Effect of Foliar application of CPPU, CCC on growth and flowering of Rose plant (*Rosa hybrida* L.)

Sakar Nawzad Star[1] akghm005@uokirkuk.edu..iq

Kefaia Gazi AI-Saad[2] dr..kefaigahzi@uokirkuk.edu..iq

Osamah Ibrahem Ahmed[3] osama_alzaidbagy@uokirkuk.edu.iq

[1,2] Department of Horticulture and landscape/ College of Agriculture/ University of Kirkuk/ Kirkuk/ Iraq.
[3] Department of forestry / College of Agriculture/ University of Kirkuk/ Kirkuk/ Iraq.

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Abstract

The study was conducted in the Lath house of the College of Agriculture / University of Kirkuk / Agricultural Research and Experiment Station, for the period from September 15/ 2021 to Until the end of April / 2022, The research included studying the effect of spraying with a growth regulator (CPPU) at concentrations of (0, 30, 60) mg L^{-1} with two sprays, the first one a day after the seedling rotation process, and the second one a week later, The first spray, And spraying with CCC growth regulator at concentrations of (0, 2000) mg.L^{-1}, with two sprays, the first three days after spraying with CPPU, and the second two weeks after the first spraying on the growth and flowering of *Rosa hybrid* L., The factorial experiment was conducted according to the randomized complete block design (R.C.B.D), with a split experiment. The results were analyzed using the statistical software [1], Statistical analysis and Duncan's multiple range test were used to compare the means at the 5% probability level. The effect of spraying with the growth regulator CPPU at a concentration of 30 mg. L^{-1} led to a significant increase in the number of leaves, 167.66 leaves. $plant^{-1}$ and the flower diameter was 13.91 cm, while the concentration of 60 mg. L^{-1} increased the vase life by 19.08 days. Spraying with growth regulator CCC at a concentration of 2000 mg. L^{-1} resulted in a significant increase in the number of leaves to 164.44 leaves. $plant^{-1}$ and The number of flowers is 11.72 flowers. $Plant^{-1}$. The interaction between CPPU and CCC had a significant effect, as it increased the diameter of the flower by 14.31 cm, while the concentration of 60 mg. L^{-1}, And a concentration of 2000 mg. L^{-1} of CCC increased the number of flowers to 12.33 flowers. $Plant^{-1}$.

Key words: *Rosa hybrid L., CPPU, CCC.*
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Correspondence Author: Sakar Nawzad Star - akghm005@uokirkuk.edu..iq

Introduction

Rose shrub *Rosa hybrida* L. belongs to the genus Rosa, to the Rosaceae family, there are more than 200 species and 18,000 varieties worldwide, The Sultan Rose is considered the king of flowers and a symbol love, peace and beauty [1]. It is a perennial shrubby plant that reaches a height of more than 1 m and lives up to 20 years. It has thorny branches. Its leaves are alternate, feathery, compound consisting of three, five, and seven leaflets. Its flowers are beautiful and pink in shape, with a very strong scent [2,3].

Roses generally rank first among the global commercial cut flowers. Varieties of royal roses bloom almost throughout the year, but flowers are concentrated during two seasons: The fall season (during November) has few flowers, high quality, strong scent, and bright colour. As for the spring season (during April and May), there are many flowers, but they are of low quality when compared to autumn flowers, as they can be improved by good nutrition and thinning of buds as soon as they are formed[3,4], The deciduous rose is one of the most famous medicinal and aromatic plants, and the deciduous rose has been growing wild in Central Asia since 4000 years before the birth of [5], The shrub rose is included in the main products, including rose water, tea, rose oil, dried flowers, cosmetics, and its use immediately after harvesting for industrial purposes. Dried rose buds are used in the food industry. The flowers of the shrub rose contain carboxylic acid, vitamin C, organic acids and fatty acids [6], Rose oil has great benefits as an antidepressant, psychological relaxant, antioxidant, anti-inflammatory, lipid-lowering, anti-bacterial, and anti-ulcer. The propagation of shrub roses takes place in two methods: (sexual) seed reproduction and (asexual) vegetative reproduction, such as grafting and cuttings [7].

Among the objectives of the rose breeding programs are the strength and length of the flower stem, the shape, size and color of the flowers, heat resistance, strong smell, large flower diameter, free of diseases, and high productivity of flowers. There are four main groups of rose cultivars from a commercial point of view, which are cut flowers with aromatic scent used for vases, flowering plants produced from stem cuttings, potted plants for garden decoration, and flowers used for medicinal purposes [8].

growth regulators is one of the means to regulate and improve growth, and it is defined as organic compounds that are produced naturally in plants and are known as plant hormones, or are synthesized in the laboratory and are called industrial growth regulators [9]. It is of great importance as it modifies the physiological processes of plants and improves the vegetative and flowering characteristics of plants and thus increases production and yield [10].

Cytokinins come in the third rank of growth regulators that encourage growth after auxins and gibberellins. Cytokinins are natural hormones that play an important role in the process of plant growth and development. It has positive effects on the physiological processes that occur in the plant, such as stimulating cell division, eliminating apical dominance, preventing flower fall, accelerating the formation of lateral buds, and does not lead to shortening of internodes, but rather increases the number of vegetative and flowering lateral branches, and thus increases the yield [11,12]. [13] She indicated that spraying benzyl adenine on the

daughter of the consul plant *Euphorbia pulcherrima* L. with (0, 75, 150) $mg.L^{-1}$, A concentration of 150 $mg.L^{-1}$ gave a significant reduction in reducing plant height by 15.01 cm and increasing the number of branches by 4.12, and The wet and dry weight of the leaves were (1.01, 0.24) gm, respectively, and the percentage of potassium in the leaves was 1.86%, and the number of sepals was 3.32, and the number of colored leaves was 25.22, and the percentage of carbohydrates in the bottle was 3.17%, and the diameter of the bottle, the diameter and length of the bottle holder, and the content of the leaves of carbohydrates and nitrogen were reduced.

