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The effect of chemical fertilization and foliar spraying with gibberellic acid and benzyl adenine in the growth and flowering of rose plants

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***Abstract*---**This experiment was carried out in a plastic house belonging to the olive nursery, the Department of Gardens and Afforestation, Amanat Baghdad for the agricultural season 2020 /2021 to study the effect of chemical fertilization (NPK) equivalent to four concentrations (0,50,100,150)mg.l^{-1} and foliar spray gibberellic acid (0,100,200)mg.l^{-1} and Benzyl Adenine (0,100,200)mg.l^{-1} in the growth and flowering of Angelina-class shrub flower plants. The plants were fertilized with NPK compound fertilizer equivalent to irrigation water throughout the trial period as needed, while the foliar spraying of plants by growth regulators gibberellic acid and benzyl adenine was done in succession, where the first spray was dated 1/12/2020 and the second spray age dated 5/1/2020 and the third workshop dated 3/2/2020 .The experiment was carried out according to the Randomized Complete Block Design (R.C.B.D.) with three replications and the averages were compared using Duncan's multiple ranges test at a probability level of 5%.Using the SAS program, the results showed as follows :1.Chemical fertilization with compound fertilizer led to a Significant increase in most characteristics, and the concentration treatment 150 mg.l^{-1} Significantly in the characteristics in early appearance of Flowering buds 111.52 days, the number of flowers 7.44 flowers plant^{-1},diameter of the flower 10.25cm number of petals 33.44 petal flower^{-1},Flowering Stem length 53.19cm, fresh weight of flowering, 20.20g,flowering time 29.88 days, vase life 10.80 days. 2.foliar spraying with growth regulators led to a significant increase in the flowering characteristics growth gibberellic acid spraying at the

concentration of 200mg.l^{-1} significantly increase appearance of flowering buds 110.88 days, number of flowers 7.51 plants^{-1} length of flowering stem 55.05cm, vase life 11.23 days, The treatment of gibberellic acid spraying exceeded 100 mg.l^{-1} liters morally in the 9.46cm flower diameter and the fresh weight of the flower 10.14g.3.foliar spraying a concentration of 200mg.l^{-1} liters of benzyl adenine led to a increase in the highest duration of flowering 30.33 days. 4.The interaction between the two studied factors showed a significant improving the flowering characteristics, with the treatment of interference between chemical fertilization at 150mg.l^{-1} and gibberellic acid at a concentration of 200mg.l^{-1} in terms of early appearance of flowering buds 97.76 days, number of Flowers 8.60 plant^{-1},flower diameter 10.99cm. The chemical fertilization interference at a concentration of 100mg.l^{-1} and gibberellic acid at a concentration of 200 mg.l^{-1} led to significant increase in length of flowering stem the pink leg 68.11cm. The effect of the interaction between chemical fertilization at a concentration of 100mg.l^{-1} and gibberellic acid at a concentration of 100 mg.l^{-1} significantly exceeded in the vase life 12.53 days .The effect is the interaction between chemical fertilization at a concentration of 100mg.l^{-1} and benzyl adenine at a concentration of 100mg.l^{-1} in the qualities and vase life 12.43 days. As well as chemical fertilization at a concentration of 150mg.l^{-1} and benzyl adenine at a concentration of 100mg.l^{-1} number of petals in flower 34.99 petal flower^{-1}. The interaction between chemical fertilization at a concentration of 150mg.l^{-1} and benzyl adenine at a concentration of 200mg.l^{-1} led to a significant increase in the, fresh weight of flowering stem 23.91g and duration of flowering 39.66 days.

***Keywords*---**rose, chemical fertilization, gibberellic acid, benzyl adenine.

Introduction

Roses are one of the most important types of ornamental plants of great economic and aesthetic importance since ancient times for the spread of its cultivation in various countries of the world in temperate and cold regions (Abu Zeid,2002).Roses are one of the most widespread flowering plants in public and private parks and are successfully grown in different regions of Iraq in order to withstand high summer temperatures, Amin and others (2010).Roses are one of the most important and widespread types of flowers cut and flowers: single or reserved, or half reserved, its flowers are characterized by their aromatic scent, some of which are non-aromatic and aesthetic, and their colors are multiple and bright, as well as live flowers long after picking, and roses of evergreen plants or half-falling leaves, belongs to the family of rosaceae and contains individual feather compound leaves, containers on oval leaves and toothed edges, The nature of its growth is an existing shrub or climber, and others are short dwarfs (Hyena and others,2004; Hafez,2008; Ibrahim,2008; Shaheen,2014).

