EFFECT OF DIFFERENT FERTILIZATION TREATMENTS ON *Jasminum grandiflorum* L.

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ABSTRACT

This study was carried out at the Experimental Farm, Fac. of Agric., Kafer El-Sheikh, Tanta University during two successive seasons of 2000 and 2001. *Jasminum grandiflorum* L. was subjected to nine fertilization treatments, viz., full dose of NPK, biofertilizer + full dose of NPK, biofertilizer + ¾ dose of NPK, biofertilizer + ½ dose of NPK, biofertilizer + ¼ dose of NPK, K-humate, K-humate + full dose of NPK, k-humate + biofertilizer and K-humate + ½ dose of NPK. Full dose of NPK combined with biofertilizer increased all parameters of vegetative growth, flower yield, concrete percentage and absolute oil as well as N, P and K contents in the plants. It was followed by decreasing order with biofertilizer + ¾ dose of NPK and full dose of NPK treatments. Regarding the oil components, methyl anthranillate, geraniol, benzyl benzoate and 2,5 dimethyl cyclo hexanol showed highest values with K-humate + full dose of NPK, biofertilizer + ¾ dose of NPK, biofertilizer + full dose of NPK and K-humate treatments, respectively. The highest values of indol and jasmone were obtained with biofertilizer + ½ dose of NPK and biofertilizer + ¾ dose of NPK, respectively.

Keywords : ***Jasminum grandiflorum***, Jasmine NPK fertilizer, biofertilizer and essential oil.

INTRODUCTION

Jasmine (*Jasminum grandiflorum* L. Oleaceae family) is one of the economical and source of Egyptian currency plants it is used in the treatment of hysteria, uterine disorders, and childbirth, muscle relaxation and coughs (**Lis-Balchin *et al.* 2002**).

Organic and biofertilizers are promising alternative for mineral fertilizer. Their use reduces the amount of mineral fertilizer and produce less polluted environments. All used N levels increased the vegetative growth, flower yield / plant, weight of 100 flowers,

concrete recovery and absolute oil yield % as well as gave the highest percentage of N P K in the plants of *Jasminum grandiflorum* L. (**Bhattacharjee, 1988; Khalafalla *et al.*, 1994 and Hegazy, 1999**).

On the other hand, **Natarajan and Rao (1980a)** found that frequency of fertilizing had little effect on the vegetative growth or floral characteristics of *Jasminum grandiflorum* L.

As such, used Farm Yard Manure (FYM) plus NPK improved the growth and flowers parameters of some *Jasminum spp.* **Muthuswamy and Pappiah (1977), Natarajan and Rao (1980b) Natarajan *et al.* (1981) and Natarajan and Rao (1983)** reported that an annual dressing of 10 kg FYM/ plant and monthly application of 40 g from each of N, P and K / plant gave the highest flower yield.

Almost little could be traced in the literature about the effects of biofertilization or humic acid treatments on Jasmine, but focused on the other plants. Adding humic acid increased the production of secondary lateral roots, the number of nodules / plant and their fresh and dry weight of *Sesbania sesban* L. plants (**Bano *et al.*, 1988**), also increased N content in the rice leaves (**Thangavelu and Ramabadran, 1993**). Also, **Bohame and Papadopoulos (1997)** found that when humic acid was applied with *Lycopersicon esculentum* L. plants, the shoots, and roots dry matter and root length were greatest.

Meanwhile, humic acid at 20 kg / ha combined with N fertilizer at 35 Kg of N/ha led to increased the seed yield and dry matter of *Sesamum indicum* L. plant (**Singarvel and Govindasamy, 1998**).

