

## Research of Some Maize Hybrids (*Zea mays*) in Kosovo's Agroecological Conditions

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### ABSTRACT

The object of the study is to investigate the suitability of some maize hybrids (*Zea mays*) from Seed Origin: Croatia (Hybrids Institute of Zagreb BC), Standard (NS 640 and NS 640 Hybrids). There were investigated six maize hybrids: BC 288, BC 354, BC 394, BC 408, BC 418, BC 5982, while the comparative hybrids (Standard) are NS 444, Standard NS 640. The research was conducted in two agro-climatic regions of Kosovo (in Arbnes, on the research farm of the Agriculture Institute of Kosovo, Peja – Dukagjini's Plain, and in Pestovo – Kosovo's Plain, the private property of the company called "Pestova"). There were investigated these parameters; the height of the stump placement on the stalk, the height of the plant, the number of trams per plant, the length of the tram, the weight of the tram, the weight of grains on the tram, grain weight, humidity, the weight of 1000 grains (Absolute P.), seed protein content (%), the content of seed fat (%). The agro-climatic and pedological data of Kosovo, compared to the yields obtained in maize culture indicate that the genetic potential of hybrids cultivated here is not exploited. The obtained results showed that there were statistically significant differences at different levels for traits investigated across the hybrids included in the plots relative to the standard (NS 444, NS 640.) and between localities.

**Keywords:** corn yield kg/plot, corn yield, crude protein content, corn fats.

### INTRODUCTION

Maize (*Zea mays*) is a very important crop, which originates from America. In recent years, in Kosovo, there have been cultivated around 70.000–85.000 ha each year with little oscillations year by year (Andris, 2016). The average yield of maize results from 4.0–5.0 t/ha. An interest and need of primary importance for Kosovar agriculture is the regionalization of hybrids, not only in terms of their products but also due to their dedication or use (Brkic, 2012). The selection of hybrids with high genetic potential as well as high adaptability to our country's agro-climatic conditions will also be a priority in the future (Abu, 2012, Fetahu, 2013). The agro-climatic and pedological data of Kosovo, compared to the yields obtained in maize culture indicate that the genetic potential of hybrids cultivated here is not

exploited. For this reason, modern agro-technology should be applied to exploit the genetic potential and obtain higher yields (Salillari, et al.2014).

### AGRO-CHEMICAL ANALYSIS OF SOIL IN THE REGIONS

#### Reddish brown spot on brownish reddish

From Table 1 we notice that we are dealing with leavened soil, which includes over 50% of the surface and represents a fairly heterogeneous group. The basic feature of these lands is the presence of reddish-colored jewels from the surface to the depth where this color becomes more pronounced, for this reason, has the name, These lands are deep and often very deep type

**Table 1.** Data on the agrochemical properties of the soil in the area of Dukagjini–Peja

Depth in cm	pH %	Humus %	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
			mg/100g soil		
0–20	6.90	3.82	0.19	12.40	20.0
20–40	6.90	3.07	0.15	14.30	16.8
40–60	7.30	1.80	0.09	7.8	13.2
60–80	7.88	1.05	0.05	2.0	10.2
80–100	7.95	0.80	0.04	1.5	10.2

(A1-A3-BT-C). For chemical properties, we can say that based on the results, these soils are non-carbonate, the pH value on the ground is acidic and the acidity decreases (Darko, 2014). The content of humus in the first layers is moderate but the humus content decreases deeper. The general nitrogen content of the soil up to the 40 cm layers is considered average (Ercole, 2011). Earth is supplied moderately with easily accessible phosphorus. While potassium, these lands are considered rich.

From Table 2 we note that Pestova lands are smonice lands as they are nearly ¼ of the land surface in Kosovo. Our studies have been done on carbonless melons with a very humid-accumulative horizon up to 90 cm (Brkic, 2016). According to the chemical properties of the smonica is non-carbonic, neutral Ph, high humus and nitrogen content, phosphorus and potassium is well supplied.

## METHODOLOGY

Experiments were set according to the randomized block method in three replications. The surface of each experimental plot was 21 m<sup>2</sup> (10 m long × 2.1 m wide). The research was conducted in two agro-climatic regions of Kosovo (in Arbesh, on the research farm of the Agriculture Institute of Kosovo, Peja – Dukagjini’s Plain, and in Pestovo – Kosovo’s Plain, the private property

of the company called “Pestova”. Seeding in the absence of a machine was done manually on 02.05.2020 in the plain of Kosovo in Pestova, while on 30.04.2020 in the plain of Dukagjini in Arbëresh while for the sake of optimal density, two seeds were thrown into a lodge for each hybrid (Musa, 2013). Planting is done according to the block system random method.