The genus of roses contains more than 200 species, and all the types of roses that exist today occurred as a result of hybridization, i.e. resulting from several vaccinations between different types, as well as the extract of perfumes from the flowers of some species as used in the work of jams and syrups (Badr,2010).

Rose plants have been known as the queen of flowers, and are described as one of nature's beautiful creations among all flowers, the highest in the order of cut flowers, and the largest flowers in circulation in the world, and their participation in 51% of the world flower market, and the market value for the cultivation of international flowers is estimated at 11 billion U.S. dollars (Bisht,2013;Bhagat and others,2019; John and others,2020).

In order to increase the production of ornamental plants, especially harvesting flowers, and to obtain good vegetable growth, and flowers with high specifications in terms of shape, size and color, modern means and attention to agricultural processes must be followed to achieve these goals.

The most important agricultural process is the addition of chemical fertilizers Compound fertilizer is low-cost and easy to prepare, and most importantly, these three nutrients(N, P, K)are added in one process, so we get the nutritional balance when you add them (Abu Dahi and Younis,1988).

The Nitrogen is an important nutrient for the plant where it enters into the formation of nucleic acid bases, enzyme accompaniments, and protein, as well as in the formation of cytochromes and chlorophylls, phosphorus is involved in the formation of nuclear acids and phospholipids and also enters the formation of many other compounds of the plant, the most important of which are enzyme facilities such as NAD, NADP, which are involved in oxidation and reduction interactions and energy-rich compounds such as ATP (Abdel Al et al,2014).

Potassium is one of the largest nutrients of the plant, and is called the element of quality, i.e. it is one of the biggest factors affecting the productivity of good crop specifications, and unlike other major elements, it does not enter by installing any organic compound in it but plays the role of mediator in many interactions within the plant, such as the formation of carbohydrates and the organization of cell contents from water, as well as the process of intensifying simple compounds into complex compounds, As well as activating the functioning of enzymes and the resulting compounds (Al-Shater and Balkhi,2017).

Gibberellins, especially GA3, play an important role in the growth and development of plants, and gibberellins are classified as a variety of plant hormones that promote certain physiological pathways, or biochemical pathways in plants (Hashemabadi and Zarchini,2010).

Cytokinins are one of the hormones that play a key role in cell division and specialization, as well as other functions in physiological processes: such as top sovereignty and aging (Attia and Jadwa,1999). One of the most commonly used cytokines in studies is (kinetin) and (benzyl adenine)- BA,6, which are concerned with physiological influences, particularly textile agriculture (Khafaji,2014).

Alsheikhly(2013)In his study on the fertilization of the *Iris hollandica* Prof. Blaauw with four levels of NPK(0,50,100,150)mgL^{-1},reported significant effects in flowering stem diameter and its fresh weight, duration of flowering , bulblets number and its weights. Biram(2013) tested 3 levels of compound fertilizer NPK(15:15:15) with are 0,80 and 120g/m^2 on two varieties of *Tulipa gesneriana*.L.(var. Frenged, Lily Flowering),the level 120g/m^2 Showed an increase in all flowering characteristics of growth (flower diameter 14.29cm and flower carrier diameter 4.41mm).Al-Taie and Jamil(2019) studied the response of Tulip upstar response to three concentrations of organic fertilizer (Humi Max), (Fevist), (foli Arta) and chemical fertilizer NPK 0,1,2ml/L and the concentration of 2ml.L^{-1} of Foli Artal fertilizer has stem to a significant increase in all qualities Vegetative and flowering growth in plant length of flowering stem 32.68cm, diameter of flowering stem 0.81cm and fresh weight of flowering stem and flower 12.80g and diameter of flower is 9.01cm , the duration of flowering is 84.35 days, the duration of flowers on the plant is 18.56cm and the vase life is 14.63days .AlSheikhly(2019) used two concentrations (0 and 100)mg.L^{-1} of NPK chemical fertilization that stem to a significant increase in the fresh weight of the flower stem, stem diameter, soft weight of bulblets and while fewer days of flowering of *Iris hollandica*. Amin and al-Saad (2020) used 0,100 and 200mg.L^{-1} of gibberellic acid on gemengd from the Dutch *Iris hollandic*a plant, which significantly improved the vegetative and flowering qualities. The largest diameter of the flower was given 12.07cm at a concentration of 100mg.L^{-1},while the high concentration of gibberellin led to the longest floweing stem 68.01 cm and the longest leaf length of 130.18cm, The largest number of leaves is 5.38 leaf/plant^{-1} and the longest of vase life is 9.77 days. Gabrel et al (2018) when spraying plant *Chysanthemum morifolium* cv. Zambla White with concentrations of 100 and 200mg.L^{-1} of benzyl adenine stem to a significant increase in the dry branch weight of the dry weight of inflorescences, the duration of the full opening of the inflorescences and the duration of the survival of the inflorescences on the plant. The aim of the study is to find out the effect of chemical fertilization with compound composting (NPK), foliar spraying with gibberellic acid, and benzyl adenine, on some flowering growth characteristics of the rose plant.