Inoculation with bio-fertilizer may be increase the vegetative growth and flowering of some plants. In this respect, **Gomaa and Abo-Aly (2001)** recorded that the vegetative growth and N, P and K content of *Pimpanella anisum* L. plant were increased due to inoculation of the plant with non symbiotic N_2 fixers and half dose of bio-gas manure. **Kandeel *et al.* (2001), Ibrahim (2000) and Nofal *et al.*, (2001)** reported that inoculation of *Foerniculuin vulgare* MILL and *Ammi visnaga* L. with Azotobacter + Azospirillium in the presence of full dose of NPK gave tallest

plants, more number of umbles, high seed yield and heights N, P and K % content in both plants. **Rashed (2002)** noticed that using of organic manure, bio, and chemical fertilizers on the *Anethum graveolens* L., *Coriandrum sativum* L. and *Petroselinum sativum* L. plants increased all parameters of vegetative growth and chemical composition of the active constituents for the studied plants.

Increase of plant growth of both rice (*Oryza sativa* L.) and wheat (*Triticum sativum* L.) due to inoculation with *Azotobacter chroococum* may be attributed to increase soil-available nitrogen and consequently increase formation of metabolites which, encourage the plant vegetative growth (**Guputa *et al.*, 1989 and Ralie *et al.*, 1995**). Also, they reported that *Azotobacter spp.* synthesize stimulatory compounds such as gibberellins, cytokinins and indole acetic acid that act as growth regulators.

The present work aimed to investigate the response of vegetative growth, flower yield, concrete recovery, oil yield % and chemical composition of *Jasminum grandiflorum* L. to mineral, organic and bio-fertilization treatments.

MATERIALS AND METHODS

This study was carried out at the Experimental Farm, Faculty of Agriculture, Kafr El-Sheikh, Tanta University during two successive seasons of 2000 and 2001. The shrubs of *Jasminum grandiflorum* L. of ten years old were planted in rows 2 m apart at distance of 1.5 m between plants.

The physical and chemical properties of the experimental soil were determined, according to **Jackson (1967)**, as showed in Table (1).

The recommended fertilizer with NPK at the rate of 40+40+20 g/plant for five times was used (in the form of ammonium sulphate 20.6% N, super phosphate 16% P_2O_5 and potassium sulphate 48% K_2O) from March till October for the two seasons. K-humate as organic fertilizer (humic acid 85% + 6% K) at the rate of 4 kg/fed. (2.5 g / plant) was used four times during each season from April to August. Biofertilizer contained *Bacillus megatherium* (P.D.B.), *Azospirillum lipoforum* and *Azotobacter chroococum* was used two times at April and May (2 ml/plant of stock suspention which contained $3x10^6$ bacteria / ml).

Table (1): Physical and chemical analysis of experimental soil.

Physical analysis:	
Sand %	19.31
Silt %	30.42
Clay %	50.27
Soil texture	Clay
Chemical analysis:	
E.C (mmhos / cm)	1.74
pH	7.95
Soluble cations (meq / L)	
Na^+	13.94
K^+	1.45
Ca^{++}	5.33
Mg^{++}	1.45
Soluble anions (meq / L)	
CO_3^{--}	-
HCO_3^-	6.96
Cl^-	2.35
SO_4^{--}	12.86
Available N (ppm)	39.40
Available P (ppm)	8.37
Available K (ppm)	209.30
Organic matter %	1.6

The fertilizer (NPK, K-humate or biofertilizer) was added prior to irrigation process. Nine treatments were conducted as follow:

1- Full dose of NPK (control).
2- Bio fertilizer + full dose of NPK
3-Biofertilizer + ¾ dose of NPK
4- Biofertilizer + ½ dose of NPK
5- Biofertilizer + ¼ dose of NPK
6- K-humate
7- K-humate + full dose of NPK
8- K-humate + biofertilizer
9- K-humate + ½ dose of NPK

Complete randomized block design was used for the 9 treatments with three replicates each had 3 plants.

The flowers were picked regularly from all replicates during, July, August and September (maximum flowering period). The flowers yield (kg/plant) and weight of 100 flower (g) of each treatments were determined.

In both seasons, at the end of the experiment, plant height (cm), number of branches / plant were recorded. At the end of December, the plants were pruned at 50 cm height, then used the pruning products for determination of fresh and dry weights (kg/plant).

