

PRODUCTIVITY INDICES IN *LAVANDULA ANGUSTIFOLIA* MILL. VARIETIES, SIXTH YEAR OF VEGETATION

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Abstract. The evaluation of quantitative character indices – plant height and diameter, number of flowering stems per plant, inflorescence and floral spike length, number of whorls on the floral spike, raw material yield, and essential oil content – allowed for the characterization and assessment of each lavender variety-clone. The varieties under study synthesized and accumulated an essential oil content at standard humidity (60%) exceeding 2% (Svetlana – 2.199%; Alba 7 – 2.188%), and on dry matter basis exceeding 5% (Svetlana – 5.498%; Alba 7 – 5.472%). Raw material yield varied from 3.6 t/ha to 7.7 t/ha depending on the variety, with the most productive being Svetlana (7.7 t/ha), Alba 7 (7.3 t/ha), and Favoare (6.7 t/ha). The essential oil yield in the evaluated varieties-clones ranged from 11.6 kg/t to 22.0 kg/t. The highest yields were recorded in the varieties: Svetlana (22.0), Alba 7 (21.8), and Favoare (17.1) kg of essential oil per ton of fresh inflorescences.

Keywords: breeding, productivity, varieties, yield, essential oil.

INTRODUCTION

The cultivation of the species *Lavandula angustifolia* Mill. in the Republic of Moldova has increased in recent years, currently covering over 2,000 hectares. In order to accelerate the expansion of cultivated areas, breeding research has been carried out to develop varieties adapted to local pedoclimatic conditions, such as critical low winter temperatures, drought, summer heat, and so on, as well as different vegetation periods, high productivity, and elevated essential oil content [1; 5; 6; 7; 8].

The production and quality of essential oil are strongly influenced by pedoclimatic conditions, soil, and the cultivated varieties. For therapeutic purposes, the volatile oil is used in aromatherapy as a relaxant, antispasmodic, carminative, analgesic, sedative, hypotensive, antimicrobial, antitussive, antioxidant, and antibacterial agent [5; 6; 7; 8; 9; 11].

One of the main tasks of the research group was to create lavender varieties-clones with resistance potential and adaptive plasticity to unfavorable environmental factors, as well as the ability to accumulate valuable chemical compounds. Over the course of several years, the breeding team from the Aromatic and Medicinal Plants Laboratory of the IGFP, USM, developed six lavender variety-clones with varying vegetation periods (early, medium, and late), distinctive quantitative traits of productivity, high essential oil content in raw material, and superior quality. These have been registered, patented, and four of them have been implemented in the agriculture and economy of the Republic of Moldova [1; 2; 3; 4; 5; 6; 10]. The objective of the present research is to evaluate *L. angustifolia* clones according to high productivity indices in their sixth year of vegetation.

MATERIALS AND METHODS

This study included six local lavender varieties and three promising hybrids. The research was conducted in the Comparative Contest Crops nursery, in the sixth year of vegetation. The planting scheme used was 1.4 x 0.6 meters. In early spring, the winter hardiness and frost resistance of the studied varieties were assessed by evaluating the number of frozen shoots per plant, scored on a scale from 1 to 5 [13].

The evaluation of the variety-clones included in the research was carried out in accordance with current methodologies, based on a series of quantitative traits that directly influence productivity: plant height and diameter, inflorescence length, floral stem and floral spike length, number of whorls per inflorescence, vegetation period, and essential oil content. The methods used for setting up the experiments, evaluating the material, and statistical data interpretation followed validated lavender breeding protocols [13].

Essential oil was extracted from fresh inflorescences at full bloom using Ginsberg-type distillation apparatus [12]. The essential oil content was determined and recalculated on a dry mass basis.

RESULTS AND DISCUSSION

In the sixth year of vegetation, the lavender varieties from different maturity groups were evaluated in the CCC (Comparative Contest Crops): early (Favoare and Moldoveanca 4), medium (Cr.13S-6-7; Cr.13S-6-35; VM-18V; Vis Magic 10; Aroma Unica), and late (Svetlana and Alba 7). The species' resistance to abiotic factors (frost, wintering) was assessed. It was found that the varieties Svetlana, Favoare, Moldoveanca 4, and Aroma Unica exhibited high resistance, scoring 5 points, while Vis Magic 10, Alba 7, Cr.13S-6-35, Cr.13S-6-7, and VM-18V were rated above average, with 4 points. The quantitative traits influencing productivity

-plant height and diameter, and number of flowering stems per plant were evaluated at the full flowering stage of the lavender plants.

