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Enhancing Vegetative Growth, Flowering Quality and Chemical Constituents of ARABIAN Jasmine (*Jasminum sambac* Ait.) Var. Double Petals Sprayed with NPK, Active Dry Yeast and Ascorbic Acid

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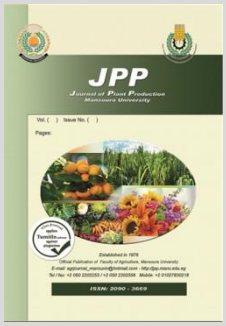

ABSTRACT

In order to studying the influence of foliar spray with different NPK levels (0.0, 1.0, 1.5 and 2.0 g/ l) as main factor and tap water, dry yeast(Y)at 0.5g/ l, ascorbic acid (AA) at 150 ppm and 0.5g/ l Y+150 ppm AA as sub factor as well as their interaction treatments on Arabian jasmine var. Double petals, a pot experimental study was conducted during 2016 and 2017 seasons at Floriculture Unit of Hort. Dept., Fac. Agric., Mansoura Univ., Egypt. These treatments (4×4) were arranged in a split-plot design with three replications. The obtained results revealed that, NPK fertilization level at 2 g/ l significantly increased Arabian jasmine growth (plant height, branches and leaves number per plant, leaves fresh and dry weights per plant and total leaves area per plant), flowering parameters (flowers number per plant, flowers fresh weight per plant, flower diameter/ plant, flower stalk length and petals number per flower) and chemical constituents (chlorophyll a, b and a + b contents, total nitrogen %, total phosphorus % and potassium%) compared to the lowest levels under study and control (sprayed with tap water). Also, using 0.5 g/ l Y+150 ppm AA recorded the highest values of all measured parameters compared to the other treatments under study. In general, the results of this study suggested that foliar applications of 2 g/ l NPK could help enhance Arabian jasmine(*Jasminum sambac* Ait.) growth, flowering and total chlorophyll content when interacted with dry yeast at 0.5 g/ l + ascorbic acid at 150 ppm.

***Keywords*:** Arabian jasmine, NPK, yeast, ascorbic acid, plant growth, flowering, total chlorophyll.

INTRODUCTION

The word jasmine has been procured from the Persian word Jasminum revealing fragrance. The Arabian jasmine (*Jasminum sambac* Ait.) belongs to the family Oleaceae. It is one of the most significant commercial conventional flower crops. This genus "Jasmine" consists of about ninety species divided over Africa, Asia, Southern Europe and Australia (Thakor *et al*., 2017). There are several varieties of jasmine plant relying on the flower size and the number of petals per flower. Arabian jasmine is an evergreen shrub as well as highly fragrant. It is extremely remarkable in the perfume industry and its flowers are utilized in various religious (Lokhande *et al*., 2015; Patil *et al*., 2018).

Nutrients play about a remarkable function in enhancing the growth ability and flowering quality of the crop apart from improving the qualitative characters (Abd El-Khalek, 2017). The major nutrients (N, P and K) are demonstrated to promote the vegetative growth and support the plant through the blooming period to crowd the process of flower setting up. Nitrogen, phosphorus and potassium have a significant influence on vegetative growth and total chlorophyll (Sharaf El-Din *et al*., 2012). Increasing NPK application levels can be increased flowering parameters (Anamika and Lavania, 1990; Saeed and Amin, 2019). Many other studies (Anuburani and Gayathiri, 2008; Ghatas, 2016; Diwivedi *et al*., 2018) have pointed out that NPK fertilization results in a significant enhance in quantity and quality of growth and flowering of ornamental plant.

The utilizing of activators bio stimulants into plants such as active dry yeast in enhancing the growth of horticultural crops essentially ornamental plants. It is extremely recommended as an environment friendly and secure process to get maximal plant growth and productivity without being forced to utilize chemical nutrients (Khedr and Farid, 2000; Wanas, 2002; Lonhienne *et al*., 2014). It has been reported that yeast extracts could enhance vegetative growth (Atowa, 2012 and Abd El-Khalek, 2017) and chemical compositions which could increase the total chlorophyll, N, P and K contents (Taha *et al*., 2016).

