

PLANT BREEDING FOR CREATION OF LATE-MATURING ORIENTAL TOBACCO GENOTYPES



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ABSTRACT

Investigations were made with six oriental varieties of tobacco types Prilep, Djebel and Yaka (P-23, P-84, P10-3/2, P-76, Xanthi Djebel 1 and YV 125/3) and fifteen F1 hybrids for the characters flowering time and length of growing season from tobacco transplanting in field to the end of harvest. The field trial was set up in 2010 and 2011 in Tobacco Institute – Prilep in a randomized block design with four replications. All appropriate cultural practices were applied during the growing season. Statistical processing of data was performed by using the analysis of variance (ANOVA)

The aim of this work was to study the mode of inheritance and to detect possible heterotic effects for the above biological characters, which will allow a selection of lines with longer growing season, higher productivity and some other positive characters inherited from the early-maturing parent. They would be promising genotypes intended for arid regions with poorer soils and longer growing season.

The period from tobacco transplanting to 50% flowering in parental varieties ranged from 45 to 95 days in Xanthi Djebel-1 (XDj-1) and in P-76, respectively, while the period from transplanting to the end of leaf harvesting in these two genotypes ranged from 70 to 145 days. There were differences in inheritance of the two stages among hybrids. The most common types of inheritance were partial dominance and dominance. The early-maturing parent dominated in the first period, while the late-maturing parent dominated in the second period and there was also an appearance of heterosis.

Keywords: tobacco, diallel crosses, mode of inheritance, biological stages

INTRODUCTION

The activity of breeders is directed toward increasing the yield, quality and resistance, but they also monitor the length of growth period in various genotypes and provide directives for their cultivation in different localities. Tobacco is a crop that can be grown at different altitudes and in areas with different soil and climate conditions, but the variety is the key factor which will give the maximum genetic potential in particular environment.

The aim of this paper comes from the necessity that varietal regionalization in the Republic of Macedonia should be followed by creation of tobacco genotypes with longer growth period, higher yield and better quality, suitable for arid areas, poor soils and longer vegetation.

MATERIAL AND METHODS

To study the mode of inheritance of the time of flowering and length of growth period from planting in field to the end of harvest, one-way diallel crossings were made between six oriental varieties of the types: Prilep (P -23 , P - 84, P 10 -3/2 , P 76/86), Djebel (Xanthi Djebel XDj-1) and Yaka (YV 125/3). The choice of parents was made on the basis of previous studies on tobacco varieties produced in R. Macedonia.

Crossings were made in 2009 and 2010, with manual castration and pollination. In 2010 and 2011, a trial was set up on the Experimental field of Tobacco Institute - Prilep with 6 parental genotypes and their 15 F1 hybrids, in randomized block design with four replications. The inter-row spacing was 45 cm, and plant spacing 15 cm. Variants in each replication were planted in four rows, i.e. 16 rows in the whole trial. Cultural practices applied during the growing period were as usual for production of oriental aromatic tobaccos.

RESULTS

Table 1. Inheritance of the time from transplanting to flowering and the length of growth period from transplanting to the end of harvest in some tobacco varieties and their diallel F1 hybrids

