

MONITORING OF HEALTH CONDITION OF THE BASMAK ORIENTAL TOBACCO

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ABSTRACT

Three-year investigations (2009 – 2011) were conducted with four oriental tobacco varieties, including the Yaka variety YK-7/4 as a check and three varieties of Basmak tobacco - MK-1, MB-2 and MB-3. The investigated varieties are characterized by a short growing season. This characteristic is in good correlation with climate changes in recent years and it allows timely harvesting and curing of tobacco. In the world and in our country, one of the priority issues for obtaining higher yields is to produce healthy tobacco. The most common field diseases in our country are Tobacco mosaic virus (TMV), Potato virus Y (PVY) and fungal disease *Phytophthora parasitica* var. *nicotianae* (black shank).

Taking into account that tobacco diseases cause major economic damage to tobacco, analyses were made on health status of the tested varieties during the three years of investigation. The obtained results show higher resistance of the varieties MK-1 and MB-2 to Tobacco mosaic virus (TMV), MK-1 and MB-3 to Potato virus Y (PVY) and MB-2 and MB-3 to *Phytophthora parasitica* var. *nicotianae*. These results can contribute to the variety selection in breeding this type of tobacco.

Keywords: tobacco, variety, Basmak, viruses, diseases

**ПОВЕКЕГОДИШНО НАБЉУДУВАЊЕ НА ЗДРАВСТВЕНАТА СОСТОЈБА НА
ОРИЕНТАЛСКИ СОРТИ ОД ТИПОТ БАСМАК**

Во тригодишните испитувања (2009 - 2011 година) беа вклучени четири ориенталски сорти од кои како стандард беше земена сортата ЈК-7/4 од типот Јака, а останатите три сорти беа од типот Басмак (МК-1, МБ-2 и МБ-3). Наведените сорти се со кратка вегетација, што е поволна карактеристика со оглед на настанатите климатски промени последниве години и истата им овозможува на производителите навремено берење и сушење на тутунот. Во цел свет, па и кај нас, еден од приоритетните проблеми за добивање на поголем принос е да имаме здрав тутун. Кај нас меѓу најприсутните болести во поле се јавуваат Tobacco mosaic virus (TMV), Potato virus Y (PVY) и габното заболување *Phytophthora parasitica* var. *nicotianae* (црнилка).

Имајќи го предвид тоа што болестите на тутунот нанесуваат големи економски штети во тутунопроизводството, си поставивме за цел да ја проучиме здравствената состојба на испитуваните сорти во текот на трите реколти. Добиените резултати од испитувањата покажуваат поголема отпорност на сортите МК-1 и МБ-2 кон Tobacco mosaic virus (TMV), поголема отпорност на МК-1 и МБ-3 кон Potato virus Y (PVY) и на МБ-2 и МБ-3 кон *Phytophthora parasitica* var. *nicotianae* над контролната сорта во опитот. Овие резултати можат многу да придонесат при изборот на сорта од страна на производителот, бидејќи влеваат извесна гаранција и сигурност за успешен произведен циклус на овој тип тутун.

Клучни зборови: Тутун, сорта, басмак, вируси, болести.

INTRODUCTION

During its life cycle, tobacco is often attacked by different pathogenic fungi, bacteria and viral infections. In the world and in our country, high attention is paid to creation of varieties that will be more or less resistant to various diseases. The efforts to reduce the occurrence of diseases, besides the use of chemical products, include various measures such as crop rotation, adequate soil treatment, advanced agro-techniques, proper fertilization and irrigation. Mickovski (1984), reported that Allard first isolated TMV in 1914 and described it as easily transmitted and harmful virus which can reduce the yield up to 30%. Leaves infected with TMV are greener, often with visible deformities, hardly to moisten, easy to break, with higher protein content. They have a negative effect on the taste of oriental tobaccos.

Mickovski (1984), reported that the infection of tobacco plants caused by PVY oc-

curs in two forms: simple and necrotic. This virus is spread throughout the world. The infection occurs in early spring, significantly reducing the quality and yield of tobacco. Symptoms vary depending on the plant host and strains of the virus. It begins with mild mosaic on leaf surface, leading to discoloration between the veins and leaf deformation, which eventually ends in death of the plant.

According to Mickovski (1984), black shank is widely spread disease, especially in the US. It attacks the stem and root of the plant. The causing agent of the disease is the pathogen *P. parasitica* var. *nicotianae* (Van Breda de Haan, 1896 and Tucker, 1931). Symptoms vary depending on climatic conditions and the stage of plant development. The infected plants are wilting and, later, the above-ground part of the stem turns dark brown.

MATERIAL AND METHODS

Three-year field trials were performed in Tobacco Institute - Prilep (2009, 2010, 2011) to study the health status of the variety YK 7-4/2 (standard) and three Basmak varieties - (MK-1, MB-2 and MB-3).