For chemical analysis (0.1 g) from dried samples of leaves was used. Nitrogen content was determined by micro Khjeldahle method according to **Pregel (1945)**. Phosphours content was colormetrically determined according to **Murphy and Riley (1962)**. Potassium was estimated by using the Flame-photometer according to **Brown and Lilliland (1946)**.

Jasmine concrete was extracted from the picked flowers with petroleum ether (40-60 °C), while the absolute oil was extracted from concrete with ethanol (95%) according to the method described by **Guenther (1961)**. The absolute oil samples were determined by extraction from concrete then stored in dark glass vials in refrigerator (at 4°C) until analysis. The sample of the second season were subjected to GC-MS analysis on Shimadzu GCMS-QP 5000 GMS.

The means were compared according to **Duncan's multiple range test (1955)**.

RESULTS AND DISCUSSION

Data presented in Table (2) showed that the treatment of bio-fertilization + full dose of NPK gave tallest plants with significant differences than any treatment in the experiment for both seasons. This treatment followed by bio-fertilizer +3/4 dose of NPK and full dose of NPK, then of bio-fertilizer + ½ dose of NPK treatments in both seasons with a decreasing order. On the other hand, the shortest plants were resulted from K-humate and K-humate + bio-fertilizer treatments. This results may be due to the increase N, P and K in the root zone as well as plant growth regulators as a result of biofertilization. Our results were in agreement with that obtained by **Khalafalla *et al.*, (1994)** on jasmin.

Also data in Table (2) indicated that the treatment of biofertilizer + full dose of N'PK significantly increased the number of branches/plant in both seasons compared with other treatments.

Table (2): Effect of different fertilization treatments on the vegetative parameters of *Jasminum grandiflorum* L. during seasons of 2000 and 2001.

Fertilization treatments	Season 2000				Season 2001			
	Plant height (cm)	No. branches/ plant	Fresh weight (g/plant)	Dry weight (g/plant)	Plant height (cm)	No. branches/ plant	Fresh weight (g/plant)	Dry weight (g/plant)
Full dose of (NPK)	189.3 b	20.66 b	3.120 b	1.124 c	192.0 b	21.66 b	3.450 b	1.017 c
Bio fertilization + full dose of NPK.	194.2 a	23.33 a	3.400 a	1.466 a	200.4 a	23.66 a	3.600 a	1.321 a
Bio fertilization + ¾ full dose of NPK	188.4 b	20.00 bc	3.068 bc	1.257 b	194.3 b	21.33 b	3.490 b	1.195 b
Bio fertilization + ½ full dose of NPK.	185.4 c	18.00 d	2.910 c	0.959 d	183.7 c	19.66 bc	3.140 c	0.958 e
Bio fertilization + ¼ full dose of NPK	173.5 de	18.00 d	2.660 d	0,820 f	175.2 d	17.67 cd	2.750 d	0.786 g
K-humate.	161.6 f	16.33 e	1.940 f	0.600 i	162.2 f	15.33 e	2.060 f	0.563 i
K-humate + full dose of NPK.	175.5 d	20.33 b	3.130 b	0.867 e	177.6 d	21.00 b	3.600 a	0.998d
K-humate + bio fertilization	162.6 f	17.50 de	2.300 e	0.687 h	162.0 f	17.00 de	2.587 e	0.734 h
K-humate + ½ full dose of NPK.	172.5 e	18.50 cd	2.580 d	0.722 g	171.0 e	18.67 cd	2.650 de	0.856 f

Means followed by a similar letter are not significantly different at the 5 % level according to Duncan's multiple range test.

Full dose of NPK, bio-fertilizer + 3/4 dose of NPK and K-humate + full dose of NPK treatments showed nearly similar effect following the First treatment. Lowest number of branches/plant were resulted from K-humate and K-humate + bio-fertilizer treatments in both seasons. This result may be due to the excess of N and growth regulators from inoculation bacteria had effects on cell devision of apical meristem.