Parents and diallel F1 hybrids	Transplanting date: 10.06.2010			Transplanting date: 15.06.2011		
	Days to the beginning of flowering	Days to 50% flowering	Days to the end of flowering	Days to the beginning of flowering	Days to 50% flowering	Days to the end of flowering
P-23	50	53	115	48	51	110
P-84	59	64	135	60	64	135
P 10-3/2	54	58	110	50	55	105
P 76/86	90	95	145	87	92	143
XDj-1	43	47	70	40	45	70
YV 125/3	57	62	120	55	60	117
P-23 x P-84	50 -d	55 pd	133 +d	48 -d	52 -d	132 +d
P-23 x P 10-3/2	50 -d	53 -d	115 +d	48 -d	51 -d	110 +d
P-23 x P 76/86	60 pd	63 pd	135 pd	58 pd	62 pd	135 pd
P-23 x XDj-1	45 pd	48 pd	100 pd	46 pd	47 pd	100 pd
P-23 x YV 125/3	51 pd	55 pd	125 +h	50 pd	55 i	123 +h
P-84 x P 10-3/2	53 -h	57 -h	125 i	48 -h	56 -d	122 i
P-84 x P 76/86	60 -d	65 -d	143 pd	58 -d	63 -d	140 i
P-84 x XDj-1	46 pd	50 pd	120 pd	43 pd	49 pd	120 pd
P-84 x YV 125/3	57 -d	61 -d	140 +h	55 -d	60 -d	138 +h
P 10-3/2 x P 76/86	60 pd	65 pd	141 +d	60 pd	64 pd	139 +d
P 10-3/2 x XDj-1	45 pd	49 pd	105 +d	45 i	48 pd	105 +d
P 10-3/2 x YV 125/3	54 -d	59 pd	118 pd	54 pd	58 i	115 pd
P 76/86 x XDj-1	60 pd	65 i	120 pd	58 i	62 pd	118 pd
P 76/86 x YV 125/3	70 i	75 i	150 +h	68 i	73 i	148 +h
XDj-1 x YV 125/3	45 pd	49 pd	125 +d	44 pd	49 pd	122 +d



Ph. 1. Prilep P-23



Ph. 2. Prilep, P-84



Ph. 3. Prilep, P 10-3/2



Ph. 4. Prilep P 76 / 86



Ph. 5. Xanthi Djebel, XDj-1



Ph. 6. Yaka, YV 125/3

CONCLUSIONS

Based on the results of two-year investigations on the mode of inheritance of the time from planting to flowering of tobacco (beginning stage and 50 % flowering) and length of the growth period from planting to the end of harvest in six oriental varieties and their fifteen F1 diallel hybrids, the following conclusions can be drawn:

- Parental genotypes P-23, P-84, P 10-3/2, P 76/86, XDj-1 and YV 125/3 are characterized by genetic homogeneity and significant differences among them, while in their diallel F1 progeny a high degree of uniformity was observed.
- The period from transplanting the seedlings in the field to the beginning of flowering in parents ranged from 40 days (2011) in the early-maturing variety XDj-1 to 90 days (2010) in the late-maturing P 76/86. In hybrids this period ranges from 43 days (2011) in P-84 x XDj-1 to 70 days (2010) in P 76/86 x YV 125/3. The period from planting to 50% flowering in parents ranges from 45 days (2011) in XDj-1 to 95 days (2010) in P 76/86 and in hybrids it is 47 days (2011) in P-23 x XDj-1 to 75 days (2010) in P 76/86 x YV 125/3. The period from planting the seedlings in the field to the end of harvest in parents ranges from 70 days (2010 and 2011) in XDj-1 to 145 days (2010) in P 76/86, and in hybrids it is 100 days (2010 and 2011) in P-23 x XDj-1 to 150 days (2010) in P 76/86 x YV 125/3.
- The mode of inheritance of biological stages in F1 progeny differs, but partial dominance is the most common. Inheritance of the time of flowering is dominated by the early-maturing parent, and the period from transplanting to the end of harvest is dominated by the late-maturing parent. Negative heterosis with poor heterotic effect on the time of flowering was recorded in P-84 x P 10-3/2. Positive heterosis with weak heterotic effect for the time from planting to the end of harvest in both years of investigation was recorded in hybrids where one of the parent was YV 125/3 (P-23 x YV 125/3, P-84 x YV 125/3 and P 76/86 x YV 125/3). The use of heterosis is economically unjustified, due to the poor heterotic effect and to the fact that our subject of investigation were oriental, small-leaf tobacco hybrids.
- For realization of the aim of our investigation we would point out to the hybrids where one of the parents is XDj-1, which has the shortest growth period, very pleasant aroma and low yield. Their F1 progeny has much longer growth period than the early-maturing parent. The inheritance is partial-dominant and dominant (dominated by the late-maturing parent), and it ensures rapid stabilization of the trait in future successive selection, aiming at the same time at increasing the yield and quality.