Experimental growing of Bulgarian oriental tobacco varieties in the Republic of Vietnam

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Abstract

The Framework Convention on Tobacco Control of the World Health Organization (FCTC/WHO) requires the reduction of additives and ingredients in tobacco products leading to smoking addiction, requiring the incorporation into these products of tobaccos with reduced Nicotine content and exclusion of chemical additives such as flavorings, softeners, etc. This gives a new opportunity for the Bulgarian Oriental Tobacco, characterized by high ecological purity and aromatic qualities for Improve the tobacco blends of Virginia tobacco. The Republic of Vietnam is a producer of significant quantities of large-leaved tobacco from the Virginia Variety Group and a producer of cigarettes of the Virginia blend type.

The Institute of Tobacco and Tobacco Products, Plovdiv, Bulgaria and the Institute of Tobacco in Hanoi, Vietnam develop a joint program for introduction of Bulgarian Oriental tobacco varieties for the needs of the tobacco industry in the Republic of Vietnam. In recent years, like some other cigarette-producing countries in the region (China, Thailand, etc.), Vietnam intends to grow oriental tobacco varieties for its tobacco industry.

The report presents the results of the testing of certain varieties of Bulgarian Oriental tobacco under the soil and climatic conditions of Vietnam.

Keywords: oriental tobacco; reduced nicotine content; introduction; Vietnam

INTRODUCTION

The WHO Framework Convention for Tobacco Control (COP/ WHO/FCTC/8/. 2018) stipulates reduction or complete elimination of additives and ingredients in tobacco products causing smoking addiction. This is achieved by using in these products tobacco with reduced nicotine content and exclusion of chemical additives such as flavorings', flavors, emollients, etc. Additives are substances different from tobacco that are intentionally added by tobacco industry to tobacco products for the purpose of achieving pleasant characteristics of toxic tobacco products and making them pleasant to consumers. This conceals some adverse effects from tobacco smoke inhalation. Tests show that burning tobacco additives leads to the release of some particularly harmful compounds. Worrying is the fact, that such additives can make tobacco products more attractive to consumers and increases their consumption and the addiction of smokers to them (Decision EU-2016/787). Such additives are sugars, sorbitol, propylene glycol, glycerin, cocoa, vanillin, menthol, Lycoris, some extracts of resins, fruits, etc. On the other hand, the alkaloid nicotine that is contained in tobacco is not the most harmful ingredient of tobacco smoke but it is the reason for smoking addiction. It is planned to use in tobacco products tobacco with low nicotine content for the purpose of reducing addiction. However, a clear threshold has not been defined yet and it should consider individual differences in nicotine sensitivity; different studies show that reduction of nicotine content to 0.4 mg/g will minimize the risk of addiction. At present nicotine content quantity in different tobacco variety groups and varieties is significantly higher. Different agri-

cultural practices, genetic manipulation and supercritical extraction are techniques developed and used by tobacco product manufacturers for the removal of nicotine from tobacco leaves used for the manufacture of tobacco products. Most available techniques are successful for the reduction of nicotine levels – genetic manipulation and superficial extraction may reduce tobacco nicotine levels to 0.4 mg/g – but such differ in their effectiveness and possible adverse effects so they are banned by law in many countries.

Bulgarian oriental tobacco is characterized by high ecological purity, aromatic qualities and relatively low nicotine content (0.4 – 2.4 mg/g) and this it them suitable for flavoring and improving Virginia tobacco blends (Bozukov, 2015, 2016**)** without unwanted genetic modification.

Significant quantities of large leaf tobacco of the Virginia variety group is grown in the Republic of Vietnam. Every year over 15000 ha are planted and over 30-35000 tons of tobacco are produced. About 40000 tons of tobacco are additionally imported to the country for the tobacco industry. Vietnam is a large producer of cigarettes of the type of Virginia blend. The country is ranked among the 15 largest tobacco consumers in the world with more than 15 million smokers /Tobacco Asia, 2016*/.* In recent years, like some other countries producing cigarettes in the region, Vietnam intends to grow oriental tobacco varieties for its tobacco industry.

The Institute of Tobacco and Tobacco Products (ITTP) – Plovdiv and the Tobacco Institute (TICO) in Hanoi have been developing for as much as four years now a joint program for the introduction of Bulgarian oriental tobacco for the needs of tobacco industry in the Republic of Vietnam in compliance with the requirements of the WHO Framework Convention for Tobacco Control on the territory of the European Union. (Bozukov et al., 2020**)**

The purpose of this cooperation is to introduce Bulgarian oriental tobacco varieties manifesting best their technological qualities under the soil and climate conditions of the Republic of Vietnam for the production of dry tobacco with certain smoking and flavor characteristics.