## RESULTS AND DISCUSSIONS

The elaboration of the achieved results and their statistical interpretation on the behavior of the hybrids investigated in the agro-climatic conditions of our country concerning the comparative 6 maize hybrids were investigated: BC 288, BC 354, BC 394, BC 408, BC 418, BC 5982 existing in Kosovo (NS 444 and NS 640). From Table 3 of the Analysis of Variance and LSD Testing at 5% and 1%, in terms of yields expressed in kg per experimental plot, show no statistically significant differences in the investigated hybrids compared to the comparable hybrids (NS 444 and NS 604). All the investigated hybrids approximately yielded the same results and the observed differences are only random we cannot conclude the superiority of any of these hybrids investigated concerning the comparative hybrids in terms of this parameter (yield). In terms of yields obtained by locality, slightly higher yields were obtained in Pestovo (Vushtrri) compared to

**Table 2.** Data on agrochemical properties of land in the Kosovo-Pestovo region

Depth in cm	pH %	Humus %	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O
			mg/100g soil		
0–20	7.40	5.78	0.29	15.50	30.0
20–40	7.44	5.55	0.29	12.50	30.0
40–60	7.62	3.00	0.15	8.70	25.0
60–80	7.70	1.50	0.07	6.50	15.0
80–100	7.77	1.10	0.06	4.20	18.0

**Note:** Smooth land.

**Table 3.** The Analysis of Variance and LSD in terms of yields expressed in kg per experimental plot at the investigated hybrids

The hybrid (A)		The location (B)		The average (A)
		Peja	Pestovo	
BC 288		16.167	18.000	17.083 <i>Ns</i>
BC 354		17.000	18.333	17.667 <i>Ns</i>
BC 394		15.500	17.667	16.583 <i>Ns</i>
BC 408		15.167 **	17.500	16.333 <i>Ns</i>
BC 418		16.500	21.333	18.917 <i>Ns</i>
BC 5982		15.667	17.833	16.750 <i>Ns</i>
NS 444 st.		16.833	19.000	17.917
NS 640 st.		18.500	18.833	18.667
The average (B)		16.416	18.562 **	The interaction A x B
The factors		A	B	AB
LSD	1%	5.0117	1.2453	6.1319
	5%	3.7815	0.9247	4.5489

**Note:** *Ns* – non- significant, \* – significant, \*\* – very significant.

Peja. Statistically, these differences are very significant so we say that in the area of Pestova, the yields achieved were higher than in the region of Peja in all the investigated hybrids. Regarding the interaction or the interaction of the factors A x B (hybrid z locality), there are also differences between the different statistical levels of significant and non-significant, which can be seen from Table number 1 itself.

From Table 3 of the analysis of Variance and LSD Testing 5% and 1%, LSD in terms of yields expressed in kg experimental plot at the investigated, Regarding the yields obtained in the hybrids explored this year, by locality, slightly higher yields were obtained in Pestovo (Vushtrri) compared to

Peja (18,562 kg/parcel respectively 16,416 kg/parcel). Statistically, these differences are very significant, so we can say that in the area of Pestovo, the achieved yields were higher than those in the region of Peja in all the investigated hybrids.

From Table 4 of the analysis of Variance and LSD Testing 5% and 1%, regarding the percentage of the protein content in the investigated maize hybrids, there are statistical differences in the significations of different levels. These differences between the BC 354, BC 408, BC 418, BC 5982, and NS 444 comparative hybrids are extremely significant, and we say that in terms of this parameter (protein content in percent), these hybrids are weaker than NS 44. Between

**Table 4.** The analysis of Variance and LSD Testing for the percentage of protein content in the investigated maize hybrids

The hybrid(A)		The location (B)		The average (A)
		Peja	Pestovo	
BC 288		14.133	13.900	14.017**
BC 354		13.400	12.967	13.183**
BC 394		15.267	14.633	14.950**
BC 408		10.967	11.900	11.433**
BC 418		13.100	11.967	12.533**
BC 5982		13.700	12.967	13.333**
NS 444 st.		13.833	13.267	13.550
NS 640 st.		12.500	9.067	10.783**
The average (B)		13.362	12.583**	The interaction A x B
Factors		A	B	AB
LSD	1 %	0.2067	0.0750	0.2912
	5 %	0.1532	0.0557	0.2161

**Note:** \* – significant, \*\* – very significant.

**Table 5.** The analysis of Variance and LSD for the percentage of fat content in the investigated maize hybrids

The hybrid (A)		The location (B)		The average (A)
		Peja	Pestova	
BC 288		5.967	5.433	5.700 **
BC 354		5.200	4.933	5.067 *
BC 394		5.300	3.500 **	5.400 Ns
BC 408		5.767**	5.500	5.633 **
BC 418		4.833	4.900	4.867 **
BC 5982		5.300	5.067	5.183 Ns
Ns 444 st.		5.333	5.267	5.300
Ns 640 st.		5.167	5.100	5.183
The average (B)		5.358	4.962*	The interaction A × B
The factors		A	B	AB
LSD	1 %	0.3116	0.1278	0.4683
	5 %	0.2310	0.0949	0.3475

**Note:** Ns – non significant, \* – significant, \*\* – very significant.

the hybrids BC 288, BC 394, and NS 444 these differences are also highly significant concerning this parameter. Significant differences were found only between the hybrid NS 444 hybrid. Whereas for the two comparative hybrids, there were also statistically significant differences in the percentage of protein content, and in this respect hybrid NSS 444 has higher protein content and as such is better in this parameter. Statistical differences of the different levels of signification were also found regarding the interaction between the factors Hybrid X Localities, which is well illustrated by Table number 4.

