghandi, et al., 1964) are essential, the agro-ecological conditions, the application of modern agrotechnical measures and the contemporary planting of plants. Yield is a very complex characteristic which is conditioned not only by wheat genotype but also by external conditions (Petrović Sofija et al., Drezner et al., 2006, Musa, Kelmendi et al. 2003, Borojević 1972, Denčić et al 2007) During the vegetation season (2016, 20017, 20018), Polish microchips were set up in two of the most important agro-productive areas of Kosovo, where six Croatian wheat cultivars were examined with the aim of introducing them into the national sort list of Kosovo.

2. MATERIAL AND METHODS

Six Croatian wheat cultivars (Silvia, Renata , Klasan, Vulcan, Galloper, Super zhitarka) were examined in climatic conditions of Kosovo on microchips, whereas the standard was taken from Pobeda. The research was conducted on two locations in Kosovo where different agro-climatic and pedagogical (Peja - Research Station of the Agricultural Institute of Kosovo and Pestova Private Farming Estate "Pestova"). The microcrops were placed with the random allocation of blocks and parcels in three repetitions. The basic plot area was 10 m^2 (10 m x 1.0 m). Preceding crop: corn in potatoes and potatoes in Pestova. Sowing was done in the optimal period (in the third decade of October) in both sites, experimental seedlings of type Hege 80. Fertilization for each cultivar and in each site was equal to the standard of 350 - 400 kg / ha (NPK 15:15:15) in autumn and spring 120 - 150 kg / ha (KAN) and 40-50 kg / ha (Urea) in the split application. Tests were carried out in the field (number of plants per 1m^2, stability level) and in laboratory conditions (yield, mass of 1000 grains, hectoliters weight, protein content), according to the rules of the ISTA International Seed Society 1996 (International Seed Association, 1996). The data collected were processed using variance analysis through F-est., whose significance for P <0.0 and P <0.01 levels was assumed as a prerequisite for comparing LSD variants.

2.1. Land analysis

The rational use of fertilizers is based on the biological needs of the plant and the cultivator, in the expected production, but also in the degree of fertility of the land where it will cultivate the agricultural culture and, in our case, the wheate. While the first two factors are known in advance and depend on the knowledge of the wheat farming culture and our productivity forecast that we seek to obtain, soil fertility is recognized by conducting a variety of chemical analyzes. For carrying out these analyzes in the land where our field trials were taken, the relevant soil samples were taken, at depth 0 - 30 cm, which were subjected to the respective analysis for the determination of the content of various chemical elements, as follows:

- Organic matter (Humus),
- General nitrogen,
- Phosphorus,
- Potassium,
- Calcium,
- Magnesium, and
- Groundwater Reaction (pH).

The land where the study of wheat cultivars in Peja was raised is reddish brown on reddish sediments, while in Pestovo the soil of the mushroom type, which represents almost 25% of Kosovo's lands. Regarding the chemical content, based on the analyzes performed in function of this paper, both parcels of field tests have approximate values

From soil analysis it turns out that both lands were generally rich in humus, average in phosphorus and potash, and rich in calcium and magnesium. On the basis of these data, doses of fertilizer in nitrogen, phosphorus and potash were determined, while no need for calcium and magnesium fertilization.

Tab.1 Data on soil chemical analysis in Peja and Pestovo.

Location	p H	$CaCO_3$ (%)	Nitrogen minerals (mg/100 g)		Humus (%	Feeder element (mg/100 g)			
			N^-NH_4	N^-NO_3		P_2O_5	K_2O	Ca	Mg
Peja	5.6	5	0.425	0.375	4.0	15.4	26.8	202.7	15.2
Pestova	5.9	6	0.820	0.315	3.6	13.2	17.6	360.5	42.0

3. RESULTS AND DISCUSSION

Biometric researches of some phonological parameters in all varieties included in microchips were performed throughout the entire vegetation season and the results obtained (three-year mean value 2016 - 2018) are presented in the tables below.

Table 2. Number of plants (m^2) of wheat cultivars examined

Varieties	PEJA	PESTOVA
Silvia	527	532
Renata	528	530
Klasan	538	557
Vulcan	573	548
Galloper	563	560
Super zhitarka	553	552
Pobeda	515	523

The investigated wheat varieties differ very little in terms of plant and plant height compared to standard species (Europe 90), so that the plant line ranges from 515 (Pobeda) to 573 (Vulcan) plants / 1 m^2.