Cycocel is a plant growth retardant that delays plant growth way to reduce leg elongation, Because it inhibits the effectiveness of meristems under the apical, And lead to shortening of the phalanges in treated plants i.e. slow or lack of vegetative growth, And it reverses the action of gibberellins that stimulate vegetative growth From static buds and works to increase elongation and Cell division due to its effect on any special enzymes It converts complex compounds into simple compounds Plants benefit from it in the process of building protein materials necessary for plant growth [14,15], It showed [16], Cycocel that spraying on David's plant *Chrysanthemum indicum* L. Balcycosyl and concentrations (0, 1000) $mg.L^{-1}$, , as the concentration of 1000 $mg.L^{-1}$ resulted in a significant increase in The plant height was reduced by 11.61 cm compared to the control treatment of 12.43 cm, And The wet weight of the inflorescences increased by 0.470 gm compared to the control treatment, which amounted to 0.441 gm, And [17] concluded that spraying allar on Iris spp In concentration (0, 750) $mg.L^{-1}$, It had an effect on growth, given the concentration of 750 $mg.L^{-1}$ Significant decrease in plant height reached 51.60 cm, And The length of the flower stand was 20.63 cm. . This study came to see the effect of spraying with different levels of growth regulators (CPPU) and (CCC) In improving the growth, flowering and anthocyanin content of flowers and their life after picking, And the content of the leaves of mineral elements of the shrub rose plant.

Materials and methods

The study was conducted in the Lath house, Affiliated to the Agricultural Research and Experiment Station, College of Agriculture / University of Kirkuk - Iraq / Sayada area, for the period from September 15/ 2021 to Until the end of April / 2022, Samples were taken from the agricultural media in which the seedlings included in the experiment were grown before planting and analyzed in the Soil and Water Resources Laboratory of the Directorate of Agriculture of Kirkuk, and both physical and chemical properties were estimated.

Table No. (1): Soil physical and chemical characteristics before planting*

Soil elements	Measruing unit	Reading
Nitrogen (N)	%	10.087
phosphorous (P)	$Mg.1^{-1}$	41.8
potassium (K)	$Mg.1^{-1}$	35.56
organic matter (OM)	%	0.907
EC	$Mmho.com^{-1}$	0.36
PH	–	7.83
TDS	–	150
The tissue		sandy
Clay		2
Silt	%	2
Sand		96

* The soil was analyzed in the soil laboratory of the Directorate of Agriculture of Kirkuk.

Rose plants (Al-Sultani variety) 2 years old were transferred by one of the approved private nurseries in Kirkuk Governorate (Mohammed Nursery) to the experimental site. It is propagated vegetatively by cuttings, homogeneous in size, and the plants are pruned. It was united by leaving (4) branches for each plant, with a height of (40) cm. After the site was fully prepared, the plants were rotated on 9/15/2021 from plastic pots with a diameter of 15 cm to larger plastic pots with a diameter of 24 cm. The capacity of one pot is sandy soil (6 .800) kg. The land of the wooden canopy in which the study is intended to be conducted has been prepared, by removing the growing bushes in it, leveling it, and adjusting it to be at one level. The irrigation process was carried out by adding (200 mL. pot^{-1}) of water daily on hot days. As for the fall and winter period, irrigation was limited to every two or three days, according to the plant's need. As for the other service operations, they included fertilization by adding the compound fertilizer NPK (20, 20, 20) 2 g. pot^{-1} to all plants. And I follow a weekly preventive program by adding a fungicide (1g TAISAM + 1g of Finis, at a concentration of $2gm.L^{-1}$, and the insecticide (Singyo), To eliminate fungal and insect causes, the growth of bushes was monitored and weeded whenever needed. The factorial experiment was carried out according to the randomized complete block design (R.C.B.D) as a factorial experiment in split plots. With three Replications, (48) experimental units, and four observations for each experimental unit, the total number of plants became (144) plants. The study included two factors, including spraying the plants with three levels of the growth regulator CPPU (0, 30, 60) $mg.L^{-1}$ and type of mulching soil pots (bark and wood of eucalyptus trees). The coefficients were randomly distributed among them, and each repetition includes all the agreements between the levels of the studied factors. The data were analyzed statistically by the statistical program [1] and Duncan's Multiple Range Test was used to compare the averages at a probability level of 0.05 [18] .

Table No. (2): The monthly average of the maximum and minimum temperatures during the study period *

The month	Average indoor temperature (°C)		% Relative humidity
	The great (ºC)	Minor(ºC)	
September	36.46	20.9	30
October	30.22	16.96	37
November	22.83	10.53	48
December	15.22	5.74	68
January	11.03	3.22	71
February	16.71	6.35	56
March	16.12	9.25	50
April	27.26	15.26	38

* Agricultural Meteorological Network - Ministry of Agriculture - Republic of Iraq

1- Factors studied:

First: spraying with the cytokinin growth regulator (CPPU):

The plants were sprayed with the growth regulator cytokinin at three levels (0, 30, 60) mg. L^{-1}, with two sprays, the first one day after the seedling rotation process, and the second one a week after the first spray, and in the early morning after dissolving it in distilled water and completing the volume to a liter, and the plants were sprayed. Hand spray until completely wet.

Second: Spraying with CCC:

The plants were sprayed with Cycocel growth retardant at two levels (0 ,2000) mg. L^{-1}. By two sprays, the first three days after spraying with the CPPU growth regulator, and the second two weeks after the first spray, and in the early morning after

dissolving it in distilled water and completing the volume to a liter, and the plants were sprayed. Hand spray until completely wet.