Under severe drought conditions that persisted throughout the vegetation period, the varieties in their sixth year of growth developed plants with heights ranging from 68.5 cm to 94.8 cm. Plant diameters ranged from 95.6 cm to 132.1 cm. These data are shown in Figure 1. These two traits indicate plant vigor. Noteworthy performances for these traits were observed in the following varieties: Svetlana with a height exceeding 130.0 cm and a diameter of 94.8 cm; Cr.13S-6-7 (122.1 cm and 80.2 cm); Cr.13S-6-35 (121.9 cm and 85.9 cm). The hybrid genotype VM-18 had the shortest height of 95.6 cm and the smallest diameter of 68.5 cm (Figure 1).

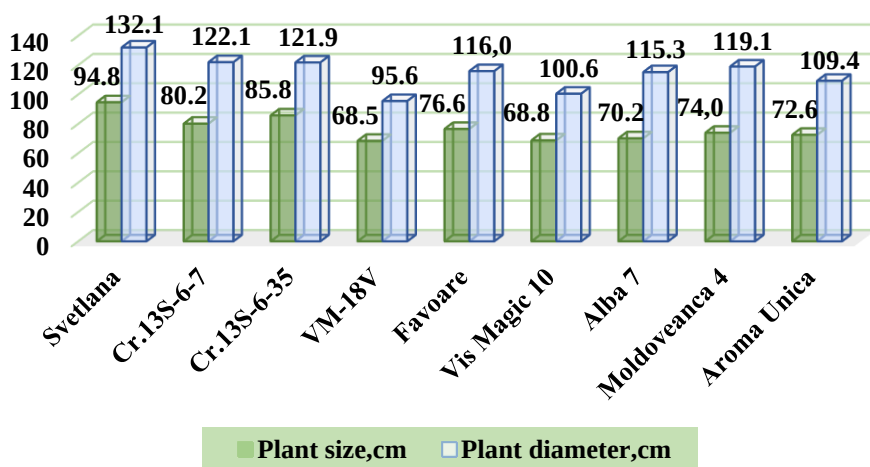


Figure 1. Height and diameter of *L. angustifolia* Mill. varieties in CCC (sixth year of vegetation), 2024

The number of flowering stems per plant is a key trait determining the production of fresh raw material. This index varied from 940 to 3023 units per plant. The highest number of flowering stems was recorded in the early variety Favoare (2503 units), followed by the medium hybrid Cr.13S-6-7 (2842 units.) and the late variety Svetlana (3023 units).

In the lavender clones evaluated in the Comparative Contest Crops, traits related to the inflorescence were also studied – namely, the length of the inflorescence and floral spike, and the number of whorls on the floral spike (Figure 2).

Based on the evaluation, the varieties with the longest inflorescences - greater than 30.0 cm - were: Favoare (32.4 cm), Cr.13S-6-7V (32.4 cm), and

Svetlana (38.7 cm). Six varieties showed inflorescence lengths above 20.0 cm: Moldoveanca 4 – 26.7 cm; Alba 7 – 28.2 cm; VM-18V – 28.5 cm; Aroma Unica – 29.4 cm; Cr.13S-6-35 – 29.4 cm; and Vis Magic 10 – 29.8 cm. For the floral spike length, lavender varieties in the sixth year of vegetation showed values ranging from 7.5 cm to 10.9 cm. The highest values were recorded for the clones: Aroma Unica (8.8 cm), Favoare (9.1 cm), and Svetlana (10.9 cm). The number of whorls on the floral spike in the tested varieties is a key index that determines the essential oil content in the raw material (inflorescences). The more whorls a variety forms - and the more flowers per inflorescence - the higher the essential oil content, as most oil glands are located on the flower calyx [8]. In the sixth year of vegetation, the number of whorls per spike ranged from 5.5 to 7.5 units.

The varieties that formed more than 6 whorls were: Alba 7 (6.2 units), Aroma Unica and Vis Magic 10 (6.3 units.), and Favoare (6.8 units.). The highest number of whorls (7.5 units.) was recorded in the late-maturing variety Svetlana, while the lowest (5.7 units.) was found in the early-maturing Moldoveanca 4 (Figure 2).

