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EFFECT OF BIO-FERTILIZERS AND ASCOBENE ON GROWTH AND FLOWERING OF *Iris tingitana* CV. WEDGWOOD L. PLANTS.

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ABSTRACT

This study was carried out at the Expermental.Nursery of the Ornamental. Hort., Dept., Fac of Agric.,Cairo Univ., Giza,during two seasons of 2000/2001 and 2001/2002,to investigate the effect of bio-fertilizers and ascobene on growth, flowering and chemical composition of *Iris tingitana* cv.Wedgwood, L.The bulbs were planted on October 14th 2000 in 30 cm.clay pots filled with a mixture of clay/sand (2:1 v/v) (3 bulbs/pot).Bio-fertilizer solutions of *Azospirillium lipoferum* and *Bacillus megatherium* , phosphorene , nitrobacterene and rizobacterene *as well as* biostmulant ascobene were applied to plants after two months from the planting and then (twice) at 21 days intervals as a soil drench. The results revealed that using phosphorene and ascobene were the best treatments for increasing the plant height. Treating Iris plants with biofertilizers significantly increased the formation of leaves dry weight of plants and the inflorescence stem diameter and length as well as fresh weight of inflorescence. Treating plants with *Bacillus megatherium* , phosphorene as well as ascobene significantly increased the dry weight of inflorescence. The treatment of *Bacillus megatherium* and *Azospirillum lipoferum* proved the superiority for producing the largest bulbs, bulblets and fresh weight of bulbs. Whereas, phosphorene,Azospirillum lipoferum and rizobacterene had a favourable effect on increasing the dry weight of bulbs. The treatment of *Bacillus megatherium* , rizobacterene as well as ascobene produced the highest content of chlorophylls.All biofertilizers increased N-percentage in leaves and bulbs.Treating the plants with rizobacterene, nitrobacterene, *Azospirillum lipoferum* or *Bacillus megatherium* increased P percentage in bulbs. Most of the biofertilizer treatments increased K content in bulbs. The treatment of nitrobacterene and phosphorene resulted in a great increase in the percentage of total carbohydrates content in leaves and bulbs.

INTRODUCTION

Nowadays, biofertilizers became the most important materials required to substitute chemical fertilizers for healthy and cheap production of many plants including flowering bulbs. *Iris tingitana* cv. Wedgwood plant is a flowering popular plant native of south America and belong to Fam. Iridaceae. The Iris plants are grown for their graceful flower colors that are blue, violet, yellow, gold, bronze and white which have darker yellow patches. Although they naturally flower in late winter or early spring, Irises can be induced to bloom earlier or later, most Iris varieties bloom from March to April in Egypt. Iris bulbs may be planted quite close together in a shaded position to prevent the soil from drying out., or in containers to provide flowers in the winter and early spring. They are excellent for cultivating in the

garden and are excellent accent plants when placed in tight groups in a border. Iris plants have been used as commercial cut-flowers. Also, Iris cultivars have promising potentialities to be planted in sandy soil besides the clay to face the greatly expanding demand of the internal and external markets. Accordingly, improving the produced flowers may be focused to maximize the profit of cultivation that depends on many factors as soil availability of macro and micro nutrients, irrigation, etc. The microbial strains (biofertilizers) led to more availability of nutrients, nitrogen fixation (N-fixing bacteria) and availability of phosphorus (phosphate dissolving bacteria) as well as the production of growth promoting substances (GPS). various works pointed out the role of biofertilizers in improving flowering, growth as well as the different physiological processes of flowering bulbs. The production of daughter bulbs and bulblets is the main factor in increasing the cultivation of bulbous plants. Fertilization with biofertilizers greatly affected the bulbs growth of many plants. The present work was done to study the effects of biofertilizers as well as ascobene on growth, bulblets production and flowering of *Iris* plants .

MATERIALS AND METHODS

This study was carried out at the Expermental. Nursery of the Department of Ornam. Hort., Fac of Agric., Cairo Univ., Giza, throughout two successive seasons of 2000/2001 and 2001/2002, locally produced bulbs of an average diameter 2.4-2.6 cm.were planted on Oct. 14th 2000 and 2001 in 30 cm clay : pots filled with a mixture of clay/sand (2:1 v/v).The physico-chemical properties of the soil used are presented in Table (A).Water solutions of bio-fertilizers containing strains of *Azospirillum lipoferum* and *Bacillus megatherium* , phosphorene , nitrobacterene and rizobacterene *as well as* ascobene were applied to plants after two months from data planting and then twice at 21-day intervals as a soil drench.