2- The traits studied:

The data for the studied traits were taken in the stage of full blooming of the flower, with a rate ranging from (50) % of the flowers, and for two stages, the first in the autumn flowering period and the second in the spring flowering period, and it included.

First: Characteristics of vegetative growth:

1-Number of developing branches (branch. plant^{-1}): The number of secondary branches developing on the main branches is calculated and the average is extracted.

2-Number of leaves (leaf. plant^{-1}): The number of leaves for plants is calculated for each experimental unit, and the average is extracted.

3- Leaf area (cm^2): The leaf area was estimated on the basis of the cloning method approved by [19] ،, where samples of plant leaves were taken for each treatment and photographed with the cloning device, Noting that the cloned papers were known for their area and weight, then the papers were weighed after the clones and the area was calculated using the ratio and proportion method Then the obtained value was multiplied by the number of leaves for each plant to extract the total leaf area of the plant.

Second: floral characteristics:

1- Number of flowers (flower. plant^{-1}): The number of flowers formed on each plant was calculated and an average was extracted until the end of the experiment.

2- Flower diameter (cm): The diameter of the cut flowers was measured at the point of its connection with the main stem, by the foot (Vernier) and modified extraction.

3- Vase life (day): The flowering age was calculated by the number of days from the date of appearance of color in the first flower until wilting or darkening began in (20) %, Noting that the cut flower stems were placed, after unifying their lengths to (15-25) cm, in containers of 250 cm2 in volume of distilled water.

Results and Discussion

1- Vegetative traits:

1-1: Number of developing branches (branch. plant^{-1}):

Data refer to the spring season, as indicated in Fig (1A, 2B) that the number of developing branches was not affected significantly when spraying agents with CPPU and CCC growth regulators, each separately, Fig (1C) indicates that the bilateral interaction between the spraying agents with growth regulators CPPU and CCC There were no significant differences between the treatments, He noted (20) that growth impediments prevent leg elongation, delay cell division, and reduce interphalangeal elongation

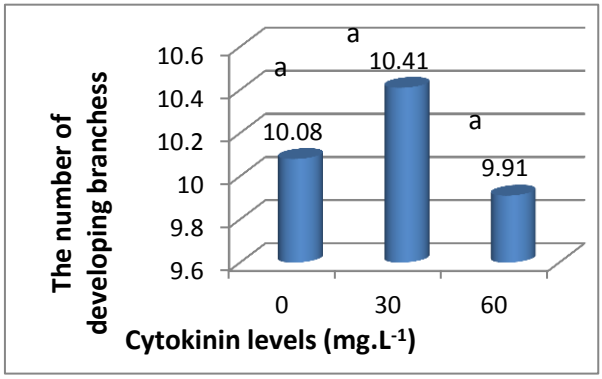

Fig (1A): The effect of cytokinins on the number of developing branches (branch. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

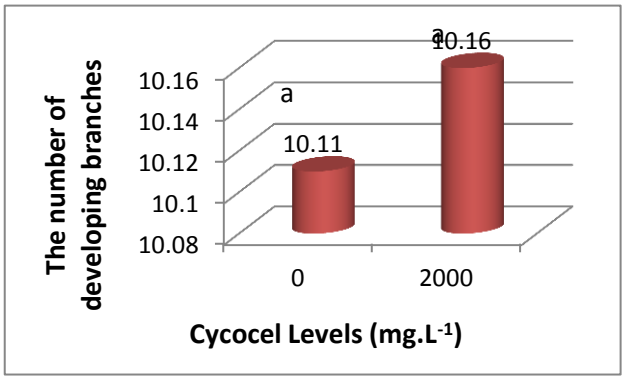

Fig (1B): The effect of Cycocel on the number of developing branches (branch. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

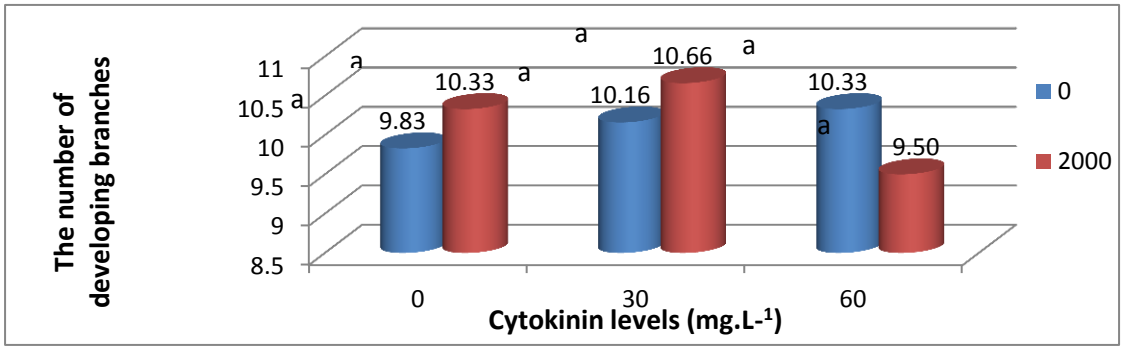

Fig (1C): The effect of the interaction between cytokinins and Cycocel on the number of developing branches (branch. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

Fig (1): The effect of cytokinins and Cycocel and the interaction between them on the number of developing branches (branch. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

1-2: Number of leaves (leaf. plant^{-1}):

