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Results of study of maize hybrid with late maturity in Lushnja district

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Abstract

In the last few years, a significant number of new foreign hybrids of maize have been included in production in our country. The assessment of their adaptation to the conditions of the Lushnja district constitutes the purpose of this study. The material used consisted of 20 foreign hybrids, and a local one. The field trials were conducted in the Experimental Base of Agroarfa in Lushnja, 2015-2017. During the vegetative period, observations of phenological phases such as growing, male and female flowering and maturity were performed. Biometric measurements were carried out on plants such as plant height, first ear height, ear length, number of rows and kernels in row, kernel thickness and 1,000kernel weight as well as yield per ha. Referring to production data, the average yield of hybrids is about 15 t/ha. High yields are hybrids H2 with 17 t/ha, H17 with 16.5 t/ha and H4 with 16.2 t/ha. The hybrid H21 appears among the good hybrids with 15 t/ha. The hybrid H21represents an appropriate alternative in the conditions of Lushnja district.

Keywords: Biometric, flowering, grain, hybrid, yield.

1. Introduction

During the last decade, in Albania the cultivated area has not changed, the production has increased around 60% [4]. Increasing grain yield has been and remains the main goal of any genetic improvement program. At the root of genetic improvementis the synthesis of lines with high combination abilities and hybrid combinations formed by their crossing [11]. The development of hybrid maize improves the productivity of farmers and assists in ensuring a sustainable supply of food. Much of the increase in maize production can be attributed to genetic improvement [8], through the use suitable hybrids. Also, the improvement of the leafy system to keep it in efficiency for as long as possible increases the likelihood of plant assimilation [2,3]. Genotype Environment interactions occur when there is a change in the relative performance of genotypes when the genotypes are exposed to different environmental conditions [10]. There is a positive correlations among the plant height with the number of the leaves and the height up to the first corn ear with the number of the leaves [5]. The yield component compensation was great enough to negate the expected grain yield response from increased plant populations [6]. High yield hybrids adapted to different areas and years, have strong agronomic requirements. The aim of such breeding are, most probably, genotypes intended for a specific set of conditions [12]. Actually, the maize production in our country extensively uses hybrid seeds imported from abroad, but yields are below of their ecologic potential that provide our country's conditions and not necessary adaptation to this plant.

2. Material and Methods

The study was conducted at the ARFA Experimental Base in Lushnja. In the study were obtained 21 corn hybrids by different companies: Pioneer, Dekalb, ZP, Coopsementi and one hybrid by ARFA. Some of these hybrids are planted in other countries, such as Italy and so on. The purpose of this study is to know how these hybrids behave under the conditions of Myzeqe, and to test the hybrid created by ARFA. The experiments were established according to randomized block schemes in three replications. In the field trials, during the vegetation period,

were recorded phonological phases as well as biometric analysis of the plant, ear and kernel traits. At full maturity, the production of each hybrid was recorded for every replication and statistical analysis of the results. Analysis of agro-morphological quantitative characters were conducted by ANOVA analysis and on morphological qualitative traits according to PCA.

3. Results and Discussion

From the data of some of the main biometric indicators of maize hybrids on the test carried out in three years (2015-2017) in Lushnja, for morphologic indications present a variation between them, but for some it is closer and to the others it was more pronounced. The plant height from 287cm to the H9, to 327cm to the H18, with an average height of 308cm. The height of insertion of first ear from the ground varies from 88cm to the H9, to 121cm to the H1, with an average height of 106 cm. There is a wider variation in the length of the ear, ranging from 17cm to 23.8cm, with an average of 20.3cm. The average number of rows in ears ranges from 13.7 to 17.6 cm in the hybrid with an average of 16.1.

An important indicator is the vertical orientation of the leaf on the stalk. Such a placement of the leaf provides a better soil coverage, a smaller competition between the plants and between the leaves in relation to the light [1,3,9]. Another important feature is an efficient and durable assimilator apparatus. From the evaluation done it turns out that the hybrids in the test are generally with erect leaf position but the angle of leaf to the stalk is different. For the average yield of hybrids, it turns out that this is more approximate for 2015 and 2016 and with significant changes in 2017 year, which is smaller. Specifically, for the year 2015 the average yield of hybrids was 155.1 kv/ha, for the year 2016 it was 152.4 kv/ha and for 2017 it was 144.2 kv/ha, because in 2017year there was a dry and very hot weather and the relative humidity of the air and heat affected the production. From the SNH hybrids, with the highest yield appear hybrid H4 that is a hybrid that fit better in the conditions of Albania.