Materials and Methods

The experiment was carried out in unheated plastic house belonging to the olive nursery, the Department of Gardens and Afforestation, Amanat Baghdad for the agricultural season from 15/8/2020 to 1/6/2021 Rose plants cv. Angelina developing in 15cm diameter pots which repotted on 1/10/2020 to 25cm diameter plastic pots filled with growing Mixture which consisting of 3parts loamy sand soil 1 part peat moss, some of chemical and physical properties of the growing miture are shown in table (1).

Table (1) the physical and chemical properties of the growing mixture of agri:

Property	Unit of measurement	Value
Degree of electrical conduction Ec 1:1	ds.m^{-1}	1.1
PH 1:1	---	7.72
Weaving	Mixed sand	
Organic Article O M	g.kg^{-1}	7.1

CaCo3 calcium carbonate		265.1
Dissolved Calcium 3+Ca	$Meq.L^{-1}$	16.24
Dissolved Magnesium 2+Mg		9.24
Dissolved Sodium +Na		3.23
Dissolved picarbons HCo3		1.1
Dissolved chlorine Cl		21.01
Dissolved potassium K		1.21
Ready-made nitrogen N		37
Ready-made phosphorus P	$mg.kg^{-1}$	5.2
Potassium Ready K		143.21
Soil separators		
Sand	$g.kg^{-1}$	784
Silt		108
Clay		108
Tissue class	----	Mixed sand

The beginning of October, where the branches were cut at a height of 30cm above the ground, and the removal of weak and dry branches and flowering branches, with an election of 3 newly developed branches with regular distribution on the tree.

All service operations were carried out from bush removal, disease control, Insects such as aphid, red spiders and powdery mildew. Irrigation was when needed according to the season of the year, and at the rate of one pint per pot, and the process of covering plants during winter and summer was carried out to protect plants from low winter temperatures, and high temperatures in summer. This is covered with yellow-colored polyethylene agricultural nylon to protect it from the cold winter and for the period from 19/11/2020 to 24/3/2021 and is covered from 6 p.m. and doors open at 8:00 a.m. the following morning, while in the summer the light synapse cover (Saran) has been covered.

Factors

The plants were planted inside the plastic house according to transactions and randomly, and the field experiment included two factors :
The first factor: chemical fertilization with NPK compound fertilizer and four levels :

1. F0 is watering with water only .
2. F1 watering with NPK compound fertilizer at a concentration of $50mg.l^{-1}$.
3. F2 watering with NPK compound fertilizer at a concentration of $100mg.l^{-1}$.
4. F3 watering with NPK compound fertilizer at a concentration of $150mg.l^{-1}$.

The second factor is spraying growth organizations with five levels :

1. Co Spray with distilled water only.
2. GA1 gibberellic acid spraying $100mg.liter^{-1}$.
3. GA2 gibberellic acid spraying $200mg.liter^{-1}$.
4. BA1 spray with a *benzyl adenine* $100mg.liter^{-1}$.
5. BA2 spray with a *benzyl adenine* $200mg.liter^{-1}$.

