Effect of shading, organic fertilizer and Gibberellic acid on the flowering growth of (*Lavandula angustifolia*) growing in Kalar city

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Abstract

The experiment was conducted in the city of Kalar for the period from April 1, 2022 to September 1. The experiment included three factors. The first factor is the percentage of shading at two levels open field and 50% lath house. The second factor was organic fertilizer for poultry (Penguin) at three levels (0, 25, 50) gm.plant^{-1}, and the third factor was spraying with Gibberellic acid at three levels (0, 250, 500) mg. L^{-1}. The experiment was designed according to a completely randomized design (R.C.B.D.). The results showed the following. The 0% shading treatment had a significant effect on the characteristics of the number of flower clusters (19,836 clusters per plant), the length of the flower clusters (23,327 cm), the length of the flower (7,768 cm), and the fresh weight of the flower. Inflorescence (0.390 g), and the number of flowers in one inflorescence (36,095 flowers. Pink inflorescence. Plant^{-1}). As for the effect of organic fertilizer (Penguin), both concentrations (25 and 50 gm Plant^{-1}) had a significant effect. Characteristics of flower spike length (23.239 and 23.217 cm). Inflorescence length (6.699, 7.133 cm), inflorescence fresh weight (0.292, 0.298 g), and number of flowers in inflorescence (30.438, 30.715 flowers. inflorescence. plant-1), respectively. As for the effect of spraying with Gibberellic acid, the concentration treatment (250 and 500 mg L^{-1}) significantly affected the length of the flower spike (22.812 and 23.215 cm). Respectively, treatment with 250 mg.L^{-1} significantly affected the length of the inflorescence (6.977 cm) and the number of flowers per inflorescence (30.656 flowers.Flower^{-1}).

Key words: shading percentage, organic fertilizer, lavender plant.
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Introduction:

Ancient man linked the diseases he afflicted with plants on the surface of the Earth, as he used plants or part of them for the purpose of treating the diseases he afflicted [1].]. The lavender plant (Lavandula angustifolia) belongs to the Lamiaceae family and is one of the important medicinal and aromatic plants. It is native to the mountainous regions of the Mediterranean countries. Lavender tolerates moderate drought and frost. It grows well in the annual range (300 - 1400 mm. year). In soils with a reaction degree of 5.8 - 8.3, it does not tolerate waterlogging and grows well in light, fertile, well-drained soils. It has been observed that lavender oil has soothing effects on cases of anxiety, nervous disorders, tension and stress, helps with relaxation and deep sleep, stops bleeding wounds, helps heal them, and is considered a good treatment for removing acne. It is used as an anti-insomnia, appetite stimulant, prevents bloating and nervous stomach irritation, and is a carminative of the intestines. [2, 3]. Many physiological processes in plants are regulated by photosynthesis, which is one of the most important environmental factors that increases the survival, growth, and reproduction of plants evenly [4]. The adaptability of plants begins with the quality of light and the ability to survive in changing environments. These plants can be used to stimulate them on a large scale, as they can filter sunlight through shade nets that affect ornamental plants. In some cases, it leads to significant improvements in their quality and production [5]. Organic fertilizers play an important role in increasing nutrients in a balanced way and ready for the plant, whether major or minor. It is one of the important ways to supply plants with nutrients, as well as improving the physical and chemical properties of the soil and increasing its fertility Poultry waste contains about 3-5% nitrogen, 0.9-3.5% phosphorus, and 1.5-3% potassium. Moreover, the content of calcium, magnesium and sulfur is much higher in livestock and pig waste.. [6,7, 8]. Plant growth regulators have an important and effective role in increasing yield and improving quality, as studies have proven. Most of the important processes of horticultural crops are regulated by plant growth regulators [9]. One of the most important plant growth regulators is Gibberellins, which are known as a group of non-food organic chemical compounds with biologically effective effects [10].

Materials and methods of work:

The Garmian Agriculture Directorate's Horticulture Kalar Station served as the site of the experiment. Ministry of Kurdistan Regional Government's Agriculture and Water Resources. Iraq. Between April 8, 2022, and September 1, 2022, it is situated at an elevation of 212 meters above sea level, 45.30472 longitudes, and 34.603033 latitudes [11].. On April 1, 2022, the soil in the open field was smoothed and plowed down to a depth of 30 cm. Regarding the lath house, open-field soil was added in its place after the previous soil within the canopy was excavated to a depth of 50 cm. The plants were bought from a family-run nursery in the Dohuk Governorate. They were planted in 20 x 15 cm plastic pots, and given their uniform size, they were one year old.

