

Quality assessment parameters of organic oriental tobacco

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Abstract

This research was conducted in the period of 2020 – 2022 in a certified organic field in the town of Gotse Delchev and under conventional conditions in an experimental field in Kozarsko village.

An assessment has been made of the basic quality parameters of the tobacco raw material obtained from organic and conventional oriental tobaccos of the Basmi variety group. The basic physical parameters of dry tobacco have been determined. The chemical parameters of tobacco have been studied – nicotine, soluble sugars, total nitrogen and ash. The basic elements of the mineral and polyphenol composition of the organic tobaccos of the Krumovgrad 58 and Nevrokop 1146 ecotype have been determined. A comparative assessment has been made of the changes in basic parameters used for quality assessment of oriental tobaccos of the Basmi variety group grown under organic and conventional conditions.

Key words: oriental tobacco; organic production; chemical components

INTRODUCTION

The different ecological, climatic and soil conditions in Bulgaria allow the creation of a wide variety of oriental tobacco varieties with specific quality parameters, determining their smoking and taste properties (Wechsler, 1999; Hight, 2001; Qing et al., 2009; Reddy, 2019). The change of climatic conditions in our country in recent years has led to the change of the main quality parameters of typical oriental tobacco varieties (Linkova, 2013; Bozukov, 2018). The widespread cultivation of a limited set of commercial, high-yielding varieties outside their typical areas has led to a decline in the quality of tobacco as a product for consumption.

Bulgarian oriental tobaccos are characterized by high ecological purity, specific aroma and low nicotine content (0.4 - 2.4%), which makes them suitable for improving various cigarette blends (Gyuzelev, 1983; Leffingwell, 2001; Staykova et al., 2015; Kirikova et al., 2019).

The purpose of the research is to make a comparative analysis of the changes in the main parameters for evaluating the quality of oriental tobaccos

from the Basmi variety group, grown under organic and conventional conditions.

MATERIAL AND METHODS

In the *period of 2020 – 2022*, in experimental fields in the town of Gotse Delchev and the village of Kozarsko, a research was made on the change of the basic parameters for assessment of the quality of organic and conventional oriental tobaccos of the Basmi variety group. Monitoring was made of the development of two ecotypes of oriental tobacco under organic conditions. All stages of the technological process of growing, picking and drying up to obtaining dry tobacco as a finished product were carried out, following the approved technological sequence. Quality assessment of dry tobacco was made based on the percentage ratio of commercial classes. The change of basic quality parameters and chemical composition of oriental tobaccos from the Basmi group, grown under organic and conventional conditions, was monitored.

RESULTS AND DISCUSSION

In the experimental field (EF) of the village of Kozarsko, the Krumovgrad 58 variety was used as a reference variety. In EF – Gotse Delchev, experiments were carried out with tobacco of the Krumovgrad and Nevrokop ecotype under organic conditions. The control in determining technical maturity for harvesting tobacco and the method of stringing the green tobacco are the main factors, after drying, determining the obtaining of material with a well-fixed colour characteristic of the variety (Bozakov et al., 2019). In all three years of monitoring, the primary manipulation with the dry tobacco was carried out with natural humidity, without additional humidification of the raw material. The basic technological parameters were determined and chemical analysis of the dry tobacco was performed.

I. Average monthly data of climatic parameters, temperature and rainfall in the country.

During the summer months for the period of 2020-2022, the climate was characterized by very high temperatures and short-term precipitation. During the months of May, June and July, maximum daytime field temperatures often exceeded 320C - 330C. The very low values of precipitation throughout the growing season of tobacco led to the need for several irrigations depending on the variety and its growing conditions. This drought was a major cause of the lower yields in all monitored varieties of oriental tobacco.

II. Quality parameters of oriental tobacco produced under organic and conventional conditions - harvest 2020, 2021 and 2022.

a) Class ratio;

The results in tables 1-3 show higher percentage values of first class oriental tobacco of the Kru-

Table 1. Technological parameters of organic tobacco of the Krumovgrad 58 and Nevrokop 1146 varieties - harvest 2020.

Ecotype	Class I %	Class II %	Class III %	Density of cut tobacco g/cm ³	Conditional cigarette output number of ciga-rettes/ kg tobacco
Krumovgrad 58	30	60	10	0.130	2110
Nevrokop 1146	25	62	13	0.225	1316

Table 2. Technological parameters of organic tobacco of the Krumovgrad 58 variety - harvest 2021

Ecotype	Class I %	Class II %	Class III %	Density of cut tobacco g/cm ³	Conditional cigarette output number of ciga-rettes/ kg tobacco
Krumovgrad 58-organic	25	60	15	0.125	2015
Reference variety-conventional Krumovgrad 58	20	65	15	0.225	1220

Table 3. Technological parameters of organic tobacco of the Krumovgrad 58 variety - harvest 2022

