RESEARCH ARTICLE (Open Access)

Stability of wheat genotypes in condition of Lushnja region

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Abstract

The aim of this research is the selection of most suitable wheat cultivars for the region of Lushnja. Ten new cultivars and six know cultivars (three local and three foreign) were planted in this area in 2012 and 2013. The experiments were implemented through the randomized block scheme, with three repeats. The climate conditions presented remarkable difference between the two years of the testing. The year 2012 conditions were suitable for wheat development. On the other hand, the year 2013 was characterized by unsuitable conditions. The main indicators studied were the morphologic ones, the phenologic phases and the biometric parameters such as: Plant height, Spike length, grain per spike, g1000 kernel weights. The average difference of production between the two years is 18%, while the difference of the biannual difference reached at 50%. The variance analysis was calculated for each year of production (tha, -1) and for each cultivar. From the analysis it was shown that nine cultivars are above the average production level. The most stable cultivars for the two years of study were G08, G07 and G02. The interaction between cultivars x years presents different levels for yield stability. The comparisons for all couples were implemented using the Tukey-Kramer HSD Method. The positive values show the couples that present verified differences.

Keywords: Cultivar, randomized block scheme, variance analysis.

1 Introduction

Lushnja region is the most important one for the production of wheat in Albania. Every year, this crop is cultivated in an area of around 18 thousand ha and it gives about 70 thousand tons or 22 - 24% of the total production in the whole country [12]. The yield increase is closely depending to a significant degree on the climatically conditions. The various climate changes from year to year can be faced with only by the selection of the suitable cultivars. The extremes in continuity such as drought followed by intensive rainfall, are by themselves catastrophic and associated with ecological effects, like the dissemination of a number of diseases and pests that affect the human populations and the agricultural production, too [10]. The cultivars are temporary in production, what might be good today, can also be good tomorrow, but the day after tomorrow they will not be any more good [8].

Improvement of the production traits may be effective for the selection of the genotypes for higher grain production [7].The objective of plant breeding is the development of cultivars combining high and stable and productivity with good quality [5]. The number of grains per spike and the weight of 1000 grains are the main contributors in the grain production of wheat [2]. Grain production also has been shown to have positive correlation with the number of grains per spike while the plant height with the weight of 1000 grains [1]. The farmers not only do not achieve the benefits of the new varieties that are created by the public institutions to be used by them but also they have to face other negative impacts from the use of non-checked seed for a long time [4]. A great number of new cultivars are selected for resistance indicates that the biotic stress is the main cause for the decrease of the production on average more than 50% [11]. The study of the new wheat cultivars in different areas of cultivation in our country has indicated significant differences in their adaptation to the eco-climatic conditions of each area [3]. The goal of this study is to evaluate some new wheat cultivars related with the production components, the extent of their vegetative period, the production realized and their stability in years with climatically conditions changes. The conclusions of this study will be valuable for the farmers involved with wheat cultivation not only in Lushnja area but also for those around it.

2. Materials and methods

Ten new cultivars and six know cultivars (three local and three foreign origin) were planted in this

area in 2012 and 2013. The list of studied materials of wheat genotypes is presented on table 1.

Table 1. The list of studied materials of wheat genotypes

Nr	*Wheat genotypes*	*Symbol*
1	Dajti	G01
2	Africa	G02
3	Bolero	G03
4	Antille	G04
5	Sirtaki	G05
6	Blasco	G06
7	Adhoc	G07
8	Ardelor	G08
9	Centauro	G09
10	Palesio	G10
11	Guadalupe	G11
12	Bilancia	G12
13	Exotik	G13
14	W12	G14
15	LVS	G15
16	Progresi	G16

The field experiment was carried out at the in Lushnja region (ordination: latitude 40^0 50' 38, 07"N; longitude 19^0 44' 44,37"; elevation 12 m), during 2012 and 2013. In each plot, ten rows were planted, each of them 5m long with a distance of 20cm between the rows and of 5cm between the plants within the row. The plot size was 10 m^2. Each wheat genotype was planted in three replications according to the Randomized Block Scheme (RCBD). Basic fertilizers were applied 300 kg ha^{-1} NPK (15:15:15). Supplemental fertilizer, 300 kg ha^{-1} (URE 46% N and NH_4NO_3 34 %). Data were recorded randomly and competitive plants for each genotype from each replication for quantities characters: plant height (PH), leaves length (LL), spike length (SL), grain per spikelet (GPS), weight of the spike kernel (WSK), and grain yield t/ha (with moisture 14 %). The genotypes were estimated for the correlation among the measured and evaluated characters. The dendrograms are designed on the basis of the genotypes' performance and their morphological parameters. The analysis of variance (ANOVA) was used for the interpretation of the data on the features studied. [13]. The production data were analyzed in compliance with ANOVA method. The differences in the production averages t/ ha^{-1} are analyzed using Limited Significant Difference the probability level 0.05 and 0.01. For the comparison among the genotypes for the production realized we used Comparisons for all pairs using Tukey-Kramer HSD.