MATERIALS AND METHODS

For the purpose of the experiment ITTP provided to the TICO institute certified tobacco seeds from several oriental tobacco varieties:

1. Basma 16;
2. Basma H;
3. Kozarsko 339;
4. Hanski 227;
5. Dupnitsa 733;
6. Rila 89

The experiment was held in two settlements in the My Son region, Ninh Son district, Ninh Thuan province – South Vietnam - My Hiep (site 1) and Phu Thuan (site 2) with different soil and climate conditions. The preceding crop was rice. The varieties were grown by a method provided by the Institute of Tobacco and Tobacco Products-Markovo vill**.** (Bozukov & Masheva, 2016).

The agricultural techniques applied in the experiment pursuant to the recommendations of the ITTP (Bozukov, et al. 2008) were as follows:

- For ***My Hiep (site 1)*** – Fertilization level: N: P_20_5: K_20 = 0: 30: 30 kg / ha
- For ***Phu Thuan (site 2) –*** Fertilization level: N: P_2O_5: K_20 = 30: 30: 60 kg / ha

Plant density at the two sites:

- The variety Hanski 227 was planted with density of 110 000 plants / ha (Distance between rows: 0.5 m; Distance between plants in rows: 0.17 cm);
- The varieties Kozarsko, Dupnitsa 733, Rila 89 were planted with density of 160 000 plants / ha (Distance between rows: 0.4 m; Distance between plants in rows: 0.15 cm);
- The varieties Basma 16, Basma X were panted with density of 280 000 plants / ha (Distance between rows: 0.3 m; Distance between plants in rows: 0.12 cm).

Tobacco plants from different varieties cultivated in the region of My Hiep were topped (flowers were removed).

The following indicators were considered:

- Period of development of tobacco plants from different varieties;
- Biometric values;
- Yield and quality of production;
- Content of basic chemical components in leaves

RESULTS AND DISCUSSION

Table 1 presents the results from growing oriental tobacco in My Hiep. and Phu Thuan.

As the data in the table show, the parameters of variety development in the two settlements are similar to the parameters of the same varieties when grown in Bulgaria.

The difference is in the period of ripening and pulling the last leaves in Phu Thuan, which is longer from 19 days (Kozarsko, Hanski 227, Dupnitsa 733 and Rila 89) to 21 days (Basma 16 and Basma H) because of the use of nitrogen fertilizer for the crops.

The development of tobacco plants is similar to the one of such grown in Bulgaria (Bozukov et al., 2008; Bozukov et al., 2018; Bozukov et al., 2020) which shows that the regions are proobably suitable for the cultivation of oriental tobacco.

In the region of My Hiep plants had weak growth and show obvious symptoms of nitrogen shortage and in the region of Phu Thuan the plants had good growth and development. Pests and diseases were insignificant without effect on tobacco development. There was Black shank /*Phytophthora parasitica* Dast. *var. nicotianae* Breda de Haan-Tucker/ on single plants from different varieties except for Dupnitsa 733 and Rila 89 which are resistant to the disease (Stankev & Bozukov, 2015).

The biometric values for the development of oriental tobacco presented in Table 2 show that the plants were significanty shorter than the normal height for the varieties, mostly in My Hiep region because of the topping of inflorecsences, failure to provide nitrogen and the disturbed irrigation regime.

However, the number of developed leaves, a genetic indicator, as well as lesf size were within the range normal for variety characteristics and typical for the varieties grown in Bulgaria.

Dry tobacco yield (Table 3) from the varieties grown in the region of Phu Thuan was within the range of yield values for Bulgaria and lower for some varieties (Hanski 227, Dupnitsa 733, Rila 89) but with higher percent of first and second class.

Table 1. Growing time of Oriental tobacco varieties

Varieties	Time (days) from planting to					
	50% plants have buds		First ripen leaf		Last havest	
	My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan
Basma 16	82	83	60	58	92	111
Kozarsko	71	71	56	57	88	109
Hanski 227	64	71	56	56	88	109
Dupnitsa 733	75	77	57	55	88	109
Rila 89	61	72	56	53	88	109
Basma X	82	82	59	58	92	111