Ecotype	Class I %	Class II %	Class III %	Density of cut tobacco g/cm ³	Conditional cigarette output number of ciga-rettes/ kg tobacco
Krumovgrad 58-organic	27	61	12	0,120	2010
Reference variety-conventional Krumovgrad 58	18	65	17	0,220	1215

movgrad 58 variety grown under organic conditions. The Krumovgrad 58 reference variety (grown under conventional conditions) shows lower quality parameters. Dry tobacco has a yellow, yellow-orange and orange-red leaf color, with a characteristic gloss and a well-expressed aroma of oriental tobacco. The parameter of conditional cigarette output is much higher – 2015 cigarettes from a kilogram of tobacco for the Krumovgrad 58 organic variety and 1220 for the reference variety.

b) Chemical parameters of organic tobacco;

The consumptive properties of tobacco and its physiological impact on the human body are determined directly by the chemical composition of tobacco and tobacco smoke (Leffingwell, 2001; Otmar & Dimitrios, 2007; Kirkova et al., 2019).

Mineral composition of tobacco

Representative average samples of organic oriental tobacco, produced in a certified organic field in the town of Gotse Delchev, were analyzed for detection basic mineral substance content.

Dry tobacco contains high values of mineral substances. The content of the elements potassium, calcium, sodium, magnesium, chlorine, etc. is particularly significant (Stoilova et al., 2014; Bozhinova, 2019).

When tobacco is burned, ash is produced, which contains all the mineral substances in the form of oxides, carbonates, chlorides and sulfates (Burns et al., 2008). The total content of mineral substances has a well-expressed correlation with the content of tobacco leaves, therefore with the

quality of tobacco (Gyuzelev, 1983). This parameter gives good information about the type and harvesting of tobacco, the method of drying and the degree of leaf damage from diseases. The effect of mineral substances on flammability is expressed not so much by the absolute content of each element, but mostly by their ratio. Some of the mineral elements are of essential technological importance, playing the role of catalysts in oxidation processes. There are data on the catalytic action of magnesium in the tobacco fermentation process (Gyuzelev, 1983; Stoilova et al., 2014; Bozhinova, 2019).

The results in Table 4 show that the reference variety (Krumovgrad 58) from EF-Kozarsko has worse parameters of the main elements potassium, calcium and magnesium compared to tobacco grown under organic conditions. These values fully correlate with the better quality parameters of organic tobacco (Staykova et al, 2015; Kirkova et. al., 2019, Bozukov et al., 2019).

Chemical composition of tobacco

The values of all chemical parameters of Nevrokop 1146 grown under organic conditions are very similar to the parameters of the Krumovgrad 58 organic tobacco. The only exception is the nicotine parameter, with values in Nevrokop 1146 approximately twice as low in comparison with the ones in Krumovgrad 58.

In classes I and II of Krumovgrad 58 organic tobacco, higher values of total sugars and phosphorus are observed compared to conventional tobacco; also, there are much lower values of total nitrogen,

Table 4. Mineral content of organic tobacco - harvest 2020.

Ecotype	PARAMETER						
	K %	Ca %	Mg %	P mg/kg	Cd mg/kg	Cu mg/kg	Zn mg/kg
Organic tobacco							
EF – Gotse Delchev							
Krumovgrad 58 – class I	1.85	1.18	0.35	1.0	0.6	14.6	38.7
Krumovgrad 58 – class II	1.51	1.24	0.34	0.0	0.8	13.8	42.3
Nevrokop 1146 – class I	1.73	1.10	0.28	0.0	0.5	13.4	25.3
Nevrokop 1146 – class II	1.77	1.06	0.25	1.0	0.6	14.0	24.9
REFERENCE VARIETY							
EF - Kozarsko							
Krumovgrad 58 – class I	2.01	2.16	0.27	6.0	0.5	14.0	69.2
Krumovgrad 58 – class II	2.11	2.54	0.25	5.0	1.1	12.0	73.8

ash and chlorides. The Nevrokop 1146 ecotype grown in a district typical for the variety under organic conditions is characterized by chemical values of tobacco similar to the ones of conventional tobacco. Nicotine is the only exception, with values approximately twice as low in comparison with the ones of organic tobacco.

Polyphenol composition of tobacco

Krumovgrad 58 grown under organic conditions shows lower values of all tested phenolic acids in comparison with the reference variety. Flavonoids in organic tobacco are with higher values in com-

parison with conventional tobacco. The results in Table 6 show much higher values of phenolic acids and flavonoids in the Nevrokop ecotype in comparison with the Krumovgrad ecotype, both grown under organic conditions.

Chemical composition of tobacco

The results in Table 7 show that Krumovgrad 58 ecotype – organic has the best values of all chemical parameters. The reference variety has increased values of total nitrogen and ash. This leads to the worsening of dry tobacco quality parameters and imbalanced smoking characteristics.

