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Research Article

The effect of prune breeding and spraying active yeast suspension on the growth and production of flowers in two rose *Rosa* spp. cultivars

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Abstract: An experiment was conducted during the 2019-2020 growing season to study the effect of breeding pruning and spraying with active yeast suspension on the growth and production of cut flowers for two cultivars of roses. Legend cultivar was significantly excelled to the Damascene cultivar in leaf area, total chlorophyll content of leaves and number of days to flowering (575.46cm².plant^{-1}, 76.70mg.100 gm^{-1} fresh weight, and 49.7 days, respectively). In contrast, the Damascus cultivar excelled in the height of the plant and flower diameter (116.10 and 9.05cm, respectively). Pruning on two flowering branches led to a significant increase in the average plant height trait, leaf content of nutrients (N, P, and K). The flower stalk length and flower diameter were recorded 115.80cm, 3.38%, 0.459%, 3.47%, 57.90cm and 9.31cm, respectively. The spraying with active yeast suspension had the best significant values for the rates of all studied traits, represented by plant height, leaf area, and leaf content of chlorophyll and the content of the leaves of nutrients (N, P, K) and the number of days to flowering and the diameter of the flower.

Keywords: Cut flowers, Plant cultivar, Breeding pruning, Active yeast suspension

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Introduction

The genus *Rosa* belongs to the Rosaceae family with more than 120 species. It has more than 30,000 cultivars, widely distributed in the temperate regions of the northern hemisphere and the mountains region of the tropics (Horibe & Yamada, 2017). It is one of the important ornamental plants in gardens due to its various uses as a home garden plant, public gardens, potted plants and boxes used in beautifying buildings (Bhattacharjee 2006). Studies have proven that pruning is one of the important economic and scientific techniques to control plant growth, encourage the largest number of branches with strong growth, and ensure the abundance and quality of production (Rao & Sushma 2016). Zekavati & Zedeh (2013) indicated that the severe pruning of the rose varieties gave the best results in the flower diameter (3.85cm) than light pruning, which recorded the lowest diameter of the flower (3.31cm), as well as its excelled in the number of flowers and plant height. In the rose cultivar, *R. indica*, pruning at the height of 90cm from the soil surface on November 15 had the best traits in the flowering date, number of flowers, and flower weight (Notani et al. 2014).

Yeast extract contains many plant nutrients and growth regulators such as auxins, gibberellins and cytokinins (Tisdale et al., 1999; El-Desouky et al. 2007). Al-Taie (2013) mentioned that treating the geranium plant, *Pelargonium grandiflorum* L., with a suspension of bread yeast led to a significant increase in the flowering time and the number and diameter of florets at a concentration of 6mg.L^{-1}. Al-Sahhaf et al. (2017) reported a similar result by spraying the *Mathoila incaana* L. with dry yeast extract at 0, 3 and 6mg.L^{-1}. Because of the aesthetic and coordination importance of the rose plant and for improving the vegetative and flowering traits of the plant, this research was conducted to investigate the effect of prune breeding and spraying with active yeast extract on the growth and flowering indicators of two cultivars of roses.

Materials and methods

The experiment was conducted in the Department of Soil Sciences and Water Resources, College of Agriculture, Sumer University, from 11/1/2019 to 28/12/2020 to study the effect of prune breeding and to spray with active yeast suspension on the growth and production of cut flowers in two rose cultivars, *R. damacena* and rose legend belonging to the hybrid tea group. The lathhouse soil was ploughed twice perpendicularly to a depth of 30cm, and the soil was smoothed and leveled. Then it was divided into three terraces with a width of 100cm and the distance between one terrace was 100cm. The rose seedlings were planted at the age of one year on 10/11/2019 with two lines on the terrace. The distance between the lines was 60cm and between plants was 20cm, with an average of 6 plants for the experimental unit, leaving a distance of 100cm between the experimental units. The random soil sample was taken at a depth of 30cm, and their chemical and physical were analyzed in the laboratory (Table 1).

A uniform pruning process was conducted for all plants immediately after planting to remove weak and dead branches and encourage plants to form new branches to conduct prune breeding on 3/2/2020 to select the necessary branches for pruning procedures. The secondary flower buds were also removed periodically from the flowering branches, leaving one flower bud for each branch to reach the good size of the flowers. All service operations of bush removal, fertilization and irrigation were conducted equally for all plants in the experimental units. The fertilization process was conducted using the compound fertilizer N.P.K as balanced (20:20:20) with microelements sprayed on the plant at a concentration of 1.5g.L^{-1} every month throughout the study period, except July and August due to high temperatures and fear of burning plants.

