

## RESEARCH OF SEVERAL HYBRIDS OF CORN FROM THE REGION IN THE AGRO-ECOLOGICAL CONDITIONS OF KOSOVO

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### Abstract

The research of seven maize hybrids from Croatia was performed during 2011/2012 and 2012/2013 by comparing the hybrids with their characteristics that belong to the FAO group. The research was performed in important cultivating regions of Kosovo that is in the research fields of Agricultural Institute of Kosovo in Peja and in Pestova – Plain of Kosovo. The agro climatic and pedology conditions of Kosovo, compared to the obtained yields in the maize indicate that one that does not use the full genetic potential of the hybrids that are cultivated in Kosovo. Due to this reason, a new genetic potential was used into this study. The obtained results indicate that the hybrids cultivated in the fields of Pestova provide a yield that in other attributes like stem and husk is better than maize cultivated in the fields of Peja. From the studied hybrids, Jumbo 48KR indicated more favorable attributes, the other hybrids indicated average attributes, while the lowest was observed with the hybrid BC 288 BKR.

**Keywords:** yield, Jumbo 48 KR, protein content, fat content.

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### 1. Introduction

The corn (*Zea mays* L.) represents one of the most important crops. In Kosovo, the surfaces that are used to cultivate this culture reach 70.000-80.000 ha per year, which represents around 32.27% of the arable land (Fetahu, 1998, Aliu et al, 2008). In the last period, the average yield of the corn is rather low and it ranges between 4.0 – 5.0 t/ha (Montgomery et al, 1970, Salilari et al, 2000). The yield as a main characteristics of the culture is conditioned not only by the corn genotype, however it also depends in the external conditions (Andriç et al, 2006, Berkiç et al, 2006, Musa, et al, 2003), other factor is that the corn requires a high level of nitrogen, whereby the kernels require 20-25 kg per ton (Muzilli & Oliveira, 1992; Sangoi et al, 2001). Higher immobilization and lower mineralization may contribute to decrease N availability in no-tillage maize during the crop establishment (Ernani et al, 2002).

The success of genetic improvement of maize yield depends on several factors such as initial sources of genes, improvement method, and types of the gene actions involved in yield control, inheritance and genetic control of related traits such as capacity of production (Rezaei et al, 2004). Biomass accumulation in kernels begins shortly after fertilization and can be represented by a sigmoidal pattern in which a lag and a linear growth phase can be distinguished (Duncan et al, 1965).

In general, the agro climatic and pedology conditions of Kosovo, compared to the obtained yield in corn, indicate the lack of utilization of full genetic potential of the hybrid varieties that are produced in Kosovo, therefore this study will serve as additional impetus to increase the production of various corn hybrids that originate from the region.

### 2. Materials and methods

The study was performed in the span of two years (2011/2012 and 2012/2013) whereby the first studied various corn hybrids from Croatia (BC 288 BKR, BC 354, BC 394 KR, BC 5982, BC 408, BC 418 BKR and Jumbo 48 KR) with the aim of determining the adaptation to the agro climatic conditions and possible introduction in the national list of Kosovo.

The evaluation was conducted at two different localities of Kosovo known for different agro climatic and pedology characteristics (Peja - Research Station of Kosovo Institute of Agriculture and Pestova - private agriculture company). The experimental design was a complete randomized block design in three replications (Berzsenyi & Lap, 2004). Each hybrid was

sown in plots 10 m long and 0.7 m wide with 1m space distant each other. Previous crop in trials set up in Peja was winter wheat, while in Pestova was potato. The sowing was done manually within optimal time (third decade of April) in both of localities, with the sowing distance of 25cm within a row according to the FAO group of maturity each experimental plot received the following amount of fertilizer: 350 kg/ha (NPK 10:30:20), as a basal application, 150 kg/ha (Urea) and 50 kg/ha (KAN) respectively, split in two top dressing application, in both of respective localities, evaluation has been performed in the field (plant height, the height of the first cob within the plant and cobs number/plant), and in the laboratory conditions (grain yield, crude protein content), according to the ISTA regulations (International Seed Association ,1996). The obtained data were statistically processed using MSTAT-C program (Crop and soil sciences Dept., Michigan St. Univ., USA).