Table 3. Stalk height (cm) wheat cultivar testing

Varieties	PEJA	PESTOVA
Silvia	91.0	90.0
Renata	80.0	77.8
Klasan	76.2	76.5
Vulcan	75.2	74.8
Galloper	77.8	81.0
Super zhitarka	75.0	76.0
Pobeda	81.0	82.0

The investigated wheat varieties differ very little in terms of plant and plant height compared to standard species (Pobeda) 82,0.cm while the plant height is ranges from 74.8 cm (Vulcan) to 91.0 cm (Silvia).

Table 4. Mass of 1000 grains (gr), examined wheat varieties

Varieties	PEJA	PESTOVË
Silvia	50.9	54.9
Renata	41.6	41.5
Klasan	47.5	46.0
Vulcan	42.1	41.6
Galloper	44.9	46.5
Super zhitarka	46.3	47.5
Pobeda	47.3	57.9

In laboratory conditions the mass of 1000 grains (gr) was investigated, where the differences in the examined varieties were compared with the standard variety Pobeda (47.3 gr or 57.9 gr). The lowest mass of 1000 grains was included in the Renata variety in both test sites (41.5 gr or 41.6 gr), while the highest in the Silvia variety (54.9 gr or 50.9 gr).

Table 5. Hectoliter mass (kg), examined wheat

Varieties	PEJA	PESTOVË
Silvia	82.9	82.5
Renata	81.7	79.8
Klasan	83.1	81.0
Vulcan	82.1	81.5
Gallper	82.0	81.8
Super zhitarka	82.2	82.3
Pobeda	80.5	79.4

As far as the hectoliter weight (kg) is concerned, very small differences have been found between the examined wheat cultivars compared to the standard variety (Table 5), so that the smallest hectoliter mass found in Pobeda in Pestova (79.4 kg), while the largest in the Klasan variety Stoves (83.1 kg). It should be noted that the mass of 1000 grains and the hectoliter mass for some authors are genetic varieties but which are influenced by external conditions (Mladenov et al.1998).

Various variants were statistically significant between varieties, localities, and interaction of the x locality x (Table 6). The highest yield of grain was found in the Silvia variety (6930 kg / ha), while the lowest in the Vulcan variety (5805 kg / ha). Compared to the standard variety in all examined varieties except for the Renata variety, statistically significant differences of different significance levels were found. In terms of the grain yield of varieties cultivated on certain localities, there are statistically significant differences between Peja and Pestova sites so that the highest yield was found in sorghum sown in Peja (6393 kg / ha) while the smallest on the locality Pestova (6183 kg / ha). As far as wheat cultivars are concerned, no statistically significant differences have been reported for years of experimentation. Statistically very significant differences of different levels were also determined with the inertial factor of the x locality factor, (Table 6).

Table 6. Grain yield of examined wheat varieties, kg / ha, (ANOVA)

Varieties (A)	The site (B)	Year(C) 2016	2017	2018	Mid (AxB)	Mid (A)
Silvia	Peja	7029	6974	7250 **	7084 **	
	Pestova	6737	6476	7113	6775	6930 **
	middle (AxC)	6883	6725	7182 **		
Renata	Peja	6928	6729	6532	6730	
	Pestova	6001	6025	6222	6083	6406 Ns
	middle (AxC)	6465	6378	6378		
Klasan	Peja	6177	5948	6009	6045	
	Pestova	6021	5822	5776	5873	5959 **
	middle(AxC)	6099	5885	5893		
Vulcan	Peja	6233	5917	4970	5707 **	
	Pestova	5866	5944	5898	5903	5805 **
	middle (AxC)	6050	5931	5434 **		
Galloper	Peja	7072	6670	6379	6707	
	Pestova	6076	6003	7090	6390	6548 *
	middle (AxC)	6575	6337	6735		
Super zhitarka	Peja	6166	5972	6301	6147	
	Pestova	5990	5924	5896	5937	6042 **
	middle (AxC)	6079	5948	6099		
Pobeda	Peja	6090	6243	6665	6333	
	Pestova	6496	6291	6172	6320	6326
	middle (AxC)	6293	6267	6419		
Middle (C)		6349 Ns	6210 Ns	6305 Ns		

Middle (BxC)	C_1	C_2	C_3	Mid (B)
B_1	6528 **	6351	6301	B_1 6393 ** B_2 6183 **
B_2	6170	6069 **	6310	Interaction (AxBxC) **

FACTOR		A	B	C	AB	AC	BC	ABC
LSD	1 %	239.55	94.58	267.17	315.22	1015.63	414.59	2263.18
	5 %	174.87	71.85	202.97	219.39	670.42	304.61	1232.91