***Analysis of agro-morphological quantitative characters*:** ANOVA analysis showed the presence of significant differences between maize hybrids for the most important agro-morphological traits analyzed, with probability F $<P_{0.05}$ (Tab. 2). High degree of variation was observed for the morphological characters as ear length, number of kernel rows and yield per hybrid genotypes. Variation between plant height and first ear height were found not significant at the probability $P_{0.05}$. PCA on correlations identified the total variance of the principal components (PC) and the proportion of the variances explained by each factor. All quantitative variables contribute to 100% of total variation. The first three PCs explain 89.164% > 75.0% of the original variation (Tab. 1), acceptable for comparison, characterization and evaluation of hybrids of maize (Joliffe 2002)..

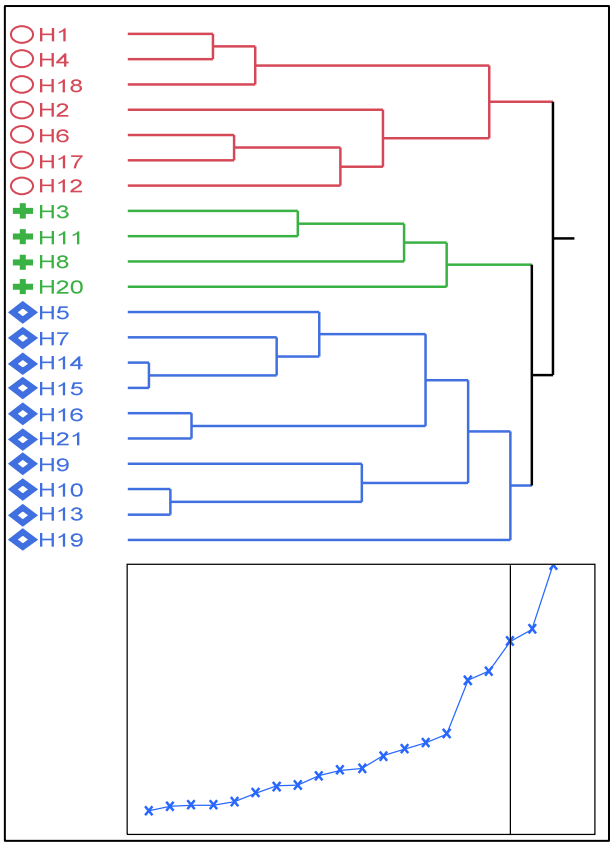
Table 1. Matrix of eigenvalues of principal components for 21maize hybrids and 5 agro-morphological traits.

Principal Components/factor analysis						
PC No.	Eigenvalue	Percent variance	Cumulative Percent	χ^2	df	Prob. > χ^2
1	1.9769	39.539	39.539	29.921	9.323	0.0006*
2	1.5380	30.760	70.299	21.022	7.370	0.0048*
3	0.9432	18.865	**89.164**	10.642	4.781	0.0518
4	0.3358	6.715	95.879	0.974	2.177	0.6563
5	0.2061	4.121	100.000	0.000	9.323	0.0006*

χ2 – Chi Square, DF– degree of freedom; Prob. – probability; *significance level equal to the 0.05 of probability

***Relationships between the morphological characters and maize hybrid genotypes*:** Relationships between 21 maize hybrids assessed by agro-morphological traits and genetic distances revealed by cluster analyses categorized all maize hybrids into three clusters (Fig.1). Clusters were differentiated by length of ear, number of rows and yield per genotype traitssignificant at the probability F $<P_{0.05}$ and $P_{0.01}$. Cluster I included sevenmaizehybrids with similarity between them. Cluster II consisted of tenmaizehybrids and cluster III included four maize hybrids characterized by the highest and intermediate values for all the variables analyzed.Highest similarity was found between hybrids No. 14 (leader) and No. 15 (Joiner) (distance calculated = 0.479099678). The highest distance was found between hybrids No. 1 and hybrid No. 3 (distance calculated = 5.303954851).

The maximum information from agro-morphological data was received using ordination methods in combination with cluster analyses [8, 10]. Three-dimensional scaling of relationships (hybrid genotypes x traits) that accounts for the larger proportion of the total variance in PC1, PC2 and PC3 revealed by PCA indicate that the contribution of each maizehybrid and of each quantitative agro-morphological trait on the total of variation is not equal.



No. of Clusters	Distance	Leader	Joiner
20	0.479099678	H14	H15
19	0.566192637	H10	H13
18	0.581382172	H16	H21
17	0.582507225	H1	H4
16	0.653104608	H6	H17
15	0.819990872	H1	H18
14	0.966687386	H7	H14
13	0.980359534	H3	H11
12	1.168627522	H5	H7
11	1.268778147	H6	H12
10	1.308257893	H9	H10
9	1.561534119	H2	H6
8	1.686401413	H3	H8
7	1.808331797	H5	H16
6	1.983696356	H3	H20
5	3.041455383	H5	H9
4	3.227679874	H1	H2
3	3.806335518	H5	H19
2	4.039192188	H3	H5
1	5.303954851	H1	H3

Figure 1. Dendrogram of relationships between 21maize hybrids

There were sevenmaize included in PC1 that account for 39.5% of total variation, and ninemaizehybrids in PC2 which contribute with 30.8% on the total variation. Four other maizehybrids included in PC3 account for 18.9% on the total variation (Tab. 1; Fig. 2).