The first fertilization was performed with irrigation water on 1/11/2020 for the autumn season, as the plants were watered with NPK compound fertilizer (20-20-20) by four concentrations 0,50,100,150mg.l^{-1} with irrigation water. NPK was dissolved with water and after confirming its melting, the pots were watered by half a liter per pot, the comparison treatment was watered with pure water, the watering was performed in the morning, and the process was repeated when needed according to the season of the year, and a month later, on 1/12/2020,the plants were sprayed with the first spray with gibberellic acid and benzyl adenine and concentrations 100,200mg.l^{-1} For each of them.

gibberellic acid and benzyl adenine were obtained through an office selling medical and chemical materials in Baghdad province (produced by the Indian company) the concentration of the active substance of gibberellic acid 95% and benzyl adenine concentration of the active substance has 99%, Growth regulators were prepared to dissolve the required weights of gibberellic acid (100,200)mg.l^{-1} in drops of ethyl alcohol (70%) and then complete the size to 1 liter by distilled water, As for benzyl adenine , the required weights of (100,200mg.l^{-1} in drops of sodium hydroxide (NAOH) were dissolved and then completed to 1 liter by distilled water. m1 of diffuser (Tween20) was added to the spray solutions to prevent surface tension, and immediately after the preparation of the concentrations are sprayed on the plants on the same day, the comparison factors was sprayed with distilled water, and the spraying was performed early in the morning, The first spray was dated 1/12/2020, the second spray dated 5/1/2020 and the third workshop on 3/2/2020, the plants were sprayed to complete wetness .

Experience design :

A factorial experiment was applied in the nursery using the design of the Randomized Complete Block Design (RCBD) and with 3 duplicates per repeater containing 20 experimantalunit (4x5) and each unit consisting of 5 plants, so the number of trial plants is 300 plants, and the averages for the qualities studied were compared using the Duncan multi- range test at the probability level of 5% (al-rawi,2000) using the SAS program.

Characteristics of flowering growth

Number of days needed for the appearance of flowering buds(day),Number of flowers plant (flower.plant^{-1}), Flower diameter(cm), Number of petals in flower (petal-1flower), Flower stem length(cm) ,fresh weight of flowering stem(g), Flowering period(day), Vase life(day).

Results

Number of days needed for the appearance of flowering buds (day)

Table(2)results indicate that the increased concentration of chemical fertilization led to a significant early treatment of F150, with the lowest duration of bud appearance 111.52 days after the highest duration of bud appearance 156.72 days in the comparison transaction. As for the impact of spraying by growth significant, the duration of the appearance of buds significantly decreased at

GA200 treatment, giving 110.88 days while it was 149.07 days in the comparison transactions.

The effect of interaction between the factors studied was significant in this capacity, as the transaction (GA200+F150) gave early in the number of days needed for the appearance of flower buds and reached 97.76 days, compared to the comparison transactions, which indicated a delay in the duration of the appearance of flower buds amounted to 180.63 days.

Table(2)The effect of chemical fertilization (NPK), foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in the number of days needed for the emergence of flower buds (day) of rose plants.

Compound fertilizer / Growth Regulators	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	180.63 a	157.00 c	133.00 E	125.66 f	149.07 A
GA100	152.33 c	134.00 e	113.66 G	106.66 hi	126.66 D
GA200	133.00 e	112.76 gh	100.00 J	97.76 j	110.88 E`
BA100	165.00 b	144.00 d	124.10 F	106.86 hi	134.99 B
BA200	152.63 c	144.43 d	101.00 Ij	120.66 f	129.68 C
Rate Chemical fertilization	156.72 A	138.44 B	114.35 C	111.52 D	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Number of flowers (plant^{-1})

Table(3)results showed that chemical fertilization with F150 resulted in a significant increase in the giving of the largest number of flowers to 7.44 flowers plant^{-1}, and did not differ significantly from the treatment of F100 if it amounted to 7.12 flowers plant^{-1}, while the comparison treatment recorded the lowest number of flowers, at 4.73 flowers plant^{-1}.

While the results showed that the influence of growth organizations in GA200 treatment led to a moral increase in the number of flowers, reaching 7.51 flowers plant^{-1},and did not differ significantly from GA100 treatment of 7.06 flowers plant^{-1},while comparison treatment gave the lowest number of flowers to 5.22 flowers plant^{-1}.