The experiment includes three factors: first, the plant cultivars, which is the damacena cultivar of *R. damascene* L. (V1) and the Italian cultivar Legend (its red flowers) (V2). The second is pruning, at two levels, prune breeding on two flowering stalks (T1), and breeding on four flowering stalks (T2). The plants were pruned to the specified number of branches growing from the surface of the soil to form the structure of the plant that will bear the yield in the future. The branches were chosen for the treatments distributed around the middle of the plant to leave the heart open for ventilation and lighting. The third factor was the active yeast suspension in three concentrations of 0, 3 and 6g.L^{-1} (A1, A2 and A3, respectively). The active yeast suspension was prepared by taking 3 and 6g of dry yeast (from Chinese company Al-DANA General Trading Co. LLC) and dissolving it in one liter of warm water at a temperature of 35°C with the addition of sugar in a ratio of 1:1 (weight) and left for 24 hours for activating and doubling yeast (Morsi et al. 2008). Then, it was used as a spray on the foliage after the end of the activation period. The active yeast suspension was sprayed two weeks after pruning, using a 2-litre hand sprayer until complete wetness.

The experiment was conducted according to the Randomized Complete Block Design (RCBD) with a factorial experiment (2×2×3) and the split-plot system. The above three factors' interactions, with three replications, and the averages of all study indicators were compared according to the LSD significant difference test at the probability level of 0.05 (Al-Rawi & Khalaf Allah 2000).

Results and discussion

plant height (cm): Table 2 shows significant differences for all studied factors and their interactions in the plant height, where the cultivar V1 had the highest height (116.10cm) compared to the lowest height of V2 (103.30cm). The T1 had the highest plant height (115.80cm) compared to T2 (103.60cm). As for the effect of spraying the active yeast suspension, A3 (6g.L^{-1}) showed the highest average of 125.20 cm, while it decreased in A1 (0g.L^{-}

Table 1. Some physical and chemical properties of the soil of the experimental field.

Traits	Units	Values
pH	-	7.5
Electrical conductivity (ECe)	$DS.m^{-1}$	2.1
Soil organic matter SOM	g. kg^{-1} soil	8
availability nitrogen		122
availability phosphorous	mg. kg^{-1} soil	18
availability potassium		250
sand		160
silt	g. kg^{-1} soil	530
Clay		310
soil texture	Silty clay loamy	

Table 2. Effect of breeding pruning and spraying with active yeast suspension on plant height (cm) for two rose cultivars.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1}			Interaction V×T
		0 (A1)	3 (A2)	6 (A3)	
Damascene (V1)	T_1	100.6	127.1	141.1	122.9
	T_2	97.9	106.9	123.1	109.3
Legend (V2)	T_1	88.9	111.4	125.9	108.8
	T_2	87.8	95.1	110.6	97.9
L.S.D 0.05			27.97		16.15
		Interaction V×A			Cultivars average (V)
Damascene (V1)		99.3	117.00	132.1	116.1
Legend(V2)		88.40	103.3	118.3	103.3
L.S.D 0.05			19.78		11.42
		Interaction T×A			pruning breeding average (T)
A1		94.8	119.3	133.5	115.8
A2		92.9	101.00	116.9	103.6
L.S.D 0.05			19.78		11.42
Active yeast suspension g. L^{-1}(A)		93.8	110.1	125.2	
L.S.D 0.05			13.99		

^{1}) to 93.80cm. In the triple interaction between the experiment factors, V1T1A3 recorded the best results for the plant height trait (141.10cm), while V2T2A1 had the lowest height (87.80cm).

Leaf area (cm^2.$plant^{-1}$): The results in Table 3 shows the significant effect of the experimental factors and their interactions on the trait of the leaf area of the plant, where the cultivar V2 gave the largest average leaf area of 575.46cm^2.$Plant^{-1}$, compared to cultivar V1, recorded the lowest average leaf area of 507.09 cm^2.$Plant^{-1}$.The results also showed that T1 had the largest average leaf area trait of 597.41cm^2.$Plant^{-1}$in comparison to the lowest values of 485.14 m^2.$Plant^{-1}$ in T2. The results indicated a significant increase for this trait, which was accompanied by an increase in the levels of active yeast suspension, as the treatment A3 (6g.L^{-1}) recorded the highest average for this trait (666.58cm^2.$Plant^{-1}$) compared to treatment A1 (0g.L^{-1}) (400.17cm^2.$plant^{-1}$). The triple interaction of the study factors showed that the largest average leaf area was in the plants treated V2T1A3, which amounted to 812.04cm^2.$Plant^{-1}$, compared to the lowest average for this trait, was 380.48cm^2.$Plant^{-1}$when treatment V1T2A1.