The data in the spring season in Fig (2A) indicate that the treatment of spraying with the growth regulator CPPU at a concentration of 30 mg.L^{-1} had a significant effect on The number of leaves increased, reaching 167.66 leaves. plant^{-1}, compared to untreated plants, which averaged 140.41 leaves. plant^{-1}, As for Fig (2B), it indicates that the treatment of spraying with the growth regulator CCC had a significant effect on increasing the number of leaves as it increased with increasing concentration and It gave the highest value when the concentration of 2000 mg.L^{-1} reached 164.44 leaf.plant^{-1} compared to untreated plants, in which it reached 150.00 leaf.plant^{-1}, The reason for the increase in the number of papers is due to the role of CPPU in Increase the apical meristems and cambium tissues and add new cells to the plant, Which led to an increase in the number of leaves [21], or it may be due to the role of cytokinins in cell divisions, As it stimulates the process of drawing nutrients from the roots and from the old leaves to the places of active growth, Which led to an increase in the number of leaves as a result of strong vegetative growth [22], The ability of the CPPU growth regulator to increase leaves as a result of the stimulating and positive effect on increasing the vegetative growth traits, including chlorophyll and chloroplasts,

which leads to an increase in photosynthesis, Thus increasing the production of carbohydrates [23], and this is consistent with [24] on the rose plant *R. damascene*, And a significant increase in the number of leaves on plants when spraying with Cycocel, This is indicated by [25] The increase in the number of leaves by spraying with Cycocel on a plant *Solidago Canadensis* ،The effect of CCC growth retardant in delaying leaf senescence may be due to hindering the breakdown of chlorophyll. This agrees with [26] on the *Rosa damascena* plant, In Fig (2C), the effect of the binary interference between the spraying agents with growth regulators CPPU and CCC, as the treatment of Spraying with the growth regulator CPPU at a concentration of 30 mg. L^{-1} with spraying with the growth regulator CCC, which recorded 169.66 leaves. $plant^{-1}$ Compared with the treatment without spraying with growth regulators CPPU and CCC, it recorded 121.00 leaves. $Plant^{-1}$, Cytokinins have an important role in increasing the size of cells and expanding their width and Hence the increase in its size [27] and thus the increase in the number of leaves, Several sources indicate that treating plants with CCC with different concentrations leads to an increase in the number of lateral branches of the plant by breaking the apical dominance of the plant, And both growth regulators encouraged a significant increase in the number of leaves per plant [28], and that the interaction of the two regulators, cytokinins and cytokines, The action of each of them separately led to the improvement of plant growth characteristics.

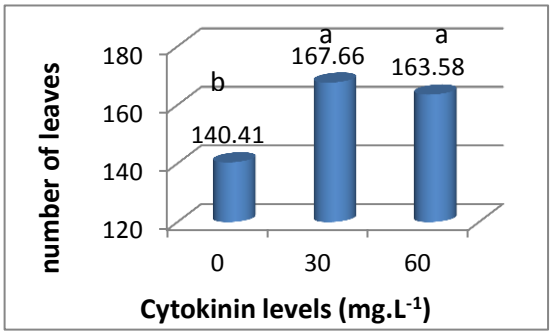

Fig (2A): The effect of cytokinins on the number of leaves (leaf. $plant^{-1}$) of Rose plant (*Rosa hybrida* L.)

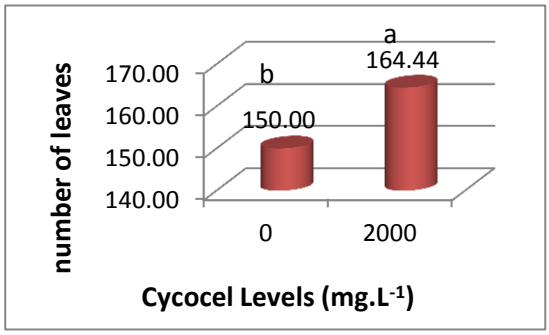

Fig (2B): The effect of Cycocel on the number of leaves (leaf. $plant^{-1}$) of Rose plant (*Rosa hybrida* L.)

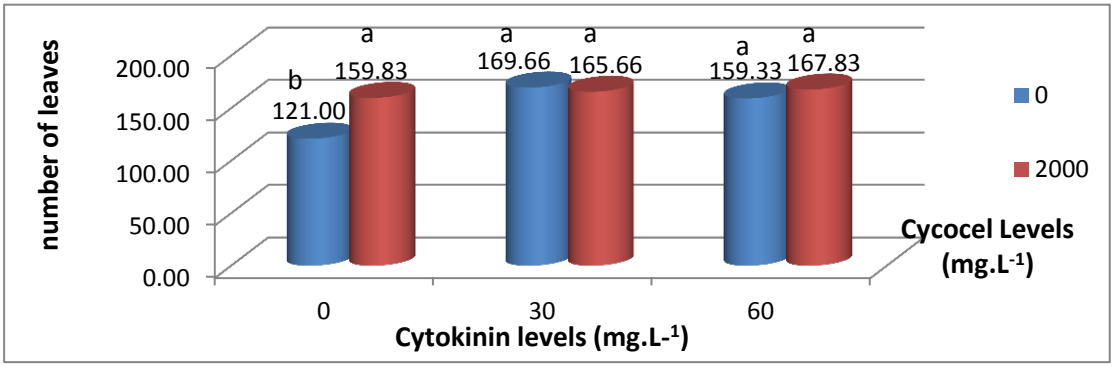

Figure (2-c): The effect of the interaction between cytokinins and Cycocel on the number of leaves (leaf.$plant^{-1}$) For Rose plant (*Rosa hybrida* L.)

Figure (2): The effect of cytokinins and Cycocel and the interaction between them on the number of leaves (leaf.$plant^{-1}$) For Rose plant (*Rosa hybrida* L.)

1-3: Leaf area (cm^2):

The results of the statistical analysis in the spring season in Fig (3A, 3B) indicate that the treatment of spraying with growth regulators CPPU and CCC had no significant effect on the average leaf area each separately, It is noted from Fig (3C) that the bilateral interaction between the spraying agents with growth regulators CPPU and CCC, there were no significant differences between the treatments for the characteristic of leaf area, And the plants were not characterized by an increase in leaf area, And The reason may be due to the small size of the leaves of the plants treated with Cycocel [29,25], And This result can be explained by the addition of growth retardants causing hormonal changes within the plant, Or it may be a result of the small size of the cells as a result of the addition of growth retardants [30], And growth constraints affect the length of leaves and their content of protein and chlorophyll [31,32].

