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Original Article

Yield and morphological characteristics of some types of CMS hybrids of tobacco Prilep

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***Abstract*:**
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This paper presents characteristics of the four newly created hybrid varieties of tobacco Prilep. The survey was conducted in period from year 2005. to 2006, and was performed at the experimental field of AD Selekcija in Aleksinac. The aim was to perform a comparative analysis of the newly created CMS hybrid varieties of tobacco type Prilep through testing the yield and morphological characteristics. Relating morphological traits, all tested hybrids showed the characteristic of the oriental tobacco type Prilep. The hybrid P-3 had a slightly greater plant height, whereas the hybrid P-2 achieved the greatest number of leaves per plant and the hybrid P-4 some greater size of the largest leaf as well as the length of internodes. The hybrid P-3 exhibited a much greater yield of dry leaves than hybrids P-2 and P-4. The same hybrid achieved significantly better features in proportional representation of high classes compared to the hybrid P-2.

Key words: tobacco, Prilep, hybrid, dry leaf yield, morphological characteristics

Introduction

Production area of tobacco (*Nicotiana tabacum* L.) has decreased in the recent period in Serbia. According to the report of the Serbian Chamber of Commerce, the production was only 320.000 kilograms in 2009. Production of oriental tobacco is mainly conducted in the regions of South Morava and Kosovo and Metohija. One of the reasons for production decrease is the present assortment which does not satisfy either the yield or the quality (Stančić et al., 1998). For this reasons, breeders are trying to create hybrids based on cytoplasmic male sterility (CMS). In this way, the illegal seed production will be prevented, and conditions for achieving varietal uniformity and good yield and quality will be also created in the entire production area. Knowledge in gene pool of tobacco could assist in selection of materials for breeding or genetic investigations (Moon et al., 2009).

On the basis of the needs for oriental tobacco that is present 8-10% in the manufacture of cigarettes, the goal of the work was to perform a comparative analysis of the newly created CMS hybrid varieties of tobacco type Prilep through testing the yield and morphological characteristics.

Materials and methods

The survey comprised four hybrids based on CMS of type Prilep: P-1, P-2, P-3 and P-4. The process of plant breeding was carried out through a series of crossbreeding, where sterile analogues were conducted at first. The subsequent procedure comprised the research of combining potentials of the achieved material in order to find the best parental genotypes of F1 hybrids. The survey was conducted from year 2005. to 2006.,

Table 1. Morphological characteristics of tested tobacco hybrids

Hybrids	Plant height including flower (cm)	Number of leaves per plant	Internodes length (cm)	Length of leaf (cm)	Width of leaf (cm)	Ratio leaf length / width
P-1	49	36	1,6	13,1	7,9	1,66
P-2	50	39	1,8	13,2	8,1	1,63
P-3	55	38	2,2	13,7	8,1	1,69
P-4	49	35	2,5	15,2	8,9	1,71

Table 2. Yield of leaves (kg/ha) and Percentage of high classes (I and II)

Hybrids		Yield of leaves (kg/ha)	Rank	% representation (I and Class II)	Rank
P-1		1410	2	26,56	2
P-2		1356	4	22,31	4
P-3		1494	1	28,76	1
P-4		1361	3	23,38	3
LSD	0,05	93,72		6,12	
	0,01	130,23		8,32	
Cv		5,62		3,21	

at the experimental field of AD Selekcija in Aleksinac. The experiment was set up according to a completely randomized block design with five replications. During the experiments the optimal agricultural practices for oriental tobacco cultivation of were applied. Yield of dry leaves (kg/ha) and calculation of the proportional representation of high classes (I and II) (Jovanović, D., 2001) were obtained after harvesting, drying and grading. Investigation of the morphological characteristics was carried out during the vegetation period, and ten plants from each trial were used as a representative sample. The measurement was done on the insertion of the middle leaf and it included the height of the plants with a flower, the number of leaves per plant, the length of internodes in the middle of the stem, the size of leaves and the ratio of leaf length and width.

Results and discussion

Morphological traits of the tested hybrids were obtained during the vegetation period (Tab. 2).

The hybrid P-3 achieved the highest height (55 cm), while hybrids P-1 and P-4 expressed some lower values. Regarding the number of leaves per plant, the hybrid P-2 had the greatest value (39), whereas the hybrid P-4 the lowest (35). Investigation of the genetic variability of plant height and number of leaves per plant in some varieties of oriental tobacco and their F1 hybrids is a significant precondition for high and stable yield (Korubin-Aleksoska, A., 2010). The highest (2.5 cm) and lowest (1.6) length of internodes were found for hybrids P-4 and P-1respectively.

The greatest leaf size was found in the hybrid P-4 with an average length of 15.2 cm and an average width of 8.9 cm. The hybrid P-1 had the smallest leaf with an average length of 13.1 cm and an average width of 7.9 cm. Miceska et al. 2003 obtained higher values for the examined morphological characteristics of tobacco type Prilep. Regarding the ratio of leaf length and width, the hybrid P-4 showed the greatest value (1.71), while the lowest value (1.66) was found for the hybrid P-1. Bearing in mind the correlation between leaf size and its chemical composition, relation of length and width of the leaf is an important parameter for the quality of oriental tobacco. The parameters of morphological characteristics of tested hybrids were typical for the oriental tobacco type Prilep.

The leaf yield is a trait that is influenced by many interrelated factors. Genetic properties of tobacco hybrids and agro-ecological conditions of production are the decisive factors in formation of organic and mineral complex of substances, affecting the corresponding leaf yield. The hybrid P-3 achieved the greatest dry leaf yield (1494 kg / ha), while the hybrids P-2 and P-4 exhibited lower values (**Tab.1**). Statistically significant differences were found among the hybrids. The hybrid P-3 achieved significantly greater yield comparing to hybrids P-2 and P-4. No significant differences were obtained among other tested hybrids. Tobacco breeders focus their program on those quantitative traits that are highly associated with leaf yield (Drazic et al., 2010).

The quality of tobacco was expressed through the percentage of high classes of the leaves (I and II, Tab. 1). The hybrid P-3 exhibited the highest percentage of high class representation (28.76%),

while the hybrid P-2 had the lowest participation of high classes in dry leaf (22.31%). The hybrid P-3 showed some better characteristics compared to the hybrid P-2 in term of the proportional distribution of high classes. There was no statistically significant difference among other tested hybrids. The obtained yield values and the percentage of high classes of the leaves are in accordance with the results obtained by Miceska & Dimitrieski (2000).

Conclusion

The obtained mean values and variability parameters show that the tested hybrids exhibited a high variability in yield and morphological traits. The genotypes usually varied in leaf yield, the percentage of high classes, plant height and internodes length. The hybrid P-3 achieved the highest yield of dry leaves. It also had the best proportional distribution of high classes, whereas morphological characteristics of this hybrid were typical for the oriental tobacco type Prilep. Genetic potential and morphological characteristics of the hybrid P-3 could be included in breeding program of oriental tobacco.

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