Total chlorophyll content of leaves (mg.100g^{-1} fresh weight): The two cultivars under study differed significantly in the total chlorophyll content of the

Table 3. Effect of breeding pruning and spraying with active yeast suspension on leaf area (cm2.plant-1) for two rose cultivars

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene(V1)	T_1	399.92	606.97	658.53	555.14
	T_2	380.48	436.06	560.63	459.05
Legend (V2)	T_1	421.77	685.23	812.04	639.68
	T_2	398.55	500.03	635.15	511.24
L.S.D 0.05			121.6		70.2
Interaction V×A					Cultivars average (V)
Damascene (V1)		390.20	521.51	609.58	507.09
Legend(V2)		410.16	592.63	723.59	575.46
L.S.D 0.05			86.0		49.6
Interaction T×A					pruning breeding average(T)
T1		410.84	646.10	735.28	597.41
T2		389.51	468.04	597.89	485.14
L.S.D 0.05			86.0		49.6
Active yeast suspension g. L^{-1}(A)		400.17	557.07	666.58	
L.S.D 0.05			60.8		

Table 4. Effect of breeding pruning and spraying with active yeast suspension on the chlorophyll content of leaves (mg.100gm-1 fresh weight) for two rose cultivars.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	49.3	74.7	90.4	71.4
	T_2	26.9	50.00	78.4	51.8
Legend (V2)	T_1	59.2	95.8	111.7	88.9
	T_2	45.5	59.9	88.9	64.4
L.S.D 0.05			26.07		15.05
Interaction V×A					Cultivars average (V)
Damascene (V1)		38.1	62.3	84.4	61.6
Legend(V2)		51.9	77.8	100.3	76.7
L.S.D 0.05			18.43		10.64
Interaction T×A					pruning breeding average (T)
T1		54.3	85.2	101.00	80.2
T2		35.7	54.9	83.7	58.10
L.S.D 0.05			18.43		10.64
Active yeast suspension g. L^{-1}(A)		45.00	70.1	92.3	
L.S.D 0.05			13.04		

leaves (Table 4), where the cultivar V2 recorded the highest value of the total chlorophyll content in the leaves (76.7mg. 61.6 mg.100gm^{-1} fresh weight). The same is the case with pruning breeding, as the T1 significantly increased the chlorophyll content of the leaves, reaching a maximum of 80.2mg.100gm^{-1}. The active yeast suspension spray affected the total chlorophyll content in the rose plant leaves. The results indicate A3 (6g.L^{-1}) excelled in the rest of the treatments giving it the highest average (92.3mg.100g^{-1} fresh weight), while A1 (0g. L^{-1}) recorded the lowest rate (45.0mg.100g^{-1} fresh weight). As for the triple interaction between the experiment factors, the V2 achieved the highest

Table 5. Effect of breeding pruning and spraying with active yeast suspension on the percentage of nitrogen (%) for two cultivars of roses.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1}			Interaction V×T
		0 (A1)	3 (A2)	6 (A3)	
Damascene (V1)	T_1	2.01	2.98	4.06	3.01
	T_2	1.92	2.16	2.76	2.28
Legend (V2)	T_1	2.59	3.61	5.06	3.75
	T_2	2.49	2.96	3.45	2.96
L.S.D 0.05			0.94		0.54
	Interaction V×A				Cultivars average (V)
Damascene (V1)		1.96	2.57	3.41	2.64
Legend (V2)		2.54	3.28	4.25	3.36
L.S.D 0.05			18.43		0.67
	Interaction T×A				pruning breeding average (T)
T1		2.3	3.29	4.56	3.38
T2		2.2	2.56	3.1	2.62
L.S.D 0.05			0.67		0.38
Active yeast suspension g. L^{-1}(A)		2.25	2.92	3.83	
L.S.D 0.05			0.47		

average for this trait, amounting to 111.7mg.100gm^{-1} in V1T2A1.

