Effect of vermocompost and potassium sulfate spraying on the growth and flowering of freesia bulbs

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Abstract

The research was carried out in the shed affiliated to the Department of Plant Production Technologies/College of Technology/Musayyib Fall season 2022 Spring season 2023 to study the effect of vermicompost and potassium sulfate spraying on the growth and flowering of freesia bulbs. Cultivated in plastic pots with a diameter of 22 cm. The research included the effect of two factors, the first is the addition of vermocompost with three levels VO (without addition), V1 (adding vermocompost 5% of the weight of the pot), V2 (adding vermocompost 10% of the weight of the pot) and the second is potassium sulfate with three levels KO (spraying with distilled water), K1 (spraying with 1g L-1), K2 (spraying with 2g L-1.(

The experiment was carried out according to a completely randomized design (C, R, D) for an experiment with two factors (3 x 3) and with three replications, as each repetition contains 9 treatments. The averages were compared according to the least significant difference test (L.S.D) at the 5% probability level.

The results can be summarized as follows-:The addition of 10% of vermicompost fertilizer from the weight of the pot led to a significant increase in all the studied traits (vegetative and flowering), as the highest rates were given in the emergence period (12.2 days), plant height (48.16 cm), number of leaves (9.60 plant-1), leaf length (24.09 cm), leaf width (1.64 cm), flowering age (12.83 days), respectively.The results of spraying treatment with potassium sulfate at a concentration of 2 mg L-1 showed the best averages for all the studied traits (vegetative and flowering), represented by the duration of emergence (13.06 days), plant height (51.00 cm), number of leaves (9.85 leaves) -1), leaf length (24.45 cm), leaf width (1.64 cm), al-Mazhari age (14.33 days)

1 Introduction

Freesia***L.*** ***Freesia hybrid,*** a group of winter annual bulbs under climatic conditions in Iraq of its original homeland South Africa, belongs to the family Iridaceae with a single cotyledon, and includes more than 50 genera, of which there are 19 species, and the genus circulating is a hybrid derived from the strains of F.refoacta***, f.alba, f.carymbese, f.techtinni*** [3]. The name of this genus of freesia is due to the name of the Swedish doctor and scientist Frees.

The freesia of potted plants as well as grown in basins and up to the height of the plant to about (30-40 cm) be flat leaves green sword color and flowers funnel shape with an attractive aromatic smell stacked in the form of clusters and carry Shmarikh floral on a flower holder and the number of florets (4-10) Zahira which is of different colors, including yellow, red, white and purple fruit box with three dwellings and inside seeds black color [10] The process of producing and marketing cut flowers has become an important trade for many countries of the world for the purpose of raising their economy. This is by paying attention to agricultural operations, which are important things to improve the growth of the plant in its entirety, as well as increasing the production of good quality commercial flowers, and these processes include the use of organic fertilizers, which have an important role in improving the physical properties of the soil related to permeability, porosity, movement of water and air within the soil, the spread of roots, moisture retention and soil temperature, as well as acting as a chelating substance that reduces the loss of nutrients and their sedimentation, as well as reducing the acidity of the soil in the root area [11].

Vermokkampost fertilizer is a Latin word consisting of two parts Fermi and means worms and compost means fertilizer, the meaning of this word is vermocompost and Vermokpost is one of the finest types of organic fertilizer in the world and consists of waste products that result from eating worms of organic matter and called (Worm casting). Increases germination rates significantly due to the presence of rooting hormones and growth regulators in it, the use of vermocompost reduces significantly (about 30%) of the use of irrigation water because it retains a large amount of water for long periods due to the presence of humic acid and fulvic acid.

Vermocompost fertilizer is rich in beneficial microorganisms and nutrients necessary for plant nutrition such as N, P, K, calcium , iron and magnesium [8]. It is one of the fertilizers that are easily soluble and absorbed from the plant [5] activates the action of beneficial soil microbes such as nitrogen-fixing and phosphate-solvent bacteria and fungi that secrete Growth hormones such as cytokinin, auxin and gerlin [5]

Potassium increases the ability of plants to retain water through its control of the mechanism of opening the closure of the stomata [7] and has an important role in improving plant growth, increasing its productivity and improving its quality by stimulating the plant to absorb nitrogen and phosphorus, which ensures the process of nutritional balance [2]

- Research Objectives:

1 **- Study the effect of different levels of vermocompost on the vegetative and floral growth characteristics of freesia plants.**
2 **Study of the effect of spraying different levels of potassium on the vegetative and flowering growth of freesia plant**
3 **Study of the Interactionping Effect of Vermocompost and Potassium on Vegetative and Floral Growth Characteristics of Freesia Plant**

2 Materials and methods of work

The experiment was carried out in the canopy of the Department of Plant Production Techniques / Technical College / Musayyib for the autumn season of 2022 and the spring season of 2023 to study the effect of levels of

vermocompost and potassium spraying on the growth and flowering of freesia bulbs.