The interaction between the factors studied notes that the treatment (GA200+F150) significantly outperformed the giving of the most flowers amounted to 8.60 flowers plant^{-1}, and did not differ significantly from the treatment

(BA100+F150), which recorded 8.11 flowers plant^{-1},while the treatment (BA100+F0) gave the lowest number of flowers amounted to 2.11 flowers plant^{-1}.

Table(3)The effect of chemical fertilization (NPK), foliar spraying with gibberellic acid and benzyl adenine and the overlap between them in the number of flowers plant^{-1} for rose plants.

Compound fertilizer / Growth Regulator	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	4.03 g	5.43 Efg	5.63 defg	5.80 cdefg	5.22 B
GA100	6.46 bcdef	6.63 abdcef	8.00 ab	7.17 abcde	7.06 A
GA200	6.80 abcde	7.00 Abcde	7.66 abcd	8.60 a	7.51 A
BA100	2.11 h	4.66 Fg	7.77 abc	8.11 ab	5.66 B
BA200	4.27 g	4.77 Fg	6.55 bcdef	7.55 abcd	5.79 B
Rate Chemical fertilization	4.73 C	5.70 B	7.12 A	7.44 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Flower diameter (cm)

The results of table (4)indicate that there is an effect of chemical fertilization treatment in the diameter of flower, the F150 treatment significantly exceeded the increase in the diameter of the flower to 10.25cm, and did not differ from the treatment F100 if it reached 9.58cm, compared to the comparison transaction with the diameter of the flower 7.50cm. The effect of spraying in growth regulators is noted from the same table that the plants treatment with GA100 significantly outperformed in giving the largest diameter of the flower 9.46cm, and did not differ significantly from the treatment GA200, BA100 and BA200, the diameter of the flower was 9.33, 8.99cm and 8.88cm sequentially, while the comparison treatment recorded the smallest diameter of the flower was 7.52cm. The interaction had a moral effect in this capacity, the treatment (GA200+F150) was characterized by giving it the largest diameter of the flower amounted to 10.99 cm, while the smallest diameter of the flower when treatment (C0+F50) was 6.38cm.

Table(4)The effect of chemical fertilization, foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in the diameter of the flower (cm) of rose plants.

Compound fertilizer / Growth treatment	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	7.05 Fg	6.38 G	8.34 defg	8.33 defg	7.52 B
GA100	7.98 Efg	8.44 cdefg	10.66 ab	10.77 a	9.46 A
GA200	7.83 Egf	8.11 egf	10.38 abcd	10.99 a	9.33 A
BA100	7.37 Efg	8.60 bcdef	9.33 abcde	10.66 ab	8.99 A
BA200	7.27 Efg	8.55 cdef	9.22 abcde	10.49 abc	8.88 A
Rate Chemical fertilization	7.50 B	8.01 B	9.58 A	10.25 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Number of petals in flower (petal flower^{-1}:

Table(5)results showed that chemical fertilization had a significant impact on the number of petals, giving the treatment F150 the highest number of petals at 33.44 petals flower^{-1}, while comparative plants gave the lowest number of petals in the flower at 22.01 petals flower^{-1}. The results of the same table showed that plants treatment with growth regulators did not excel significantly, GA200 treatment recorded the highest number of petals 29.05 petal flower^{-1}, while the comparison treatment recorded the lowest number of petals 25.55 petal flower^{-1}. The interaction between the factors studied had a clear impact in this capacity, with the results indicating that the highest number of petals resulted from the treatment (BA100+F150) of 34.99 petals flower^{-1},and did not differ significantly from treatment (GA200+F150), (GA100+F150) and (BA200+F150), which reached 34.11, 33.77 and 33.77 petals flower^{-1} sequentially, while the (BA200+F0) treatment gave the lowest number of petals in flower at 17.33 petals flower^{-1} in comparison treatment.

Table(5)The effect of chemical fertilization, foliar spraying with gibberellic acid and benzyl adenine, and the interaction between them in the number of petals in flower (petal flower^{-1}) of rose plants.