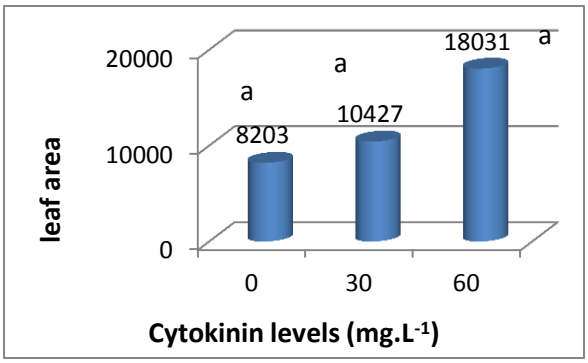

Fig (3A): The effect of cytokinins on the leaf area (cm^2) of Rose plant (*Rosa hybrida* L.)

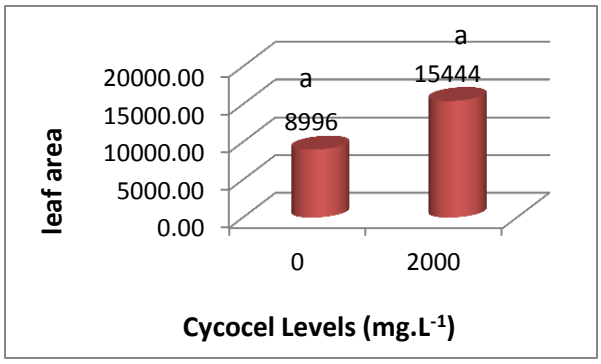

Fig (3B): The effect of cycocel on leaf area (cm^2) of Rose plant (*Rosa hybrida* L.)

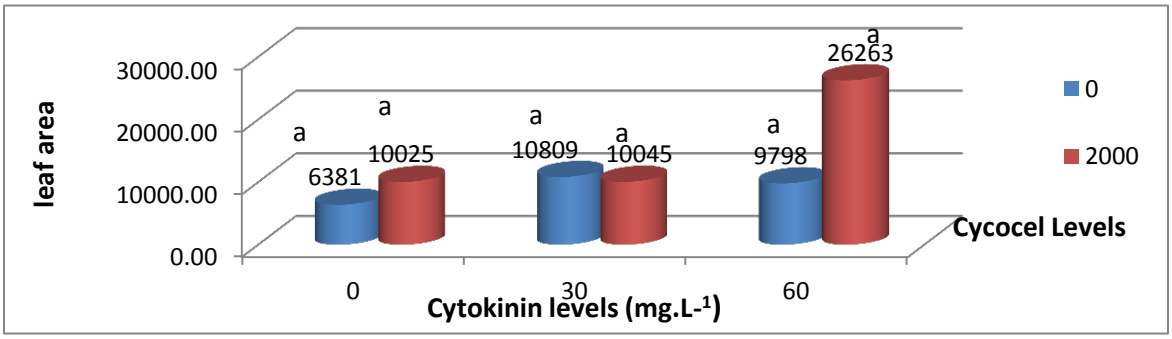

Fig (3C): The effect of the interaction between cytokinins and Cycocel on the leaf area (cm^2) of Rose plant (*Rosa hybrida* L.)

Fig (3): The effect of cytokinins and Cycocel and the interaction between them on the leaf area (cm^2) of Rose plant (*Rosa hybrida* L.)

2- Floral traits:

2-1: Number of flowers (flower.plant^{-1}):

The results of the statistical analysis in the spring season in Fig (4A) indicate that the CPPU spraying treatment did not have any significant effect on the number of flowers, as for Fig (4B), the treatment of spraying with the growth regulator CCC at a concentration of 2000 mg. L^{-1} showed significant superiority for the number of flowers, reaching 11.72. flowers.plant^{-1},

compared to the control treatment, which amounted to 9.83 flowers.plant^{-1}, The growth obstacles affect the growth and development of the plant through its influence on the physiological factors in the plant, and It developed mainly to control stem growth by shortening plant height, and Low branch lengths, dwarfing of the plant, and decreased vegetative growth May stimulate the emergence of flower buds and plant resistance to inappropriate environmental conditions such as freezing, Fig (4C) indicates that the effect of the interaction between the spraying agents with growth regulators CPPU and CCC It registered a transaction The treatment was sprayed with growth regulator CPPU at a concentration of 60 mg.L^{-1}, The highest rate of flowers was 12.33 flowers. Plant^{-1}, Record the lowest values for a transaction Spraying with the growth regulator CPPU at a concentration of 30 mg. L^{-1} and without spraying with the growth regulator CCC, as it reached 9.33 flowers. plant^{-1}, The reason for this may be due to the fact that cytokinins act to cause the plant to flower After the formation of the vegetative system, It is considered one of the internal factors of importance for flowering plants and its role in controlling the proportion of sugars and their quantity and pushing them to primitive or primary floral facilities, specifically the meristematic regions [33], This may be attributed to the ability of the CPPU to break the apical sovereignty It encourages the formation of lateral buds and an increase in their number, as well as an increase in the number of leaves Which reflects positively on the number of flowers [34 ,35], and this agrees with the results indicated by [36] on the shrub rose plant Mercedes variety and [37] on the shrub rose plant *Rosa hybrida* L. [24] on the shrub rose plant *R. damascene*, The reason may be due to the fact that the Cycocel treatment caused the cessation of vegetative growth, Increasing the content of leaves of nitrogen, phosphorus and potassium, as well as increasing the number of leaves, These factors combined caused an increase in the number of flowers in the plant.

