

PRODUCTIVITY AND QUALITY OF BULGARIAN LAVENDER VARIETIES

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Abstract: Bulgarian lavender varieties / *Lavandula vera* / are well known to the world aromatic, chemical and pharmaceutical industry. Specific climatic conditions characterized by cold winters, short springs and hot summers are very favourable for rapid growth and development of lavender plants. Genetic material created under these conditions was demonstrated with varieties: Sevtopolis, Druzhiba, Yubileyna, Raya, Hemus, Hebar and Karlovo, the potential of which in the form of the amount of harvested flowers varies from 560 to 690 kg / da in that with high content of essential oil in the range of 1.9 to 2.6 percent. Bulgarian lavender oil is high quality and is in direct competition with French oil.

Key words: varieties, productivity, quality, essential oil

Introduction

In recent years, Bulgaria has reached a leading position in the world production of quality lavender essential oil from 200 t in 2015 to 250 t in 2016, compared to the production per capita it is leading in the world ranking. It is the high quality of Bulgarian lavender oil which determines its application in the global perfume and cosmetics industry. Quantities produced in other countries except France have a lower quality indicators based on the higher content of camphor and are used for the production of fresheners mainly.

Material and methods

During the period 2013-2015 in the region of Plovdiv and experimental base AU - Plovdiv, field trials have been carried out to establish specific productive features and detailed qualitative parameters of Bulgarian lavender production. The results for the varieties are compared to the quality criteria of Bulgarian lavender oil. Lavender oil is volatile due to the free alcohols. (Nematian, A., et al., 2014). Increased rate of some ingredients determines the quality of the oil. A basic method for the preparation of essential oil is steam distilled with steam temperature over 140 ° C and pressure of 4-5 atmospheres (Jablonský, M., et al., 2016). While growing lavender preferably a light soils with alkaline reaction (Cordovilla, M., et al., 2014), (Dallev, M., & Ivanov, I., 2015). Chemical composition and its main components influencing the quality of essential oil and its price (Kara, N. and Baydar, H., 2013), (Danh, L., et al., 2013).

Results and discussion

The results for productivity, presented as average values according to different varieties during the research period, are as follows: Sevtopolis 5,6 t / ha⁻¹, essential oil 2%, yield 49.2, late-flowering variety, Druzha 6,4 t /ha⁻¹, essential oil 1.9%, yield 52.8 medium flowering variety, Yubileyna 6,3 t /ha⁻¹, essential oil 1.9%, yield 52.8 suitable for dry flower. The volume of essential oil of l/ha reaches 180 l.

The results for the varieties are compared to the quality criteria of Bulgarian lavender oil with the following main parameters: 1,8-cineole,% - 1.6- 4.2, cis-Ocimene + trans-Ocimene,% - 2-4 8.4 linalool,% - 16.1- 42.5, camphor,% - up to 0.5, lavandulol,% - 0.8- 2.7, terpinen-4-ol,% - 4-5- 8.7 linalyl acetate,% - 24.7- 51.6 lavandulyl acetate,% - more than 4.5. For Sevtopolis Table 3 the main ingredients are 1,8-cineole,% - 1.8, cis-Ocimene + trans-Ocimene, -5.4%, linalool, -32.2%, camphor% - to 0.6, lavandulol,% - 0.6, terpinen-4-ol, -0.4%, linalyl acetate,% - 28.6, lavandulyl acetate,% - over 5.6. For Druzha Table 4 the main ingredients are: 1,8-cineole,% - 1.4, cis-Ocimene + trans-Ocimene, -8.7%, linalool, -34.8%, camphor,% - to 0.2, lavandulol,% - 0.3, terpinen-4-ol, -3.1%, linalyl acetate,% - 35.9, lavandulyl acetate,% - over 1.2. For Yubileyna Table 5 the main ingredients are 1,8-cineole,% - 0.6, cis-Ocimene + trans-Ocimene, -14,9 linalool%, -25.0%, camphor% - to 0.3 lavandulol,% - 0.2 terpinen-4-ol, -0.9%, linalyl acetate,% - 33.3, lavandulyl acetate,% - over 6.2.

Average essential oil content in% for the period according to different varieties: Sevtopolis- 2.8%, Druzha- 2.4%, Yubileyna -2.3% Table 1. The average values of biometric identifiers for the research period by varieties are as follows: Sevtopolis- height-58cm, bush diameter - 72.5cm, number of inflorescences-304, length of spike- 5.4cm, number of flower nodes- 4.9, number of flowers in 1 node- 7.7 length of the flower stem- 22.9 cm. Druzha- height-57cm, bush diameter- 89.5cm, number of inflorescences-345, length of spike-4.9cm, number of flower nodes- 4.8, number of flowers in 1 node- 8.1 length of the flower stem- 19.9 cm. Yubileyna- height-61cm, bush diameter- 86.5cm, number of inflorescences-252, length of spike-9.1cm, number of flower nodes- 6.2, number of flowers in 1 node- 9.5 length of the flower stem- 26.6 cm Table 2. Demonstrated indicators characterize to the greatest extent the productive capacity of Bulgarian lavender varieties, and their quality characteristics provoke demand on the world market of essential oils. In recent years, in Bulgaria's neighboring countries there has been an increased interest in this culture and Bulgarian varieties are mainly preferred in the cultivated lavender areas.

