

RESEARCH ON THE INFLUENCE OF FERTILIZATION ON *Lavandula angustifolia* Mill. SPECIES IN THE ORGANIC CULTURE OF THE BUFTEA AREA (ILFOV)

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Abstract

Lavandula angustifolia Mill., part of the Lamiaceae family, is a medicinal and aromatic plant used in various industries, such as the pharmaceutical and cosmetic ones. This paper discusses aspects concerning the growth and development of *Lavandula angustifolia* Mill. (the Emilia and George 90 varieties) when fertilization products approved for organic agriculture are applied. In terms of floral stem and inflorescence development, it is observed that the George 90 variety has larger dimensions than the Emilia variety. The George 90 variety had a floral stem length of 60.25 cm, whereas the Emilia variety measured 58.45 cm. From the perspective of the increase in length (cm) of the inflorescence, it was found that the George variety had a longer inflorescence (13.23 cm) compared to the Emilia variety (8.18 cm).

Key words: fertilization, *Lavandula*, biometric parameters.

INTRODUCTION

Lavandula angustifolia Mill. (lavender, also known as *Lavandula officinalis*) is part of the Lamiaceae family (formerly Labiatae) and is a woody (aromatic) shrub to the Mediterranean Mountains (around the Mediterranean Sea - Ghavani et al., 2022). It is grown in Northern and Eastern Africa, Southern Europe, the United Kingdom, the United States, Southwestern Asia, Australia, and even in India (Basch et al., 2004; Pleguezuelo et al., 2009). Namdeo (2018) mentions that there are hundreds of plant genera used in herbal remedies as well as medicines (traditional and folk medicine) worldwide.

Medicinal and aromatic plants (including *Lavandula angustifolia* Mill.) are an important source of nutrients and natural remedies, as noted by Bouzid (2023).

According to Ghavani (2022), *Lavandula* species (lavender) are among the medicinal plants that aid in stress management, encompassing over 40 species and hundreds of hybrids. Notable examples include: *Lavandula angustifolia* Mill., a frost-resistant species with many decorative flower varieties, and the most

cultivated of the four species (Açıkgöz, 2024); *Lavandula stoechas* (formerly known as *Lavandula vera*), a tall plant with gray-green foliage, late blooming, but with a strong characteristic scent; *Lavandula latifolia* (French lavender); and *Lavandula intermedia*, which is actually a hybrid between *Lavandula latifolia* and *Lavandula angustifolia* (Açıkgöz et al., 2024; Ghavani et al., 2022).

Cardoso et al. (2022) mention that management methods, including biological, mechanical, and molecular approaches, have been developed with the aim of replacing all synthetic products used as fertilizers and pesticides.

Genetically modified microorganisms will become more efficient biofertilizers or biocontrol agents in the future, with a favorable effect on plant productivity (Pole et al., 2022). The author Quarashi (2024) mentions that ornamental medicinal plants are of particular economic importance because they are used both for landscaping (remediating degraded lands) and for phytomanagement of waste heaps, providing long-term delivery of ecosystem goods and services. They are also used in the cut flower industry, while also

possessing medicinal (therapeutic) and even phytochemical values (Pandey et al., 2004).

Medicinal plants have been widely used since ancient times for their medicinal and culinary properties, in the pharmaceutical and cosmetic industries as well (hair-care products, body products, face creams, etc.), and they also represent an important group of species containing volatile compounds. These plants can be successfully cultivated on degraded or contaminated soils (Greff et al., 2023; Pandey et al., 2024; Shakoor et al., 2024).

The effects of fertilization on the microbial properties of the soil greatly depend on the product and the cultivated species (Zubek et al., 2012).

Fertilizations with phosphorus and potassium influence the physiological processes (the intensity of photosynthesis and transpiration) of commercial lavender (*Lavandula angustifolia* Mill.), according to research conducted by Camen et al., 2016.

Organic fertilizers applied to crops induce positive effects on the organic carbon, nitrogen, and phosphorus content in the soil, according to research conducted by Morugán-Coronado et al., 2020.

Long (2018) mentions that there are over 85,000 ornamental plants worldwide, and these are cultivated in various regions of the planet (Earth), many of which are commercially available on the global market due to their popularity among consumers (Long et al., 2024).