Ascorbic acid (AA) is an abundant molecule in citrus plants. It has else been presented to play numerous roles in plant development and growth such as in division and wall expansion of cell as well as other developmental processes (El-Khayat *et al*., 2015). It also actions as an antioxidant as it detoxifies H_2O_2 which is create by the dismutation of O_2 (Kasim *et al*., 2017). Ascorbic acid at 200 ppm, enhanced growth and stimulated accumulation of carbohydrate (Bedour and Rawia, 2011). In addition, Farahat *et al*. (2017) indicated that the application of 200 ppm ascorbic acid led to increase growth parameters and chemical constituents of *Monstera delicious* plants compared to control (sprayed with tap water).

Therefore, the objective of this study was to evaluate the influence of NPK, active dry yeast and

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ascorbic acid as foliar application on plant growth, flowering parameters and chemical constituents in Arabian jasmine (*Jasminum sambac*) Double petals cultivar.

MATERIALS AND METHODS

Two pot experiments were carried out at Floriculture Unit of Hort. Dept., Fac. Agric., Mansoura Univ., Egypt during the two consecutive winter seasons of 2016 and 2017. This study was conducted to investigate the influence of different NPK levels, dry yeast extract (Y) and ascorbic acid (AA) rates and their interactions on plant growth, flowering parameters and chemical constituents of Arabian plants (*Jasminum sambac*, Ait.) plant.

The Arbian jasmine seedlings (three months old healthy and uniform sized plants having 12-14 leaves and 22-25 cm height) were obtained from privet Nursery in Belbas District, Sharkia Governorate, Egypt. Seedlings were planted in the experimental plots on 1st March during the two consecutive seasons. The experimental plot area was containing 15 pots. Pots in 40 cm diameter were filled with 6 kg with soil mixture of clay and sand (2/1, *v/v*). Seedlings were planted to be one plant/pot. The physical and chemical properties of the used mixture of soils are shown in Table 1 according to Chapman and Pratt (1978).

Table 1. Physical and chemical properties of experimental farm soil (average of two seasons)

Physical analysis												**Soil texture**
Clay (%) **15.87**			**Silt (%)** **3.43**						**Sand (%)** **78.70**			**Sandy**
Chemical analysis												
Time	pH	E.C. (dsm^{-1})	Soluble cations (m. mol/ l)					Soluble anions (m. mol/ l)			Available (ppm)	
			Ca^{++}	Mg^{++}	Na^{+}	Zn^{++}	Mo^{++}	Cl^{-}	HCO_3^{-}	SO_4^{--}	N	P	K
Before planting	7.72	0.67	1.85	0.92	0.37	1.12	1.32	3.07	1.19	0.81	118	53	65

The statistical layout of this experiment was a split-plot design experiment between four NPK levels (0.0, 1.0, 1.5 and 2.0 g/ l) as main plot and four Y and AA rates [control (sprayed with tap water), 0.5 g/ l Y, 150 ppm AA, and 0.5 g/l Y + 150 ppm AA] as sub-plot in randomized complete blocks design (RCBD) with three replicates. The interaction treatments between NPK levels as well as active yeast and ascorbic acid rates were 16 treatments. The NPK source was Grow more compound fertilizer contains 9: 49: 8 percentages, respectively. The source of AA ($C_6H_8O_6$) was Techno Gene Company (TGC), Dokky, Giza, Egypt. اسم مركب سماد NPK

Active dry yeast was obtained commercially as powder from the local market, Egypt. The rate (0.5 g) of yeast were weighed and set with 1000 cm^3 of water in a glass beaker with teaspoon entire of sugar. The beaker of this rate was preserved in a dark warm site for 30 minutes as described by Hanafy *et al*. (2012).