K and freesia rumat were brought from one of the onion producers in the city of Izmir, Turkey

The experiment included two factors:

First / the first factor / add vermocompost fertilizer, which is in three levels:

1- Without adding a river soil only and symbolized by the symbol

2- Add vermokhumpost 5% of the weight of the pot soil and symbolize it

3- Add vermokhumpost 10% of the weight of the pot soil and symbolize it

Second / factor II / potassium, which is three concentrations:

1- Spraying with distilled water (control treatment)

2- Spraying at a concentration **of 1** g liter-1

3- Spraying at **a concentration of 2** g $^{\text{liter-1}}$

On 10/11/2022, I planted Alak and Ramat in two anvils of 7 kg of soil measuring (24×23) cm filled with agricultural medium and according to the experiment treatments, and the coRamat was covered after planting with anvils with a light layer of soil and watered with water.

All service operations were carried out from irrigation, weeding and control whenever needed, as well as fertilization operations with chemical fertilizer brosol neutral N.P.K every two weeks once sprayed on plants.

Potassium sulfate K2SO4 potassium percentage (50%) was used as a source of potassium after the appearance of (2-3) real leaves sprayed on the vegetative total, and the spraying process was repeated at a rate of spraying every (15) days throughout the experiment period.

Spraying operations were carried out in the early morning until complete wetness with the addition of some drops of (liquid soap) as a diffuser and to break the surface tension of the water during the spraying of the solution

Then prepare the spray solutions by dissolving the calculated weights of potassium sulfate in distilled water to obtain the required concentrations.

1.2 Studied traits

1- Dawn date (day)

Calculated by the number of days from the date of planting until the emergence of the bud above the soil surface for all plants of one experiment, then according to the rate and for each treatment separately.

2- Plant height (cm)

According to the height of the plant from the surface of the pot soil to the top of the flower using a metric tape measure and for all plants of one experimental and then according to the rate for each treatment

3- Number of leaves on the plant ($^{\text{leaf-1}}$)

Where the number of leaves for each plant in the experimental unit was calculated, the rate was extracted for each experimental unit and for all the treatments

4- Paper width (cm)

The width of the leaf was calculated using a ruler, where the width of the leaves was taken for each plant of the experimental unit

5- Leaf length (cm)

The length of the leaves was calculated using a tape measure and for all plants the experimental unit and then extracted the rate and for all treatments.

6- Flowering age (day)

The flowering age was calculated by choosing two plants for each treatment and in a random

manner, where the flowers were picked diagonally from the bottom when the first flower blooms in the flower inflorescence in the early morning and the flowers were placed bottles containing distilled water filled to a third at room temperature and the number of days of their stay valid was calculated in coordination and the rate was extracted for each transaction (2005, Hassna).

Results and discussion

1- Buds eruption (day)

Table (1) indicates that there are significant differences between the levels of factors studied in the impact on the emergence of buds, it has outperformed the treatment of adding vermokmokpost at a concentration of 10% significantly and gave the highest average in the characteristic of bud emergence and was 12.12 days compared to the treatment of not adding vermocompost, which gave the lowest average of 9.41 days. As for the potassium spray treatment levels, the treatment exceeded 2 g litre-1 Significantly and gave the highest average of 13.06 days compared to the comparison treatment, which gave the lowest average of 9.04 days, as for the interference treatments, the treatment (10% Vermocompost + 2 g $^{\text{liter-1 potassium}}$) significantly outperformed and gave the highest average in the characteristic of bud emergence of 15.73 days compared to the treatment of not adding vermocompost and not spraying potassium, which gave the lowest average of 8.60 days.

Table 1. Effect of vermocompost and potassium spraying and their interaction in budding trait (day)

Rate	**Potassium g $^{l-1}$**			**Vermokpost %**
	2	**1**	**0**	
9.41	10.50	9.14	8.60	**0**
10.63	12.94	9.87	9.09	**5**
12.12	15.73	11.19	9.43	**10**
	13.06	10.07	9.04	**Rate**
	Overlap	**Potassium**	**VermokBoost**	**LSD**
	0.67	0.39	0.39	