Seedling was produced in traditional way, with polyethylene covered seedbeds in Tobacco Institute - Prilep. 5 g/10 m² first-class seed material was used in the trial and all necessary agro-technical measures were applied (watering, fertilization and protection) in order to obtain healthy and well-developed seedlings.

Soil preparation before tobacco transplanting consisted of one autumn and two spring ploughings. Fertilization was done with 300 kg/ha NPK (8:22:20) and tobacco was

transplanted on 2.6.2009, 7.6.2010 and 11.6.2011. Investigations were performed in randomized block design with 5 replications at 45 × 12 cm spacing between plants on previously prepared soil. The area of the main plot was 9 m² and the useful area was 6,16 m².

Each plot consisted of 5 rows, 3 of which were used for observation and 2 as protective zone. The number of plants in the row was 42 (38 stalks were harvested and 4 served as protective zone). Number of plants in the plot (3 rows) was 126 and number of plants for calculation was 114 (3 rows). Monitoring of the health status of plants was done at 100% flowering stage.

RESULTS AND DISCUSSION

During the three-year trials, appropriate protective measures were applied in seedbeds

and field. Health inspection in the stage of 100% flowering revealed the existence of

the viral diseases TMV and PVY and fungal disease black shank. The infection of tobacco stalks differed depending on the resistance of the variety, distribution and amount of precipitation, air temperature and other factors. Data in Table 1 and Figure 1 show that the average percentage of TMV ranged from 1.12% (2009) in the check variety YK 7-4/2 to 0.18% (2009) in varieties MK-1 and MB-2. The average percentage of infection in the investigated period of three years ranged from 0.77% in the check YK 7-4/2 to 0.26 in variety MK-1.

According to Miceska et al. (2003), viral infection with TMV slows down the growth of tobacco plant regardless of the stage of development. It reduces the height of the

plant with inflorescence by 1 – 6 cm and leaf number by 1-5 leaves. The conclusion of other researchers and our own is that attention should be paid to the creation of resistant varieties and to the use of appropriate preventive agro-technical measures. According to Dimitrieski et al. (2012), chemicals should be used carefully and properly as a preventive measure in production of resistant varieties. In the control of TMV, Taskoski et al. (2006), recommended application of phytosanitary measures, use of the same seed without plant residues, use of healthy seedlings for transplanting, crop rotation, harvest of healthy plants first and then of the infected ones, by which secondary infections would be reduced.

Table 1. Percentage of TMV infected plants in the period 2009-2011

Variety	Year	Number of observed plants	TMV infected plants %	Average 2009 /2011	Difference	
					Absolute	Relative
YK 7-4/2 Æ	2009	535	1.12	0.77	/	100.00
	2010	522	0.19			
	2011	505	0.99			
MK-1	2009	550	0.18	0.26	- 0.51	33.77
	2010	536	0.19			
	2011	500	0.40			
MB-2	2009	543	0.18	0.44	- 0.33	57.14
	2010	543	0.74			
	2011	505	0.39			
MB-3	2009	525	0.57	0.64	-1.13	83.11
	2010	524	0.94			
	2011	495	0.40			

Percentage of PVY infected plants (Table 2, Figure 1) is significantly lower than that of TMV and ranges from 0.40% in the check variety YK 7-4/2 (2011) to 0.18% in varieties MK-1 (2009) and MB-2 (2010). The average percentage of PVY infection ranges from 0.21% in the check variety YK 7-4/2 to 0.07% in variety MK-3. Therefrom it can be stated that the highest tolerance to PVY was recorded in the variety MB-3 and the lowest in the check variety YK 7-4/2. According to the registered percentage of infection, varieties MK-1, MB-2 and MB-3 have higher tolerance to TMV and PVY compared to the standard variety.

Mickoski (1984), stated that PVY can be easily transmitted mechanically by inoculation with infected juice, but natural infection is most often carried out by aphids. Therefore, attention should be paid to remove weeds that host the vector and to avoid tobacco producing in the vicinity of other plants such as potatoes, peppers and tomatoes.

Table 2. Percentage of PVY infected plants in the period 2009-2011

Variety	Year	Number of observed plants	PVY infected plants %	Average 2009 /2011	Difference	
					Absolute	Relative
YK 7-4/2 Æ	2009	535	/	0.21	/	100.00
	2010	522	/			
	2011	505	0.40			
MK-1	2009	550	0.18	0.13	- 0.08	61.90
	2010	536	/			
	2011	500	0.20			
MB-2	2009	543	/	0.19	-0.02	90.48
	2010	543	0.18			
	2011	505	0.39			
MB-3	2009	525	/	0.07	-0.14	33.33
	2010	524	/			
	2011	495	0.20			

Table 3. Percentage of plants infected with *Phytophthora parasitica* var. *nicotianae* (black shank) in the period 2009 -2011