Heaviest fresh and dry weight, were obtained from the treatment of bio-fertilizer + full dose of NPK in both seasons (Table, 2). Both values of K-humate alone showed the lowest results in both seasons. This results may be due to the role of nitrogen on cell enelargement in plant tissues and growth regulators from inoculation bacteria has a stimulating effect on the general physiological process of the plant, leading to appreciable increase in growth of the different vegetative organs leading to increment of the fresh and dry weights.

These results were in agreement with that obtained by **Monib *et al.* (1983)**. They found that, inoculation of caster oil plant of *Ricinus communis* L by *Azospirillum*, *Azotobacter* and phosphate-solubilizing bacteria improved plant growth as indicated by increase of 11-14% in length, 9-45% in dry weight. Also, **Khalafalla *et al.*, (1994), Gomaa and Abo Aly (2001)** and **Rashed (2002)** on other plants.

Data in Table (3) illustrated that the use of bio fertilizer + full dose of NPK treatment in both seasons gave a significant value of flower yield/plant compared with the other treatments. The lowest yield was obtained by using K-humate in both seasons. This result may be due to increase N, P and K and growth regulators (as a result of biofertilizers) increase leaf area, number of secondary shoots as well as vigor of the plant, which in turn reflected on flowers production. This confirmed by **Natarajan *et al.* (1981), Bhattacharjee (1988)** and **Hegazy (1999)** on *jasminum spp.*

From data in Table (3) it was noticed that the highest values of 100 flowers weight were obtained by by using bio-fertilizer + full dose of NPK in both seasons followed by plants treated with K-humate + full dose of NPK then full dose of NPK in both season. Also, it was clear from data that, there were no significant

Table (3): Effect of different fertilization treatments on flower yield, weight of 100 flowers concrete recovery % / plant and absolute oil % concrete of *Jasminum grandiflorum* L. during seasons of 2000 and 2001.

Fertilization treatments	Season 2000				Season 2001			
	Flower yield (kg/plant)	Weight of 100 flowers (g)	Concrete %	Absolute oil/concrete %	Flower yield (kg/plant)	Weight of 100 flowers (g)	Concrete %	Absolute oil/concrete %
Full dose of (NPK)	2.859 b	13.30 c	0.276 de	54.03 b	2.897 c	13.31 b	0.278 e	54.28 d
Bio fertilization + full dose of NPK.	2.943 a	13.98 a	0.291 a	54.90 a	3.053 a	13.88 a	0.299 a	54.96 a
Bio fertilization + ¾ full dose of NPK	2.844 c	12.98 d	0.286 b	54.71 a	2.895 c	13.01 c	0.288 b	54.82 b
Bio fertilization + ½ full dose of NPK.	2.549 e	13.10 d	0.280 c	54.12 b	2.726 d	13.06 c	0.296 a	54.44 c
Bio fertilization + ¼ full dose of NPK	2.243 g	12.36 f	0.274 e	53.76 c	2.339 f	12.78 d	0.282 cd	53.80 e
K-humate.	2.140 i	12.23 f	0.250 g	52.27 e	2.208 h	12.15 e	0.258 f	52.30 g
K-humate + full dose of NPK.	2.814 d	13.80 b	0.277 d	54.14 b	2.904 b	13.40 b	0.285 bc	54.24 d
K-humate + bio fertilization	2.151 h	11.90 g	0.267 f	53.16 d	2.260 g	10.86 f	0.280 de	53.18 f
K-humate + ½ full dose of NPK.	2.350 f	12.78 e	0.265 f	53.69 c	2.507 e	12.92 d	0.280 de	53.68 e

Means followed by a similar letter are not significantly different at the 5 % level according to Duncan's multiple range test.

differences between treatments of bio-fertilizer + ¾ dose of NPK and bio-fertilizer + ½ dose of NPK in the both seasons. The same effect was observed with full dose of NPK and K-humate + full dose of NPK treatments especially in the second season. While, the lowest values were obtained from K-humate in both seasons. This result may be to increment of biological process which help in solubilization of meneral nutrients, synthesis of vitamins, amino acids, auxins and carbohyderate of plant, which in turn accounts of flower weight. This result was in agreement with that obtained by **Muthuswamy and Pappiah (1977)** and **Khalafalla *et al.*, (1994)** on *jasminum grandiflorum* L.