Table 1. Variability of biometric parameters- 2013 - 2015 years

Bush diameter, cm									
Varieties	2013			2014			2015		
	min	max	average.	min	max	average	min	max	average
Sevtopolis	65.0	85.0	73.0	80.0	95.0	86.0	65.0	85.0	72.5
Druzhba	80.0	91.0	85.3	75.0	100.0	91.0	80.0	100.0	89.5
Yubileyna	80.0	95.0	89.6	80.0	100.0	89.5	75.0	95.0	86.5

Number of inflorescences									
Varieties	2013			2014			2015		
	min	max	average.	min	max	average	min	max	average
Sevtopolis	86.0	151.0	118.7	342.0	561.0	437.7	228.0	371.0	304.6
Druzhba	138.0	211.0	171.6	410.0	678.0	566.4	272.0	448.0	345.5
Yubileyna	165.0	301.0	221.4	248.0	369.0	305.7	181.0	317.0	252.9

Table 2. Variation in the content of essential oil 2013 – 2015 years

Content of essential oil, %									
Copt	2013			2014			2015		
	min	max	average.	min	max	average	min	max	average
Sevtopolis	2,1	3,0	2,6a	2,1	2,8	1,5b	2,3	3,2	2,8a
Druzhba	1,9	2,7	2,4b	1,7	2,8	2,4a	1,9	2,8	2,4b
Yubileyna	2,2	2,7	2,4b	2,3	2,8	2,4a	2,2	2,8	2,3b

Table 3. Variation of the main constituents of the essential oil

SEVTOPOLIS								
Main constituents	2013		2014		2015		BG sandard	
	min.	max.	min.	max.	min.	max.		
1,8-cineole, %	1,2	1,9	1,1	1,8	1,3	1,8	1,6 - 4,2	
cis-β-ocimene, %	0,7	1,2	0,1	0,2	1,4	2,0		
trans-β-ocimene, %	0,8	1,5	0,1	0,1	2,7	3,4		
cis-β-ocimene + trans-β-ocimene, %	1,5	2,6	0,2	0,4	4,1	5,4	2,4 - 8,4	
linalool, %	30,5	32,0	22,0	22,3	28,9	32,2	16,1 - 42,5	
camphor, %	0,2	0,3	0,4	0,6	0,2	0,6	до 0,5	
lavandulol, %	1,2	2,5	1,0	2,2	0,2	0,6	0,8 - 2,7	
terpinen-4-ол, %	1,5	2,1	0,8	1,1	0,2	0,4	4,5 - 8,7	
linalylacetate, %	27,1	28,7	25,2	25,9	26,9	28,6	24,7 - 51,6	
lavandulylacetate, %	4,6	5,6	4,1	4,9	4,6	5,6	над 4,5	

Table 4. Variation of the main constituents of the essential oil

DRUZHBA							
Main constituents	2013		2014		2015		BG sandard
	min.	max.	min.	max.	min.	max.	
1,8-cineole, %	1,4	1,9	0,2	0,2	0,8	1,4	1,6 - 4,2
cis- β -ocimene, %	3,6	5,5	1,3	1,9	4,9	6,9	
trans- β -ocimene, %	1,2	1,7	4,3	5,3	1,2	1,8	
cis- β -ocimene + trans- β -ocimene, %	4,9	7,2	5,6	7,2	6,1	8,7	2,4 - 8,4
linalool, %	31,4	33,3	31,1	31,5	32,9	34,8	16,1 - 42,5
camphor, %	0,2	0,3	0,2	0,3	0,1	0,2	до 0,5
lavandulol, %	2,4	3,5	0,4	1,1	0,1	0,3	0,8 - 2,7
terpinen-4-ол, %	2,3	2,7	2,3	2,8	2,3	3,1	4,5 - 8,7
linalylacetate, %	27,2	33,0	34,9	35,4	33,3	35,9	24,7 - 51,6
lavandulylacetate, %	1,1	1,3	1,0	1,2	0,8	1,2	над 4,5

Table 5. Variation of the main constituents of the essential oil

YUBILEYNA							
Main constituents	2013		2014		2015		BG sandard
	min.	max.	min.	max.	min.	max.	
1,8-cineole, %	0,4	0,6	0,4	0,5	0,4	0,6	1,6 - 4,2
cis- β -ocimene, %	4,9	6,3	2,2	3,1	6,7	8,3	
trans- β -ocimene, %	3,6	5,2	1,2	1,9	4,8	6,5	
cis- β -ocimene + trans- β -ocimene, %	8,5	11,5	3,4	5,0	11,5	14,9	2,4 - 8,4
linalool, %	24,7	27,0	28,8	30,0	22,6	25,0	16,1 - 42,5
camphor, %	0,3	0,6	0,1	0,2	0,1	0,3	до 0,5
lavandulol, %	0,8	2,1	0,7	1,4	0,0	0,2	0,8 - 2,7
terpinen-4-ол, %	10,3	11,8	8,2	9,1	8,2	9,0	4,5 - 8,7
linalylacetate, %	27,0	30,6	28,0	29,0	29,8	33,3	24,7 - 51,6
lavandulylacetate, %	4,6	6,5	3,5	4,6	4,4	6,2	над 4,5