Preparation of *Azospirillium* and *Bacillus* Strains : Distilled water was put in the flask, then peptone (5gm /L) and beef extract (3gm /L) were added and all sterilized in autoclave at 121ºC for20 minutes.The flask was left at room to cool. After that the strains of *Azospirillum lipoferum* and *Bacillus megatherium* were inoculated. The flasks were incubated at 28ºC for 7-10 days to obtain the highest growth. They were applied at 2 liters/ fed.(plant density of Iris plants per fed.is 40,000), which equal the application of one cm. /lL/20bulbs. Phosphorene, nitrobacterene, rizobacterene and ascobene were applied as recommended by Ministry of Agriculture at two kg/ fed (i.e. one gram/L /20 bulbs).

The following treatments were used: 1- Control 2- *Azospirillum lipoferum* 3- *Bacillus megatherium*4- Phosphorene 5- Nitrobacterene 6- Rizobacterene 7- Ascobene .The treatments were replicated 3 times and each replicate contained 9 plants,in a complete randomized design.

Chemical Determinations: Chlorophyll-a,b and carotenoids were determined according to Fahmy (1970) -Total carbohydrates (%D.W.) in dried leaves, inflorescences and bulbs were determined according to Herbert *et al.*

(1971).The contents of N, P and K were determined using the wet digestion procedure (Piper, 1947). Total nitrogen content was determined using Nesslar method (Koch and McMeekin,1924).Phosphorus content was determined according to Troug and Meyer (1939).The content of K was determined by using Atomic Absorption Flame Spectrophotometer .The data were statistically analyzed using the L.S.D. test at 5% to compare the means of the different treatments Steel and Torrie (1980).

RESULTS AND DISCUSSION

1-Effect on vegetative growth

Plant height:

Data in Table (1) show that, in both seasons, treating the plants with the different treatments significantly increased plant height as compared with the control. In the first season, phosphorene and ascobene increased the plant height to 48.0 and 47.9 cm., respectively, compared with 34.8 cm for the control plants. In the second season,the increases in plant height were significant with the application of ascobene, phosphorene and rizobacterene giving the averages of 49.3, 48.2 and 47.5 cm., respectively.Using *Bacillus megatherium* gave the shortest plants (39.8cm). Thus, it may be concluded that treating Iris plant with ascobene , phosphorene and rizobacterene were the best treatments in increasing the plant height,which can be attributed to the capability of these microorganisms in inducing beneficial effects on plant growth by contributing growth hormones, such as cytokinins or auxins (Bouton *et al*. 1979 and 1985; Tein *et al*. 1979).These results are in line with those obtained by Bonito *et al.,* (1995) on *Zinnia elegans* and *Gerbera jamesonii* and Dessouky (2002) on *Borago officinalis* plants .

Table (1): Effect of biofertilizers and ascobene on plant height ,number of leaves, fresh and dry weights of leaves of Iris plants during the seasons of 2000/2001 and 2001/2002

Treatments	Plant height (cm.)		Number of leaves (gm.)		Fresh weight of leaves (gm./plant)		Dry weight of leaves (gm./plant)	
	2000	2001	2000	2001	2000	2001	2000	2001
Control.	34.8	38.2	5.75	5.67	12.76	15.74	1.45	2.33
Ascobene	47.9	49.3	6.50	6.93	18.04	22.26	2.08	3.39
Rizobacterene	45.7	47.5	7.00	6.67	25.84	25.62	3.84	4.30
Phosphorene	48.0	48.2	7.02	5.83	20.68	24.60	3.70	4.68
Nitrobacterene	42.3	41.0	7.00	6.33	17.60	18.10	2.18	3.48
Azospirillum lipoferum	41.5	42.0	8.00	6.83	22.70	18.98	3.30	2.79
Bacillus megatherium	46.5	39.8	8.90	6.77	23.74	18.26	3.89	3.39
L.S.D.$_{5\%}$	5.49	4.58	0.53	0.73	0.63	0.34	0.42	0.31

Number of leaves/plant:

Data in Table(1) show that, in both seasons, all biofertilizers used increased the number of leaves/plant compared to untreated plants. In the first season, both *Bacillus megatherium* and *Azospirillum lipoferum*

treatments gave the highest increments in leaf formation(8.9 0 and 8.00 leaves, respectively) compared with 5.75 leaves for the control. In the second season, the highest number of leaves 6.93 and 6.83 were obtained from the treatment of ascobene and *Azospirillum lipoferum*, respectively.The least number of leaves / plants 5.67 was recorded for the control plants.Generally,it can be concluded that treating Iris plants with biofertilizers significantly increased the formation of leaves,which may be due to the increase in nitrogen content in the soil as a result of N fixation and phosphorus from phosphate dissolving bacteria as well as growth promoting substances such as indole acetic acid and gibberellins produced by all organisms used.These results are in agreement with those obtained by El-Naggar and Mahmoud (1994) on *Narcissus tazetta* , Bonito *et al.*(1995) *on Zinnia elegans* and *Gerbera jamesonii* , Misra (1995)and Kathiresan and Venkatesha (2002) on gladiolus .