Variety	Year	Number of observed plants	Plants infected with black shank %	Average 2009 /2011	Difference	
					Absolute	Relative
YK 7-4/2 Æ	2009	535	/	1.32	/	100.00
	2010	522	/			
	2011	505	3.96			
MK-1	2009	550	/	1.00	-0.32	75.75
	2010	536	/			
	2011	500	3.00			
MB-2	2009	543	/	0.99	-9.52	75.00
	2010	543	/			
	2011	505	2.97			
MB-3	2009	525	/	0.61	-0.71	46.21
	2010	524	/			
	2011	495	1.82			

Table 3 shows that *P. parasitica* var. *nicotianae* was registered only in 2011. The presence of the disease can be associated with the occurrence of heavy precipitations at the end of seedlings production and the beginning of field production. The highest percentage of black shank was observed

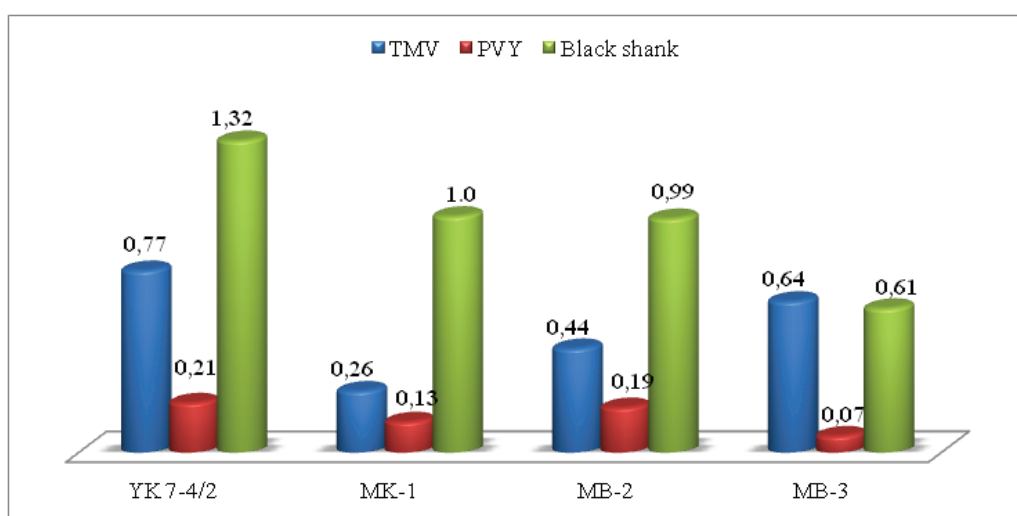
in the standard variety YK 7-4/2 (3.96%) and the lowest percentage was recorded in MB-3 variety (1.82%), which indicates that it has higher resistance to the disease. The three-year average ranged from 1.32% infection in the check variety YK 7-4/2 to 0.61% in MB-3 (Figure 1). General con-

clusion is that the newly created varieties, especially MB -3, show higher tolerance to *P. parasitica* var. *nicotianae*, but it can be also stated that the percentage of infection in other varieties of the trial did not achieve alarming proportions.

Taskoski (2003) reported that the application of chemicals cannot provide complete control of *P. parasitica* var. *nicotianae* in tobacco because it is a soil pathogen. For this reason, attention was turned to creation of resistant varieties. The same au-

thor noted that the first variety resistant to black shank disease was created by Tisdale in Florida, 1922 and it was named Florida 301. The next forty years this variety was used as a resistant parent to create a number of varieties resistant to black shank. In tobacco producing regions of R. Macedonia, black shank disease was recorded in 1986 (Taskoski et al., 2001). Due to the favorable climate conditions and intensive way of farming, it occurs in some tobacco regions almost every year, with various intensity.

Figure 1 – Average percentage of disease infection



CONCLUSIONS

- The three-year average infection of Tobacco Mosaic Virus (TMV) ranged from 0.77% in the standard variety YK 7-4/2 to 0.26% in MK-1, which is 66.23% less than the check variety. According to the obtained results, the newly created variety MK-1 has higher tolerance to TMV.
- The average infection of Potato virus Y (PVY) ranges from 0.21% in the standard variety YK 7-4/2 to 0.07% in variety MK-3. The highest tolerance to PVY was recorded in MB-3 variety and the lowest in the check variety YK 7-4/2.

- *Phytophthora parasitica* var. *nicotianae* (black shank) is present in small percentage, ranging from 1.32% in the standard variety YK 7-4/2 to 0.61% in MB-3. General conclusion is that the newly created varieties, especially MB -3, show higher tolerance to black shank, but it can be also stated that the percentage of infection in other varieties of the trial did not achieve alarming proportions.
- The obtained data on TMV and PVY infection show that varieties MK-1, MB-2 and MB-3 have higher tolerance than the standard variety.

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