Each experimental unit received 5 letters solution using spreading agent (Super Film at a rate of 1ml /l). The foliar application of NPK, Y and AA were sprayed seven times during the season by once every 30 days starting from the 1st April until 1st October.

Data Recorded

In both seasons, at the end of this study (First of November during the two consecutive seasons), the following data were recorded:

Plant growth: Plant height (cm), number of branches/ plants, leaves number per plant as well as fresh and dry weights of leaves/ plant (g) was recorded. Three jasmine plants were randomly chosen from each experimental unit in 2016 and 2017 seasons.

Also, the jasmine leaves were cleaned from the dust and 10 disks 1 cm diameter was taken from the leaves with a paper puncher, plant leaf area was calculated n the opinion of Keller (1972) using the following formula:

Leaf area (cm^2) = fresh weight of 10 leaves/ fresh weight of 10 disks × Disk area ($2\pi r^2$)

Then, total leaves area/ plant (m^2) was calculated by multiplying leaf area (cm^2) × number of leaves per plant/ 10000.

Flowering parameters: duration of flowering (days), number of flowers/plants, fresh weight of flowers/ plant (g), flower diameter (cm), flower stalk length (mm) and petals number/ flower were tabulated.

Chemical constituents: In jasmine fresh leaf samples taken during both seasons, photosynthetic pigments (chlorophyll a and b as well as chlorophyll a +b determined at mg/ 100g as fresh weight) were measured according to the methods of Saric *et al*. (1967). Also, total nitrogen, total phosphorus and potassium percentages in dry jasmine leaves during both seasons, N, P and K percentages were determined according to the methods of AOAC (1990).

Statistical Analysis

The statistical layout of this experiment was split-plot design in completely randomized block design. Data were analyzed as maintained by Gomez and Gomez (1984). The obtained means were compared utilizing computer program of Statistic version 9 (Analytical software, 2008).

RESULTS AND DISCUSSION

Plant growth:

Data presented in Table 2 reveal that, the highest values in plant height (cm), number of branches and leaves per plant, leaves fresh and dry weights per plant (g) and total leaves area per plant (m^2) were observed with the highest level of NPK (2g/l) compared to the other ones under study in the 2016 and 2017 seasons. In the same time, all NPK fertilization levels significantly increased white jasmine plant growth parameters compared to control. In addition, using dry yeast or ascorbic acid alone or in combination increased

abovementioned parameters compared to control (sprayed plants with tap water). The best treatment in this regard was obtained from yeast at 0.5 g/ l + ascorbic acid at 150 ppm as foliar spray application compared to the other ones under study. In general, the best interaction treatment in increasing jasmine this concern was that 2 g/ l of NPK plus 0.5g/ l of yeast combined 150 ppm of ascorbic acid with compared to the other interaction treatments. The increases in jasmine height as well as number of leaves per plant by this treatment were about 45.24 and 50.55 % as well as 60.01 and 63.45 % compared to control in 1st and 2nd seasons, respectively.

Table 2. Effect of NPK level (A), yeast (0.5 g/ L) and ascorbic acid (150 ppm) as foliar spray (B) as well as their interactions (A× B) on vegetative growth of *Jasminum sambac* plant during 2016 (1st) and 2017 (2nd) seasons

