

Grain Yield and Yield Components of Winter Barley

Vera RAJIČIĆ¹, Dragan TERZIĆ¹, Vesna PERIŠIĆ¹, Marijana DUGALIĆ¹, Vera POPOVIĆ²

¹University of Niš, Faculty of Agriculture, Kosačičeva 4, Kruševac, Serbia
²Institute of Field and Vegetable Crops, Maxim Gorky St. 30, Novi Sad, Serbia
Correspondence: e-mail: verarajicic@yahoo.com



Introduction

Barley cultivars that were in production until the end of the eighties were characterized by the lower yields, good technological quality and higher stem sensitive on lodging. Barley is globally cultivated on an area of about 47.5 million hectares, an average yield of 2.6 t/ha being realized making it the fifth grown crops. Barley is one of the oldest agricultural species, which has gone through genetic alterations during the process of domestication. The grain quality of barley is affected by genetic and environmental factors as well as their interaction (Đekić *et al.* 2011; Madić *et al.* 2014; Pržulj *et al.* 2014).

Materials and Methods

During the 2013/14 and 2014/15 growing seasons, three cultivars of winter barley (Grand, Zlatnik and Rekord) grown at the experimental field of the Small Grains Research Centre in Kragujevac (Serbia) were studied. The experiment was laid out in a randomised block design with five replications and a plot size of 50 m² (10 m x 5 m). In all years, winter barley was sown in the second half of October at a row spacing of 12.5 cm. Fertilizers have used in the 300 kg/ha of form of complex NPK fertilizer (8:24:16, superphosphate (17% P₂O₅) and ammonium nitrate (AN) 34.4% N. The following traits were analysed: grain yield, 1000 grain weight and test weight.

Results and Discussion

Analysis of variance was found highly significant effect of year on the grain yield (F=10.351**), 1000 grain weight (F=240.215**) and test weight (F=42.373**). Based on the analysis of variance, it can be concluded that there are very significant differences in grain yield and 1000 grain weight regard the cultivar (Table 1).

The grain yield of winter barley significantly varied across years, from 5.324 t/ha in 2013/14 to 5.922 t/ha in 2014/15. The average two-year value of grain yield was 5.623 t/ha. Thousand grain weight were significantly greater in 2013/14 than in the 2014/15 year. The 1.000 grain weight of winter barley varied across cultivars, from 38.27 g in cultivar Grand to 42.92 g in cultivar Rekord. The average two-year value of 1.000 grain weight was 41.08 g. Test weight were significantly greater in 2014/15 than in the previous year. The average two-year value of test weight was 65.28 kg/hl (Table 2).

During the first year of investigations, cultivar Grand achieved the highest grains yield (5.761 t/ha), followed by Rekord (5.194 t/ha), while the lowest yield was at Zlatnik cultivar (5.017 t/ha). During the second year of investigations the yield of Grand cultivar was the highest with 6.394 t/ha (Table 3). Considerable variation in yield depending on years of research have established Popović *et al.* (2011) and Rajičić *et al.* (2019). During the first year, cultivar Rekord achieved the highest average 1000 grain weight (51.93 g). During the second year of investigation 1000 grain weight observed was the highest at Zlatnik variety (34.17 g). Average test weight observed in the first and second year period was the highest at Zlatnik variety (64.70 kg/hl and 70.12 kg/hl). Malting barley is expected to have 1000 grain weight of 40 to 46 g and test weight of 68 to 75 kg/hl (Paunović *et al.* 2006).

Negatively and medium correlations were observed between grain yield and 1000 grain weight in the 2013/14 (r=-0.687*), in the 2014/15 (r=-0.582*) and investigation period (r=-0.684**). Positively correlations were observed between 1000 grain weight and test weight in the first year (r=0.178) and second year (r=0.731**), Table 4.

Conclusions

More favourable conditions in 2014/15 resulted in a higher average the grain yield value (5.922 t/ha) compared to 2013/14 (5.324 t/ha). Based on these results, it can be concluded that several traits have a decisive role in the formation of grain yield. The contribution of each individual feature can be different for different genotypes and the various environmental conditions so that this results from the interaction between the features within each genotype and genotype interactions with environmental factors.



Table 1. The analysis of variance for the traits analyzed in Kragujevac, Serbia

Effect	df	Mean sqr Effect	Mean sqr Error	F	p-level
The analysis of variance for grain yield					
Year, (Y)	1, 22	2.149	0.208	10.351	0.004
Cultivar, (C)	2, 21	1.539	0.173	8.888	0.002
Year x Cultivar, (YxC)	2, 18	0.090	0.073	1.239	0.313
The analysis of variance for 1000 grain weight					
Year, (Y)	1, 22	1591.810	6.627	240.215	0.000
Cultivar, (C)	2, 21	48.911	78.084	0.626	0.544
Year x Cultivar, (YxC)	2, 18	4.808	2.130	2.257	0.133
The analysis of variance for test weight					
Year, (Y)	1, 22	253.091	5.973	42.373	0.000
Cultivar, (C)	2, 21	28.732	15.573	1.845	0.183
Year x Cultivar, (YxC)	2, 18	6.141	3.425	1.793	0.195

Table 2. Mean values for the tested parameters at winter barley cultivars

		Grain yield, (t/ha)		1000 grain weight (g)		Test weight (kg/hl)	
		x	Sd	x	Sd	x	Sd
Years	2013/14	5.324	0.386	49.22	3.061	62.03	2.715
	2014/15	5.922	0.515	32.93	1.971	68.53	2.139
Cultivar	Grand	6.078	0.502	38.27	8.082	63.77	3.145
	Zlatnik	5.202	0.259	42.05	8.523	67.41	3.584
	Rekord	5.590	0.447	42.92	9.813	64.66	4.897
	Average	5.623	0.540	41.08	8.692	65.28	4.089

Table 3. Mean values for the tested parameters by studied environments in barley

Years	Cultivar	Grain yield, (t/ha)		1000 grain weight (g)		Test weight (kg/hl)	
		x	Sd	x	Sd	x	Sd
2013/14	Grand	5.761	0.271	45.80	0.864	61.00	1.283
	Zlatnik	5.017	0.170	49.93	1.014	64.70	2.337
	Rekord	5.194	0.206	51.93	2.549	60.40	2.337
2014/15	Grand	6.394	0.497	30.73	0.573	66.55	0.950
	Zlatnik	5.388	0.190	34.17	1.666	70.12	2.223
	Rekord	5.985	0.086	33.90	1.186	68.92	1.464

Table 4. Correlation coefficients by studied environments in barley

	Grain yield	1000 grain weight	Test weight
Correlations between the traits analysed in the 2013/14			
Grain yield	1.00	-0.687*	-0.412
1.000 grain weight		1.00	0.178
Test weight			1.00
Correlations between the traits analysed in the 2014/15			
Grain yield	1.00	-0.582*	-0.661*
1.000 grain weight		1.00	0.731**
Test weight			1.00
Correlations between the traits analysed in the 2013/15			
Grain yield	1.00	-0.684**	0.208
1.000 grain weight		1.00	-0.715**
Test weight			1.00