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RESEARCH ON THE INFLUENCE OF SOME ORGANIC PRODUCTS ON THE DEVELOPMENT OF LAVANDULA ANGUSTIFOLIA MILL. PLANTS

Oprea (Butnariu) Gabriela[1], Badea Monica Luminița[1], Ion Ligia[1], Marin Doru Ioan[1]
University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd, District 1
Correspondence author. E-mail: gabriela3020022002@yahoo.com

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ABSTRACT

This paper presents the Lavandula angustifolia Mill., a species of the Lamiaceae family, is an aromatic plant with a wide spectrum of applications in fields such as: pharmaceuticals, cosmetics and the food industry. The present study analyzes the growth and development of two lavender varieties, Emilia and George 90, under organic farming conditions, with emphasis on the effects of organic fertilization. Data analysis revealed significant differences between the two varieties. The George 90 variety showed an average height 16.38% higher than the Emilia variety (73.11 cm vs. 63.8 cm). Also, the average diameter of the plants of the George 90 variety was 41.98% higher compared to the Emilia variety (154.32 cm vs. 118.34 cm). These results suggest a more pronounced vegetative vigor in the George 90 variety under experimental conditions.

INTRODUCTION

Lavandula angustifolia (Mill.), a medicinal and aromatic plant used in the perfume and pharmaceutical industry and/or landscaping (Chrysargyris et al., 2016), belongs to the Lamiaceae family, Lavandula kind. It has north-western Mediterranean origins, shows tolerance to drought, requiring sunny places to grow and develop (Detar et al., 2020, citing Weiss, 1997).

In Romania, L. *angustifolia* grows only in crops, as a honey and aromatic plant (Potlog and Vințan, 1983). Its stem is woody, strongly branched from the base, forming a bush with a globular appearance (Figure 1). The volatile (essential) oil extracted from the flowers of this species is rich in linalyl acetate, which gives the characteristic smell, coumarin, tannin and a bitter principle (Constantinescu et al., 2004).

The *Lavandula angustifolia* Mill. species stands out for its versatility in various industrial fields. It is especially valued for its role as a solvent and fixative in the ceramic industry, but also for its insecticidal (moth, mosquito) and aromatic properties, being also used in the production of tobacco, detergents and other products (Munteanu, 1988 cited by Roman, 2008, Muntean, 1990, Constantinescu and colleagues, 2004, Stănescu and colleagues, 2014, Pârvu, 2016).

The species exhibits a wide spectrum of pharmacological activities, including antispasmodic, antiseptic, sedative and cicatrizing effects. Due to these properties, lavender is used both in traditional human medicine, for the treatment of

conditions such as headaches, bronchitis and digestive disorders, and in veterinary medicine, especially for external use (Păun and colleagues, 1988; Pârvu, 2006; Ion and colleagues, 2008, Pârvu and colleagues, 2016).

According to the study provided by Camen and colleagues (2016), potassium application in *L. angustifolia* culture had a beneficial effect on essential physiological processes such as photosynthesis and sweating. Peçanha (2021) demonstrated that phosphorus fertilization improves the adaptability of lavender to the Brazilian tropical climate, favoring plant height growth. Furthermore, Silva (2017) demonstrated that organo-mineral fertilizers increase the yield of lavender crops by improving flowering and essential oil quality. Açıkgöz and colleagues (2024) demonstrated that treatments with cyclotriphosphazene compounds, both before and after harvest, stimulate the accumulation of phenolic acids in lavender plants. According to Zubek and colleagues (2012), moderate use of mineral fertilizers stimulates microbial activity in the soil.

Figure 1. Bushes of the *Lavandula angustifolia* Mill species.
Emilia variety (left) and *George 90* variety (right)

MATERIAL AND METHODS

The research was carried out on lavender plants, the *Emilia* and *George 90* varieties, the *Lavandula angustifolia* Mill species.