2. Plant height (cm)

Table (2) indicates that there are significant differences between the levels of factors studied in the impact on the plant height characteristic, it outperformed the treatment of adding vermocompost at a concentration of 10% significantly and gave the highest average in the plant height characteristic and was 48.16 cm compared to the treatment of not adding vermocompost, which gave the lowest average amount. As for the levels of potassium spray treatment, it exceeded the treatment of 40.98 cm 2g $^{L-1}$ Significantly and gave the highest average reached compared to the comparison treatment, which gave the lowest average amounted, as for the interference treatments, the treatment (10% 51.0cm 39.55cm ^{1} vermocompost + 2g$^{\text{liter-1 potassium}}$) significantly outperformed and gave the highest average in the characteristic of plant height reached compared to the treatment of not adding 56.21 cmvermocompost and not spraying potassium, which gave the lowest average amount. 37.03 cm

Table 2. Effect of vermocompost and potassium spraying and their interaction in plant height trait (cm)

Rate	Potassium g $^{l-1}$			Vermokpost %
	2	1	0	
40.98	46.10	39.80	37.03	0
44.57	50.70	43.59	39.41	5
48.16	56.21	46.08	42.21	10
	51.00	43.16	39.55	Rate
	Overlap	Potassium	VermokBoost	LSD
	1.78	1.03	1.03	

3- Number of leaves ($^{leaf-1}$)

Table (3) indicates that there are significant differences between the levels of factors studied in the impact on the number of leaves in the plant, it has outperformed the treatment of adding vermokampost at a concentration of 10% significantly and gave the highest average in the characteristic of the number of leaves in the plant and was 9.60 leaves compared to the treatment of not adding vermocompost, which gave the lowest average of 8.30 leaves. As for the levels of potassium spray treatment, the treatment exceeded 2 g l-1 Significantly and gave the highest average of 9.85 leaves compared to the comparison treatment, which gave the lowest average of 8.09 leaves, as for the interference treatments, the treatment (10% compost + 2 g liter-1 potassium) outperformed significantly and gave the highest average in the number of leaves in the plant amounted to 11.21 leaves compared to the treatment of not adding vermocompost and not spraying potassium, which gave the lowest average of 7.74 leaves.

Table 3. **Effect of Vermokhumpost and potassium spraying and their interaction in the characteristic of the number of leaves in a plant ($^{leaf-1}$)**

Rate	Potassium g $^{l-1}$			Vermokpost %
	2	1	0	
8.30	8.94	8.23	7.74	0
8.73	9.41	8.65	8.12	5
9.60	11.21	9.17	8.42	10
	9.85	8.68	8.09	Rate
	Overlap	Potassium	VermokBoost	LSD
	0.34	0.20	0.20	

4- Leaves length (cm)

Table (4) indicates that there are significant differences between the levels of factors studied in the impact on the characteristic of leaf length, it outperformed the treatment of adding vermokcampost at a concentration of 10% significantly and gave the highest average in the characteristic of leaf length and was 24.09 cm compared to the treatment of not adding vermocompost, which gave the lowest average of 20.78 cm. As for the levels of potassium spray treatment, the treatment exceeded 2 g $^{l-1}$ Significantly and gave the highest average of 24.45 cm compared to the comparison treatment, which gave the lowest average of 20.75 cm, as for the interference treatments, the treatment (10% Vermocompost + 2 g $^{liter-1\ potassium}$) significantly outperformed

and gave the highest average in the characteristic of leaf length of 27.40 cm compared to the treatment of not adding vermocompost and not spraying potassium, which gave the lowest average of 20.02 cm.

Table 4. Effect of vermocompost and potassium spraying and their interaction in leaf length trait (cm)

Rate	Potassium g $^{l-1}$			Vermokpost %
	2	1	0	
20.78	21.63	20.70	20.02	0
22.24	24.32	21.66	20.74	5
24.09	27.40	23.40	21.48	10
	24.45	21.92	20.75	Rate
	Overlap	Potassium	VermokBoost	LSD
	0.95	0.55	0.55	

5. Leaves width (cm)

Table (5) indicates that there are significant differences between the levels of factors studied in the impact on the characteristic of the presentation of the paper, it outperformed the treatment of adding vermocompost at a concentration of 10% significantly and gave the highest average in the characteristic of the width of the paper and was 1.64 cm compared to the treatment of not adding vermocompost, which gave the lowest average of 1.29 cm. As for the levels of potassium spray treatment, the treatment of 2 g $^{L-1 \text{ significantly}}$ exceeded and gave the highest average of 1.64 cm compared to the comparison treatment, which gave the lowest average of 1.34 cm, as for the interference treatments, the treatment (10% vermocompost + 2 g liter-1 $^{\text{potassium) outperformed}}$ significantly and gave the highest average in the leaf width of 1.81 cm compared to the treatment of not adding vermocompost and not spraying potassium, which gave the lowest average of 81.23 cm.