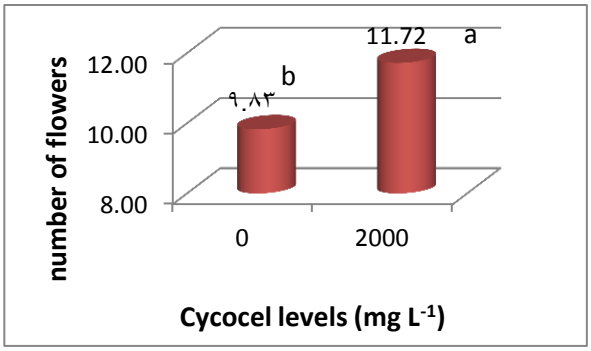

Fig (4A): The effect of cytokinins on the number of flowers (flower. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

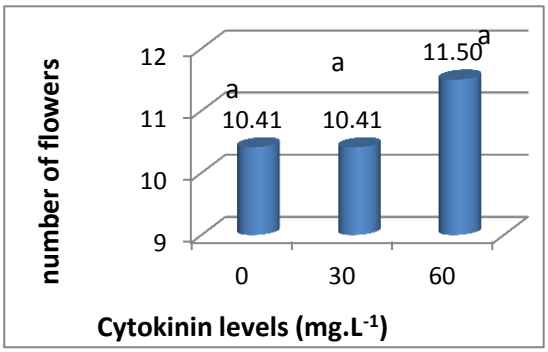

Fig (4B): The effect of Cycocel on the number of flowers (flower. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

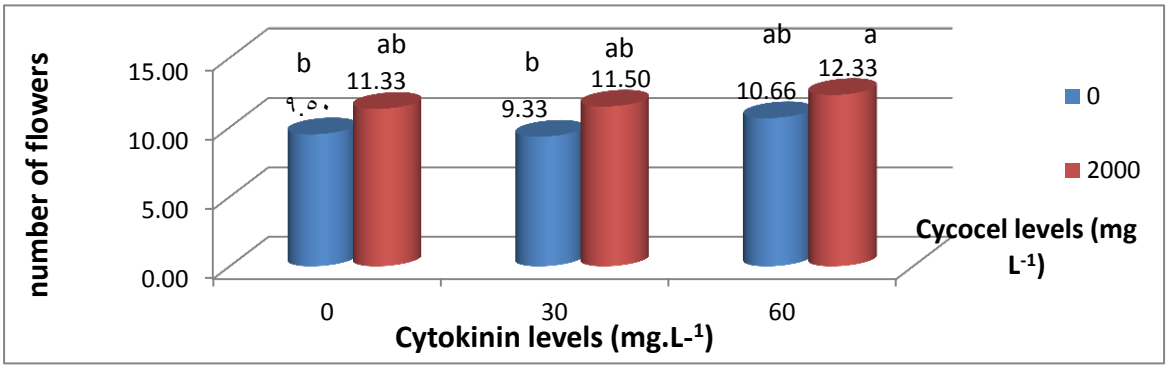

Fig (4C): The effect of the interaction between cytokinins and Cycocel on the number of flowers (flower. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

Fig (4): The effect of cytokinins and Cycocel and the interaction between them on the number of flowers (flower. plant^{-1}) of Rose plant (*Rosa hybrida* L.)

2-2: flower diameter (cm):

Spring season data in Fig (5A) It indicates that the spraying treatment with the growth regulator CPPU at a concentration of 30 mg.L^{-1} led to a significant superiority in flower diameter, reaching 13.91 cm, compared to the control treatment, which was 12.38 cm. Fig (5B) indicates that the CCC spray treatment did not have any significant effect on flower diameter, and this may explain the catalytic (encouraging) role of cytokinins that led to an increase in flower diameter [27], Because cytokinins work on cell expansion, hypertrophy, and cell elongation [38], It increases the flexibility and expansion of the cell wall by encouraging cell division and its ability to form DNA and stimulate growth [39], and the reason for this may be due to the role of cytokinin in cell division, increase in number and lateral expansion, This leads to an increased rate of nutrient transfer and aggregation in flowers [35], As for Fig (5C), it indicates that the bilateral overlap between two agents spraying growth regulators CPPU and CCC led to a significant increase in flower diameter When treated with growth regulator CPPU at a concentration of 30 mg.L^{-1} and spraying with growth regulator CCC at a concentration of 2000 mg.L^{-1}, it reached 14.31 cm compared to without spraying with growth regulators CPPU and CCC, the lowest values were 11.81 cm, It was found that CPPU has a major role in stimulating the process of cell division and specialization in association with AuxinsIn addition to its importance in many other physiological processes such as the activity of the apical meristem tissue and the growth of flower buds, And the increase in the number of flowers and their diameter [40], and this may explain what was previously mentioned about the increase in the concentration of chlorophyll in the leaves, In addition to increasing the processes of photosynthesis in the leaves, Which in turn leads to an increase in the percentage of carbohydrates and the content of mineral elements in the leaves, and thus stimulates the gene responsible for building anthocyanins, This is indicated by [41], The growth obstacles affect the growth and development of the plant through its influence on the physiological factors in the plant, and its development is essential to control the growth of the stem, leads to stunting of the plant, and stimulate the emergence of flowering buds.

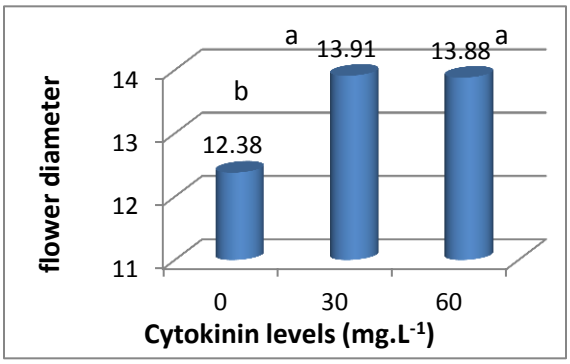

Fig (5A): Effect of cytokinins on flower diameter (cm) of Rose plant (*Rosa hybrida* L.)