Studied attributes:

The number of flower spikes and the number of flowers per inflorescence were calculated for all flowering plants in all experimental units, and the average was calculated. The length of the flower spikes and the length of the inflorescences of all flowering plants were taken using a tape measure and the average was calculated. The weight of the inflorescences was taken using a sensitive balance and the average was calculated at the end of the experiment

Results:

It was shown from the data in Table No. (1) that zero% shading had a significant effect, with an average number of flower spikes of 19,836. flower spikes. plant $^{-1}$, the shading

percentage of 50% gave a lower average value of 7.521 flower spikes. Plant$^{-1.}$ As for the rate of fertilization with organic fertilizer, there were no significant differences between the different treatments. As for the effect of spraying with Gibberellin acid, the comparison treatment (0 mg L^{-1}) outperformed the rest of the treatments with an average of 15.963 flower spikes. plant $^{-1}$, and the 500 mg L^{-1} treatment gave the lowest average of 11.749 flower spikes. plant $^{-1}$.

It is shown in Table No. (2) that the effect of zero% shading was significantly superior with an average of 23.327 cm, and the 50% shading effect gave a lower average of 20.554 cm. As for the effect of organic fertilizer, the concentration of 25 gm zero plant^{-1} organic fertilizer gave the highest average with an average of 23.239 cm and was significantly superior to the comparison treatment (0 gm . plant^{-1}), which gave an average of 19.366 cm. As for the effect of spraying with Gibberellin acid, the 500 mg. L^{-1} treatment gave the highest averages with an average of 23.215 cm and was significantly superior to the comparison treatment (zero mg.L^{-1}), which gave an average capacity of 19.794 cm.

It was shown from the data in Table No. (3) that the effect of the zero% shading percentage is Morally superior to the 50% shading percentage, with an average of 7.768 and 5.528, respectively. As for the effect of organic fertilizer, the concentration of 50 gm.plant^{-1} organic fertilizer gave the highest average with an average of 7.133 cm and significantly beat the comparison treatment (0 gm.plant^{-1}), which gave the lowest average of 6.122 cm. As for the effect of spraying with Gibberellin acid, the treatment was 250 mg L^{-1} gave the highest averages with an average of 6.977 cm and had a significant increase over the 500 mg. L^{-1}. treatment, which gave the lowest average of 6.279 cm.

It was shown from the data in Table No. (4) that the effect of the zero% shading percentage was significantly greater than the 50% shading percentage, with an average of 0.390 gm fresh weight of the flower. Pink inflorescence and the 50% shading percentage gave an average of 0.169 gm. As for the effect of organic fertilizer, the treatment of 25 and 50 gm.plant^{-1} organic fertilizer gave the highest averages with an average of 0.292 and 0.298 gm fresh weight of the flower. Pink inflorescence, respectively, and they were significantly superior to the comparison treatment (0 gm.plant^{-1}), which gave an average of 0.250 gm fresh weight of the flower.Pink inflorescence. As for the effect of spraying with Gibberellin acid, the treatment with 250 mg. L^{-1} of Gibberellin acid had a significant effect on this trait and gave the highest averages with an average of 0.312 g fresh weight. It was significantly superior to the rest of the treatments, and the comparison treatment (0 mg L^{-1}) gave the lowest average of 0.263 gm per plant $^{-1}$

It is clear from the data in Table No. (5) that there was a significant increase in the average number of flowers in the pink inflorescence with 0% shading, with a value of 36,095 flowers. Inflorescence^{-1}, while with a shading percentage of 50%, a value of 21,380 flowers was obtained. Pink inflorescence $^{-1}$, and the effect of fertilization with organic fertilizer. The treatment with 50 and 25 g. Plant^{-1} organic fertilizer gave the highest average value of 30,438 and 30,715 flowers. Pink inflorescence $^{-1}$, and they significantly outperformed the comparison treatment (Plant^{-1}), which gave the lowest average value of 25,059 flowers. Pink inflorescence $^{-1}$. As for the effect of spraying with Gibberellin acid, the 250 mg treatment. Plant^{-1} gave the highest average, with a value of 30,656 flowers. Pink inflorescence $^{-1}$, and it significantly defeated the comparison treatment (Safflower. Plant^{-1}), which gave the lowest average, 27,065 flowers. Pink inflorescence.$^{-1}$.