3. Results and Discussions

Results for the two years investigations on the wheat genotypes indicators analyzed are presented in tab.2

Table 2. Multivariate Correlations

	days to flowering	*days to maturity*	*Yield t/ha*	*plant height*	*leaves length*	*spike length*	*grain per spike*	*weight of the spike kernel*
days to flowering	**1.0000**	0.7762	0.4783	0.2178	0.1024	-0.0583	0.4976	0.3586
days to maturity	0.7762	**1.0000**	0.6261	0.1133	0.1033	-0.1849	0.3170	0.3765
Yield t/ha	0.4783	0.6261	**1.0000**	0.1069	0.3960	-0.1261	0.3503	0.4112
plant height	0.2178	0.1133	0.1069	**1.0000**	0.0551	0.5670	0.3722	0.1312
leaves long	0.1024	0.1033	0.3960	0.0551	**1.0000**	0.3417	0.2734	-0.0895
spike length	-0.0583	-0.1849	-0.1261	0.5670	0.3417	**1.0000**	0.5903	-0.1277
grain per spike	0.4976	0.3170	0.3503	0.3722	0.2734	0.5903	**1.0000**	0.3966
weight of the spike kernel	0.3586	0.3765	0.4112	0.1312	-0.0895	-0.1277	0.3966	**1.0000**

The correlations are estimated by REML method.

From the analysis of the correlations for the features studied, it is observed that there are strong positive correlations between days to maturity with days to flowering (r= 0.77 **) and days to maturity with yield t/ha (r= 0.62 **). As for the other parameters, it is observed weak correlations. From the data of the study (table 2), as for the plant indicators, spike and grain, in the genotypes studied, it appears that there is variation for the parameters observed. The same results are confirmed also by Uddin et . al [14].The plant height in the majority of the genotypes varies from 82 to 96 cm, which indicates a tendency for the genotype with lower plant height. The height was higher at G 04 respectively 96cm, while at G 01 the height was lower of 82 cm. The difference between the highest at G 04 and the lowest at G 01 was 14 cm or 17 %. The results reported by Fetahu *et al*. [6] for plant height have been from 70.8 to 79.05 cm. The average spike length minimum is 7 cm and maximum 10cm. The difference between the longest

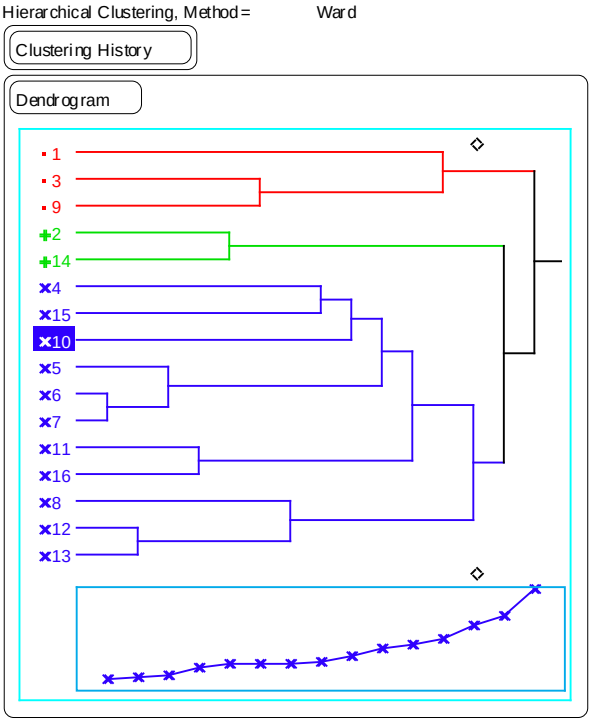

Figure1. Dendrogram of wheat genotypes for analyzed parameters

G 10 and the shortest G 14 was 3 cm or 42%. The number of grains per spike, the least is observed at G01 and the greatest at G 10 and G 11 with 46 grains. The difference between the greatest and the least was 8 or 21 %. Related to the grain indicators, significant variation appears in the grains weight in spike. The maximum value results to be 2.64 g at G02 and the minimum with 1.9 g at G 01. The difference between them was 38%.

Results for the analyzed parameters on the Dendrogram (Fig.1) showed that wheat genotypes are divided into three main groups. The first group represents three genotypes G01, G03 and G09, second group are two genotype G02 and G14, represents similarity in the hierarchy and there are differences from the others.

Evaluation of the length of the period from germination until flowering, and days until full maturation and its relation to grain yield t ha^{-1}

Environmental conditions have a significant influence in prolonging the period from flowering to full maturation [9]. This is a very important indicator for the climate conditions in the low coastal zone. The vegetative period in days until flowering and days until full maturation is described in Table 4.