The most effective treatment (Table 3) on the concrete percentage was obtained by the use of biofertilizer + full dose of NPK in both seasons. This treatment usually followed by plants treated with biofertilizer + ¾ dose of NPK then with bio fertilizer + ½ dose NPK, in the first season, as well as biofertilizer + ½ dose of NPK then biofertilizer + ¾ dose of NPK in the second one.

This result confirmed by **Muthuswamy and Pappiah (1977), Khalafalla *et al.* (1994)** and **Hegazy (1999)**.

The highest values for absolute oil was noticed in case of the treatment with biofertilizer + full dose of NPK and biofertilizer + ¾ dose of NPK followed by the treatments with biofertilization + ½ dose of NPK then full dose of NPK for both seasons (Table, 3). This result may be due to increase of a viable nutrients, which enhances oil biosynthesis, through playing direct or indirect role in the volatile oil biosynthesis processes.

The obtained result was in agreement with that obtained by **Muthuswamy and Pappiah (1977), Natarajan** and **Rao (1983) and Hegazy (1999).**

As regard the chemical composition of the absolute oil data in Table (4) showed distinct variably in the percentage of oil components. Some components were present in higher proportion in relation to the others methyl anthranilate, geraniol, benzyl benzoate and 2, 5 dimethyl cyclo hexanol.

The highest values of these components were observed with K-humate + full dose of NPK, biofertilizer + ¾ dose of NPK, biofertilizer + full dose of NPK and K-humate treatments, respectively.

Table (4) Percentage of volatile oil components of *Jasminum grandiflorum* L. as affected by different fertilization treatments.

No.	Retention time	Identification	Treatment								
			1	2	3	4	5	6	7	8	9
1	3.317	Lenalol	2.91	0.81	1.42	2.63	2.63	2.02	0.51	1.76	0.36
2	3.631	Methyl phenol	0.54	0.30	0.06	0.75	0.51	0.56	0.11	0.90	0.12
3	.3.770	Benzyl alcohol	0.70	0.45	0.93	0.70	1.36	0.91	0.57	1.36	0.50
4	4.60	Phenyl methyl ester	2.37	0.67	1.21	3.05	1.68	3.12	1.02	2.66	0.55
5	6.83	Eugenol	2.73	2.64	3.37	2.75	1.11	1.51	0.80	3.24	1.64
6	7.050	Farnesene	0.72	0.96	0.98	0.38	0.24	0.52	0.10	0.68	0.21
7	7.410	Jasmone	2.12	2.12	3.00	2.16	1.80	1.90	1.99	2.89	1.30
8	8.500	Unknown	0.58	1.00	2.41	1.76	0.65	1.24	0.91	1.10	1.41
9	9.800	Indol	1.53	1.93	1.82	2.72	0.94	1.82	1.00	0.97	0.41
10	10.800	Unknown	0.52	0.35	0.40	0.53	0.34	0.35	0.18	0.37	0.31
11	12.300	Unknown	0.40	0.58	0.57	0.75	0.51	0.66	0.27	0.60	0.48
12	13.700	2,5 dimethyl cyclo hexnol	15.41	11.74	11.10	12.66	10.52	15.71	9.20	17.56	14.58
13	14.000	Methyl ester of myristic acid	2.58	2.45	2.82	2.53	2.58	3.35	1.53	2.81	3.64
14	15.300	Benzyl benzoate	16.01	17.74	11.78	10.04	11.65	10.69	7.19	10.66	8.57
15	16.700	Farnesol	4.10	2.53	2.35	18.01	2.83	3.01	1.46	3.67	3.29
16	17.500	Geraniol	16.9	12.71	28.83	20.40	11.96	18.52	10.07	19.47	21.41
17	18.500	Unknown	6.18	6.63	4.52	4.03	4.14	6.21	0.26	1.12	5.36
18	19.000	Nerolidol	4.72	6.14	6.00	3.98	4.87	5.52	3.64	5.38	7.75
19	19.500	Unknown	1.13	0.56	0.32	0.28	0.51	0.43	1.31	1.31	0.48
20	19.800	Unknown	-	0.86	0.45	0.29	1.54	1.77	1.64	-	0.08
21	23.000	Unknown	0.27	0.34	-	0.18	-	0.17	-	0.28	0.17
22	24.600	Unknown	1.20	-	-	-	1.31	-	-	-	-
23	25.300	Unknown	0.55	-	-	-	-	-	-	-	0.12
24	28.000	Methyl anthranillate	11.20	25.47	13.88	8.19	32.07	18.36	51.72	20.57	25.10
25	28.500	Farnesyl acetone	4.28	-	14.41	0.28	3.60	0.95	1.24	0.56	0.50