### 3. Results and Discussion

From the Table 1 we observe that the height of the plant and the positioning of the first husk in the plant was the highest with the hybrid JUMBO 48 KR and the height of the plant  $245 \pm 2.08$  cm in Pestova, respectively  $236 \pm 2.24$  cm in Peja, whereas the height of the first husk was  $109 \pm 1.25$  cm in Pestova, respectively  $104 \pm 0.85$  cm in Peja, while the lowest height of the plant was observed with hybrid BC 288 BKR with  $220 \pm 2.50$  cm in Pestova, respectively  $202 \pm 2.10$  cm in Peja, also the lowest height of the first husk was observed at hybrid BC 288 BKR  $92 \pm 1.26$  cm in Pestova, respectively  $83 \pm 1.06$  cm in Peja. In addition, from the Table 1 clearly we can observe that in general all the hybrids that were cultivated in Pestova indicate more favorable attributes. The highest number of husks per plant is observed at hybrid BC 288 BKR with  $1.4 \pm 0.55$  it was the same for Pestova and Peja, whereas other hybrids yielded lower number of husks.

**Table 1.** The height of the plant, the height of the husk and their number per plant at the researched corn hybrids

Hybrid	Location	The height of the plant (cm)	The height of the husk (cm)	Number of husks
BC 288 BKR	Peja	$202 \pm 2.10$	$83 \pm 1.06$	$1.4 \pm 0.55$
	Pestova	$220 \pm 2.50$	$92 \pm 1.26$	$1.4 \pm 0.55$
BC 354	Peja	$225 \pm 2.86$	$88 \pm 2.02$	$1.2 \pm 0.25$
	Pestova	$237 \pm 1.60$	$94 \pm 1.04$	$1.2 \pm 0.32$
BC 394 KR	Peja	$220 \pm 2.00$	$90 \pm 1.65$	$1.3 \pm 0.13$
	Pestova	$237 \pm 3.05$	$95 \pm 1.45$	$1.3 \pm 0.35$
BC 408B	Peja	$218 \pm 1.00$	$93 \pm 2.60$	$1.3 \pm 0.38$
	Pestova	$228 \pm 1.08$	$98 \pm 0.68$	$1.3 \pm 0.14$
BC 418 BKR	Peja	$227 \pm 2.55$	$99 \pm 1.58$	$1.2 \pm 0.56$
	Pestova	$239 \pm 3.50$	$104 \pm 1.02$	$1.2 \pm 0.28$
BC 5982	Peja	$220 \pm 2.16$	$95 \pm 0.58$	$1.2 \pm 0.20$
	Pestova	$232 \pm 3.08$	$105 \pm 2.06$	$1.2 \pm 0.18$
JUMBO 48 KR	Peja	$236 \pm 2.24$	$104 \pm 0.85$	$1.2 \pm 0.26$
	Pestova	$245 \pm 2.08$	$109 \pm 1.25$	$1.2 \pm 0.22$

From the Table 2 we observe a great diversity between the observed corn hybrids regarding the length of the husk, the number of circles in the husk and the number of kernels in the husk.

The largest length of the husk is indicated at hybrid JUMBO 48 KR with  $25.0 \pm 0.96$  cm in Pestova, respectively  $23.5 \pm 0.85$  cm in Peja, while the shortest length is indicated at hybrid BC 288 BKR with  $20.0 \pm 1.12$  cm in Pestova, respectively  $19.5 \pm 0.85$  cm in Peja.

Number of rows of kernel also indicates pronounced variations at the researched hybrids of the corn. The highest value is indicated at hybrid BC 5982 with  $17 \pm 0.45$  in Pestova, respectively  $16 \pm 0.20$  in Peja, while the lowest number is observed at BC 394 KR with  $13 \pm 0.17$  in Pestova, respectively  $12 \pm 0.35$  in Peja.

Regarding the number of kernel in rows the highest value is observed at hybrid BC 394 KR with  $55 \pm 1.35$  in Pestova, respectively with  $52 \pm 1.01$  in Peja, while the lowest is with hybrid BC 288 BKR with  $42 \pm 0.55$  in Pestova, respectively with  $39 \pm 0.56$  in Peja.

