

ORIGINAL SCIENTIFIC PAPER

## New lines of aromatic Yaka tobacco resistant to TMV

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### Abstract

Two-year investigations (2005 - 2006) were conducted to determine some morphological-productional and qualitative properties of four new tobacco lines and their resistance to TMV, compared to the standard variety Yaka 125/3. The new lines, created by interspecies hybridization, were stabilized in relation to stalk height, leaf number, shape and size and also to the growing period. In four of the lines resistance to TMV were obtained. During the growing period, estimations were also made on the disease appearance and distribution in top leaves and suckers. The new lines achieved adequate stalk height for the type Yaka, higher leaf number, higher yield and some of them even higher quality compared to the standard. Four new TMV resistant tobacco lines were created for Yaka tobacco growing regions. Three of them showed better characteristics than the standard and they can be grown in mass production of this type.

Key words: tobacco, aromatic Yaka tobacco, new lines, TMV resistance

### Introduction

Tobacco mosaic virus is the most widely distributed viral disease in the world. In some plots where infestation occurs immediately after transplantation, 50 - 100% of plants can be infested, resulting in 30% reduction of yield and 50% of total tobacco value (Mickovski, 1984; Dimitrov, 2003). Due to its high adaptability, thermo resistance, unusual ability to change and to reproduce in leaf tissue, this disease is difficult to control (Petkova, 2008). In addition, chemical products are not effective in prevention of the disease. The problem can be solved only by creation and introduction of new, disease resistant tobacco varieties. Breeding of varieties resistant to TMV had a long tradition in former Soviet Union and Bulgaria (Ternovskiy 1938, 1953; Kostov 1941, 1943, 1944; Manolov 1979), up to the present (Kurtova et al., 1990; Tranceva, 1989, 1995, 2000). Having in mind the importance of oriental tobaccos in the total tobacco exports of our country, as well as the more frequent and intensive attacks of TMV in certain regions, a project on creation of new oriental varieties resistant to TMV was realized in 1997 - 2000 in Tobacco Institute-Prilep, financed by the Ministry of education and science (Miceska et al., 2000). Large number of resistant varieties and lines has been created over the past years. Four of the consolidated lines of the type Yaka and the variety Yv 125/3 as a standard were subject of this paper. Investigations included morphological and production analysis, as well as estimations on their resistance to TMV.

### Material and methods

Subject of our investigations was 4 newly created tobacco lines resistant to TMV: Basma MB 123-82/1, Yaka 123-7/2, Yaka 65-82/1 and Jk l. 301/23, including Jk 125/3 as a standard. The selection process was carried out by the method of interspecies hybridization, in accordance with the basic laws of Mendel, using the scheme of monohybrid dominant inheritance. Test plants were inoculated with juice from TMV infected plants, and infestation was made according to the method of Ternovskiy (1965),

quoted by Trancheva (1965). Newly created lines were consolidated in relation to their height, number, shape and size of the leaves, duration of the growing period and resistance to TMV. The design was randomized blocks with four replications. In 2005 and 2006 two estimations of occurrence and distribution of disease were made on top leaves and suckers, the first one on 07.09. and the second on 22.09. Disease intensity was assessed from the total number of observed plants and the number of TMV infected plants, expressed in %. According to the symptoms of mosaic disease on tobacco and the percentage (intensity) of infestation, investigated varieties can be divided in two groups: resistant - with no symptoms of disease, and susceptible - showing visible marks of the disease (Šutic, 1983, Miceska et al, 2005).

### Results and discussion

Two year investigations (2005-2006) of the standard variety Yv. 125/3 and newly created lines of Yaka tobacco (Table 1) showed TMV resistance in four investigated lines (Yb l. MB123-82/1, Yaka l. 123/7, Yaka l. 65-82/1 and Yaka line 301/23).

Table 1. Resistance of Yaka tobacco varieties to TMV

Variety lines	Years	I estimation				II estimation			
		Total nu. of obs. plants	Total nu. of infested plants	Intens. of attack %	Resp. to TMV	Total nu. of obs. plants	Total nu. of infested plants	Intens. of attack %	Resp. to TMV
Yv 125/3 Ø	2005	104	57	54,80	+	104	75	72,11	+
	2006	121	61	50,41	+	121	78	64,46	+
	2005	145	0	0,00	-	145	0	0,00	-
Yb. l. MB123-82/1	2006	139	0	0,00	-	139	0	0,00	-
Yaka l. 123/7	2005	148	0	0,00	-	148	0	0,00	-
	2006	146	0	0,00	-	146	0	0,00	-
Yaka l. 65-82/1	2005	141	0	0,00	-	141	0	0,00	-
	2006	145	0	0,00	-	145	0	0,00	-
Yaka l. 301/23	2005	142	0	0,00	-	142	0	0,00	-
	2006	144	0	0,00	-	144	0	0,00	-