Table 5. Basic chemical parameters of tobacco

SAMPLE Class	PARAMETER, %						
	Nicotine	Soluble sugars	Total nitrogen	Ashes	Sand	Phosphorus	Chlorides
Krumovgrad 58 class I	0.82	23.2	1.45	8.56	1.14	0.45	0.09
Krumovgrad 58 class II	0.71	22.1	1.48	8.29	1.34	0.47	0.09
Nevrokop 1146 class I	0.40	23.2	1.00	7.79	2.59	0.42	0.11
Nevrokop 1146 class II	0.32	22.8	0.73	7.78	2.14	0.36	0.10
REFERENCE VARIETY EF - Kozarsko							
Krumovgrad 58 class I	1.26	19.8	1.67	10.79	0.84	0.30	0.27
Krumovgrad 58 class II	2.14	13.8	1.90	12.62	1.73	0.30	0.18

Table 6. Polyphenols in tobacco

SAMPLE Class	Polyphenols, mg/g					Σ
	Phenolic acids			Flavonoids		
	NChA	ChA	4-O CfA	Rut	K-3 Rut	
Krumovgrad 58 class I	2.41	13.37	4.00	12.33	1.91	34.01
Krumovgrad 58 class II	1.95	10.92	3.38	12.33	1.61	30.19
Nevrokop 1146 class I	2.80	20.15	5.45	13.48	1.77	43.64
Nevrokop 1146 class II	2.85	19.66	4.91	14.94	1.91	44.27
REFERENCE VARIETY EF - Kozarsko						
Krumovgrad 58 class I	2.73	14.26	4.37	9.57	1.56	32.49
Krumovgrad 58 class II	2.60	11.29	4.19	11.49	1.67	31.23

Polyphenols in tobacco: Chlorogenic acid/ChA/, Neochlorogenic acid/NChA/, 4-O- Caffeoylquinic acid/ 4-O CfA/, Rutin/ Rut/, Kaempferol-3- Rutoside/K-3 Rut/

Table 7. Chemical parameters of tobacco of the Krumovgrad ecotype - harvest 2021

SAMPLE Class	PARAMETER, %					
	Nicotine	Soluble sugars	Reducing sugars	Reducing substances	Total nitrogen	Ashes
Krumovgrad 58 class I	0.80	22.2	12.00	9.70	1.40	8.05
Krumovgrad 58 class II	0.70	21.0	14.58	8.50	1.35	7.80
REFERENCE VARIETY EF - Kozarsko						
Krumovgrad 58 class I	1.20	19.3	11.58	9.00	1.57	10.15
Krumovgrad 58 class II	1.90	14.05	10.30	7.68	1.80	13.01

Table 8. Chemical parameters of tobacco of the Krumovgrad ecotype- harvest 2022

SAMPLE Class	Parameter, %						
	Nicotine	Soluble sugars	Total nitrogen	Ashes	Sand	Phosphorus	Chlorine
Krumovgrad 58 class I	0.93	20.24	1.27	9.43	2.21	0.51	0.23
Krumovgrad 58 class II	0.85	19.32	1.30	8.83	1.37	0.43	0.20
REFERENCE VARIETY EF – Kozarsko							
Krumovgrad 58 class I	1.15	18.20	1.60	10.40	2.30	-	0.25
Krumovgrad 58 – class II	1.80	13.10	1.75	12.85	2.25	-	0.21

Table 8 presents the values of basic chemical parameters of tobacco of the Krumovgrad ecotype, organic and conventional tobacco of harvest 2022. The results show that the Krumovgrad 58 ecotype – organic has the best values of all chemical parameters. Nicotine in organic tobacco ranges from 0.85% to 0.93% and the values are lower in comparison with the reference variety. Total sugars have higher values, 19 % - 20 % in organic tobacco, and in conventional tobacco – 13 % -18 %.

The values of the parameter of chlorine and sand are approximately the same for organic and conventional tobacco Krumovgrad 58 for the two classes.

The reference variety has increased values of the parameters of total nitrogen and ash. This leads to worse quality parameters of dry tobacco and imbalanced smoking characteristics.

CONCLUSIONS AND RECOMMENDATIONS

The soil, climatic and ecological conditions in Bulgaria allow the creation of a large number of to-

bacco varieties with specific qualities, smoking and taste properties. Because different varieties of oriental tobacco are no longer cultivated in their typical districts, they have lost their typical characteristics.

The quality of oriental tobacco of the Basmi variety group is mainly determined by variety characteristics and conditions of tobacco cultivation. Tobaccos of the Basmi variety group are extremely affected by climate change; such change is happening in recent years. In order to increase the quality of the main varieties sought at the market, it is mandatory to observe technologies for the production and primary processing of tobacco.

In the period of 2020-2022, a research was carried out to determine the basic technological and chemical parameters of some varieties of oriental tobacco grown under organic and conventional conditions. Better values of basic technological and chemical parameters of tobacco grown under organic conditions compared to the reference variety have been proven.

The cultivation under organic conditions of the existing varieties of oriental tobacco known and proven in practice will contribute to reducing the

negative impact of climate changes on dry tobacco quality. High quality raw material can be obtained by changing some stages of the cultivation technology for certain varieties of oriental tobacco, under organic conditions This is a way to satisfy the interests of buyers on the market with different requirements regarding quality, chemical and smoking properties of Bulgarian oriental tobacco.

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