Treatments 1, 2, 3, 4, 5, 6, 7, 8 and 9 = full dose of NPK, Bio fertilizer + full dose of NPK, Bio fertilizer + ¾ dose of NPK, Bio fertilizer + ½ dose of NPK, Bio fertilizer + ¼ dose of NPK, K-humate, K-humate + full dose of NPK, K-humate + bio fertilizer, and K-humate + ½ dose of NPK, respectively.

Nerolidol and farnesol were showed intermediate values. The indicative treatment of K-humate + ½ dose of NPK for the former and biofertilized + ½ dose NPK for the latter.

Methyl phenol, benzyl alcohol and farnesene recorded the lowest value. There was no distinct differences between all treatments except with K-humate + biofenilizer which showed the highest value in this respect comparing with the other treatments.

Concerning eugenol and jasmone, the highest value were noticed with biofertilizer + ¾ dose of NPK and the lowest values was recorded with K-humate + full dose of NPK for the first and K-humate + ½ dose of NPK for the second.

On the other hand the highest value of methyl ester of myristic acid was presented with K-humate + ½ dose of NPK, while the lowest value was showed with K-humate + full dose of NPK.

In case of indol, the highest value was noticed with biofertilizers + ½ dose of NPK and the lowest value was showed with K-humate + ½ dose of NPK.

Our result confermed with **Kandeel, 1987** who reported that, consequent changes take place in the oil constitution directly or indirectly by affecting the other plant hormonal movement which may reflect the mechanism of the essential oil biosynthesis in relation to the content of carbohydrates and protein.

The effects of different fertilization treatments on chemical composition of jasmine plants are presented in Table (5). In case of N%, the highest value was obtained with biofertilizer + full dose of NPK treatment. K-humate treatment only gave the lowest N%. Non significant differences were noticed among treatment with K-humate + biofertilizer or K-humate + ½ dose NPK. The increment of Ncontent as a result in application of bio and chemical fertilizers might due to excesses of N in root zone which in turn in N uptake.

For P%, the highest value was recorded with biofertilizer + full dose of NPK treatments followed by biofertilizer + ¾ dose of NPK, full dose of NPK then biofertilizer + ½ dose NPK and finally with K-humate + full dose of NPK treatments.

Concerning the K%, the highest value was observed in case of bio-fertilization + full dose of NPK treatment in the two seasons

Table (5): Effect of different fertilization treatments on nitrogen, phosphorus and potassium percentage in *Jasminum grandiflorum* L. flowers during seasons of 2000 and 2001.

Fertilization treatments	Season 2000			Season 2001		
	N %	P %	K %	N %	P %	K %
Full dose of (NPK)	4.10 b	0.230 c	1.670 ab	4.31 a	0.210 c	1.590 a
Bio fertilization + full dose of NPK.	4.46 a	0.295 a	1.745 a	4.50 a	0.276 a	1.666 a
Bio fertilization + ¾ full dose of NPK	4.03 b	0.256 b	1.572 bc	4.36 a	0.245 b	1.600 a
Bio fertilization + ½ full dose of NPK.	3.82 b	0.200 d	1.490 c	3.92 b	0.210 c	1.455 b
Bio fertilization + ¼ full dose of NPK	3.50 c	0.179 e	1.365 d	3.43 c	0.172 f	1.257 c
K-humate.	2.65 e	0.153 g	1.050 f	3.72 d	0.145 g	1.100 d
K-humate + full dose of NPK.	4.11 b	0.196 d	1.600 c	4.45 a	0.204 d	1.600 a
K-humate + bio fertilization	3.12 d	0.160 f	1.220 e	3.20 c	0.170 f	1.188 d
K-humate + ½ full dose of NPK.	3.42 cd	0.182 e	1.340 d	3.52 c	0.186 e	1.300 c