Table 2. Growth characteristics of Oriental tobacco varieties

Varieties	Plant hight (cm)		Total leaves's number		Fresh leaves in the midle stalk					
					Length (cm)		Width (cm)		Weight (g)	
	*My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan
Basma 16	60.1	99.5	31.2	31.6	15.5	18.6	8.6	11.2	3.3	5.0
Kozarsko	59.3	109.4	28.1	27.2	21.4	24.0	10.8	12.3	6.2	8.0
Hanski 227	69.1	105.7	26.4	24.6	21.9	25.2	13.3	16.5	7.2	9 2
Dupnitsa 733	68.3	115.9	28.5	25.2	21.1	23.0	12.4	13 5	6.8	7.4
Rila 89	64.5	114.0	25.0	26.0	24.4	24.4	13.2	14 5	6.0	6.3
Basma X	49.2	112.2	29.9	32.4	17.6	19.8	9.7	12.0	4.0	5.2

**The hight of topped plants. Tobacco plants are topped late when two-thirds of the leaves are harvested. The removal part includes flower buds and 1 to 2 adjacent leaves*

Yield was much (2 to 3 times) lower for varieties grown in the region of My Hiep. This was due to the fact that tobacco was topped and this, together with the flower) removed several top leaves that were not harvested. The quality of dry tobacco was very good.

The organoleptic test showed that dry leaves of these varieties in the two test sites had the typical values for the technological parameters of colour, elasticity, density and aroma of oriental tobacco.

The content of some chemical substances (Table 4) was different from the one in these varieties grown in Bulgaria. **(**Bozukov et al., 2020) Nicotine in varieties grown in Vietnam was much lower (two-three times) in comparison with nicotine in the ones grow in Bulgaria despite the topping of inflorescences of plants in the region of My Hiep. Content of soluble carbohydrates was with similar values. Chlorine values were also quite high which is undesirable for tobacco. Chlorine values were also quite higher which is undesirable for tobacco. This is because of the salted areas used in crop rotation for rice production and the water used for irrigation. It is necessary to make corrections in the fertilization and irrigation schedules for plants in vegetation.

CONCLUSIONS

The development of tobacco varieties in the two settlements is similar to that of the same varieties grown in Bulgaria which shows that the regions are probably suitable for growing oriental tobacco.

The biometric values for the development of oriental varieties show that the plants in the two sites are much shorter than the typical height for the varieties, mostly in the region of My Hiep because of the topping of inflorescences, failure to deliver nitrogen and the disturbed irrigation regime. The number of shaped leaves which is genetic as well as their size are parameters normal for the variety characteristics and typical for the varieties grown in Bulgaria.

Yield of dry tobacco from the varieties grown in the region of Phu Thuan is within the range of

Table 3. Yield and cured leaves in good grades of Oriental tobacco varieties

Varieties	Yield (tones/ha)		Percentage of cured leaves in grades 1-2	
	My Hiep	Phu Thuan	My Hiep	Phu Thuan
Basma 16	0.83	1 63	94.1	93.7
Kozarsko	0.80	1.40	90.2	88.0
Hanski 227	0.94	1 59	92.2	94.2
Dupnitsa 733	0.80	1.57	94.5	89.1
Rila 89	0.72	1 60	91.6	81 5
Basma X	0.64	1.73	89.2	87.5

Table 4. Content of some chemical components in cured leaves of Oriental tobacco varieties

Varieties	Nicotine (%)		Total Nitrogen (%)		Red. Sugar (%)		Chlorine (%)	
	My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan	My Hiep	Phu Thuan
Basma 16	0.25	0.32	1.22	1.06	24.5	17.4	1.35	0.63
Kozarsko	0.39	0.65	1.22	1.39	21.0	16.0	1.29	0.51
Hanski 227	0.49	0.89	1.30	1.39	20.2	14.9	1.43	0.72
Dupnitsa 733	0.35	0.66	1.28	1.49	20.9	16 2	1.69	0.73
Rila 89	0.33	0.51	1.26	1.48	17.3	6.8	1.55	0.69
Basma X	0.31	0.30	1.39	1.18	20.5	21.2	1 46	0.65

yield values from Bulgaria. For varieties grown in the region of My Hiep yield is much (2 to 3 times) lower which is also due to the fact that tobacco was topped in which several top leaves that are not harvested are removed with the flowers. Dry tobacco is with very good quality (high percent of first class). The organoleptic test shows that dry leaves of such varieties in the two sites have the typical technological values such as colour, elasticity, density and aroma of oriental tobacco.

Nicotine content in the varieties grown in Vietnam is much lower (two-three times) in comparison with the one in varieties grown in Bulgaria despite topping of inflorescences of the plants in the region of My Hiep. Content of soluble carbohydrates is within similar values and chlorine content is much higher.

It is necessary to make corrections in the of fertilization and irrigation schedules of tobacco plants during the vegetation period.

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