Nitrogen percentage (%): The cultivar V2 gave the highest percentage of nitrogen in the leaves (3.36%) compared to the cultivar V1, which gave the lowest percentage of nitrogen, amounting to 2.64%. The same applies to the treatment of prune breeding. The treatment of T1 excelled and recorded the highest percentage of this trait (3.38%), which decreased to the lowest of 2.62% for T2, and spraying plants with a suspension of active yeast had a significant effect. In the percentage of nitrogen in the leaves, there was a direct relationship between the percentage of nitrogen and the treatment concentration used. The A3 (6 g.L^{-1}) excelled in the rest of the spraying treatments with active yeast, and recorded the highest percentage of nitrogen, amounting to 3.83%, compared to A1 (0 g. L^{-1}), which gave the lowest rate (2.25%). As for the triple interaction, we find significant differences between the treatments, as the V2T1A3 recorded the highest nitrogen percentage of 5.06% compared to the lowest nitrogen percentage 1.92% for the V1T2A1 (Table 5).

Percentage of phosphorous (%): Both cultivars did not show significant differences in the percentage of phosphorus in the leaves. The results showed that T1 had the highest percentage of phosphorous (0.459%) compared to T2 (0.307%). The results indicated that spraying with active yeast suspension significantly affected the percentage of phosphorous, and A3 had the highest percentage of 0.488% without a significant difference from treatment A2 (0.423%), and both excelled in the control A1 (0.238%). The triple interaction between the experimental factors led to significant differences in the percentage of phosphorous, where the interaction V2T1A3 had the highest percentage of 0.570% compared to the lowest percentage of 0.200% in V1T2A1 and V2T2A1 (Table 6).

Percentage of potassium (%): There were no significant differences between the two cultivars' potassium percentage in the leaves. As for the presentation coefficient of rearing, T1 had the highest percentage of potassium (3.47%), while it decreased significantly to 2.81% for T2. Spraying plants with active yeast suspension led to a significant increase in the percentage of potassium. The triple interaction between the study factors showed a significant effect

Table 6. Effect of breeding pruning and spraying with active yeast suspension on the percentage of phosphorous (%) for two cultivars of roses.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	0.273	0.530	0.540	0.448
	T_2	0.200	0.300	0.410	0.303
Legend (V2)	T_1	0.280	0.560	0.570	0.470
	T_2	0.200	0.300	0.430	0.310
L.S.D 0.05			0.204		0.118
		Interaction V×A			Cultivars average (V)
Damascene (V1)		0.237	0.415	0.475	0.476
Legend (V2)		0.240	0.430	0.500	0.390
L.S.D 0.05			0.144		0.083
		Interaction T×A			pruning breeding average (T)
T1		0.277	0.545	0.555	0.459
T2		0.200	0.300	0.420	0.307
L.S.D 0.05			0.144		0.083
Active yeast suspension g. L^{-1}(A)		0.238	0.423	0.488	
L.S.D 0.05			0.102		

Table 7. Effect of breeding pruning and spraying with active yeast suspension on the percentage of potassium (%) for two cultivars of roses.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	1.98	3.65	4.66	3.43
	T_2	1.86	2.61	3.83	2.76
Legend (V2)	T_1	1.99	3.85	4.74	3.52
	T_2	1.86	2.61	4.10	2.85
L.S.D 0.05			0.94		0.54
		Interaction V×A			Cultivars average (V)
Damascene (V1)		1.92	3.13	4.24	3.09
Legend (V2)		1.92	3.23	4.42	3.19
L.S.D 0.05			0.66		0.38
		Interaction T×A			pruning breeding average(T)
T1		1.98	3.75	4.70	3.47
T2		1.86	2.61	3.96	2.81
L.S.D 0.05			0.66		0.38
Active yeast suspension g. L^{-1}(A)		1.92	3.18	4.33	
L.S.D 0.05			0.47		

on the percentage of potassium, and the highest percentage was 4.74%, which was recorded in the triple interaction treatment V2T1A3, which did not differ significantly from most of the treatments compared to the interaction treatments V1T2A1 and V2T2A1 which recorded 1.86 and 1.86%, respectively (Table 7).