Means followed by a similar letter are not significantly different at the 5 % level according to Duncan's multiple range test.

followed by biofertilizer + ¾ dose of NPK and K-humate + NPK treatments. The lowest value was recorded in case of K-humate treatment only in both seasons.

From the data in Table (5), it was noticed that N, P and K % were increased with increasing dose of NPK. Also, the biofertilizer improves elements uptake. This result was in agreement with that results obtained by **Khalafalla *et al.*, (1994), Ibrahim (2002), Kandeel *et al.* (2001), Nofal *et al.* (2001) and Rashed (2002).**

The previously mentioned findings were in conformity with those mentioned by **Guputa *et al.*, (1989)** on *Oryza sativa* L. and **Ralie *et al.* (1995)** on *Triticum sativum* L. wheat as they pointed out that the increase in plant growth was mainly due to inoculation of *Azotobacter chroococum* which led to increase soil available nitrogen and consequently increase formation of metabolites which encourage the plant vegetative growth. Also, they reported that *Azotobacter spp.* entrants the synthesis of stimulatory compounds such as gibberellins, cytokinins and indole acetic acid that act as growth regulators.

The aforementioned results clearly indicated that there was a merit in the use of combined NPK + bio-fertilization.

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الملخص العربي

تأثير معاملات تسميد مختلفة على الياسمين البلدي

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تم معاملة الياسمين البلدي بتسع معاملات تسميد و هي : الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم (أضيف على ٥ دفعات كل دفعة تحتوي ٤٠ +٤٠+ ٢٠ جم / نبات من سلفات أمونيوم ٢٠,٦%، سوبر فوسفات ١٦% وسلفات بوتاسيوم ٤٨%) و التسميد الحيوي (أضيف على دفعتين كل دفعة تحتوي على ٢مل من المعلق البكتيري) + الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم ، التسميد الحيوي + ¾ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، التسميد الحيوي + ½ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، التسميد الحيوي + ¼ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، هيومات البوتاسيوم، هيومات البوتاسيوم + الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، هيومات البوتاسيوم + التسميد الحيوي و هيومات البوتاسيوم + ½ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم.

أدى استخدام الجرعة كاملة من سماد الآزوت، الفوسفات والبوتاسيوم + التسميد الحيوي إلى زيادة كل قياسات النمو الخضري، المحصول الزهري، النسبة المئوية للعجينة والزيت المطلق و كذا محتوى النبات من الآزوت، الفوسفات و البوتاسيوم تليها بمعدل أقل النباتات المعاملة بالتسميد الحيوي + ¾ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم ثم المعاملة بالجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم.

أعطت هيومات البوتاسيوم + الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، التسميد الحيوي + ¼ الجرعة الكاملة من ن فو بو، التسميد الحيوي + الجرعة الكاملة من سماد الآزوت، الفوسفات والبوتاسيوم و هيمات البوتاسيوم أعلى قيم لكل من انثرا نيلات الميثيل، الجيرانيول، بنزيل بنزوات، ٥،٢ داي ميثيل سيكلو هكسانول من مكونات الزيت المطلق على التوالي.

أما أعلى قيمة للإندول و الجاسمون فقد تم الحصول عليها باستخدام التسميد الحيوي + ½ الجرعة الكاملة من سماد الآزوت، الفوسفات والبوتاسيوم و التسميد الحيوي + ¼ الجرعة الكاملة من سماد الآزوت، الفوسفات و البوتاسيوم، على التوالي.