Compound fertilizer	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	

Growth Regulators					
C0	19.10 Gh	24.99 Defg	27.55 abcdef	30.55 abcd	25.55 A
GA100	27.11 Bcdef	23.66 Defgh	28.99 abcde	33.77 ab	28.38 A
GA200	25.77 Cdefg	26.88 Bcdef	29.44 abcde	34.11 ab	29.05 A
BA100	20.77 Fgh	22.99 Efgh	32.55 Abc	34.99 a	27.83 A
BA200	17.33 H	22.88 Efgh	33.99 Ab	33.77 ab	26.99 A
Rate Chemical fertilization	22.01 C	24.28 C	30.50 B	33.44 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Flowering Stem length (cm) :

Table(6)results indicate that there is an effect of chemical fertilization treatments in the length of the flowering Stem, the F150 treatment significantly exceeded the increase in the length of the flowering Stem, reached 53.19cm,and did not differ significantly from the treatment F100, if recorded 46.90cm while the comparison treatment gave the lowest length of the flowering Stem amounted to 27.93cm.The plants treatment with growth regulators significantly outperformed the GA200 treatment,which gave the longest flowering Stem 55.05cm,and did not differ significantly from the GA100 treatment,with a flowering Stem length of 48.05cm,while the comparison treatment recorded the shortest length of the flowering Stem at 31.77cm.The interaction had a significant effect in this capacity, as the treatment (GA200+F100) was characterized by giving it the longest length of the flowering Stem of 68.11cm,and did not differ significantly from the treatment (GA200+F150) if recorded 67.77cm,while the shortest length of the flowering Stem at treatment (BA200+F0) was 13.11cm.

Table(6)The effect of chemical fertilization,foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in the length of the flowering Stem(cm) of rose plants.

Compound fertilizer / Growth Regulators	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	15.89 De	35.11 cde	33.00 cde	43.11 abc	31.77 C
GA100	27.66 Cde	45.55 abc	54.66 abc	64.33 ab	48.05 AB
GA200	48.22	36.11	68.11	67.77	55.05

	Abc	cde	a	a	A
BA100	34.78 Cde	40.22 bcd	42.00 abcd	42.55 abc	39.88 BC
BA200	13.11 E	35.55 cde	36.77 cde	48.22 abc	33.41 C
Rate Chemical fertilization	27.93 C	38.50 B	46.90 AB	53.19 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Fresh weight of flowering stem (g) :

Table(7)results indicate that the effect of chemical fertilization led to a significant increase in the Fresh weight of flowering stem,as the transaction F150 recorded the highest Fresh weight of flowering stem 20.20g, and did not differ significantly from the treatment F100 at 18.75g,while the comparative transaction gave the lowest Fresh weight of flowering stem 15.76g.The GA200 treatment was significantly superior to the GA200 treatment, giving the highest Fresh weight of flowering stem 20.07g,and was no different from GA100, BA200 and BA100 treatment with a Fresh weight of 19.82,18.06 and 18.00g, while the comparison treatment recorded the lowest Fresh weight of flowering stem at13.24g.The results of the interaction between the two factors studied showed a significant rise,with (BA200+F150) recording the highest Fresh weight of flowering stem and was 23.91 g while the treatment (BA200+F0) recorded the lowest Fresh weight of flowering stem at 10.31g, and did not differ significantly from the comparison treatment if it reached 11.60g.

Table(7)The effect of chemical fertilization, foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in Fresh weight of flowering stem(g) of rose plants.

Compound fertilizer / Growth Regulators	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	11.60 Ef	12.17 Def	15.41 bcdef	13.77 edcf	13.24 B
GA100	21.45 abc	15.59 Abcdef	21.50 abc	20.75 abc	19.82 A
GA200	19.76 abcd	18.63 Abcde	19.99 abcd	21.91 ab	20.07 A
BA100	15.70 abcdef	18.40 Abcde	17.24 abcdef	20.67 abc	18.00 A
BA200	10.31 f	18.40 Abcde	19.63 abcd	23.91 a	18.06 A
Rate Chemical	15.76	16.64	18.75	20.20	

fertilization	B	B	AB	A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Flowering period (day)

Table(8)results showed that the effect of chemical fertilization led to a significant increase in the length of the duration of the flowering at treatment where recorded F150 at 29.88 days,while the comparative treatment gave the lowest duration of flowering 22.93 days.Spraying with growth regulators The BA200 treatment outperformed and gave the longest period of flowering to 30.33 days,while the comparison treatment gave the lowest of duration of the flowering,at 19.35 days. While the results of the interaction between the factors studied indicate a significant increase, the (BA200+F150) treatment gave the longest of duration of the flowering and was 39.66 days, while the transaction (C0+F100) recorded the lowest duration of the flowering 18.66 days compared to the comparison treatment.