The medicinal plants belonging to the Lamiaceae family (*Lavandula dentata*, *Mentha spicata*, *Origanum vulgare*, *Rosmarinus officinalis* and *Thymus vulgaris*) are rich in mineral substances (especially in phosphorus, calcium and magnesium) and proteins as well, simultaneously being acknowledged through research done by Bouzid et al., 2023, that metals and pesticides are found in reduced quantities in plants (less than the allowed limits).

MATERIALS AND METHODS

The biological material was presented by two varieties belonging to the *Lavandula angustifolia* Mill. species.

The Emilia and George 90 varieties are included in the Official Catalogue of Varieties in Romania.

The experimental variants are the following:

Factor A - variety: a₁ - Emilia, a₂ - George 90; Factor B - fertilization: b₁ - CONTROL - UNFERTILIZED, b₂ - COMPOST (10 t/ha), b₃ - COMPOST (10 t/ha) + CROPMAX. (1 l/ha), b₄ - CROPMAX (1 l/ha), b₅ - BLACKJAK (2 l/ha) + CROPMAX (1 l/ha), b₆ - BLACKJAK (2 l/ha).

The planting distances were: for the Emilia variety - 100/120 cm, and for the George 90 variety - 100/100 cm.

The experiment was conducted in the Buftea area, Ilfov County. Fertilizations were applied to the plants, both root and foliar, on April 6th, 2023, and May 7th, 2023.

The details of the two varieties are provided in the Table 1.

Tabel 1. Description of the Emilia and George 90 varieties

Name	Emilia variety	George 90 variety
Plant size	Big compared to other lavender species	Big, distinct compared to all lavender species
Foliar system (color)	Green with light gray tints	Green with light gray tints
Leaf margins	No incisions (absent)	No incisions (absent)
Flowering stem	Long	Very long
Spike	Wide, short	Wide, long
Spike form	Cylindrical	Cylindrica
Flower (calyx)	Green-ish	Green-ish
Pubescence (hairs)	Strong	Strong
Corolla	Violet	Violet
Flowering period	Average	Average

Biometric measurements were taken regarding the length of the floral stem (cm) and the length of the inflorescence (cm). The analysis of the results was statistically expressed using the ANOVA program.

RESULTS AND DISCUSSIONS

The power of fertilization on the lengthiness (cm) of the inflorescence

Based on the data presented in Table 2, it results that the greatest influence on the development of the floral stem (length growth) of the Emilia variety was noticed in variant V₃. The statistical analysis (ANOVA) indicates that variant V₃ exhibited a 1.60 cm increase compared to the landmark (unfertilized) in terms of floral stem-length growth for the Emilia variety, representing 102.81%. It is also

noted that between the first measurement (April 6, 2023) and the last fertilization (July 9, 2023),

the floral stems grew by 48.55 cm, representing a percentage increase of 590.40%.

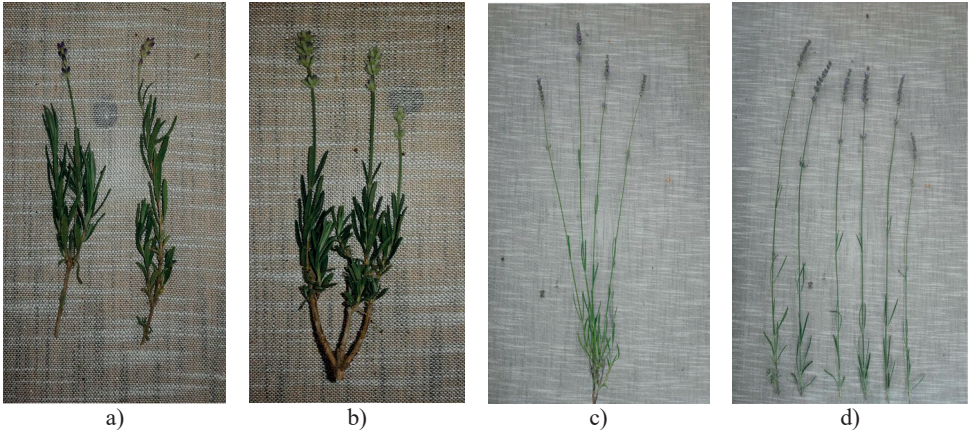


Figure 1. Floral stem length (cm) in May (a, b) and June (c, d) 2023; a) and c) - Emilia variety; b) and d) George 90 variety

Table 2. The effect of fertilization on the floral stem length (cm) (Emilia variety) in 2023

