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# ESSENTIAL OIL CONTENT AND COMPOSITION OF LAVENDER ORIGINS, INTRODUCED IN BULGARIA

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## Abstract

The genus *Lavandula* includes a variety of species under the common name lavender. Bulgaria has a tradition in the production of high-quality lavender oil. This is the result of many years of selection work, which includes the study of introduced samples and their adaptogenic abilities in the country habitat. Three samples of *Lavandula angustifolia* Mill., that originated from Poland were studied and compared with the Bulgarian varieties "Hemus" and "Sevtopolis". The content of the essential oils ranged from 0.39% to 3.98%. The chemical composition, determined by GC/MS, revealed the main compounds: linalyl acetate (13.0÷44.9 %), linalool (21.8÷42.1%), β-caryophyllene (4.6÷7.4 %), cis-β ocimene (2.8÷10.5 %), lavandulyl acetate (1.9÷4.3%), terpinen-4-ol (0.3÷2.0 %), limonene+1.8 cineole (2.3÷6.0 %) and trans-β ocimene (0.1÷3.8%).

The sample with the dark purple florescence showed promising quantitative and qualitative characteristics of the essential oil and can be involved in the selection program for lavender cultivation.
**Key words:** *Lavandula angustifolia* Mill., volatiles, quality

## INTRODUCTION

The genus Lavandula includes a variety of species under the common name lavender. They are naturally spread in the Mediterranean areas, where they are grown and processed for essential oil. The plants and their products have widespread uses by various industries, such as the pharmaceutical, food, perfumery, and cosmetics industry, as well as in agriculture as biopesticides. The essential oil has long been considered to be natural remedies for various ailments. It is known for its sedative, antispasmodic, antimicrobial, antidepressant and anti-inflammatory properties. Bulgaria has a tradition in the production of high-quality lavender oil from Lavandula angustifolia Mill (Stanev et al., 2016). This is due to decades of selection work, which includes the study of introduced samples and their adaptogenic abilities in the country habitat (Boyadjieva, 1975).

As the variety is an agroecotype by its biological nature, it is necessary to study it under the specific ecological conditions.

The aim was to test the introduced lavenders according to the main indicators of yield and quality of the essential oil under the conditions of the Kazanlak valley, Bulgaria.

## MATERIALS AND METHODS

*Plant material and Processing*

The study was conducted in 2020. The plant samples of *Lavandula angustifolia* Mill that originated from Poland (seed propagation) and the Bulgarian varieties "Hemus" and "Sevtopolis" as the standard were used as a study material. A distinctive feature of the introduced specimens was the coloring of the inflorescences - white, violet and dark purple.

All the lavenders were harvested in the warm hours of the day in July, observing the appropriate degree of flowering of 50 - 100%

with stems up to 10 cm. The processing was carried out on the same day.

The essential oil was obtained by steam distillation of the material, using the modification of Clevender apparatus. The process parameters were: sample amount 100 g; distillation rate 8 – 10 ml/min; temperature of the distillate: 30°C; duration of the process: 1.0 h. The essential oil was measured to the graduated part of the separator in milliliters and was calculated as a percentage by volume (v/w). For better accuracy, a relative density recalculation was made and was presented as a percentage by weight (w/w). After collecting, the oil was treated with anhydrous $Na_2SO_4$ and stored in tightly closed vials ant 4°C till analysis.

*Chemical analysis*

The essential oil was analyzed using gas chromatography, performed on Agilent 7820A GC System coupled with flame ionization detector and 5977B MS detector. The protocol was made according to ISO 3515 for gas chromatographic analysis of lavender oil. The capillary column EconoCap™ EC™ (30 m x 0.32 mm ID, 0.25 µm film thickness) was used. It was operated with oven program from 40°C (5 min held) to 240°C at a rate of 10°C /min, 10 min held at the final temperature was applied. Hydrogen (99.999%) was used as a carrier gas at a constant flow rate of 1.0 ml/min. The split ratio was 1:50, the inlet temperature was set to 200°C and the FID temperature was set to 300°C.

The GC/MS analysis was performed at all the conditions, described above. The ingredients were quantified by area of FID peaks without any correction factor. The oil constituents were identified by their mass spectra, matching with the NIST and MS library, as well as whenever possible, the authentic substances was used.

## RESULTS AND DISCUSSION

The content of the essential oils in the white, violet, dark purple, "Hemus" and "Sevtopolis" lavenders were 0.39±0.05; 1.18±0.08; 0.98±0.02; 1.89±0.00 and 3.98±0.12, respectively. The data showed that the introduced samples had low oil content. The amount in the white lavender was minimal, and in the purple and dark purple lavenders, it was higher and almost similar, but far below the standards.

The chromatographic profiles were typical for the essential oil of L. angustifolia (Lawrence, 2015). Sixteen compounds were identified and monitored: the main one was linalyl acetate (13.0 – 44.9%), followed by linalool (21.8÷42.1%), β-caryophyllene (4.6÷7.4 %), cis-β ocimene (2.8÷10.5%), lavandulyl acetate (1.9÷4.3%), terpinen-4-ol (0.3÷2.0 %), limonene+1.8 cineole (2.3÷6.0%) and trans-β ocimene (0.1÷3.8%).

The qualified lavender oil is determined by higher ester and a low content of camphor and camphor-like ingredients (Konakchiev, 2015; Lawrence, 2015). The standards varieties "Hemus" and "Sevtopolis" were with linalyl acetate content 44.4% and 39.7% respectively. They oils contained lavandulyl acetate 3.1 and 4.3% respectively. The introduced samples (white, violet and dark purple) contain linalyl acetate 13.0%; 26.5% and 43.8% respectively. The lavandulyl acetate levels were 1.9%; 2.6% and 4.2 % respectively.

The camphor and 1.8 cineole are characteristic and main components of lavender oils from lavandin (Konakchiev, 2015; Lawrence, 2015). In our study, camphor levels were extremely low in all samples, ranging from 0.1 to 0.2%. According to ISO 1535, it should be less than 0.6%. Due to the specificity of the GC column, lemonene and 1.8 cineole were reported in total. The oils of the introduced lavenders (white, violet, dark purple) this sum comprised 6.0%; 2.7 and 3.6% respectively. In "Hemus" and "Sevtopolis" the same were 3.8% and 2.3%. Overall, all the levels were high, especially that of the white lavender.

For the other components (α-pinene, camphene, 3-octanone, cis-ocimene, trans-

ocimene, borneol, lavender, alpha- terpinene and β-caryophyllene) the amounts were within limits, typical for lavender oil.

## CONCLUSION

The seed-propagated lavenders, originating from Poland, were studied in the conditions of the Kazanlak valley, Bulgaria. One of them (the dark purple florescence) showed promising quantitative and qualitative characteristics of the essential oil compared to the standard. It can be involved in the selection program for lavender cultivation.

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