** = Very Significant, * = Significant, Ns = Not Significant

Table 7. Ingredient of Crude Protein Wheat Varieties,% (ANOVA)

Varieties (A)	The site (B)	Year (C) 2016	2017	2018	Mid (AxB)	Mid (A)
Silvia	Peja	15.20	14.70	15.10	15.00	
	Pestova	15.10	16.60	16.10	15.93	15.47 **
	middle(AxC)	15.15	15.65	15.60		
Renata	Peja	15.30	15.50	15.80	15.53	
	Pestova	15.60	16.90	17.60 **	16.70 **	16.12 **
	middle(AxC)	15.45	16.20	16.70 **		
Klasan	Peja	15.10	14.30	15.50	14.97	
	Pestova	15.10	15.30	15.90	15.43	15.20 **
	middle(AxC)	15.10	14.80	15.70		
Vulcan	Peja	15.30	12.30 **	14.20	13.93 **	
	Pestova	15.40	13.20	14.80	14.47	15.63 **
	middle(AxC)	15.35	12.75 **	14.50		
Galloper	Peja	15.10	13.90	15.60	14.87	
	Pestova	15.20	14.90	16.30	15.47	14.97 **
	middle(AxC)	15.15	14.40	15.95		
Super zhitarka	Peja	14.70	14.10	15.40	14.73	
	Pestova	14.90	14.90	15.80	15.20	15.17 **
	middle(AxC)	14.80	14.50	15.60		
Pobeda	Peja	15.50	14.80	16.90	15.73	
	Pestova	15.70	15.20	15.70	15.53	14.20
	middle(AxC)	15.60	15.00	16.30		
Middle (C)		15.23 **	14.76 **	15.76 **		

Middle (BxC)	C_1	C_2	C_3	Mid (B)
B_1	15.17	14.23 **	15.50	B_1 14.97 ** B_2 15.53 **
B_2	15.29	14.29	16.03 **	Interaction (AxBxC) **

FACTOR		A	B	C	AB	AC	BC	ABC
LSD	1 %	0.2150	0.1917	0.3100	0.3212	1.2390	0.4213	2.4521
	5 %	0.1540	0.0140	0.2472	0.2306	0.7811	0.3518	1.2120

** = Very Significant, * = Significant, Ns = Not Significant

The content of crude protein in wheat grain in the examined cultivars was different from the standard variety, (Table 7). The highest percentage of protein was found in the Renata variety (16.12%), while the lowest percentage in the Pobeda variety (14.20%). With respect to the content of protein of varieties grown on certain sites, there are statistically significant differences between the Peja and Pestova sites. The highest percentage of protein content was found in sorghum sown in the locality of Pestova (15.53%), while the smallest in Peja locality (14.97%). Statistically very significant differences of different levels were also determined with factor inertia (sort x locality x years).

4. CONCLUSION

- The investigated wheat varieties differ very little in terms of plant and plant height compared to standard species (Pobeda), so that the plant line ranges from 515 (Pobeda) to 573 (Vulcan) plants / 1 m^2, while the plant height is ranges from 74.8 cm (Vulcan) to 91.0 cm (Silvia).
- In laboratory conditions the mass of 1000 grains (gr) was investigated, where the differences in the examined varieties were compared with the standard variety. The lowest mass of 1000 grains was included in the Renata variety in both test sites (41.5 gr or 41.6 gr), while the highest in the Silvia variety (54.9 gr or 50.9 gr).
- As far as the hectoliter weight (kg) is concerned, very small differences have been found between the examined wheat cultivars compared to the standard variety (Table 5), so that the smallest hectoliter mass found in Pobeda in Pestova (79.4 kg), while the largest in the Vulcan variety Stoves (83.1 kg). It should be noted that the mass of 1000 grains and the hectoliter mass for some authors are genetic varieties but which are influenced by external conditions (Mladenov et al.1998).
- Various variants were statistically significant between varieties, localities, and interaction of the x locality x (Table 6). The highest yield of grain was found in the Silvia variety (6930 kg / ha), while the lowest in the Vulcan variety (5805 kg / ha). Compared to the standard variety in all examined varieties except for the Katarina variety, statistically significant differences of different significance levels were found. In terms of the grain yield of varieties cultivated on certain localities, there are statistically significant differences between Peja and Pestova sites so that the highest yield was found in sorghum sown in Peja (6393 kg / ha) while the smallest on the locality Pestova (6183 kg / ha). As far as wheat cultivars are concerned, no statistically significant differences have been reported for years of experimentation. Statistically very significant differences of different levels were also determined with the inertial factor of the x locality factor, (Table 6).

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