**Table 2.** The obtained values of husk parameters, at the researched hybrids

Hybrid	Location	The length of the husk (cm)	Number of rows	Number of rows in the husk
<b>BC 288 BKR</b>	Peja	19.5±0.85	16±0.40	39±0.56
	Pestova	20.0±1.12	18±0.36	42±0.55
<b>BC 354</b>	Peja	21.5±1.04	14±0.26	44±0.90
	Pestova	22.5±0.96	16±0.45	46±0.60
<b>BC 394 KR</b>	Peja	23.0±0.95	12±0.35	52±1.01
	Pestova	23.0±0.96	13±0.17	55±1.35
<b>BC 408B</b>	Peja	23.0±0.85	14±0.44	47±0.86
	Pestova	23.5±1.22	16±0.55	51±0.56
<b>BC 418 BKR</b>	Peja	23.5±1.11	14±0.46	49±1.20
	Pestova	24.5±0.76	16±0.40	51±0.95
<b>BC 5982</b>	Peja	20.5±0.85	16±0.20	41±1.26
	Pestova	21.0±0.44	17±0.45	45±0.68
<b>JUMBO 48 KR</b>	Peja	23.5±0.85	12±0.35	48±0.80
	Pestova	25.0±0.96	15±0.18	52±1.08

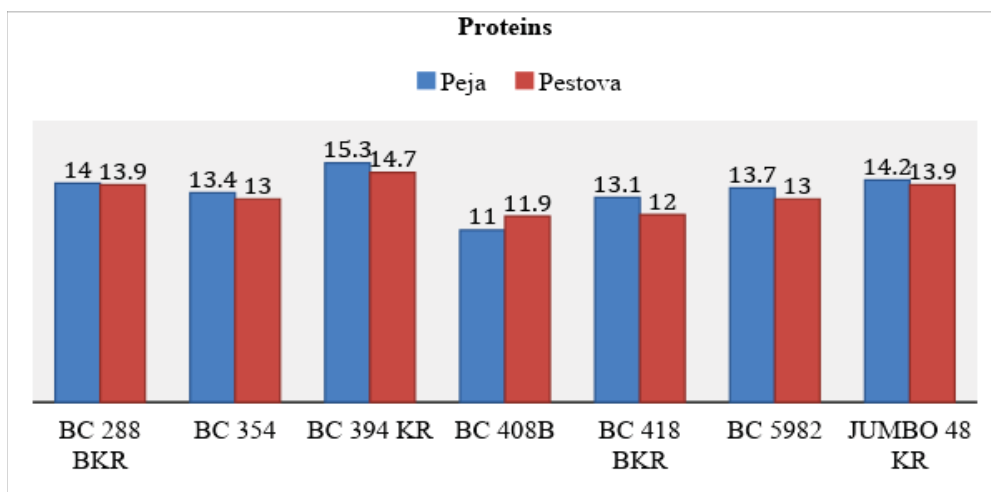
**Table 3.** The yield that was obtained at researched corn hybrids

Hybrid	Location	Yield kg/crop	Yield t/ha	
			With cob	kernel
<b>BC 288 BKR</b>	Peja	16.2±1.75	9.8±0.76	7.9±0.85
	Pestova	18.0±1.73	11.1±0.73	8.9±1.20
<b>BC 354</b>	Peja	17.0±0.87	11.5±1.16	9.6±1.10
	Pestova	18.3±2.02	12.2±1.31	10.2±1.42
<b>BC 394 KR</b>	Peja	15.5±1.50	10.2±1.81	8.5±0.92
	Pestova	17.5±2.29	11.5±0.96	9.6±2.46
<b>BC 408B</b>	Peja	15.2±1.04	10.1±0.94	8.4±1.31
	Pestova	17.5±3.91	11.5±1.47	9.5±1.14
<b>BC 418 BKR</b>	Peja	16.5±1.50	11.0±1.32	9.0±0.87
	Pestova	21.3±6.03	13.1±0.95	10.7±0.85
<b>BC 5982</b>	Peja	15.6±1.61	12.3±1.11	10.2±0.96
	Pestova	17.8±1.76	13.8±1.35	11.4±1.32
<b>JUMBO 48 KR</b>	Peja	17.5±2.78	11.5±1.57	9.6±0.82
	Pestova	21.6±3.51	13.9±1.25	11.6±1.02