The number of days to flower (day): The cultivar V2 had a higher number of days to flower (49.7 days) vs. 70.2 days in cultivar V1; however, no significant differences were found between them. Spraying plants with a suspension of active yeast at a

Table 8. Effect of breeding pruning and spraying with active yeast suspension on the number of flowering days (day) for two cultivars of roses.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	92.0	75.3	56.5	74.9
	T_2	80.4	63.8	52.5	65.5
Legend (V2)	T_1	65.9	42.0	35.0	47.7
	T_2	68.4	43.6	43.6	51.8
L.S.D 0.05			15.21		8.78
	Interaction V×A				Cultivars average (V)
Damascene (V1)		86.6	69.6	54.5	70.2
Legend(V2)		67.1	42.8	39.3	49.7
L.S.D 0.05			10.75		6.21
	Interaction T×A				pruning breeding average (T)
T1		79.4	58.7	45.7	61.3
T2		74.4	53.7	48.0	58.7
L.S.D 0.05			10.75		6.21
Active yeast suspension g. L^{-1}(A)		76.9	56.2	46.9	
L.S.D 0.05			7.6		

Table 9. Effect of breeding pruning and spraying with active yeast suspension on flower stalk length (cm) for two rose cultivars.

Cultivars(V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	45.90	60.90	64.80	57.20
	T_2	38.20	46.00	50.30	44.80
Legend (V2)	T_1	46.60	62.70	66.30	58.50
	T_2	38.90	46.10	51.40	45.50
L.S.D 0.05			10.19		5.88
	Interaction V×A				Cultivars average (V)
Damascene (V1)		42.00	53.40	57.60	51.00
Legend (V2)		42.80	54.40	58.80	52.00
L.S.D 0.05			7.21		4.16
	Interaction T×A				pruning breeding average (T)
T1		46.30	61.80	65.60	57.90
T2		38.60	46.00	50.80	45.10
L.S.D 0.05			7.21		4.16
Active yeast suspension g. L^{-1}(A)		42.40	53.90	58.20	
L.S.D 0.05			4.16		

concentration of 6 g.L^{-1} led to a significant delay in the number of days for flowering (46.9 days) compared to spraying with distilled water (76.90 days). The triple interaction between the experimental factors showed significant differences in the number of days of flowering between treatments, as plants treated with V2T1A3 had a significantly earlier number of days to flowering, i.e. 35.0 vs. 92.0 days in V1T1A3 treated plants.

Flower stalk length (cm): Table 9 indicates that the two cultivars did not differ in the length of the flower stalk. T1 obtained the largest significant value for the

Table 10. Effect of breeding pruning and spraying with active yeast suspension on flower diameter (cm) for two rose cultivars.

Cultivars (V)	pruning breeding(T)	Active yeast suspension g. L^{-1} 0 (A1)	3 (A2)	6 (A3)	Interaction V×T
Damascene (V1)	T_1	8.24	10.26	10.61	9.7
	T_2	7.85	8.37	8.99	8.4
Legend (V2)	T_1	7.43	9.48	9.83	8.91
	T_2	7.18	7.56	7.91	7.55
L.S.D 0.05			1.67		0.96
Interaction V×A					Cultivars average (V)
Damascene (V1)		8.05	9.32	9.8	9.05
Legend (V2)		7.31	8.52	8.87	8.23
L.S.D 0.05			1.18		0.68
Interaction T×A					pruning breeding average (T)
T1		7.84	9.87	10.22	9.31
T2		7.52	7.92	8.45	7.98
L.S.D 0.05			1.18		0.68
Active yeast suspension g. L^{-1}(A)		7.68	8.92	9.34	
L.S.D 0.05			0.83		

length of the flower stalk (57.90cm), which decreased significantly to 45.10 cm for T2. The results showed a significant difference in the levels of spraying with active yeast suspension in A3 (6g.L^{-1}) excelled, giving the highest average for this trait, reaching 58.20cm compared to A1 (0g.L^{-1}), which the lowest average for this trait was 42.40cm.

flower diameter (cm): Table 10 shows that all the studied factors and their interactions significantly affected the flower diameter. The flowers of the cultivar V1 were significantly higher than the V2, which reached 9.05 and 8.23 cm, respectively. Pruning the breeding on two flower stalks led to a significant increase in the average flower diameter, where T1 gave the largest flower diameter of 9.31cm compared to the T1 (7.98cm). A3 (6g.L^{-1}) recorded the highest mean for flower diameter of 9.34cm, while A1 (0 g. L^{-1}) gave the lowest rate (7.68cm). The results of the triple interaction of the experimental factors show the significantly excelled in the interaction treatment V1T1A3 by recording the largest flower diameter of 10.61cm, while the smallest diameter of the flower was 7.18cm when the interaction V2T2A1.