Treatments		Plant height (cm)		Number/ plant: Branch		Number/ plant: Leaf		Weights of leaves/ plant (g): Fresh		Weights of leaves/ plant (g): Dry		Total leaf area (m^2) / plant	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NPK* fertilization level (g/l)													
Control		45.05	43.08	8.14	8.70	37.83	40.03	45.51	46.93	5.84	5.99	0.081	0.092
1.0		45.54	47.06	8.97	9.50	40.58	41.44	48.61	50.03	6.32	6.73	0.091	0.098
1.5		55.12	54.28	9.58	10.78	41.72	44.44	53.62	55.99	7.41	7.63	0.101	0.112
2.0		56.21	56.08	10.92	12.47	48.28	52.28	59.51	62.49	8.31	8.66	0.121	0.141
LSD at 5%		0.94	0.68	0.55	0.53	0.62	0.57	0.79	1.09	0.25	0.19	0.001	0.001
Yeast (Y) and ascorbic acid (AA) application													
Control		45.75	45.10	7.92	8.67	37.11	39.89	45.69	46.47	6.10	6.17	0.078	0.089
Y		50.18	49.95	8.58	9.28	40.19	43.03	48.94	49.50	6.50	6.80	0.090	0.103
AA		52.34	52.00	9.81	10.92	44.58	46.14	54.47	58.71	7.39	7.79	0.109	0.119
Y + AA		53.65	53.44	11.31	12.59	48.53	49.14	58.14	60.77	7.88	8.24	0.116	0.132
LSD at 5%		0.55	0.48	0.41	0.48	0.77	0.81	0.65	0.75	0.19	0.21	0.002	0.003
Interaction													
Zero	Control	41.40	38.97	7.22	8.00	33.33	36.44	41.37	42.37	5.33	5.07	0.066	0.076
	Y	44.87	42.50	7.44	7.78	35.78	39.33	42.73	44.73	5.57	5.87	0.074	0.085
	AA	46.67	44.60	8.44	9.11	40.11	41.55	47.17	48.27	6.07	6.47	0.089	0.099
	Y + AA	47.28	46.27	9.44	9.89	42.11	42.78	50.77	52.33	6.40	6.57	0.096	0.107
1.0	Control	42.10	40.50	7.89	8.22	35.33	37.22	43.83	44.80	5.57	5.87	0.072	0.079
	Y	45.37	47.65	8.44	8.44	39.33	40.22	46.13	46.87	5.83	6.47	0.085	0.092
	AA	46.33	49.60	9.44	10.44	42.78	42.89	51.10	52.80	6.67	7.00	0.099	0.104
	Y + AA	48.37	50.50	10.11	10.89	44.89	45.44	53.37	55.67	7.20	7.57	0.106	0.116
1.5	Control	48.20	49.83	7.89	8.67	37.00	40.89	47.73	46.77	6.40	6.13	0.081	0.093
	Y	56.18	53.67	8.78	9.78	40.56	42.78	51.60	50.07	6.83	7.00	0.095	0.103
	AA	57.27	55.27	9.56	11.00	43.56	45.33	55.43	63.67	8.00	8.63	0.110	0.120
	Y + AA	58.83	58.33	12.11	13.67	45.78	48.78	59.70	63.47	8.40	8.73	0.119	0.133
2.0	Control	51.32	51.10	8.67	9.78	42.78	45.00	49.83	51.93	7.10	7.60	0.095	0.110
	Y	54.30	56.00	9.67	11.11	45.11	49.78	55.30	56.33	7.77	7.87	0.106	0.131
	AA	59.10	58.53	11.78	13.11	51.89	54.78	64.17	70.10	8.83	9.07	0.138	0.152
	Y + AA	60.13	58.67	13.56	15.89	53.33	59.56	68.73	71.60	9.53	10.10	0.144	0.173
LSD at 5%		1.34	0.99	0.90	0.99	1.47	1.51	1.37	1.69	0.41	0.42	0.004	0.005

*** NPK (9:59:8) called Grow more fertilization**

Furthermore, N, P and K elements play a major role in many physiological and biochemical processes leading to taller plants as obtained in jasmine (Marschner, 1997). These results also found by Fayaz *et al*. (2016) on gerbera and Gaber (2019) on geranium plants. Also, spraying neem plants with yeast extract at 15% significantly increased plant growth (Taha *et al*., 2016). In addition, application of ascorbic acid at 200 ppm led to increase *Monstera delicious* height (Farahat *et al*., 2017).