From Table 5 of the analysis of variance and LSD testing with 5% and 1%, in terms of percentage of seed fat content in most of the hybrids tested showed statistically significant differences. In the hybrids BC 288 and BC 408, in comparison to hybrid NS 444, statistically significant differences were observed in seed fat content, and all of these

hybrids showed better results in this parameter. Hybrids BC 418 and compared to hybrid NS 444 (comparative) has slightly lower seed fat content and the differences between them are only significant whereas hybrids BC 394, BC 5982, compared to hybrid NS 444 have not been identified statistical differences and in this respect, these hybrids have yielded approximately the same results in terms of seed fat content and that the observed differences are only random (Aliu, et al., 2016). No statistical differences were found between the comparable hybrids NS 444 and NS 640 concerning this parameter investigated in maize hybrids (Baker, 2012). Generally, the cultivated hybrids in the locality of Pestova have shown lower fat content in their seed. Also after analysis of variance and LSD testing, statistical differences of different signaling levels were found in the interaction or the Hybrid x Locality factors interaction, which can be seen in Table 5.

**Table 6.** Values of some parameters in the tram and harvest index of the investigated maize hybrids

Hybrid	Weight of three trams	$\bar{X}$	Weight of grains all three trams	$\bar{X}$	Weight of grains all three trams	$\bar{X}$	Weight of 1000 grains	Tram Index
BC 288	697.549	232.5	566.647	188.8	130.902	43.6	414.036	0.81
BC 354	802.874	267.6	680.954	226.9	121.920	40.6	354.660	0.84
BC 394	876.411	292.1	740.216	246.7	136.195	45.4	366.888	0.84
BC 408	781.915	260.6	647.446	215.8	134.469	44.8	382.140	0.83
BC 418	1.022.694	340.9	836.883	278.9	185.811	61.9	433.580	0.82
BC 5982	823.921	274.6	687.352	229.1	136.569	45.5	355.636	0.83
Standard NS 444	894.042	298.0	740.761	246.9	153.281	51.1	347.584	0.83
Standard NS 640	1110.637	370.2	897.223	299.1	213.414	71.1	476.212	0.81

## CONCLUSIONS

Based on the results obtained in the research plots for the maize hybrid in the Plain of Dukagjini and the Plain of Kosovo (Pestovo), we can conclude the following.

Regarding the yields obtained in the hybrids explored this year, by locality, slightly higher yields were obtained in Pestovo (Vushtrri) compared to Peja (18,562 kg/parcel respectively 16,416 kg/parcel). Statistically, these differences are very significant, so we can say that in the area of Pestovo, the achieved yields were higher than those in the region of Peja in all the investigated hybrids.

Regarding the percentage of seed protein content in the investigated maize hybrids, there are statistical differences in the significations of different levels. These differences between the BC 354, BC 408, BC 418, BC 5982, and the comparative hybrid NS 444 are highly significant, and we say that in terms of this parameter, these hybrids are weaker than the hybrid NS 444. Between the hybrids BC 288, BC 394, and NS 444, these differences are also highly significant (higher) in terms of this parameter. Significant statistical differences were also found in terms of localities, so in most of the cases, the cultivated hybrids in the locality of Peja were higher in protein content.

Significant statistical differences in seed fat content were found in BC 288 and BC 408 hybrids in comparison with the hybrid NS 444 and all of these hybrids showed better results in this parameter. BC 418 hybrids and NSS 444 (standard) hybrids have somehow lower seed fat content and the differences between them are only significant.

Regarding the fat content, expressed in % of the investigated maize hybrids, statistical differences were also found in different localities but these differences are only significant. In general, the cultivated hybrids in the locality of Pestovo (Vushtrri) have shown lower fat content in their seed.

The Terrestrial Index as a very important indicator of the productivity of a hybrid has also shown numerous variations in researched maize hybrids. The highest value for this index was given by BC 354 hybrids and BC 394. The standard or comparative hybrids had a Tram Index among the investigated hybrids and had these values NS 444 (0.83) and hybrid NS 406 (0.81).

In regards to agro technical measures, particular attention should be paid to the following aspects: investigate hybrids with high potential of production and with good adaptability to the agro-climatic conditions of our country; the planting of certain hybrids should be carried out within the optimal time; soil analysis should be carried out in advance as to the content of the main nutrients (N, P, K) to compile the formula as regards the fertilization of certain maize hybrids; adequate and balanced use of nutrient fertilizers based on soil nutrient content and planned yield; plant circulation should be respected in order of eliminating the possibility of attacks by the wintering potentials of Biological Harmful Agents (ADBs); applying Integrated Protection to maize crops but also pre-crops; the use of modern machinery in all stages of production, manipulation, and storage of corn.

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