Experimental version	06.04.	23.04.	07.05.	11.06.	09.07.	Difference (cm) and signification	Percentage compared to landmark (unfertilized)	Difference (cm) (09.07-06.04)	Percentage compared to the value (06.04.2023)
V1	9.43	22.48	32.93	44.81	56.85	Ct	100.00	47.42	602.86
V2	9.63	23.28	33.75	45.66	57.81	0.96	101.68	48.18	600.31
V3	9.90	24.61	35.91	46.51	58.45	1.60*	102.81	48.55	590.40
V4	9.83	23.70	34.30	45.95	58.35	1.50*	102.63	48.52	593.59
V5	9.66	23.53	34.20	45.81	57.91	1.06	101.86	48.25	599.48
V6	9.53	23.08	33.58	45.46	57.51	0.66	101.16	47.98	603.46

LSD 5% = 1.29; LSD 1% = 1.77; LSD 0.1% = 2.43

The data that concerns the effect of fertilization on the floral stem length (cm) for the George 90 variety is briefly stated in Table 3, in which it is observed that the greatest power on the growth in length of the floral stem was also registered by variant V₃, with a distinction of 1.69 cm compared to the landmark. The statistical resolution demonstrates that all variants logged increase ranging from 0.89 cm (V₆) to 1.69 cm (V₃) contrasting to variant V₁

(landmark - unfertilized). The greatest accumulation in the floral stem length for the George 90 variety was stated in variant V₄, with a length of 48.88 cm, constituting the distinction between the first fertilization (06.04.2023) and the last fertilization (09.07.2023), which corresponds to a percentage increase of 499.00%. The highest percentage compared to the value from 06.04.2023 was recorded in variant V₆.

Table 3. Power of fertilization on the floral stem length George 90 variety, in the year 2023

Experimental version	06.04.	23.04.	07.05.	11.06.	09.07.	Difference (cm) and signification	Percentage compared to landmark (unfertilized)	Difference (cm) (09.07-06.04)	Percentage compared to the value (06.04.2023)
V1	11.58	24.38	33.96	46.26	58.56	Ct	100.00	46.98	505.69
V2	11.78	24.96	34.48	46.98	59.58	1.02	101.74	47.80	505.77
V3	12.20	25.56	35.00	48.06	60.25	1.69*	102.88	48.05	493.85
V4	12.05	25.43	34.88	48.38	60.13	1.57*	102.68	48.08	499.00
V5	11.86	24.96	34.71	47.23	59.86	1.30	102.21	48.00	504.72
V6	11.68	24.78	34.26	49.98	59.45	0.89	101.51	47.77	508.98

LSD 5% = 1.51; LSD 1% = 2.07; LSD 0.1% = 2.84

The disagreement between the first (06.04.2023) and the last fertilization (09.07.2024), displayed in centimeters (cm) and percentage (%).

It is noticed that between the first and last measurements (for both varieties – Emilia and George 90) concerning the growth in length of the floral stem, the further outcome was registered: for the Emilia variety, the largest distinction was recorded in variant V₃, with 1.60 cm, representing a percentage of 102.81%, while for the George 90 variety, the largest difference was also recorded in the same variant (V₃), specifically 1.63 cm, representing a percentage of 102.88%.

The effect of fertilization on the length (cm) of the florescence

Table 4 presents data regarding the influence of fertilization on the growth of the inflorescence in the Emilia variety.

The most noticeable effect of fertilization on the growth of the measurements of

inflorescence was registered in variant V₃, with a distinction of 1.67 cm compared to variant V₁ (the unfertilized landmark).

The related statics exhibits that variants V₂-V₅ recorded growths ranging from 0.99 cm (V₂) to 1.47 cm (V₄) in terms of floral stem length.

The largest percentage difference (125.65%) was recorded in variant V₃.

Regarding the George 90 variety, the gathered data about the influence of fertilization on the length of the inflorescence is emerged in Table 5.

The conclusion drawn that the greatest influence of fertilization was recorded in variant V₃, with a growth of 1.32 cm compared to variant V₁ (unfertilized control), representing 111.08% of the landmark (unfertilized).

Thereby, the analysis and statistics show that for all other variants (V₂, V₄, V₆), the growths ranged between 0.27 cm (V₂) and 0.65 cm (V₅) compared to V₁ (unfertilized landmark).