Table(8)The effect of chemical fertilization, foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in the period of flowering (day) of rose plants.

Compound fertilizer / Growth Regulators	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F50	F100	F150	
C0	19.66 Gh	19.00 fgh	18.66 h	20.00 fgh	19.35 D
GA100	23.33 Ef	24.33 de	25.53 cde	26.00 dec	24.80 C
GA200	23.66 Def	25.00 de	25.66 dce	28.00 dc	25.58 CB
BA100	23.00 Gfe	24.33 de	25.66 dce	35.66 b	27.16 B
BA200	25.00 De	27.33 dce	29.33 c	39.66 a	30.33 A
Rate Chemical fertilization	22.93 C	24.00 BC	24.97 B	29.88 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Vase life (day)

The results of table(9)indicate that the effect of chemical fertilization led to a significant increase in the long of the vase life at the treatment F150,recording 10.80 days and not significantly different from the treatment F100 where it

recorded 10.68 days, while The comparison treatment gave the lowest vase life at 8.85 days. Data in table (30) show that the cut flowers obtained from plants treated with GA200 show a maximum of vase life 11.23 days, and the comparison treatment did not differ significantly from the BA100 and GA100 treatment at 11.15 and 11.03 days, while the comparison treatment gave the minimum of vase life 6.34 days. The interaction between the factors studied led to a significant increase, the treatment (GA100+F100) recorded the longest vase life at 12.43 days, and did not differ morally from the treatment (BA100+F100) and it reached 12.43 days, while the comparison treatment recorded the lowest vase life it reached at 6.00 days.

Table (9)The effect of chemical fertilization, foliar spraying with gibberellic acid and benzyl adenine and the interaction between them in the vase life (day) of rose plants.

Compound fertilizer / Growth Regulators	Fertilizer level (NPK) mg.L^{-1}				rate Growth Regulators
	F0	F 50	F100	F150	
C0	6.00 H	6.03 h	6.16 h	7.16 g	6.34 C
GA100	9.76 E	10.16 ce	12.53 a	11.66 abc	11.03 A
GA200	10.30 Ce	11.00 cd	11.50 bc	12.13 ab	11.23 A
BA100	9.76 E	10.76 cd	12.43 a	11.66 abc	11.15 A
BA200	8.43 F	9.66 e	10.76 cd	11.40 bc	10.06 B
Rate Chemical fertilization	8.85 C	9.52 B	10.68 A	10.80 A	

Means that Share the same letter for each factor or the interaction between Them are not significantly different according to the Dunkan multiple test at the probability levels of 0.05.

Discussion

The results indicate that treating rose plants with chemical fertilization at a concentration of 150 mg.L^{-1} had a generally positive effect on the characteristics of flowering growth, as the number of days required for the emergence of the flower bud, the number of flowers, flower diameter, the number of petals, the length of the flower stem, the fresh weight of the flower with the stem, the duration of flowering and the flowering age compared to untreated plants. The reason may be due to the presence of phosphorous, which leads to the rapid formation of flower buds and their early opening and the increase in the number of flowers (Abu Zaid, 2002),and it may be due to the high level of all nutrients for plants, and therefore, the plant completed its vegetative growth in a faster time, which led to early growth Flowering (Madhuri and Barad, 2018) on the carnation