Flowering parameters:

The data illustrated in Table 3 reveal that, using NPK fertilization level treatments significantly delayed flowering formation in Arabian jasmine plants compared to control in both seasons. In contrast, increasing NPK levels significantly increased number of flowers per plant, flowers fresh weight per plant, flower diameter, flower stalk length and petals number per flower in both seasons. The increases in number of flowers per plant as well as flower diameter by 2 g/l NPK treatment were about 33.24 and 33.52 % as well as 13.69 and 19.46 % compared to control in 1st and 2nd seasons, respectively. However, active dry yeast and ascorbic acid each alone or in combination significantly increased jasmine flower parameters compared to control in the both seasons. The increases in number of flowers per plant as well as flower diameter by 0.5 g/ L dry yeast + 150 ppm ascorbic acid treatment were about 17.09 and 18.77 % as well as 15.34 and 16.02% compared to control in 1st and 2nd seasons, respectively. Also, the best interaction treatment was 2 g/ L NPK level and 0.5g/ L Y + 150 ppm AA in comparison with the other interactions between NPK levels and Y and AA rates under study in both seasons. Furthermore, under each of dry yeast or/and ascorbic acid rates flowering parameters of Arabian jasmine were gradually increased (except that of

duration of flowering) as NPK increased from 1.0 to 2.0 g/ L in both seasons.

The results regrinding NPK fertilization are in harmonization with those found by Abd El-All (2011) on cast-iron plant, Elboraie and Kasem (2019) on golden pothos, Kwon *et al*. (2019) on bellflower and Abou El-Ghait (2020) on *Jasminum sambac*, Single petals cultivar. In addition, Abdel Aziz *et al*. (2009) on gladiolus and Sardoei *et al*. (2014) on *Gazania rigens* plants also heave reported similar results concerning ascorbic acid positive effect on flowering parameters. Moreover, Atowa (2012) stated that using yeast extract at 2.5g/ L for improving most of freesia flower parameters (flowering percentage, flowering date, spike stem length and spike stem diameter).

Chemical constituents:

Data of both seasons in Table 4 indicate that, chlorophyll a, b and a+ b contents as well as total nitrogen, total phosphorus and potassium percentages in jasmine leaves was significantly increased with any NPK fertilization levels compared with control in both seasons, in most cases. The increases in total chlorophyll (a+ b) content as well as total nitrogen percentage by 2 g/ L NPK treatment were about 10.65 and 6.32% as well as 12.72 and 3.38 % compared to control in 1st and 2nd seasons, respectively. *Jasminum sambac* chemical constituents were significantly increased by using active dry yeast and ascorbic acid each alone or in combination compared to control in both seasons. Also, total chlorophyll (a+ b) content, N, P and K % were increased up to 9.48 and 7.55 %, 10.69 and 11.06%, 14.36 and 18.86% and 9.79 and 9.28% when jasmine plants were sprayed with 0.5 g/ L yeast + 150 ppm ascorbic acid in the first and second seasons, respectively. In the same time, chemical constituents of jasmine leaves were increased as a result of the treatments of 0.5g/ L Y + 150 ppm AA combined with most of NPK levels compared to the other interaction treatments in the two seasons. The increases in jasmine total chlorophyll (a+ b) as well as potassium percentage by this treatment were about 22.01 and 14.56 % as well as 19.40 and 20.25 % compared to control in 1st and 2nd seasons, respectively.

Table 3. Effect of NPK level (A), yeast (0.5 g/ L) and ascorbic acid (150 ppm) as foliar spray (B) as well as their interactions (A× B) on flowering parameters of *Jasminum sambac* plant during 2016 (1st) and 2017 (2nd) seasons