Fresh Dry weights of leaves

As shown in Table (1),in the first season, all treatments significantly increased the fresh weight of leaves.Rizobacterene treatment was the best as it increased fresh weight of leaves to 25.84 gm. compared with 12.76 gm. for control. *Azospirillum lipoferum* and *Bacillus megatherium* treatments showed also a great influence in this concern, giving 22.70 and **23.74** gm fresh weight of leaves, respectively. In conclusion ,the increase in leaves fresh weight can be attributed to the increase in both plant height and number of leaves / plant as already discussed (Table,1).These findings are in agreement with those obtained by Sidorenko *et al.* (1996) on potato, Misra (1995) on gladiolus and Shalan *et al.* (2001) on roselle plants . In both seasons, the effects of biofertilizer treatments on dry weight of leaves was in parallel with their effects on fresh weight of leaves.These results may be attributed to the increase in fresh weight of leaves per plant. Similar findings were reported by Misra (1995) on gladiolus ,and El-Naggar (1998) on tuberose plants.

2. Effect on flowering

Data on the effect of biofertilizers as well as biostimulant ascobene on flowering of *Iris tingitana* cv. Wedgwood, in terms of inflorescence stem length (cm),inflorescence stem diameter (cm),fresh and dry weights of inflorescence (gm.) are presented in Table (2)

Inflorescence stem length

In the first season, the treatments of phosphorene, *Azospirillum lipoferum* and *Bacillus megatherium* biofertilizers significantly increased the inflorescence stem length compared to the uninoculated plants. The tallest spike (29.5 cm) was obtained from the treatment of *Bacillus megatherium* , while the shortest one (20.3cm) resulted from ascobene. Also, using Azospirillum lipoferum and phosphorene treatments showed a significant influence in this concern. In the second season, the only effective treatments on infloresence stem length were *A. lipoferum B. megatherium*., which increased the infloresence stem length to 28.8 and 30.3 cm, respectively. comparing with 23.8 cm for the control. In conclusion, the increment in infloresence stem length may be due to plant hormones produced from *Azospirillum lipoferum* or *Bacillus megatherium* and partially to nitrogen fixations as well as availability of P by these organisms. Similar results were

obtained by Wange and Patil (1994) on *Polianthes tuberosa* and Kathiresan and Venkatesha (2002) on gladiolus cv. White Prosperity

Table (2): Effect of biofertilizers on inflorescence stem length , inflorescence stem diameter, fresh and dry weights of inflorescence of Iris plants during the seasons of 2000/2001 and 2001/2002.

Treatments	Inflorescence stem length (cm.)		Inflorescence stem diameter(cm)		Fresh weight of inflorescence (gm.)		Dry weight of inflorescence (gm.)	
	2000	2001	2000	2001	2000	2001	2000	2001
Control.	21.3	23.8	0.70	0.73	13.29	12.64	1.79	1.87
Ascobene	20.3	21.3	0.68	0.80	16.76	16.15	2.26	2.36
Rizobacterene	21.4	24.0	0.77	0.87	14.50	17.13	2.07	2.48
Phosphorene	24.5	25.3	0.75	0.80	15.33	18.93	2.19	2.61
Nitrobacterene	20.4	22.5	0.65	0.80	14.44	15.47	1.89	2.30
Azospirillum lipoferum	25.4	28.8	0.82	0.85	15.54	16.68	2.17	2.26
Bacillus megatherium	29.5	30.3	0.93	1.05	18.15	20.82	2.59	3.25
L.S.D.$_{5\%}$	2.8	3.6	0.11	0.06	1.67	2.23	0.52	0.64

Inflorescence stem diameter

Data on the response of inflorescence stem diameter of Iris plant to biofertilizers (Table , 2) show the superiority of using *Bacillus megatherium* treatment for increasing the inflorescence stem diameter comparing with the control, in both experimental trials. The inflorescence stem diameter reached to 0.93 and 1.05 cm. against 0.70 and 0.73 cm for the control, in the first and second seasons, respectively. Also, *Azospirillum lipoferum* treatment revealed a favorable effect on this trait, in both seasons. Applying rizobacterene and phosphorene ,in the first season, had no significant effect on inflorescence stem diameter , but in the second one , all the treatments showed a significant effect in this respect.