The triple interaction treatments between the cultivar, the breeding pruning, and the active yeast suspension spray showed significant differences. The longest flower stalks reached 66.30cm for the flowers of V2T1A3, while this value reached the lowest for the stalk of V1T2A1 (38.20cm). There are significant differences between V1 and V2, and we find that V1 excelled in the trait of plant height and flower diameter (Tables 1, 10). The reason for this may be due to the difference in the genetic structure between the two cultivars, which is reflected in the physiological and life reactions that occur in the plant (Chaudhari et al. 2018).

We find that V2 excelled in leaf area, leaf content of total chlorophyll, leaf content of nitrogen, and the number of days to flower (Tables 3, 4, 5, 8). The reason may be due to the nature of the cultivar and the accumulation of nutrients and carbohydrates inside the plant, thus increasing the process of plant cell division and differentiation and maintaining the chloroplast and the continuation of the photosynthesis process and the processing of the plant with its biological products, which is positively reflected on the indicators of vegetative and flower growth (Abdul Jaleel et al. 2007). Also, the increase in the content of the leaves of V2 from the nitrogen has a positive effect on the growth of the roots and increases the absorption of nitrates, which leads to an increase in the leaves from chlorophyll and the leaf area of the plant.

Chen & Chen (2004) mentioned that there is a positive relationship between the leaf area and the rate of photosynthesis and then the accumulation of the products of this process in flowers, as it is the center of attraction for these materials. These materials led to early flowers (Table 8). The results indicated that T1 excelled in the breeding on four flower stalks (T2) in most of the studied traits, and this may be due to the difference in the distribution of the necessary elements for growth, including light, the small number of branches left on the plant leads to obtaining a more significant amount of nutrients and light, that improve and enhance photosynthesis reactions and increase the production of nutrients and carbohydrates (Notani 2014). This increase in plant height, leaf area, and leaf content of total chlorophyll. Also, raising the average of plant growth positively affects the increase in the number and size of plant leaf cells (Mattson & Schjoerring 1997), which is reflected in the rise in the absorption of nutrients and the efficiency of the effectiveness of leaves in the photosynthesis process (Al-Qazwini 2014). These processes result in the accumulation of produced nutrients and the availability of materials necessary for the growth of the vegetative system and to give the highest average of nutrients (Tables 5-7). Better results of T1 over T2 in the length of the flower stalks and the diameter of the flowers (Tables 9, 10), can be because the plants raised on two flowering branches have obtained a greater amount of nutrients and their exploitation in the representation of carbohydrates, which led to its flowers having good flowering traits, the length of the flower stem and the diameter of the flowers (Al-Dulaimi 2005).

The response to spraying with active yeast suspension Tables (2-10) can be attributed to the yeast containing amino acids, proteins, and mineral elements, which enter the organic bases and lead to the formation of DNA and RNA and the synthesis of growth hormones, including cytokinins, and increase the vegetative growth of the plant including plant height and leaf area (Tables 2-3). The effect on the total chlorophyll content of the leaves after spraying with yeast is because yeast contains sugars and many nutrients such as copper and magnesium, which are directly absorbed by the leaves. In addition, yeast is a natural source of cytokinins, which works to impede the decomposition of chlorophyll and then delay the aging of leaves (Stino et al. 2009) due to its positive effect on the content of leaves sprayed with yeast from N, P and K which actively contribute to the production of chlorophyll. The increase in the proportion of macronutrients N, P and K in the leaves of plants sprayed with active yeast suspension (Tables 5-7) may be because yeast increase the leaf area and the content of the leaves from chlorophyll, which increase photosynthesis and its products from carbohydrates (Al-Sahhaf et al. 2017), which is reflected in the strength of vegetative growth, and then the transfer and assembly of elements in plant organs. As for the significant effect of yeast in increasing the floral characteristics, the reason may be due to the role of the active yeast suspension in containing nutrients such as iron, manganese, and zinc and the role of these elements in the photosynthesis process and increasing the production of nutrients inside the plant, and containing regulators such as auxins and gibberellins, which have a role in the growth process and improve the trait of flower growth (Al-Ta'i 2013).

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