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PRODUCTIVITY AND QUALITY OF BULGARIAN LAVENDER VARIATIES

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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: 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*: variaties, 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.

MATERIALS 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 DISCUSSIONS

The results for productivity, presented as average values according to different varieties during the research period, are as follows: Hemus 6.3 $t.ha^{-1}$, essential oil 2%, yield 49.2, late-flowering variety, Hebar 6.4 $t.ha^{-1}$, essential oil 1.9%, yield 52.8, medium flowering variety, Raya 6.9 $t.ha^{-1}$, essential oil 1.9%, yield 52.8 suitable for dry flower. The volume of essential oil of reaches 180 l/ha.

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 Hemus the main ingredients are 1,8-cineole, % - 3.9, cis-Ocimene + trans-Ocimene, % -4.8, linalool, -33.9%, camphor, % - up to 0.4, lavandulol, % - 0.9, terpinen-4-ol, % -0.3, linalyl acetate, % - 39.6, lavandulyl acetate, % - over 3.4. For Hebar the main ingredients are

1,8-cineole, % - 1.1, cis-Ocimene + trans-Ocimene, -12.6 %, linalool, -28.5 %, camphor % - to 0.4 lavandulol, % - 0.2 terpinen 4-ol, -0.2%, linalyl acetate, % - 36.9, lavandulyl acetate, % - over 3.9. For Raya the main ingredients are 1,8-cineole, % - 2.3, cis-Ocimene + trans-Ocimene, -6.0%, linalool, -38.4%, camphor, % - to 0.6, lavandulol, % - 0.4, terpinen-4-ol, -0.5%, linalyl acetate, % - 36.2, lavandulyl acetate, % - more than 5.4.
Average essential oil content in % for the period according to different varieties: Hemus- 1.8%, Hebar- 2.8%, Raya- 2.9%.

The average values of biometric identifiers for the research period by varieties are as follows: Hemus- height – 52 cm, bush diameter - 59.5 cm, number of inflorescences- 302, length of spike - 5.3 cm, number of flower nodes - 4.7, number of flowers in 1 node - 8.3 length of the flower stem - 21.8 cm. Hebar- height – 55 cm, bush diameter - 80.0 cm, number of inflorescences - 456, length of spike - 4.9 cm, number of flower nodes - 4.5, number of flowers in 1 node - 6.5 length of the flower stalks - 21.3 cm. Raya- height - 51 cm, bush diameter - 70.0 cm, number of inflorescences- 413, length of spike - 4.9 cm, number of flower nodes - 4.2, number of flowers in 1 node - 5.9 length of the flower stem - 15.8 cm (Table 2).

Table 1. Variability of biometric parameters 2013 - 2015 years

Bush diameter, cm									
	2013			2014			2015		
Var	min	max	aver	min	max	aver	min	max	aver
1	45	60	53	55	85	66b	45	70	59c
2	60	80	72	70	80	77a	70	86	80b
3	65	85	73	60	90	78a	60	80	70c
Number of inflorescences									
	2013			2014			2015		
Var	min	max	aver	min	max	aver	min	max	aver
1	79	138	111	250	331	277	210	404	302
2	211	368	275	330	451	401	340	546	456
3	170	240	200	410	723	580	195	615	413

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

Content of essential oil, %									
	2013			2014			2015		
Var	min	max	aver.	min	max	aver	min	max	aver
1	1,2	2.5	2.0	1.2	2.2	1.6	1.3	2.5	1.8
2	2,1	3.2	2.7	1.9	2.6	2.3	2.2	3.2	2.8
3	2,2	3.6	3.1	2.3	3.3	2.6	2.3	3.6	2.9

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.
Chemical composition and its main components influencing the quality of essential oil and its price. In the Table 1 and 2; 1. Hemus, 2. Hebar, 3. Raya, Variaties.

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

Hemus						
Main content	2013		2014		2015	
	min.	max.	min.	max.	min.	max.
1,8-cineole, %	2.2	3.3	2.0	3.7	2.9	3.9
cis-β-ocimene, %	1.9	2.3	1.2	1.9	1.8	2.4
trans-β-ocimene, %	1.4	2.0	0.6	1.2	0.9	2.4
cis-β-ocimene + trans-β-ocimene, %	3.3	4.3	1.8	3.1	2.8	4.8
linalool, %	38.6	41.0	29.7	31.1	31.2	33.9
camphor, %	0.1	0.2	0.4	0.6	0.3	0.4
lavandulol, %	0.8	1.1	0.8	1.5	0.6	0.9
terpinen-4-ол, %	3.9	4.5	2.1	2.8	0.2	0.3
linalylacetate, %	2.8	28.7	31.6	32.9	36.8	39.6
lavandulylacetate, %	2.5	3.2	2.0	2.9	2.8	3.4

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

Hebar						
Main content	2013		2014		2015	
	min.	max.	min.	max.	min.	max.
1,8-cineole, %	1.8	2.3	3.0	4.5	0.7	1,1
cis-β-ocimene, %	5.9	6.5	1.7	2.4	6.7	7.2
trans-β-ocimene, %	5.4	6.0	1.5	2.4	4.8	5.4
cis-β-ocimene + trans-β-ocimene, %	11.3	12.5	3.2	4.8	11.5	12.6
linalool, %	28.5	28.8	28.0	28.5	26.9	28.5
camphor, %	0.3	0.5	0.4	0.6	0.2	0.4
lavandulol, %	1.0	2.6	0.8	1.2	0.1	0.2
terpinen-4-ол, %	1.1	1.6	2.9	3.8	0.1	0.2
linalylacetate, %	29.5	30.8	28.2	28.7	33.9	36.9
lavandulylacetate, %	2.9	3.2	3.4	3.6	3.3	3.9

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

Raya						
Main content	2013		2014		2015	
	min.	max.	min.	max.	min.	max.
1,8-cineole, %	1.0	1.7	1.9	2.9	1.2	2.3
cis-β-ocimene, %	1,7	2.1	1.6	2.3	2.8	3.1
trans-β-ocimene, %	1.0	1.8	0.2	0.3	2.1	2.9
cis-β-ocimene + trans-β-ocimene, %	2.7	3.9	1.8	2.6	4,9	6.0
linalool, %	33.9	37.0	32.9	34.1	32.2	38.4
camphor, %	0.1	0.2	0.1	0.2	03	0.6
lavandulol, %	1.0	1.3	0.5	0.8	0.2	0.4
terpinen-4-ол, %	0.9	1.4	2.1	3.4	0,2	0,5
linalylacetate, %	28.9	35.7	32.8	34.5	28.9	36.2
lavandulylacetate, %	3.6	5.2	4.2	5.2	3.7	5.4

CONCLUSIONS

The greatest amount of lavender is obtained from a variety Druzhba.
Variety Hemus synthesized the greatest amount linalylatcetate 39.6%, followed by 36.9% Hebar variety and variety Sevtopolis by 36.2%.
Linalilatsetat is the most important ingredient that significantly affects the quality of lavender oil.

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Bulgarian lavender varieties Hemus, Hebar and Raya show high productivity and very good quality in different agro-meteorological conditions of each year, which allows us to recommend them for growing in Bulgaria's neighboring countries.

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