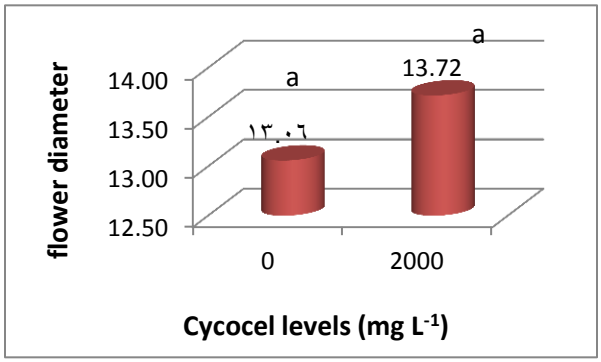

Fig (5B): The effect of Cycocel on the flower diameter (cm) of Rose plant (*Rosa hybrida* L.)

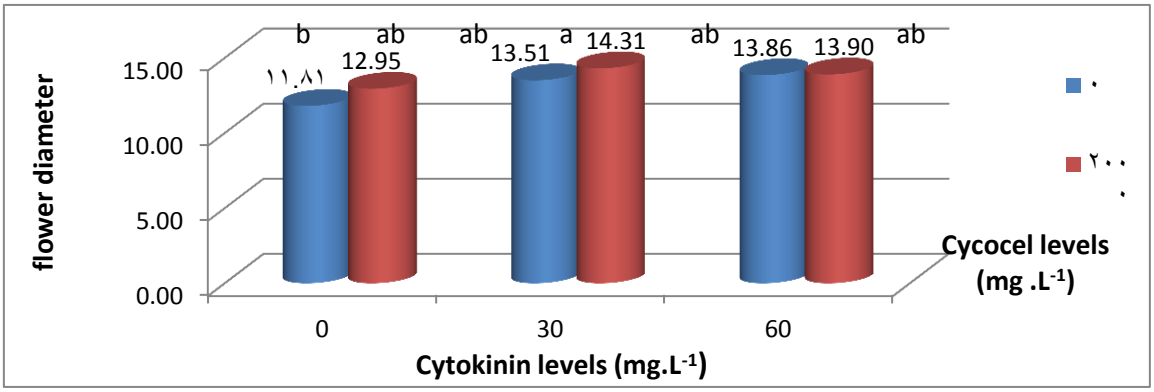

Fig (5C): The effect of the interaction between cytokinins and Cycocel on flower diameter (cm) of Rose plant (*Rosa hybrida* L.)

Fig (5): The effect of cytokinins and Cycocel and the interaction between them on flower diameter (cm) of Rose plant (*Rosa hybrida* L.)

2-3: Vase life (day):

The results of the spring season are shown in Fig (6A), The treatment of spraying with growth regulator CPPU had a significant effect on extending vase life as it lasted 19.08 days when spraying at a concentration of 60 mg.L^{-1} compared to untreated plants, which took 17.25 days, Fig (6B) indicates that spraying with growth regulator CCC did not significantly affect the vase life, As a result of the abundance of carbohydrates resulting from the process of photosynthesis and the abundance of its food stock, which enabled it to survive for as long as possible [42], Or it may be due to the ability of long-acting cytokinins, Phenylurea, to inhibit and reduce the sensitivity of florets to ethylene, Thus, extending its vase life, which is shown by [43], He explained that cytokinins hinder aging [44], and prevent the formation of protein enzymes that degrade soluble protein in chloroplasts and mitochondrial membranes [45], It has a major role in building proteins, as it works to increase the building of proteins, and this is reflected in increasing the content of Polyribosome cells [46], composition of DNA, chlorophyll, enzymes, vitamins, plant hormones, In addition to the formation of cell membranes, NADP, ATP, and amides [47 ,48] and [49], Fig (6C) indicates that the interaction between the spraying agents with growth regulators

CPPU and CCC, We find that spraying with the growth regulator CPPU at a concentration significantly increased vase life It took 19.33 days, compared to the comparison treatment of spraying with growth regulators CPPU and CCC, which reduced vase life, as it took 15.83 days, The reason for this may be due to the fact that Cycocel caused an increase in the content of chlorophyll, carbohydrates and mineral elements in the leaves of NPK, And he worked to reduce the height of the plant, which means optimal utilization of processed carbohydrates In addition to increasing plant absorption of nutrients [50], This is consistent with the results of [51] on the Narcissus *Narcissus* L plant Salome of 60 mg.L^{-1} without spraying with the growth regulator CCC

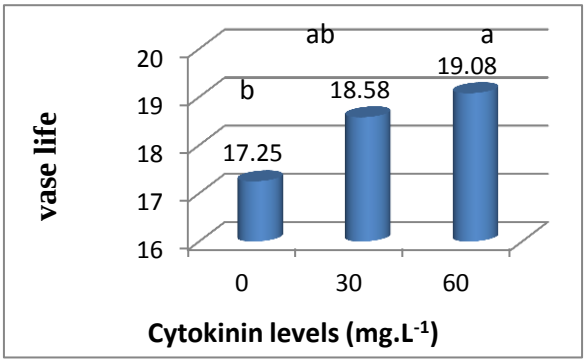

Fig (6A): The effect of cytokinin on the vase life (day) of Rose plant (*Rosa hybrida* L.)

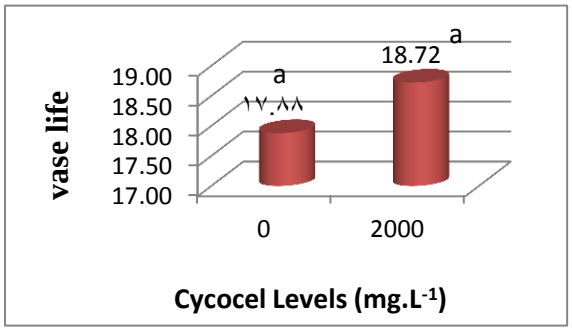

Fig (6B): The effect of Cycocel on the vase life *Rosa hy*(day) of Rose plant (*brida* L.)