Treatments		Duration of flowering (days)		Flower/ plant Number		Flower/ plant Fresh weight (g)		Flower Diameter (cm)		Flower Stalk length (mm)		Flower Petals number	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NPK* fertilization level (g/l)													
Control		65.89	66.14	56.56	57.67	20.03	21.43	24.04	23.53	11.82	11.99	16.83	15.98
1.0		67.81	69.30	59.00	61.64	21.57	22.60	24.78	24.93	12.48	12.94	17.22	16.59
1.5		75.03	70.97	69.22	71.05	23.12	24.10	26.12	26.97	14.00	13.93	17.75	17.89
2.0		78.06	81.50	75.36	77.00	25.76	26.78	27.33	28.11	15.73	15.07	18.22	18.31
LSD at 5%		0.95	1.29	1.24	1.29	0.55	0.51	0.21	0.23	0.23	0.30	0.46	0.39
Yeast (Y) and ascorbic acid (AA) application													
Control		69.81	69.22	59.69	60.69	20.97	21.59	23.93	24.03	12.49	12.38	16.56	16.53
Y		72.28	72.58	63.22	65.28	21.88	22.72	24.58	25.13	13.01	13.05	17.00	17.01
AA		69.25	70.25	67.33	69.30	23.18	24.18	26.16	26.51	13.99	13.83	18.11	17.5
Y + AA		75.45	75.86	69.89	72.08	24.44	26.41	27.60	27.88	14.53	14.67	18.36	17.73
LSD at 5%		1.14	1.23	0.68	0.76	0.44	0.44	0.21	0.32	0.29	0.22	0.31	0.28
Interaction													
Zero	Control	66.11	65.78	52.11	53.56	18.87	19.40	23.10	22.17	11.20	11.43	16.22	15.78
	Y	67.22	68.56	56.11	56.11	19.37	20.23	23.40	23.50	11.50	12.07	16.33	15.89
	AA	63.78	64.89	57.55	59.11	20.03	21.80	24.17	23.77	12.13	12.17	17.22	16.12
	Y + AA	66.45	65.33	60.44	61.89	21.83	24.27	25.50	24.70	12.43	12.30	17.56	16.12
1.0	Control	66.55	67.56	54.11	56.89	19.70	20.73	23.73	23.50	11.70	12.33	16.33	16.12
	Y	67.33	69.11	57.44	60.78	20.67	21.63	23.83	24.23	12.23	12.43	16.67	16.34
	AA	66.11	66.33	61.11	63.00	22.27	23.20	24.93	25.23	12.60	12.93	17.89	16.45
	Y + AA	71.22	74.21	63.33	65.89	23.63	24.83	26.63	26.77	13.37	14.07	18.00	17.45
1.5	Control	72.45	69.44	63.67	62.10	21.60	21.93	24.23	24.97	12.83	12.67	16.45	16.78
	Y	76.11	70.56	66.22	70.44	22.77	23.47	24.67	25.50	13.37	13.47	17.22	17.56
	AA	74.00	68.78	72.11	74.21	23.87	24.60	27.27	28.13	14.83	14.17	18.45	18.56
	Y + AA	77.55	75.11	74.89	77.44	24.23	26.40	28.30	29.27	14.97	15.40	18.89	18.67
2.0	Control	74.11	74.11	68.89	70.22	23.70	24.30	24.63	25.47	14.23	13.07	17.22	17.45
	Y	78.45	82.11	73.11	73.78	24.73	25.53	26.43	27.27	14.93	14.23	17.78	18.23
	AA	73.11	81.00	78.56	80.89	26.53	27.13	28.27	28.90	16.40	16.07	18.89	18.89
	Y + AA	86.56	88.78	80.89	83.11	28.07	30.13	29.97	30.80	17.37	16.90	19.00	18.67
LSD at 5%		2.18	2.48	1.71	1.84	0.93	0.92	0.42	0.59	0.55	0.49	0.70	0.61

*** NPK (9:59:8) called Grow more fertilization**

Table 4. Effect of NPK level (A), yeast (0.5 g/ L) and ascorbic acid (150 ppm) as foliar spray (B) as well as their interactions (A× B) on chemical constituents in leaves of *Jasminum sambac* plant during 2016 and 2017 seasons

