BREEDING FOR DROUGHT TOLERANCE IN TOBACCO

A. KORUBIN-ALEKSOSKA, B. GVEROSKA, M. DIMITRIESKI, J. ALEKSOSKI
University of "St. Kliment Ohridski"- Bitola,
Scientific tobacco institute-Prilep, 7500 – Prilep, Republic of Macedonia
e-mail: anakorubin@yahoo.com

ABSTRACT

Today we are witnessing continuous spreading of drought as a result of global warming. The need for irrigation increases for all crops, including tobacco. The oriental sun-cured tobacco does not require large quantities of water, but certain amounts of precipitation during the growing season are still necessary for obtaining a good quality raw material. The shortage of rain and possibilities for irrigation can be overcome by selection of varieties tolerant to drought. Tobacco Institute - Prilep has developed programs for investigation of the assortment and improvement of the existing varieties and creation of new genotypes. The investigation included nine varieties belonging to different types of tobacco, a part of which have been commercially used in the Republic of Macedonia and others are kept for further breeding. The trial was set up in the Experimental field of the Institute during 2012 and 2013 in randomized blocks with three replications. Each variant was investigated in conditions with and without irrigation. The aim of the paper was to study the oriental varieties in order to obtain data on their tolerance to drought and to supply material for further selection. Drought tolerance was determined by classical breeding methods based on phenotypic expression of morphological and production traits. For this purpose, modern breeding programs are using molecular markers in different stages of the selection process. The highest degree of tolerance to drought was observed in genotypes P-84 (type Prilep) and P-2 (type Dzebel). These genotypes can be included in the programs for improvement of the investigated trait.

Keywords: tobacco (Nicotiana tabacum L.); oriental varieties; morphological traits; production traits; tolerance to drought.

RESULTS AND DISCUSSION

Table 1. Quantitative traits of oriental tobacco varieties grown under different water amounts in the stage of rapid growth (July-August)

Variety	Quantitative traits					
	Stalk height with inflorescence (cm)		Leaf number per stalk		Dry mass yield (g/stalk)	
	Unirrigated* $\bar{x}\pm s_{\bar{x}}$	Irrigated** $\bar{x}\pm s_{\bar{x}}$	Unirrigated $\bar{x}\pm s_{\bar{x}}$	Irrigated $\bar{x}\pm s_{\bar{x}}$	Unirrigated $\bar{x}$	Irrigated $\bar{x}$
2012						
1. P - 7	53,38 ± 0,12	66,40 ± 0,11	44,31 ± 0,15	54,35 ± 0,15	9,71	13.20
2. P - 84	71,17 ± 0,14	77,55 ± 0,07	40,11 ± 0,05	42,15 ± 0,05	20,38	21.73
3. P - 23	52,04 ± 0,11	64,28 ± 0,09	42,46 ± 0,22	50,04 ± 0,22	10,69	16.92
4. P 65/94	60,18 ± 0,21	77,19 ± 0,17	52,20 ± 0,20	59,72 ± 0,20	11,52	23.71
5. YK 7-4/2	80,62 ± 0,27	98,21 ± 0,19	24,82 ± 0,08	32,84 ± 0,08	3,89	6.80
6. YK - 23	90,56 ± 0,39	108,04 ± 0,32	34,26 ± 0,12	40,18 ± 0,12	12,14	15.55
7. YV 125/3	105,34 ± 0,35	125,71 ± 0,31	35,52 ± 0,10	42,25 ± 0,1	12,76	18.07
8. Dj № 1	70,22 ± 0,29	79,72 ± 0,25	22,41 ± 0,05	30,49 ± 0,05	4,33	6.23
9. Pobeda 2	102,00 ± 0,34	110,55 ± 0,25	40,79 ± 0,16	42,36 ± 0,15	14,05	15.78
2013						
1. P - 7	50,27 ± 0,10	65,44 ± 0,15	42,02 ± 0,14	54.00 ± 0,15	8.73	13,44
2. P - 84	68,16 ± 0,14	75,13 ± 0,09	38,44 ± 0,05	42,36 ± 0,05	19.81	21,51
3. P - 23	50,84 ± 0,12	63,28 ± 0,08	40,73 ± 0,20	49,28 ± 1,02	9.74	16,13
4. P 65/94	60.41 ± 0,23	75,57 ± 0,17	50,52 ± 0,18	58,04 ± 0,17	12.05	23,53
5. YK 7-4/2	77,36 ±0,21	100,06 ± 0,19	22,52 ± 0,06	33,54 ± 0,13	3.22	6,72
6. YK - 23	85,29 ± 0,35	105,24 ± 0,34	32,38 ± 0,12	38,91 ± 0,10	10.48	15,46
7. YV 125/3	101,34 ± 0,36	125,37 ± 0,29	34,11 ± 0,12	42,43 ± 0,07	11.89	17,78
8. Dj № 1	68,17 ± 0,31	80,73 ± 0,27	20,73 ± 0,06	28,74 ± 0,07	4.17	6,72
9. Pobeda 2	99,72 ± 0,33	107,83 ± 0,24	39,82± 0,17	43.04 ± 0,12	13.38	15,34

*Unirrigated: 2012. -12 mm (July) + 20 mm (August) = 32 mm
2013 - 11 mm (July) + 9 mm (August) = 20 mm
**Irrigated: 2012 - 32 mm + 100 mm = 132 mm
2013 - 20 mm + 100 mm = 120 mm

MATERIAL AND METHODS

Varieties of the oriental tobaccos Prilep (P-7, P-84, P-23 and P 65/94), Yaka (YK 7-4/2 YK-23 and YV 125/3) and Djebel (Dj. № 1 and Pobeda 2) were used as material for investigation. Two of them (P 65/94 and YV 125/3) are commercial varieties, and the others are genetic resources that are included in breeding programs for improvement of various traits, in our case it is for their tolerance to drought. The trial was set up in the Experimental field of Tobacco Institute - Prilep in 2012 and 2013. Analyses were made on unirrigated variants and variants irrigated in the stage of rapid growth (July and August) with 100 mm (100 l/m2), applied by four waterings of 25 mm. Estimates were made on the following traits: stalk height with inflorescence, leaf number and dry mass. Measurements of the former two traits were made in the stage of rapid growth and of the latter during the treatment of fermented tobacco.


Ph. 1. Prilep P-7


Ph. 2. Prilep P-84


Ph. 3. Prilep P-23


Ph. 4. Prilep P 65/94


Ph. 5. Jaka, YK 7-4/2


Ph. 6. Jaka, YK-23


Ph. 7. Jaka, YV 125/3


Ph. 8. Djebel N^{0} 1


Ph. 9. Pobeda 2

CONCLUSIONS

The lowest height of the stalk with inflorescence in 2012 was recorded in P-23 and in 2013 in P-7 (unirrigated variant) and P-23 (irrigated variant). The lowest leaf number per stalk in the two years was recorded in Dj № 1 and the highest in P 65/94. The lowest yield was obtained with YK 7-4/2 and the highest in P 65/94 (irrigated variant).

The variety P-84 is second-ranked for dry mass yield under irrigated conditions, but first-ranked in dry conditions, and therefore it is considered as drought tolerant. Pobeda 2 is fourth-ranked variety under irrigated conditions, but second-ranked in dry conditions and it can be also considered as drought tolerant.

P-84 and Pobeda 2 can be used as parental genotypes in creation of hybrids from which, by successive selection, new drought tolerant varieties will be obtained. Also, they can be use in backcross breeding to improve this trait in commercial varieties that are susceptible to drought.