The *Emilia* variety, officially approved in 2009 and reconfirmed/re-registered in 2021, is appreciated for its adaptability to the climatic conditions of our country. The plant is tall compared to other varieties of lavender, the color of the leaf system is green, with slight shades of gray (weak shade), not showing incisions on the edges of the leaves (they are absent). The flowering stem is very long, the spike is wide and long, the shape is cylindrical. The flower has a greenish calyx, strong pubescence (shows hairs), and the corolla is purple, the epoch of the beginning of flowering is middle (Figure 1).

The *George 90* variety, approved in April 2017, is a new lavender variety, distinct, uniform and stable, according to ISTIS evaluations. The plant is tall compared to other varieties of lavender, the color of the leaf system is green, with slight shades of gray (weak shade), not showing incisions on the edges of the leaves (they are absent). The flowering stem is very long, the spike is wide and long, the shape is cylindrical. The flower has a greenish calyx, strong pubescence (shows hairs), and the corolla is purple (Figure 1).

The experiment was carried out in the Buftea area (Ilfov). Fertilizers and bio-stimulants of natural origin were used to evaluate their effect on the growth of two

lavender varieties, *Emilia* and *George 90*. The application of the products was root-oriented and foliar on 04.06.2023 and 05.07.2023. To monitor growth, biometric measurements were taken (height and diameter) at approximately one-month intervals starting on 04/06/2023. Experimental variants and planting distances are shown in Table 1-2. The results were statistically analyzed using the ANOVA program.

Table 1

Experimental variants (*Lavandula angustifolia* Mill.)

Variety *Emilia*	Variety *George 90*
V_1 – LANDMARK - UNFERTILIZED	V_1 – LANDMARK - UNFERTILIZED
V_2 – COMPOST (10 t/ha)	V_2 – COMPOST (10 t/ha)
V_3 – COMPOST(10 t/ha)+CROPMAX(1 l/ha)	V_3 – COMPOST(10 t/ha)+CROPMAX(1 l/ha)
V_4 – CROPMAX (1 l/ha)	V_4 – CROPMAX (1 l/ha)
V_5 – BLACKJAK (2 l/ha)+CROPMAX (1 l/ha)	V_5 – BLACKJAK (2 l/ha)+CROPMAX (1 l/ha)
V_6 – BLACKJAK (2 l/ha)	V_6 – BLACKJAK (2 l/ha)

Table 2

Plant distance of the *Lavandula angustifolia* Mill. species, *Emilia* and *George 90* varieties

Plant distance		
The name	*Emilia*	*George 90*
Row spacing (D)	100 cm	100 cm
Distance between plants in a row (d)	120 cm	100 cm
Plant density/ha	8.333	10.000

RESULTS AND DISCUSSIONS

The influence of fertilization on the height (cm) of the plants

From the centralized data in Table 3, it results that the greatest influence on the development of the *Emilia* variety, *Lavandula angustifolia* Mill. was the V_3 variant, registering a difference of 4.43 cm at last determination (07.09.2023) compared to the V_1 variant.

Table 3

The influence of fertilization on the height (cm) of plants (*Emilia* variety)

The experimental variant	06.04.2023	23.04.2023	07.05.2023	11.06.2023	09.07.2023	%	Increase (cm) and signification	Difference (06.04./ 09-07)	% Compared to the value 06.04.2023	% Compared to the landmark (unfertilized)
V_1	54.26	56.50	60,05	61.85	63.43	100.00	Ct	9.17	116.90	100,00
V_2	57.08	59.45	62.88	64.38	66.36	104.61	2.93*	9.28	116.25	122.30
V_3	58.91	59.99	61.75	65.61	67.86	106.98	4.43**	8.95	115.19	125.64
V_4	56.63	57.86	61.18	63.21	65.43	103.15	2.00	8.8	115.53	120.58
V_5	57.96	59.86	61,78	64.78	66.83	105.36	3.40*	8.87	115.30	123.16
V_6	55.36	58.03	61.30	62.98	65.83	103.78	2.40	10.47	118.91	121.32

DL 5% = 2.90 cm; DL 1% = 3.99 cm; DL 0,1% = 5.46 cm

The statistical analysis shows that the V_3 variant recorded significant increase in terms of plant height for the *Emilia* variety.