Treatments		Chlorophyll content (mg/ 100 g F.W.)						Percentage of					
		A		B		A+ B		N		P		K	
		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
NPK* fertilization level (g/l)													
Control		1.672	1.717	0.789	0.878	2.461	2.595	1.737	1.777	0.193	0.200	1.261	1.279
1.0		1.718	1.739	0.792	0.890	2.510	2.629	1.765	1.786	0.203	0.199	1.308	1.296
1.5		1.809	1.813	0.828	0.901	2.637	2.714	1.853	1.810	0.213	0.229	1.377	1.344
2.0		1.846	1.848	0.877	0.911	2.723	2.759	1.958	1.926	0.231	0.231	1.403	1.410
LSD 5%		0.020	0.015	0.012	0.016	0.025	0.024	0.024	0.027	0.006	0.011	0.006	0.012
Yeast (Y) and ascorbic acid (AA) application													
Control		1.687	1.723	0.781	0.845	2.468	2.568	1.731	1.718	0.195	0.196	1.267	1.272
Y		1.717	1.760	0.804	0.874	2.521	2.634	1.785	1.799	0.206	0.208	1.319	1.318
AA		1.798	1.808	0.841	0.922	2.639	2.730	1.882	1.873	0.216	0.222	1.373	1.349
Y + AA		1.843	1.824	0.859	0.938	2.702	2.762	1.916	1.908	0.223	0.233	1.391	1.390
LSD 5%		0.018	0.008	0.009	0.011	0.021	0.015	0.019	0.020	0.005	0.007	0.008	0.009
Interaction													
zero	Control	1.630	1.667	0.733	0.847	2.363	2.514	1.647	1.723	0.183	0.177	1.237	1.220
	Y	1.627	1.713	0.790	0.857	2.417	2.570	1.723	1.740	0.193	0.200	1.253	1.277
	AA	1.710	1.737	0.820	0.893	2.530	2.630	1.770	1.803	0.193	0.210	1.270	1.297
	Y + AA	1.720	1.750	0.813	0.913	2.533	2.663	1.807	1.840	0.200	0.213	1.283	1.323
20	Control	1.637	1.703	0.757	0.827	2.394	2.530	1.707	1.707	0.193	0.183	1.260	1.243
	Y	1.677	1.723	0.773	0.870	2.450	2.593	1.727	1.780	0.207	0.197	1.303	1.283
	AA	1.777	1.767	0.820	0.923	2.597	2.690	1.797	1.810	0.207	0.207	1.327	1.303
	Y + AA	1.780	1.763	0.817	0.940	2.597	2.703	1.830	1.847	0.207	0.210	1.343	1.353
40	Control	1.733	1.757	0.793	0.850	2.526	2.607	1.757	1.703	0.197	0.217	1.287	1.273
	Y	1.773	1.790	0.797	0.880	2.570	2.670	1.780	1.787	0.210	0.217	1.350	1.320
	AA	1.820	1.847	0.837	0.927	2.657	2.774	1.937	1.827	0.217	0.237	1.413	1.367
	Y + AA	1.910	1.857	0.883	0.947	2.793	2.804	1.940	1.923	0.227	0.247	1.457	1.417
60	Control	1.747	1.767	0.840	0.857	2.587	2.624	1.813	1.740	0.207	0.207	1.283	1.350
	Y	1.790	1.813	0.857	0.890	2.647	2.703	1.910	1.890	0.213	0.220	1.370	1.393
	AA	1.887	1.883	0.887	0.943	2.774	2.826	2.023	2.053	0.247	0.233	1.480	1.430
	Y + AA	1.960	1.927	0.923	0.953	2.883	2.880	2.087	2.020	0.257	0.263	1.477	1.467
LSD 5%		0.036	0.021	0.019	0.024	0.044	0.036	0.041	0.044	0.011	0.016	0.015	0.020

*** NPK (9:59:8) called Grow more fertilization**

Furthermore, El-Naggar and Ahmad (2016) applying yucca plants with 4 g NPK/ L/ month treatment which gave the highest significant values of leaf N content and total chlorophyll leaf content compared to control. Also, Gaber (2019) demonstrated that applying of mineral NPK monthly combined with ascorbic acid foliar application enhanced leaf chemical composition parameters i.e., total chlorophyll content (SPAD) and mineral content (N, P and K percentages) during the both seasons. The richest leaf total nitrogen, total phosphorus and potassium percentages were obtained by jasmine plants treated with chemical fertilization at 6 g/pot in both seasons (Abou El-Ghait *et al*., 2020).