Table 3 Days until flowering, days until full maturation and yield t/ha

Genotype	*days to flowering*	*days to maturity*	*yield t/ha*
G01	134	186	5.07
G02	143	201	7.7
G03	140	196	5.37
G04	138	194	7.2
G05	142	197	6.77
G06	139	201	6.7
G07	143	199	7.63
G08	140	196	7.6
G09	138	195	6.53
G10	138	192	5.6
G11	139	196	7.27
G12	139	193	7
G13	139	194	7.1
G14	143	200	7.3
G15	140	190	5.37
G16	141	196	5.23

Levels not connected by same letter are significantly different.

The vegetative period in days from germination – flowering in the studied genotypes varies from 134 days at G 01 and a lengthier period of flowering is observed at the cultivars G02, G07 and G14 with 143 days. The difference between the minimum and the maximum values for days up to flowering was around 9 days. Analyzing the full extension of the vegetative period (germination – full maturity), significant differences are noticed. They range from 186 days at G01 to 201days at G02. The difference between the

minimum and the maximum value for the period up to ripening/maturing was around 15 days or 8%. The cultivars G02 and G06, though they had a lengthier period by 6-8 % compared to the local cultivars (G01 and G15), gave 43-51% in 2012.

The correlation between the days up to flowering, the days up to maturing and the production in t/ha are presented in (tab.4).

Table 4. Correlation between grain yield t/ha, period length from germination to flowering and to maturity (days)

	days to flowering	*days to maturity*	*yield t/ha*
days to flowering	1		
days to maturity	0.78**	1	
yield t/ha	0.48	0.63**	1

* = Significant P ≤ 0.05 ** = highly significant P ≤ 0.01

Table 5. Yield t/ha for each wheat genotypes

Level		*Mean t ha^{-1}*
G08	A	7.1 ± 0.31
G07	A	7.0 ± 0.27
G02	A	7.0 ± 0.31
G04	A	6.9 ± 0.22
G14	A	6.8 ± 0.24
G11	A	6.7 ± 0.25
G13	AB	6.4 ± 0.38
G06	ABC	6.3 ± 0.2
G05	ABC	6.2 ± 0.31
G12	ABC	6.1 ±0.23
G09	ABCD	5.9 ± 0.27
G16	BCD	5.1±0.11
G03	CD	5.1±0.15
G10	CD	5.0±0.27
G15	CD	5.0±0.18
G01	D	4.7±0.21
CV		16.8
LSD 0.05		0.43
LSD 0.01		0.57

Levels not connected by same letter are significantly different

From the data, it results that there are strong positive relations between the days up to flowering and the days up (r = 0.78**) p = 0.01 respectively. Also, there are strong positive links between the days up to maturity and the yield t/ha (r = 0.63**).

Analysis of the realized production in t ha^{-1} according to the genotypes

In table 5, it is presented the standing of the genotypes for the production realized by each genotype according to their rank from the highest to the lowest.

In table 5, it is presented the production realized in t/ha-1 where we can see that G08 has realized the maximum production (7.1 ± 12.31) but in this group, five other cultivars are included too with their production (7.0-6.7 t ha^{-1}). In Group A are included the following cultivars with the highest production (G08, G07, G02, G04, G14 and G11). The cultivars of this group are of foreign origin. While (G01) realized the lowest (4.7 ± 0.21 t ha^{-1}). The difference between the minimum and maximum values on the production of these genotypes was (3.1 t ha^{-1}) or 51%. The average value of grain production for the genotypes studied was 6.1 t ha^{-1}.

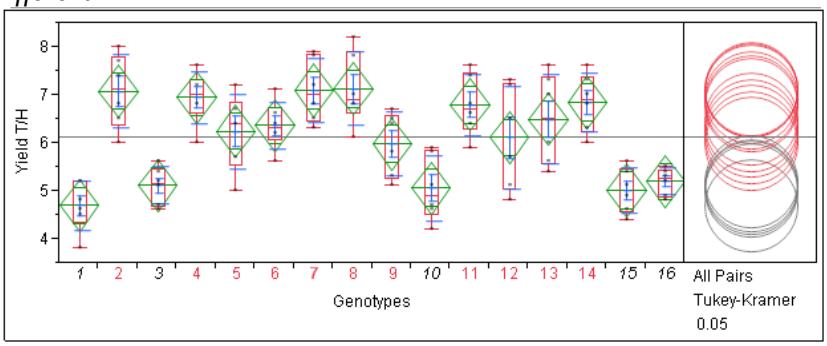

Figure 2. Dendrogram of genotypes for grain production

In the dendogram (Fig.2) for the production realized, we see that the genotypes studied are included in four main groups, depending on the production realized. This shows the nearness between them in terms of their productive capacity.

4. Conclusion

From the results of this research related with the trials of the wheat genotypes carried out in the same agro-ecological conditions, testified changes of the estimated features are identified. The significant differences in the production realized dictate the necessity that the farmers and all the other cultivators should be encouraged to cultivate the new cultivars because they easily fit the conditions of the low coastal area. Based on the results obtained, we can recommend for the cultivation of wheat cultivars Ardelor and Africa.

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