Regarding the influence of fertilization on the height of plants (cm) in the *George 90* variety, the data is centralized in Table 4. After the centralization of all

data, it is observed that the V_3 variant again had the greatest influence of fertilization on the growth of plants in the *George 90* variety, registering a difference of 21.14 cm compared to the V_1 landmark variant.

Tabel 4

The influence of fertilization on the height (cm) of plants (*George 90* variety)

The experimental variant	06.04. 2023	23.04. 2023	07.05. 2023	11.06. 2023	09.07. 2023	%	Increase (cm) and signification	Difference (06.04./ 09-07)	% Compared to the value 06.04.2023	% Compared to the landmark (unfertilized)
V_1	50.90	54.98	59.40	61.83	65.53	100.00	Ct	14.63	128.74	100.00
V_2	64.31	68.53	71.66	75.23	78.65	120.02	13.12 ***	14.34	122.29	154.51
V_3	73.80	76.70	79.61	83.33	86.93	132.65	21.40 ***	13.13	117.79	170.78
V_4	62.51	66.45	69.61	72.70	76.56	116.83	11.03 ***	14.05	122.47	150.41
V_5	66.05	69.51	72.55	75.78	79.50	121.31	13.97 ***	13.45	120.36	156.18
V_6	57.35	61.65	65.18	68.83	72.50	110.63	6.97 ***	15.15	126.41	142.43

DL 5% = 12.51 cm; DL 1% = 17.19 cm; DL 0,1% = 23.52 cm

The statistical analysis shows us that all V_2, V_3, V_4, V_5, V_6 variants have registered very significant increases in terms of plant height for the *George 90* variety, compared to the V_1 landmark variant.

The difference between the first (06.04.) and the last (09.07.) determination (cm and %)

The differences between the first and last determination for the *Emilia* and *George 90* varieties regarding plant height growth were as follows: for the *Emilia* variety, the greatest difference was recorded in the V_6 variant with a difference of 10.47 cm, representing a percentage of 118. 91%, and in the *George 90* variety, the biggest difference was also recorded in the V_6 variant, with a difference of 15.15 cm, representing a percentage of 126.41% compared to the V_1 landmark variant.

The influence of fertilization on the diameter (Ø - cm) of the plants

Table 5 presents data on the influence of fertilization on the diameter (cm) of plants of the *Emilia* variety.

Table 5

The influence of fertilization on the diameter (cm) of the plants (*Emilia* variety)

The experimental variant	06.04. 2023	23.04. 2023	07.05. 2023	11.06. 2023	09.07. 2023	%	Increase (cm) and signification	Difference (06.04./ 09-07)	% Compared to the value 06.04.2023	% Compared to the land mark (unfertilized)
V_1	66.51	77.56	85.85	98.38	107.21	100.00	Ct	40.70	161.19	100
V_2	80.40	90.65	99.53	111.71	121.43	113.26	14.22 **	41.03	151.03	182.57
V_3	88.16	98.03	107.36	117.56	126.96	118.39	19.75 **	38.80	144.01	190.88
V_4	76.38	87.53	98.23	107.38	117.76	109.84	10.55	41.38	154.17	177.05
V_5	82.35	92.23	101.65	112.63	123.26	114.97	16.05 *	40.91	149.67	185.32
V_6	75.35	83.46	93.76	104.46	113.41	105.78	6.20	38.06	150.51	170.51

DL 5% = 12.68 cm; DL 1% = 17.41 cm; DL 0,1% = 23.82 cm

It is observed that the greatest influence of fertilization on the diameter of the plants (cm) was recorded for the V_3 variant.

The statistical analysis shows us that the V_2, V_3 and V_5 variants registered very significant increases in terms of plant diameter. For the V_4 variant there were distinctly significant increases in terms of plant diameter, and for the V_6 variant there were significant increases in terms of plant diameter growth.