Likewise, Eid and Abou-Leila (2006) on croton plants and Farahat *et al*. (2007) on *Cupressus sempervirens* also have similar results regarding ascorbic acid influences. In the same time, utilizing yeast extract increased the plant composition of elements such as N, P, K, Ca, Fe and Zn, these elements are paramount components (amino acids, proteins, carbohydrate and chlorophylls) in tissues of plant, consequently better growth leads to increase the dry matter accumulation and reflected in enhancing flower quality. The previous results were in convention with those gained by Hanafy *et al*. (2012) on *Schefflera arboricola*, Taha *et al*. (2016) on *Azadirachta indica* and Hanafy *et al*. (2019) on *Ficus benjgmina* plants.

CONCLUSION

From above mentioned results, it is preferable to spray Arabian jasmine (*Jasminum sambac* Ait.) plants with NPK at 2g/ L combined with active dry yeast at 0.5 g/ L + ascorbic acid at 150 ppm seven times /season to enhance the growth parameters, flower quantity and quality and total chlorophyll content of Arabian jasmine plant.

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تحسين النمو الخضري وجودة الإزهار والمحتوى الكيميائي لنبات الفل المجوز عن طريق الرش بالنيتروجين والفسفور وبالبوتاسيوم والخميرة الجافة النشطة وحمض الأسكوربيك

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أجريت تجربة أصص خلال موسمي 2016 و2017 في وحدة الزينة التابعة لقسم البساتين، كلية الزراعة، جامعة المنصورة، مصر لدراسة تأثير الرش الورقي بمستويات NPK المختلفة (صفر ، 1.0 ، 1.5 و 2.0 جم / لتر) كعامل رئيسي وماء الصنبور، الخميرة الجافة بمعدل 0.5 جم/لتر، حمض الأسكوربيك بمعدل 150 جزء/ المليون و0.5 جم / لتر خميرة + 150 جزء/مليون من حمض الأسكوربيك كعامل تحت رئيسي بالإضافة إلى معاملات التفاعل بينهما على الفل المجوز. تم ترتيب هذه المعاملات في تصميم القطع المنشقة مرة واحدة في ثلاث مكررات. أوضحت النتائج المتحصل عليها أن التسميد بالنيتروجين والفسفور والبوتاسيوم بمستوى 2 جم/لتر أدى إلى زيادة معنوية في نمو الفل المجوز (ارتفاع النبات، وعدد الأفرع وعدد الأوراق لكل نبات، ووزن الأوراق الطازجة والجافة/ نبات وإجمالي مساحة الأوراق لكل نبات) صفات الإزهار (الوزن الطازج للأزهار لكل نبات، قطر الزهرة، طول ساق الزهرة وعدد البتلات لكل زهرة) والمكونات الكيميائية (محتويات من الكلوروفيل أ ، ب، أ + ب، النسبة المئوية للنيتروجين الكلي، النسبة المئوية للفسفور الكلي والنسبة المئوية للبوتاسيوم) مقارنة بالمستويات المنخفضة قيد الدراسة والكنترول (رش بماء الصنبور). أيضًا ، أدي استخدام 0.5 جم / لتر خميرة + 150 جزء في المليون من حمض الأسكوربيك إلى الحصول على أعلى القيم لجميع الصفات المدروسة مقارنة بالمعاملات الأخرى تحت الدراسة. بشكل عام، أشارت نتائج هذه الدراسة إلى أن الرش الورقي بمستوى 2 جم/ لتر NPK يمكن أن تساعد في تحسين نمو وإزهار والمحتوي الكلي من الكلوروفيل لنبات الفل المجوز بالتداخل مع الخميرة الجافة بمعدل 0.5 جم / لتر + حمض الأسكوربيك بمعدل 150 جزء في المليون.