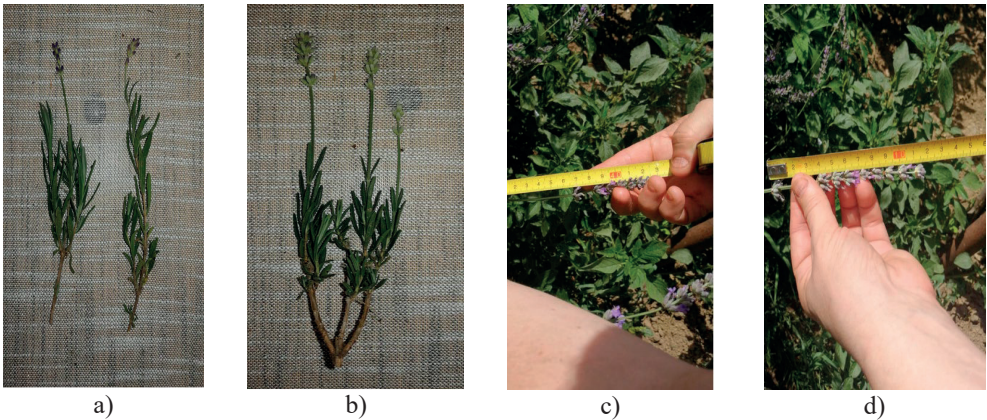


Figure 2. Floral stem length (cm) in May (a, b) and June (c, d) 2023
a) and c) - Emilia variety; b) and d) George 90 variety

Table 4. The influenza of fertilizing on the length (cm) of the inflorescence (Emilia variety), in the year 2023

Experimental version	06.04.	23.04.	07.05.	11.06.	09.07.	Difference (cm) and signification	Percentage compared to landmark (unfertilized)	Difference (cm) (09.07-06.04)	Percentage compared to the value (06.04.2023)
V1	0.31	2.68	3.45	5.08	6.51	Ct	100.00	6.20	2.100,00
V2	0.41	2.86	3.63	5.38	7.50	0.99	115.20	7.09	1.829,26
V3	0.48	3.31	3.76	5.65	8.18	1.67*	125.65	7.70	1.704,16
V4	0.45	3.15	3.75	5.55	7.98	1.47*	122.58	7.53	1.773,33
V5	0.43	3.08	3.70	5.50	7.73	1.22	118.74	7.30	1.797,67
V6	0.40	2.76	3.56	5.21	7.56	1.05	116.12	7.16	1.890,00

LSD 5% = 1.30; LSD 1% = 1.79; LSD 0,1% = 2.45

Additionally, the greatest difference (growth) between the first fertilization (April 6, 2023) and the last fertilization (July 9, 2023) was

recorded in variant V₃, with a growth of 12.65 cm.

Tabel 5. The effect of fertilization on the length (cm) of the inflorescence (George 90 variety), in the year 2023

Experimental version	06.04.	23.04.	07.05.	11.06.	09.07.	Difference (cm) and signification	Percentage compared to landmark (unfertilized)	Difference (cm) (09.07-06.04)	Percentage compared to the value (06.04.2023)
V1	0.36	3.61	5.08	9.66	11.91	Ct	100.00	11.55	3.308,33
V2	0.46	3.83	5.53	10.30	12.38	0.47	103.94	11.92	2.691,30
V3	0.58	4.11	6.25	11.36	13.23	1.32*	111.08	12.65	2.281,03
V4	0.55	4.13	6.10	10.90	12.86	0.95	107.97	12.31	2.338,18
V5	0.50	3.88	5.86	10.55	12.56	0.65	105.45	12.06	2.512,00
V6	0.43	3.68	5.40	10.13	12.18	0.27	102.26	11.75	2.832,55

LSD 5% = 1.10; LSD 1% = 1.51; LSD 0,1% = 2.06

The difference between the first determination (April 6th) and the last fertilization (July 9th), expressed in centimeters (cm) and percentage (%).

The largest difference was registered in variant V₃, with 12.65 cm, signifying a percentage of 2,281.03%, while the most insignificant difference was seen in variant V₆ (11.75 cm) compared to variant V₁ (control).

CONCLUSIONS

It is observed that as a result of the treatments applied (compost and the growth biostimulatory Cropmax), both varieties (Emilia and George 90) showed increases in both the floral stem length and the inflorescence length. Thus, the best results regarding the growth in length (cm) of the floral stem were recorded in variant V₃ (Compost+Cropmax) for both studied varieties. Regarding the growth in length (cm) of the inflorescence, it was shown that variant V₃ was also the most efficient. For the Emilia variety, the growth was 1.67 cm, while for the George 90 variety, it was 1.32 cm, compared to variant V₁ (landmark – unfertilized).

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