Table (1) The effect of shading, organic fertilizer (penjwin), and spraying with Gibberellic acid on the number of flowering spikes (flower spikes. plant $^{-1}$) of the lavender plant (*Lavandula Angustifolia*)

Shading ratio	Gibberellic acid mg. L^{-1}	Organic fertilizer (Penguin) gm ·Plant^{-1}			Shading ratio rate
		0	25	50	
Open field	0	19.91 ab	23.00 ab	26.61 a	19.83 a
	250	20.91 ab	18.91 abc	18.33 abc	
	500	17.39 abcd	15.27 abcd	18.16 abc	
%50	0	7.91 de	9.33 cde	9.00 cde	7.52 b
	250	6.33 e	7.44 de	8.00 de	
	500	6.00 e	6.50 e	7.16 de	
Compost organic fertilizer		13.07 a	13.41 a	14.54 a	
Rate of Gibberellic acid		0	250	500	
		15.96 a	13.32 ab	11.74 b	
Interaction between shading ratio and organic fertilizer			0	25	50
		Open field	19.40 a	19.06 a	21.03 a
		%50	6.74 b	7.75 b	8.05 b
Interaction between shading ratio and Gibberellic acid			0	250	500
		Open field	23.17 a	19.38 ab	16.94 b
		%50	8.74 c	7.25 c	6.55 c
Interaction between Gibberellic acid and organic fertilizer			0	25	50
		0	13.91 a	16.16 a	17.80 a
		250	13.62 a	13.17 a	13.16 a
		500	11.69 a	10.88 a	12.66 a

The values of averages with similar letters do not differ significantly according to Duncan's Multiples Range. Test at 0.05 level of significance

Table (2) The effect of shading, organic fertilizer (penjwin), and spraying with Gibberellic acid on the flower spike length (cm) of the lavender plant (*Lavandula Angustifolia*)

Shading ratio	Gibberellic acid mg. L^{-1}	Organic fertilizer (Penguin) gm ·Plant^{-1}			Shading ratio rate
		0	25	50	
Open field	0	20.66 ab	21.42 abc	21.24 ab	23.32 a
	250	25.13 ab	25.00 ab	26.03 a	
	500	24.81 ab	22.91 ab	22.71 ab	
%50	0	12.27 d	21.66 ab	21.49 ab	20.554 b
	250	13.89 d	23.71 abc	23.10 ab	
	500	19.42 b	24.72 ab	24.71 ab	
Compost organic fertilizer		19.36 b	23.23 a	23.21 a	
Rate of Gibberellic acid		0	250	500	
		19.79 b	22.81 a	23.21 a	
Interaction between shading ratio and organic fertilizer			0	25	50
		Open field	23.53 a	23.11 a	23.33 a
		%50	15.19 b	23.36 a	23.10 a
Interaction between shading ratio and Gibberellic acid			0	250	500
		Open field	21.11 cb	25.38 a	23.48 ab
		%50	18.47 d	20.23 cd	22.95 ab
Interaction between Gibberellic acid and organic fertilizer			0	25	50
		0	16.46 c	21.54 ab	21.37 Ab
		250	19.51 b	24.35 a	24.56 a
		500	22.11 ab	23.81 a	23.71 a

The values of averages with similar letters do not differ significantly according to Duncan's Multiples Range. Test at 0.05 level of significance

Table (3) The effect of shading, organic fertilizer (penjwin), and spraying with Gibberellic acid on the length of the inflorescence (cm) of the lavender plant (*Lavandula Angustifolia*)

Shading ratio	Gibberellic acid mg. L^{-1}	Organic fertilizer (Penguin) gm .$Plant^{-1}$			Shading ratio rate
		0	25	50	
Open field	0	7.12 dc	8.76 a	8.09 ab	7.76 a
	250	7.21 bc	8.14 ab	8.78 a	
	500	6.47 cd	6.72 cd	8.59 a	
%50	0	4.82 ef	5.53 de	5.79 de	5.52 b
	250	5.97 cde	5.98 cde	5.76 de	
	500	5.06 e	5.05 e	5.77 de	
Compost organic fertilizer		6.11 b	6.69 a	7.13 a	
Rate of Gibberellic acid		0	250	500	
		6.68 ab	6.97 a	6.27 b	
Interaction between shading ratio and organic fertilizer			0	25	50
		Open field	6.93 b	7.87 a	8.49 a
		%50	5.28 c	5.52 c	5.77 c
Interaction between shading ratio and Gibberellic acid			0	250	500
		Open field	7.99 a	8.04 a	7.26 b
		%50	5.38 c	5.90 c	5.29 c
Interaction between Gibberellic acid and organic fertilizer			0	25	50
		0	5.97 b	7.14 a	6.94 a
		250	6.59 ab	7.06 a	7.27 a
		500	5.76 b	5.88 b	7.18 a