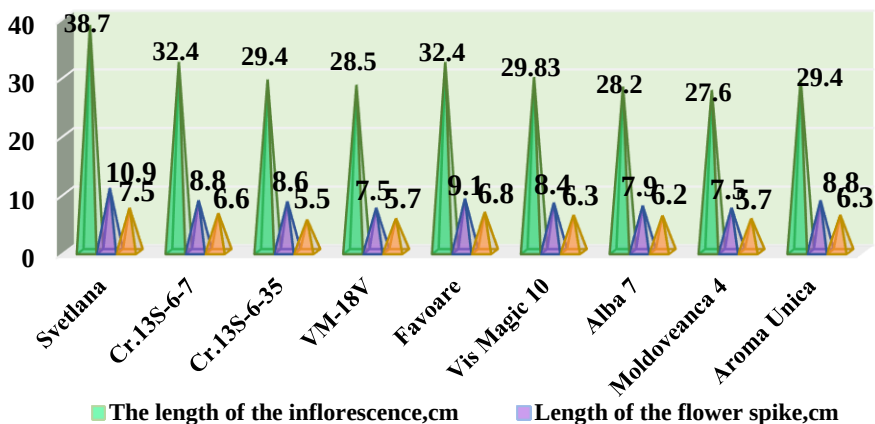


Figure 2. Characteristics of *L. angustifolia* Mill. varieties in CCC based on quantitative inflorescence traits, 2024.

In all lavender clones evaluated in the sixth year of vegetation, productivity indices were determined: raw material yield, essential oil content, essential oil production, and yield per variety (Table 1). The raw material yield ranged from 3.6 t/ha to 7.7 t/ha, depending on the variety. The highest inflorescence yields were recorded for the following varieties: Favoare (6.7 t/ha), Alba 7 (7.3 t/ha), and Svetlana (7.7 t/ha).

The research results show that the dry year of 2024 was favorable for lavender cultivation, encouraging the accumulation and synthesis of essential oil in

the raw material. Some evaluated lavender varieties accumulated an essential oil content at standard humidity (60%) of more than 2% (Alba 7 – 2.188% and Svetlana – 2.199%), recalculated to dry matter exceeding 5% (Alba 7 – 5.472%, Svetlana – 5.498%). The lowest essential oil content was found in the hybrid Cr.13S-6-7, with only 2.897% (dry matter).

Essential oil production in the evaluated clones varied from 45.5 kg/ha to 169.3 kg/ha. The highest production levels were recorded for the following varieties: Favoare (114.5 kg/ha), Alba 7 (159.7 kg/ha), and Svetlana (169.3 kg/ha).

Based on the obtained data, it can be stated that the lavender clones included in the Comparative Contest Crops also achieved a high essential oil yield, ranging from 11.6 kg/t to 22.0 kg/t. The highest yields were recorded for the varieties: Svetlana (22.0), Alba 7 (21.8), and Favoare (17.1) kg of essential oil per ton of fresh inflorescences (Table 1).

Table 1. Productivity of lavender variety-clones in CCC (2024)

Varieties - clones	Raw material production, t/ha	Essential oil content, %		Essential oil production, kg/ha	Essential oil yield, kg/t
		stand. humid, (60%)	dry matter		
Svetlana	7.7	2.199	5.498	169.3	22.0
Cr.13S-6-7	6.5	1.159	2.897	75.3	11.6
Cr.13S-6-3	5.5	1.210	3.026	66.5	12.1
VM-18V	3.6	1.263	3.196	45.5	12.6
Favoare	6.7	1.709	4.380	114.5	17.1
VisMagic10	4.9	1.424	3.632	69.7	14.3
Alba 7	7.3	2.188	5.472	159.7	21.8
Moldoveanca4	6.5	1.434	3.596	93.2	14.4
AromaUnica	5.4	1.277	3.192	68.9	12.7

The evaluation of the varieties in the sixth year of vegetation (2024) in the Comparative Contest Crops demonstrated that the most productive variety was the late-maturing Svetlana, which stood out for its high raw material yield, high essential oil content and production, and high oil yield.

CONCLUSIONS

The research conducted in the Comparative Contest Crops (CCC) on lavender variety-clones revealed well-developed plants that produce a large number of flowering stems, as well as inflorescences with long floral spikes and a high number of whorls per spike.

The essential oil content, a key breeding index in lavender, varied by variety from 2.897% in Cr.13S-6-7 to 5.498% (dry matter) in Svetlana.

The evaluation of the varieties in the sixth year of vegetation (2024) demonstrated that the most productive was the late-maturing variety Svetlana, which showed high raw material yield, high essential oil content, and high essential oil production.

The lavender variety-clones included in the comparative trials also displayed high essential oil yields, ranging from 11.6 kg/t to 22.0 kg/t. The highest yields were recorded for the varieties Svetlana (22.0), Alba 7 (21.8), and Favoare (17.1) kg/t.

The *L. angustifolia* variety-clones developed and patented are well adapted to the pedoclimatic conditions of the Republic of Moldova, maintaining their distinctiveness, productivity, and high values of quantitative traits, including an elevated essential oil content in high-quality raw material—meeting the requirements of agricultural producers and companies specialized.

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