plant *Dianthus caryophyllus*. The reason may be attributed to the increase in the number of flowers in the rose plant as a result of the addition of nitrogen fertilizers, and phosphate fertilizers improve the quality of flowers (Al-Chalabi and Al-Khayyat, 2013).The reason is also due to the role of phosphorus in increasing the total root, vegetative and flowers, which helps in absorbing a large amount of nutrients and water, as well as its role in the production of nucleic and amino acids, which contributes to the manufacture of carbohydrates and their transfer from leaves to buds and branches, which leads to a balance between a C/N ratio of The obvious effect on the differentiation of flower buds, increasing their number, duration of survival, fresh and dry weight of the flower, length and diameter of the flower stem (Al-Sahaf, 1989).The increase in flower diameter may be attributed to the accumulation of major nutrients, nitrogen, phosphorous and potassium from the fertilizer, which promoted the transfer of plant hormones to the buds, which led to early In flowers and the increase in flower diameter, the increase in flower size may be attributed to enhanced fertilization use and transfer of nutrients required for growth with increased levels of N and P (Bhalla et al., 2007) and (Naggar, 2009) in *Dianthus caryophyllus*. The increase in the tender weight of the flower and stem may be attributed to the stimulation of growth and photosynthesis and the subsequent displacement of mimic substances to maintain the growth of the developing buds (Singh, 2012),these results are consistent with the findings of Sarkar and Roychoudhary, (2003) in carnations, indicating The results in Table (8 and 9) increase the flowering period and flowering age when fertilizing rose plants. It is quite clear that the increase in nitrogen supply increases the flowering period due to the strong vegetative growth, which in turn leads to the prolongation of the flowering period (Mengel and Kirkby,1987), and this is consistent with what accessed by (Kumar and Rana, 2003; Pal and Biswas, 2004) who worked on the carnation plant. As for the increase in vase life, it is well documented that P and K in general act as protective agents and are known to reduce the rate of flower senescence. Vase life, as well, K is known to increase the resistance of plants and flowers to adverse conditions and also provides mechanical strength to flower petals and stem tissues, helping to increase vase life (Dubey et al., 2010).

Also, the treatment of gibberellin acid spray at a concentration of 200 mg.L-1 recorded a significant effect in the emergence of flower buds, number of flowers, flower diameter and flower stem length with the fresh weight of flower and stem and flowering age. The elongation of the petioles of flowers (Yassin, 2001). Just as gibberellins work early in flowering through complex hormonal substances known as phlorigine, consisting of two chemically different substances, gibberellins and anthesins. Number and size of flowers and prolonging the life of the vase (Al-Chalabi and Al-Khayyat,2013; Al-Khafaji,2014). Gibberellin treatment led to a decrease in the period from the emergence of flower buds until they open (Table 16), and this result may be explained according to the stimulation of gibberellins to attract nutrients processed in the leaves to the location of flower buds and fruits Bidwell(1979),and this result confirms by Ozcelik(2000) on the plant lisianthus.(Table 3) indicate that the number of flowers per plant was significantly increased with the increase of gibberellin levels through alpha-amylase activity, auxin stimulating effect and loss of cell wall, increased cell elongation along with cell hypertrophy.All this leads to an increase in area of leaf, leading to an increase in the photosynthetic area. Hence, this caused an increase in carbohydrates in

nutrients Similar trends were consistent with Dhekney et al.(2000) on rose plant. Gibberellins stimulate an increase in the number of branches resulting in an increase in the number of flowers and an improvement in flower weight. These results are consistent with the findings of Gupta and Dutta (2000) and Rakesh et al.(2003) and Singhrot et al.(2004) in chrysanthemum plant. The results (Table 4) indicate an increase in flower drop, the reason may be attributed to gibberellin that acts It increases the number of leaves and leaf area, which leads to an increase in the process of photosynthesis, and thus increases the size of flowers (Sharifuzzaman et al.,2011) on Calendula officinalis, and the length of the flower stem in Table (6) may be due to the gibberellin that works to stimulate division The increase in plant growth may be a result of growth hormones combined with nutrients due to the physiological role of hormones and nutrients in the synthesis of phytochemicals through the action of the activity of various enzymes and protein synthesis (Tandel et al., 2018), which leads to an increase in vegetative and flowering growth, and thus is reflected in an increase in the tender weight of the flower and stem as shown in Table (7).Table (9) results showed the superiority of gibberellin in prolonging the flowering life of cut flowers. Perhaps these results were due to the fact that the use of gibberellin acid in an appropriate concentration led to delaying flower aging and reducing ethylene production in the cut flowers, and thus the duration of flowering in the pot could be increased. These results are in agreement with Kjonboon and Kanlayanarat(2005) and El-Bably(2016) on the freesia plant.

The results shown in Table(8)showed that spraying plants with benzyl adenine at a concentration of 200mg.L-1 led to an increase in flowering time compared to the control treatment. Flowering (El-Naggar et al.,2009). Because the use of appropriate concentration of benzyl adenine delayed flower senescence and inhibited chlorophyll and protein degradation, and thus could be an increase in flowering period. These results are consistent with Baghele et al.(2012) on rose plant and Mondal and Sarkar (2017) on Hybrid Tea Rose.

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