The values of averages with similar letters do not differ significantly according to Duncan's Multiples Range. Test at 0.05 level of significance

Table (4) The effect of shading, organic fertilizer (penjwin), and spraying with Gibberellic acid on the fresh weight of the inflorescence (g) of the lavender plant (*Lavandula Angustifolia*)

Shading ratio	Gibberellic acid mg. L^{-1}	Organic fertilizer (Penguin) gm .$Plant^{-1}$			Shading ratio rate
		0	25	50	
Open field	0	0.303 d	0.420 ab	0.433 a	0.390 A
	250	0.410 abc	0.455 a	0.460 a	
	500	0.386 abcd	0.330 bcd	0.316cd	
%50	0	0.065 f	0.167 e	0.190 e	0.169 B
	250	0.166 f	0.190 e	0.191 e	
	500	0.170 f	0.190 e	0.195 e	
Compost organic fertilizer		0.250 b	0.292 a	0.298 a	
Rate of Gibberellic acid		0	250	500	
		0.263 b	0.312 a	0.265 b	
Interaction between shading ratio and organic fertilizer			0	25	50
		Open field	0.366 a	0.402 a	0.403 a
		%50	0.134 c	0.182 bc	0.192 b
Interaction between shading ratio and Gibberellic acid			0	250	500
		Open field	0.385 b	0.442 a	0.344 b
		%50	0.141 c	0.182 c	0.185 c
Interaction between Gibberellic acid and organic fertilizer			0	25	50
		0	0.184 b	0.294 a	0.312 a
		250	0.28 a	0.323 a	0.326 a
		500	0.278 a	0.260 a	0.256 a

The values of averages with similar letters do not differ significantly according to Duncan's Multiples Range. Test at 0.05 level of significance

Table (5) The effect of shading, organic fertilizer (penjwin), and spraying with Gibberellic acid on the number of flowers in the inflorescence (flower. inflorescence^{-1}) of the lavender plant (*Lavandula Angustifolia*)

Shading ratio	Gibberellic acid mg. L^{-1}	Organic fertilizer (Penguin) gm .Plant^{-1}			Shading ratio rate
		0	25	50	
Open field	0	29.80 bcd	38.80 a	39.30 a	36.09 a
	250	32.60 abc	39.96 a	39.70 a	
	500	32.73 abc	35.33 ab	36.62 ab	
%50	0	14.05 f	20.20 ef	20.23 ef	21.38 b
	250	20.16 ef	25.50 de	26.00 cde	
	500	21.00 ef	22.83 e	22.43 e	
Compost organic fertilizer		25.05 b	30.43 a	30.71 a	
Rate of Gibberellic acid		0	250	500	
		27.06 b	30.65 a	28.49 ab	
Interaction between shading ratio and organic fertilizer			0	25	50
		Open field	31.71 b	38.03 a	38.54 a
		%50	18.40 d	22.84 c	22.88 c
Interaction between shading ratio and Gibberellic acid			0	250	500
		Open field	35.96 a	37.42 a	34.89 a
		%50	18.16 c	23.88 b	22.08 b
Interaction between Gibberellic acid and organic fertilizer			0	25	50
		0	21.92 c	29.50 ab	29.76 ab
		250	26.38 bc	32.73 a	32.85 a
		500	26.86 B	29.08 ab	29.52 ab

the values of averages with similar letters do not differ significantly according to Duncan's Multiples Range. Test at 0.05 level of significance

Discussion:

We note in Table No. (1, 2, 3, 4, 5) that zero% shading (open ground) had a significant effect on flower growth characteristics, the number of flower spikes (19,836 flower spikes. Plant^{-1}), and the length of the flower spike. (23,327 cm). Inflorescence length (7.768 cm), fresh flower weight (0.390 g), and number of flowers in the pink inflorescence (36,095 flowers. Pink inflorescence. Plant^{-1}). This is consistent with what was found [12] on wild amaranth (*Tagestes minuta* L). It can be explained that shading leads to a decrease in the rate of photosynthesis and thus a decrease in the growth rate [13]. We note in Table No. (1, 3, 4, 5) The moral effect of organic fertilizer (Penjwin) 25, 50 g. Plant^{-1} on the characteristics of flower growth, including the length of the flower stalk (23.239 and 23.217 cm), respectively, the length of the inflorescence (6.699 and 7.133 cm), respectively, the fresh weight of the inflorescence (0.292 and 0.298 g), respectively, and the number of flowers in the spike inflorescence (30.438, 30.715). Flower. Pink inflorescence $^{-1}$) in a row, which we found [14, 15, 16] on the lavender plant. It has long been known that organic fertilizer (poultry waste) is one of the most desirable organic fertilizers, by improves soil fertility by adding essential nutrients, as well as improving soil moisture and nutrient retention [17]. In Tables (2, 3, 4, 5), it was shown that both concentrations of Gibberellic acid (250 and 500 mg.L^{-1}) were superior to the comparison treatment in terms of flower stalk length (22.812 and 23.215 cm), respectively. The highest values for the length of the inflorescence, the fresh weight of the inflorescence, and the number of flowers per inflorescence (6.977 cm, 0.312 g, 30.656 flowers. Inflorescence-1), respectively, were then treated with Gibberellic acid at a level of 250 mg. L^{-1}, with a significant difference at a concentration of zero mg. L-1 and 500 mg. L^{-1}. This is what was agreed upon [18] regarding the lavender plant and [19] when using

Gibberellic acid as a spray on the chrysanthemum plant. This may be due to the vital role of Gibberellic acid in increasing cell divisions and cell expansion, which encourages growth and thus leads to significant vegetative growth [20].

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تاثير نسبة التظليل والسماد العضوي وحامض الجبرليك في النمو الزهري لنبات اللافندر (*Lavandula angustifolia*) النامية في مدينة كلار

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- البحث مستل من رسالة ماجستير للباحث الاول .

الملخص:

اجريت التجربة في مدينة كلار . وتضمنت التجربة ثلاث عوامل العامل الاول نسبة التظليل وبمستوين صفر% الارض المكشوفة و50% الظلة الخشبية. والعامل الثاني السماد العضوي الدواجن(Penjwin) بثلاث مستويات (صفر , 25 , 50) غم.نبات$^{-1}$. العامل الثالث الرش بحامض الجبرليك بثلاث مستويات (صفر , 250 , 500) ملغم. لتر$^{-1}$. صصمت التجربة وفق التصميم العشوائي الكامل (R.C.B.D) واوضحت النتائج مايلي.اثرت معاملة التظليل صفر% معنويا على صفات عدد الشماريخ الزهرية (19.836 شمراخ. نبات$^{-1}$) وطول الشمراخ الزهري (23.327 سم) وطول النورة الزهرية (7.768 سم) والوزن الطري للنورة الزهرية (0.390 غم) وعدد الازهار في النورة الزهرية (36.095 زهرة.نورة زهرية زنبات$^{-1}$) اما تاثير السماد العضوي (Penjwin) فقد اثرت كلا التركيزين (25 , 50 غم. نبات$^{-1}$) معنويا على صفات طول الشمراخ الزهري (23.239 , 23.217 سم) وطول النورة الزهرية (6.699 , 7.133 سم) والوزن الطري للنورة الزهرية (0.292 , 0.298 غم) وعدد الازهار في النورة الزهرية (30,438 , 30.715 زهرة.نورة زهرية. نبات$^{-1}$)على التوالي. اما تاثير الرش بحامض الجبرليك فقد اثرت معاملة التركيز (250 , 500 ملغم.لتر$^{-1}$) معنويا على صفات طول الشمراخ الزهري (22.812 , 23.215 سم) على التوالي واثرت معاملة 250 ملغم.لتر$^{-1}$ معنويا على صفة طول النورة الزهرية (6.977 سم) وعدد الازهار في النورة الزهرية (30.656 زهرة.نورة زهرية$^{-1}$).

الكلمات المفتاحية: نسبة التظليل , السماد العضوي , نبات اللافندر.