(+)= susceptible (-)= resistant

The two estimations made on top leaves and suckers of the lines included in the comparative trial in field conditions showed no symptoms of the disease, while the standard variety Yv. 125/3 was estimated as susceptible to TMV. In both investigation years it revealed visible symptoms of TMV and high percentage of infestation in both estimations (72.11% and 64.46%, respectively). Dimitrieski et al. (2005) in their investigations of seven tobacco lines and varieties reported highest intensity of the mosaic virus in the standard variety 125/3, which corresponds to our results. According to their morphological characteristics (Table 2), the highest values for plant height were recorded in line Yaka l. 65-82/1 (139.0 cm) and the lowest in the standard variety Yv. 125/3 (107.0 cm). The highest leaf number per plant was recorded in lines Yaka l. 65-82/1 and Yaka l. 301/23 (55 and 52, respectively), while in the other two lines the average leaf number was similar to that of the standard Yv. 125/3 (43). From the data presented in Table 2 it can be seen that standard variety Yv 125/3 has the lowest values for the biggest leaf, with an average size of 21.1 cm in length and 10.5 cm in width. Line Yk l. 301/23 has the lowest

leaf length (24.5 cm) and Line Yk l. 65-82/1 the highest width (13.0 cm). The newly created lines resistant to TMV showed somewhat higher values for leaf size compared to the standard variety, but they are still within the frames typical for oriental tobacco.

**Table 2. Morphological characteristics of Investigated lines and the standard variety (average 2005-2006)**

Varieties Lines	Plant inflorescence height cm	with Leaf per plant	number	Largest leaf size	
				Length	Width
Yv. 125/3 Ø	107,5	43		21,1	10,5
Yb. MB 123-82/1	115,5	42		22,0	12,1
Yaka l. 123/7	127,5	43		23,9	12,3
Yaka l. 65-82/1	139,0	55		23,4	13,0
Yaka l. 301/23	121,0	52		24,5	11,9

Data about productional characteristics of the newly created tobacco lines compared to the standard Yv. 125/3 is presented in Table 3. The lowest average yield was obtained in the standard variety (2531 kg/ha), and the highest in Yaka l. 65-82/1 (3574 kg/ha), which is 41.21% higher than the standard. The yields of the other three lines were 27.54% - 38.40% higher compared to the standard. The highest purchase price was recorded for Yaka l. 65-82/1 (1.82 €/kg), which is 7.4% higher than the standard Yv. 125/3 (1.70 €/kg). The other lines, except for Yaka l. 301/23, showed equal or somewhat higher purchase price compared to the standard. In relation to the economic effect, relatively high differences were observed between the investigated lines and the standard (Table 3). Thus, the lowest gross income was achieved in the standard Yv.125/3 (4.302,70 €/ha), and the highest in Yaka l. 65-82/1 (6.504,68 €/ha), which is 51.14% higher compared to the standard. Economic effects of the other three lines, too, were 28.82% to 30.58% higher compared to the standard.

**Table 3. Productional characteristics of Investigated lines and the standard variety**

Varieties Lines	Yield kg/ha				Average purchase price		Average economic effect	
	2005	2006	Average	%	€/kg	%	€/ha	%
Yv. 125/3 Ø	2265	2797	2531	100,00	1,70	100,00	4.302,70	100,00
Yb. MB 123-82/1	3496	3579	3503	138,40	1,70	100,00	5.955,10	129,04
Yaka l. 123/7	2946	3510	3228	127,54	1,72	101,18	5.552,16	128,82
Yaka l. 65-82/1	3699	3448	3574	141,21	1,82	107,06	6.504,68	151,14
Yaka l. 301/23	3243	3513	3378	133,47	1,66	97,65	5.831,58	130,58

From results of the comparative investigations it can be stated that the four newly created lines, due to their resistance to TMV and good quality, are a great contribution in the selection of Yaka tobacco. These perspective lines, as future varieties, will make a solid alternative ground in elimination of harmful effects caused by the common mosaic virus in tobacco producing regions and micro-regions of the type Yaka.

## Conclusions

The results of investigations led to the following conclusions:

- Four of the newly created Yaka tobacco lines showed complete resistance to TMV in field conditions, compared to the susceptible standard variety Yv125/3.
- According to their morphological traits, the new lines are typical representatives of the type Yaka. The highest leaf number per plant was recorded in lines Yk l. 65-82/1 and Jk l.301/23 (55 and 52, respectively); in the other two lines, the average leaf number was almost the same with that of the standard variety (43). Plants of the newly created resistant varieties were somewhat higher compared to the plants of the standard variety.
- Yield of the investigated lines per hectare was relatively higher for 27.54% to 41.21% compared to the standard variety.
- The new perspective lines, except for line Yb MB 123-82/1, achieved higher purchase price per kg and higher economic effect (denars/ha), which was 28.82% - 51.14% more compared to the standard Yv 125/3.
- As a general conclusion, it could be stated that four new lines of Yaka tobacco resistant to TMV are perspective material that can be included in the mass production in future.

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