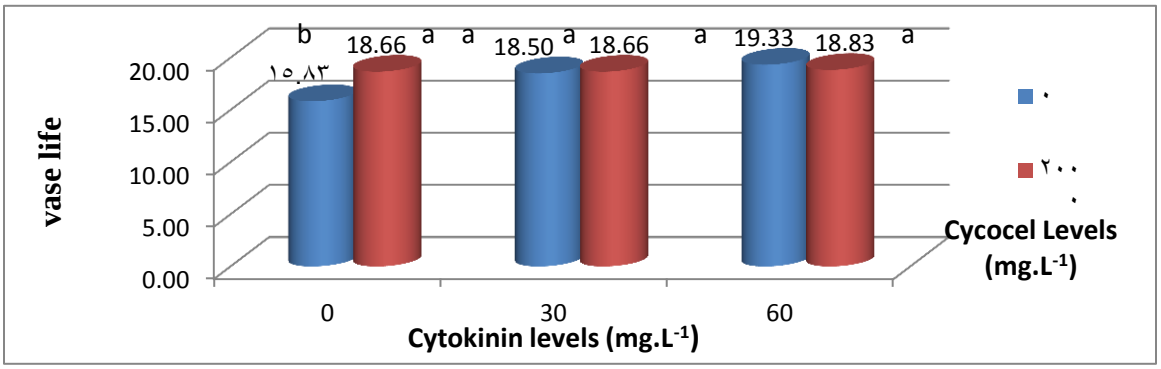

Fig (6C): The effect of the interaction between cytokinins and Cycocel on the vase life (day) of Rose plant (*Rosa hybrida* L.)

Fig (6): The effect of cytokinins and Cycocel and the interaction between them on the vase life (day) of Rose plant (*Rosa hybrida* L.)

Conclusions

1- Spraying with growth regulator CPPU at a concentration of 30 mg/L^{-1} had a significant effect on the number of leaves and flower diameter.
2- The spraying treatment with the growth regulator CCC at a concentration of (2000) mg L^{-1} resulted in obtaining the best results in the number of leaves and the number of flowers.
3- The interaction between the studied factors had a significant positive effect on the shrub rose plant.

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تأثير الرش الورقي بمنظم النمو السايتوكاينين CPPU والسايكوسيل CCC في صفات النمو والازهار لنبات الورد الشجيري *Rosa hybrid* L.

ساكار نوزاد ستار[1] كفاية غازي سعيد السعد[2] أسامة إبراهيم احمد[3]
akghm005@uokirkuk.edu.iq dr..kefaigahzi@uokirkuk.edu..iq osama_alzaidbagy@uokirkuk.edu.iq

[1، 2] قسم البستنة وهندسة الحدائق ،كلية الزرعة ،جامعة كركوك ،كركوك ،العراق .
[3] قسم الغابات ، كلية الزراعة ، جامعة كركوك ،كركوك ، العراق .

- تاريخ استلام البحث 19/04/ 2023 وتاريخ قبوله 04/06/ 2023
- البحث مستل من رسالة ماجستير للباحث الاول .

المستخلص

أجريت الدراسة في الظلة الخشبية، التابعة لمحطة البحوث والتجارب الزراعية / كلية الزراعة / جامعة كركوك – العراق / منطقة الصيادة، للفترة من 15 أيلول /2021 ولغاية نهاية نيسان /2022، وتضمن البحث دراسة تأثير الرش بمنظم النمو CPPU بالتراكيز (0، 30، 60) ملغم.لتر$^{-1}$ بواقع رشتين الاولى بعد يوم من عملية تدوير الشتلات والثانية بعد أسبوع من الرشة الأولى، والرش بمنظم النمو CCC بالتراكيز(0، 2000) ملغم.لتر$^{-1}$ بواقع رشتين الأولى بعد ثلاث أيام من الرش بمنظم النمو CPPU والثانية بعد أسبوعين من الرشة الأولى، في نمو والازهار نبات الورد الشجيري *Rosa hybrid* L.، ونفذت التجربة العاملية وفق تصميم القطاعات العشوائية الكاملة (R.C.B.D) Randomized Completely Block Design بتجربة منشقة، وحللت النتائج باستخدام البرنامج الاحصائي (1)The Statistical Analysis واعتمد إختبار دنكن متعدد الحدود Duncan's Multiple Range Test لمقارنة المتوسطات عند مستوى الإحتمالية 5%. اثر الرش بمنظم النمو CPPU بالتركيز 30 ملغم.لتر$^{-1}$ معنوياً في زيادة عدد الأوراق167.66 ورقة.نبات$^{-1}$ وقطر الزهرة 13.91 سم، اما التركيز 60 ملغم.لتر$^{-1}$ فقد زاد معنوياً من العمر المزهري 19.08 يوماً. وأدى الرش بمنظم النمو CCC بالتركيز 2000 ملغم.لتر$^{-1}$ الى زيادة معنوية وزاد من عدد الأوراق 164.44 ورقة.نبات$^{-1}$ وعدد الأزهار 11.72 زهرة.نبات$^{-1}$. واثر التداخل بين عاملي الرش بـــ CPPU و CCC معنوياً، فقد زاد من قطر الـزهـرة 14.31 سم، اما التركيز 60 ملغم.لتر$^{-1}$ وتركيز 2000 ملغم.لتر$^{-1}$ للـــ CCC فقد زاد من وعدد الأزهار 12.33 زهرة.نبات$^{-1}$.

الكلمات المفتاحية: نبات الورد الشجيري، CPPU، CCC.