Table 5. Effect of vermocompost and potassium spraying and their interaction in leaf width (cm)

Rate	Potassium g $^{l-1}$			Vermokpost %
	2	1	0	
1.29	1.38	1.25	1.23	0
1.51	1.71	1.44	1.37	5
1.64	1.81	1.63	1.47	10
	1.64	1.44	1.36	Rate
	Overlap	Potassium	VermokBoost	LSD
	0.08	0.04	0.04	

6. Flowering age (day)

Table (6) indicates that there are significant differences between the levels of factors studied in the impact on the characteristic of the flowering age, it outperformed the treatment of adding vermocompost at a concentration of 10% significantly and gave the highest average in the recipe of the flowering bud and was 12.83 days compared to the treatment of not adding compost, which gave the lowest average of 11.10 days. As for

the potassium spray treatment levels, the treatment exceeded 2 g l-1 Significantly and gave the highest average of 14.33 days compared to the comparison treatment, which gave the lowest average of 10.43 days, as for the interference treatments, the treatment (10% Vermocompost + 2 g $^{\text{liter-1}}$ $^{\text{potassium}}$) significantly outperformed and gave the highest average in the characteristic of the flowering age of 16.18 days compared to the treatment of not adding vermocompost and not spraying potassium, which gave the lowest average of 10.13 days.

Table 6. Effect of vermocompost and potassium spraying and their interaction on the characteristic of flowering age (day)

Rate	Potassium g $^{l-1}$			Vermokpost %
	2	1	0	
11.10	12.63	10.54	10.13	0
11.84	14.17	10.92	10.42	5
12.83	16.18	11.56	10.74	10
	14.33	11.01	10.43	Rate
	Overlap	Potassium	VermokBoost	LSD
	0.34	0.20	0.20	

The results in tables (1, 2, 3, 4, 5, 6) showed that the addition of organic residues mixed with the soil in the form of vermocompost at a concentration of 10% has led to a significant increase in the rate of vegetative growth characteristics represented in (bud emergence, plant height, number of leaves, leaf length, leaf width, flowering age).) The reason can be attributed to the role played by organic residues when added mixing with the soil led to improve the qualities of vegetative growth above, as well as to the good content of essential nutrients such as nitrogen, phosphorus and potassium ready for absorption by the plant and that these elements of an important role because they enter into many physiological and vital activities or stimulate to do them, which have to do with the process of photosynthesis and food processing in the plant, nitrogen works to stimulate the plant to produce Auxins and the manufacture of proteins, and encourages cell division and elongation, and thus increase the height of the plant, especially since the growing top contains high concentrations of oxins that work on cell elongation [4].

Taiz and Zeiger, 2015 have pointed out that nitrogen produced by the decomposition of organic matter increases the synthesis of chlorophyll and thus increases the carbon metabolism and energy production needed for cell division and elongation. As pointed out [1] that the increase in nitrogen in the plant leads to an increase in the construction of amino acids, which is the first nucleus for building proteins and growth and the consequent significant increase in plant height. Also, the element phosphorus has an important role in reactions Enzyme to build biological compounds and increase the effectiveness of plants to carry out photosynthesis, and that potassium has an effective role in transporting photosynthetic products and thus increasing the volume of vegetative growth. Organic fertilizers have an important role in increasing vegetative growth because they improve the physical, chemical and biological properties of the soil and increase the readiness of macro and micronutrients necessary for carrying out vital processes within the plant[6].

The results also indicated a significant increase in the above qualities when spraying the m and the reason can be due to element potassiu

the fact that potassium has an effective role in the formation of protein and increase the absorption of nitrogen and the amount of these substances in the plant depends on the plant content of the element potassium, and ssium helps in the construction of sugars pota and the formation and transfer of carbohydrates manufactured in the leaves to storage sites as potassium regulates the processes of closing and opening stomata and has an important role ion, which in the process of cell divis encourages the growth of Meristem tissues This role of potassium can contribute positively of to increasing the vegetative growth averages) plantsTesdale, *et al*., 1997Potassium also .(plays an important role in increasing the plant's to resist stress resulting from ability environmental and climatic conditions, which can be a determining factor for plant growth, plants that are fertilized with potassium raise the osmotic voltage inside the gaps and) increase the carbohydrate content[9].

Appendix No. (7) Flower picking to measure the flowering age of flowers

Conclusions

1. The treatment of adding 10% of vermocopoly to the agricultural medium achieved superiority as it gave the best indicators of the study in measurements of vegetative and flower growth.
2. Potassium spray treatment at a concentration of 2 mg liter showed the best results in vegetative and floral growth qualities.
3. The bilateral interference treatment of 10% vermocompost ++2 mg of potassium achieved the best results for all the traits studied.

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