From the centralized data in table 6 regarding the influence of fertilization on the diameter (cm) of the plants for the *George 90* variety, the following results emerged: The greatest influence of fertilization on the diameter of the plants was recorded for the V_3 variant, with a difference of 17.37 cm compared to the V_1 landmark variant.

Table 6

The influence of fertilization on the diameter (cm) of the plants (*George 90* variety)

The experimental variant	06.04. 2023	23.04. 2023	07.05. 2023	11.06. 2023	09.07. 2023	%	Increase (cm) and signification	Difference (06.04./09-07)	% Compared to the value 06.04.2023	% Compared to the landmark (unfertilized)
V_1	97.73	108.71	121.46	134.13	144.16	100.00	Ct	46.43	147.50	100
V_2	112.80	123.41	134.26	145.65	155.65	107.97	11.49	42.85	137.98	159.26
V_3	119.86	129.23	138.95	151.02	161.53	112.04	17.37	52.08	134.76	165.28
V_4	109.45	121.50	131.60	145.00	154.81	107.38	10.65	45.36	141.44	158.40
V_5	117.58	128.93	135.74	148.56	158.93	110.24	14.77	41.35	135.16	162.62
V_6	108.58	120.00	134.60	140.61	150.86	104.64	6.70	42.28	138.93	154.36

DL 5% = 12.14 cm; DL 1% = 16.68 cm; DL 0,1% = 22.82 cm

The statistical analysis shows us that all V_2, V_3, V_4, V_5, V_6 variants have registered very significant increases in terms of plant diameter (cm) for the *George 90* variety, compared to the V1 landmark.

The difference between the first (06.04.) and last (09.07.) determination (cm and %)

The differences between the first and last determination for the *Emilia* and *George 90* varieties regarding the diameter (cm) of the plants were as follows: for the *Emilia* variety the biggest difference was recorded in the V_4 variant with a difference of 41.38 cm, representing a percentage of 154.17%, and in the *George 90* variety, the biggest difference was also recorded in the V_3 variant, with a difference of 52.08 cm, representing a percentage of 134.76% compared to the V_1 landmark variant.

For a clearer interpretation of the results, we chose the *Emilia* variety as landmark, and the *George 90* variety (a newer variety in culture) to be the one with which the final comparisons will be made.

The influence of fertilization on plant height growth showed the following results: the *George 90* variety recorded a much higher plant height (cm) compared to the *Emilia* variety. Thus, the *George 90* variety recorded an average of 11.24 cm of plant height, compared to 2.53 cm in the case of the *Emilia* variety.

The differences between the two varieties (*Emilia* and *George 90*) regarding the first determination (04.06.2023) and last determination (07.09.2023) in terms of plant height growth were large, the *George* variety recording an average difference of 14.29 cm (representing 122.87%) compared to the *Emilia* variety which recorded an average difference of 9.66 cm (representing 117.15%).

The influence of fertilization on plant diameter showed the following results: the variety *George 90* recorded an average of 10.16 cm lower than the average of the variety *Emilia* (11.13 cm). The difference was given by the small diameter of some plants of the *George 90* variety.

Regarding the differences between the two varieties (*Emilia* and *George 90*) particularly in relation to the first (04.06.2023) and last determination (07.09.2023) in terms of the diameter (cm) of the plants, very big differences were recorded once again. Thus, the *George 90* variety recorded an average difference of 43.23 cm (representing 139.02%), and the *Emilia* variety recorded an average of 40.16 cm (representing 151.36%), compared to the landmark.

CONCLUSIONS

The application of treatments based on compost and biostimulator (CROPMAX) had a positive impact on the growth in height and diameter of lavender plants (*Lavandula angustifolia* Mill.), *Emilia* and *George 90* varieties.

The best results in terms of height growth were obtained in the case of the V_3 variant (COMPOST + CROPMAX) for both varieties.

Regarding the development in diameter, the V_3 variant (COMPOST + CROPMAX) proved to be the most effective in the *Emilia* variety (+19.7 cm), in the *George 90* variety (+17.37 cm) compared to the untreated landmark.

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