Fresh weight of inflorescence:

Evidently, data in Table (2), show the increment of fresh weight of inflorescence due to using the different biofertilizers,in both seasons. In this respect, receiving Iris plants *Bacillus megatherium* treatment proved its superiority for increasing fresh weight of inflorescence,the values were 18.15 and 20.82 gm.,compared with 13.29 and 12.64 gm. resulted from control plants in the first and second seasons, respectively. It worth to mention that ascobene in the first season and posphorene in the second one, showed a pronounced effect on increasing the fresh weight of inflorescence, giving 16.76 and 18.93 gm, respectively. The other biofertilizers revealed clear effect for increasing fresh weight of inflorescence in the both seasons (Table, 2).The increment in fresh weight of inflorescence in response to biofertilizers may be attributed to the increases in both the length and diameter of inflorescences (Table , 2).These findings are in line with that of Misra (1995) on gladiolus plants.

Dry weight of inflorescence:

As shown in Table (2) referring the effect of the biofertilizers treatments on dry weight of inflorescence, it could be concluded that the effect was in parallel with that on fresh weight of inflorescence. The effect was more clear in the second season than in the first one. The data show that *B. megatherium* treatment in both seasons proved its superiority for increasing dry weight of inflorescence, giving 2.59 and 3.25 gm.,compared with 1.79 and 1.87 gm.for the control plants in the first and second seasons, respectively. Applying nitrobacteria treatment recorded the lowest value in this concern (1.89 gm) in the first season, and the treatment of *Azospirillum lipoferum* gave the lowest value in the second one (2.26gm).These results are in line with that of Misra (1995) on gladiolus plants who found that all applications of biofertilizer treatments significantly increased the dry weight flowers

3-Effect on bulb and bulblets production:

Diameter of mother bulb

Data in Table (3)show that applying all biofertilizer treatments caused an increment on the diameter of the mother bulb at the end of both experimental seasons . In the first season, phosphorene *and Bacillus megatherium* produced the largest bulbs (2.79 and 2.78 cm.), respectively compared with 1.92 for the control.In the second season, *Bacillus megatherium* treatment proved the superiority for producing the largest bulbs(3.20cm),followed by *Azospirillum lipoferum* and rizobacterene, which gave an average bulb diameter of 3.02 and 3.01 cm, respectively.These results are in line with those of Gurubatham *et al.* (1989) on *Allium cepa*. (onion), El-Naggar and Mahmoud (1994) on *Narcissus*, El-Naggar (1998) on tuberose plants. Sheikh, *et al* .,(2000) studied the effect of biofertilizers on bulb production of Dutch iris cv. "Prof. Blaauw" and found that applying Azotobacter and *Azospirillum lipoferumlipoferum*increased bulb size.

Table (3): Effect of bio-fertilizers on diameter of bulb, number of bulblets (gm.), fresh weight of bulbs and dry weight of bulbs (gm.) on Iris plants during the seasons of 2000/2001 and 2001/2002

Treatments	Diameter of mother bulb cm		Number of bulblet/bulb		Fresh weight of bulb (gm.)		Dry weight of bulb (gm.)	
	2000	2001	2000	2001	2000	2001	2000	2001
Control.	1.92	2.33	2.25	3.53	3.75	4.74	1.33	1.63
Ascobene	2.43	2.92	2.45	4.67	5.78	5.74	1.86	1.92
Rizobacterene	2.53	3.01	2.80	4.50	6.48	5.77	1.97	2.08
Phosphorene	2.78	2.80	3.03	4.83	7.45	6.73	2.35	2.39
Nitrobacterene	2.64	2.78	2.77	4.33	5.90	4.66	1.79	1.88
Azospirillum lipoferum	2.64	3.02	3.57	5.17	6.02	7.20	1.86	2.49
Bacillus megatherium	2.79	3.20	4.15	4.73	8.00	6.80	2.89	2.55
L.S.D.$_{5\%}$	0.22	0.23	0.34	0.63	1.07	1.60	0.36	0.37