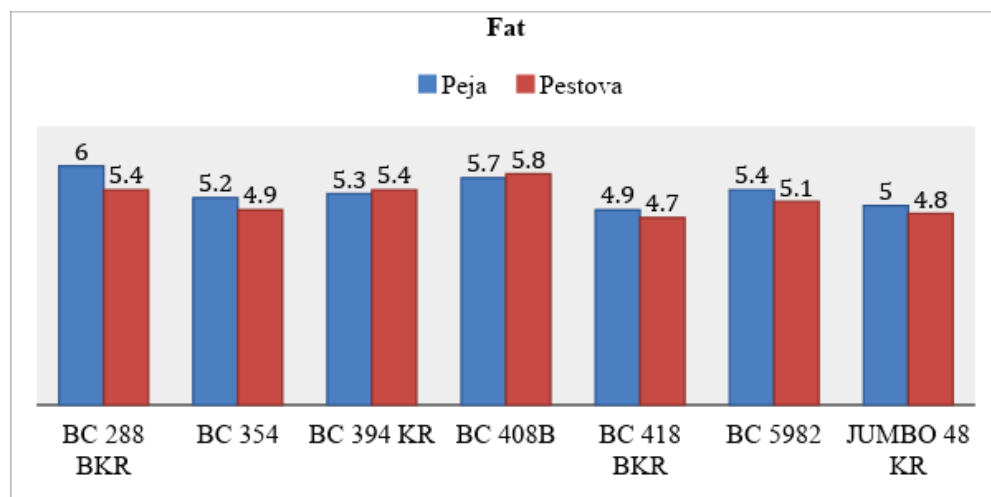
From the Table 3 we observe that all the studied hybrids indicate a high yield, respectively the highest yield expressed in kg/crop has hybrid JUMBO 48 KR with 17.5±2.78 kg/crop in Peja and 21.6±3.51 kg/crop in Pestova.

Nevertheless, as it is common, the yield is calculated in unit t/ha taking into account the weight of cob and kernel, based on this a higher yield expressed in t/ha with cob and kernel is observed at hybrid BC 5982 with 12.3±1.11 t/ha in Peja and 13.8±1.35 t/ha in Pestova both taking into account the cob, whereas with kernel only with 10.2±0.96 t/ha in Peja and 11.4±1.32 t/ha in Pestova, a similar yield is observed with hybrid JUMBO 48 KR, whereas a lower yield was observed with hybrid BC 288 BKR with 9.8±0.76 t/ha in Peja and 11.1±0.73 t/ha in Pestova with cob and 7.9±0.85 t/ha in Peja and 8.9±1.20 t/ha in Pestova with kernel, a lower yield was observed with hybrid BC 408 B.

Protein content at the studied hybrids is variable as observed in graph 1, it is higher at hybrid BC 94 KR that is 15.3% for the Peja region and 14.7 for Pestova, the hybrid JUMBO 48 KR also has a higher protein content of 14.2% in Peja and 13.9% in Pestova, while lower content is observed with hybrid BC 408B with 11.0% in Peja and 11.9% in Pestova. In general, the hybrids that are cultivated in the region of Peja indicate a higher content of protein compared to those cultivated in the location of Pestova. We consider that this happened as a result of reaction of various genotypes of the corn hybrids with the more favorable agro climatic conditions for the researched varieties in the region of Peja.



**Figure 1.** Protein content in (%) at various corn hybrids



**Figure 2.** Fat content in % at the various corn hybrids in the researched locations

Regarding fat content expressed in % at the researched corn hybrids, differences in various locations were observed. Generally speaking, the cultivated hybrids in the location of Vushtrri – Pestova indicated a lower fat content in their kernel. Hybrid BC 288 BKR has a higher fat content with 6.0% in Peja and 5.4% in Pestova, then it is hybrid BC 408 B with 5.7 % in Peja and 5.8% in Pestova, whereas lower fat content is observed at hybrid BC 418 BKR with 4.9% in Peja and 4.7% in Pestova.

#### 4. Conclusions

Based on the obtained results from the research crops with corn in the Plain of Dukagjin – Peja and in Plain of Kosovo – Pestova, we can conclude as follows: the height of the plant as well as the height of the positioning of first husk in the plant is the highest at hybrid JUMBO 48 KR. Regarding the length of the husk, the number of circles inside the husk and the number kernel rows in husk, the hybrids BC 5982 and JUMBO 48 KR indicate better results. Regarding the obtained yield at the researched hybrids based on the locations, higher yield is obtained in the location of Pestova compared to the location of Peja, whereas a higher yield is obtained with hybrids BC 5982 and JUMBO 48 KR. In major part of the cases, the cultivated hybrids in the location of Peja have a higher protein content, whereas the hybrids with higher content are BC 394 KR and JUMBO 48 KR. Hybrids BC

288 BKR and BC 408 B have a higher protein content, whereas the majority of the hybrid cultivars cultivated in location of Peja have a higher protein content.

### **Recommendation**

Location of Pestova was more suitable for the production of hybrids, even though more favorable chemical content is observed with varieties cultivated in location of Peja, whereas hybrid JUMBO 48 KR adapted more favorably in both locations.

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