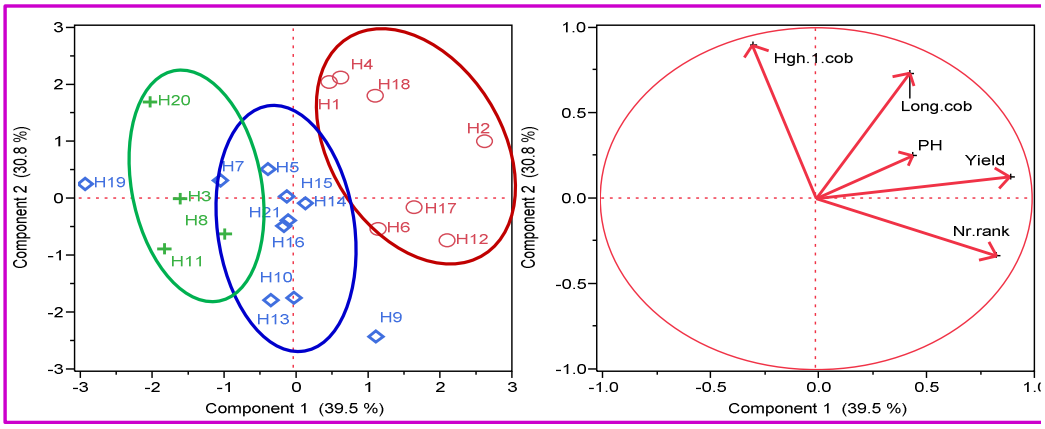


Figure 2. Relationships between 21 maizehybrids based on morphological quantitative traits revealed by PCA.

Factorial analysis identified highest weighting of PC1 and PC2 on the total variation was explained especially by maizehybridsof Cluster I and II. The lowest weighting of total variation was showed by maizehybrids of cluster III. ***Relationships between the agro-morphological traits***: Dimensional scaling for relationships between the

agro-morphological traits, showed the PC1 that explained 39.5% of total variationwas positively related to the fouragro-morphological traits (YG, No.rows, Leng.ear and PH) with eigenvectors more than 0.30 (Tab. 2; Fig. 2). PC2 that explained 30.8% of total variation was positively related to the two agro-morphological traits (Hgh.1.ear and Leng. ear) with eigenvectors more than 0.30 (Tab. 2; Fig. 2).

Table 2. F ratios and eigenvectors of three principal components for agro-morphological traits in maize hybrids

Morphological		ANOVA		Eigenvectors		
Quantitative Traits		*F* Ratio	Prob.>*F*	PC1	PC2	PC3
Plant height	PH	1.1855	0.3124	**0.31819**	0.20310	**0.87128**
First ear height	Hgh.1.ear	0.5871	0.8999	-0.21040	**0.72346**	0.11192
Ear length	Leng. ear	4.8522	<.0001*	**0.30812**	**0.59293**	-0.46028
Number of rows	No. rows	4.4536	<.0001*	**0.59379**	-0.27060	-0.09015
Yield per genotype	YG	3.3613	0.0005*	**0.63794**	0.10280	-0.09143

F– ANOVA F-ratio; *significance level equal to the 0.05 of probability; in bold eigenvectors > 0.30.

Table 3. Principal Components on Correlations

Characters	**Plant height**	**First ear height**	**Ear length**	**No. of rows**	**Yield**
Plant height	1.00	0.15	0.04	0.21	**0.33**
Firstear height		1.00	**0.43**	-0.47	-0.27
Ear length			1.00	0.15	**0.46**
No. of rows				1.00	**0.59**
Yield					1.00

Significant positive correlation was found among YG and No.rows, Leng.cob, PH traits (coefficient of correlation "r" range from 0.33 to 0.59). High of first eartrait showed a substantially negative weight on PC1 (eigenvector = --0.21040) and negative correlation with No.rows and YG ("r" range from -0.27 to -0.47). The significant correlations among quantitative agro-morphological traits can be useful for breeders to use.

4. Conclusions

Hybrids in the study represent a variation for the morphologic indicators. For the yield, the hybrids in the study appear with marked differences between hybrids and by years and many of them do not fit our conditions. Some of them, such as H2, H6, H17, H4 have yielded over 150 kv/ha which means they are well suited to the conditions of Myzeqe region and it is of interest to spread them. Hybrids in the study, generally are characterized by the vertical orientation of the leaf as well as the stay green type. H21 is ranked in the group of the best hybrids and it is suitable to be extending in production in the Myzeqe region.

5. References

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