Number of bulblets/bulb

Data recorded during the two seasons on the number of bulblets/bulb as affected by the different biofertilizer treatments and ascobene are shown in Table (3).In the first season ,*Bacillus megatherium* treatment produced the largest mother bulbs, the same trend was also noticed for its effect on producing the highest number of bulblets/bulb,the value was increased to 4.15 against 2.25 bulblets /bulb for the control. Treating Iris plants with *Azospirillum lipoferum* had a great effect on increasing the formation of bulblets per bulb, giving 3.57 bulblets /bulb. A marked increase in the formation of bulblets per bulb was also recorded with phosphorene treatment (3.03 bulblets /bulb).In the second season, all treatments showed a singnificant effect on bulblet formation as compared with the control , and both Azospirillum lipoferum and phosphorene treatments were the most effective treatments in this respect, giving 5.17 and 4.83 bulblets / bulb , respectively and the control plants produced 3.53 bulblets/bulb. The increment in bulblets formation may be due both plant hormones and nitrogen fixation produced from biofertilizer organisms. Similar results were obtained by Wange (1996) on strawberry, Sheikh, *et al*. (2000) on Dutch iris and Kathiresan and Venkatesha (2002) on gladiolus .

Fresh and dry weights of bulbs:

Data on the response of fresh and dry weights of bulb to the biofertilizer (Table, 3) show that in the first season, treating the plants with the different treatments significantly increased fresh weight of bulb as compared with the control. Using *Bacillus megatherium* increased fresh weight of bulb to 8 gm comparing with3.75 gm for the control. Treating the plants with rizobacterene and phosphorene had a favourable effect on increasing the fresh weight of bulb. In the second season, a great influence was obtained with *A. lipoferumlipoferum* and *B. megatherium*, which increased the values to 7.20 and 6.80 gm. compared to 4.74 for the control plants. In both seasons, the effects of different treatments of biofertilizers on dry weight of bulbs were almost in parallel with their effects on fresh weight of bulbs. Applying *Bacillus megatherium* proved its superiority for increasing the values comparing with the control .Also, receiving the plants either phosphorene or rizobacterene treatments in the first season revealed a favorable effect in this respect. Whereas, in the second one, *Azospirillum lipoferum* as well as phosphorene showed a favorable effect on increasing the dry weight of bulbs. So, it could be concluded that treating Iris plant with *Azospirillum lipoferum, Bacillus megatherium* and phosphorene significantly increased fresh and dry weight of bulbs. These results are in agreement with those of El-Naggar and Mahmoud (1994) on *Narcissus*, Kshiragar *et al.,* (1994) on onion, Yassin *et al*. (1994) on sweet potato, Misra (1995) on gladiolus and Sheikh, *et al.* (2000) on Dutch iris plants, since they found that biofertilizers increased fresh and dry weights of bulbs.

4- Effect on chemical constituents :

Pigment contents

As shown in Table (4) different trends were noticed on the effect of the different types of biofertilizers treatments on chlorophyll-a accumulation in the leaves. Treating the plants with *Bacillus megatherium* produced the

highest content of chlorophyll-a (0.77 and 0.97 mg/gm. F. W). compared with 0.49 and 0.68 mg/gm F.W resulted from control plants in the first and second seasons, respectively. However, treating the plants with ascobene showed also a favourable effect in this respect(0 0.65 and 0.74 mg/gm F.W) in both seasons, respectively. Data in Table (4), show the great influence of receiving the plants either rizobacterene or *Bacillus megatherium* treatments on chlorophyll (b) accumulation in the foliage parts. The values reached to 0.62 and .50 mg/gm F.W. for rizobacterene and 0.60 and 0.47 mg/gm F.W. for *Bacillus megatherium* compared with 0.35 and 0.33 mg/gm F.W resulted from control plants in the first and second seasons, respectively.

Table (4): Effect of biofertilizers on pigment content (chlorophyll-a ,clorophyll-b and carotenoids) (mg/gm F.W.) on Iris leaves during the seasons of 2000/2001 and 2001/2002.

Treatments	Chlorophyll-a		Chlorophyll-b		Carotenoids	
	2000	2001	2000	2001	2000	2001
Control.	0.49	0.68	0.35	0.33	0.41	0.35
Ascobene	0.65	0.74	0.42	0.24	0.48	0.33
Rizobacterene	0.53	0.71	0.62	0.50	0.42	0.32
Phosphorene	0.49	0.82	0.45	0.38	0.45	0.32
Nitrobacterene	0.55	0.64	0.42	0.42	0.42	0.36
Azospirillum lipoferum	0.59	0.78	0.48	0.32	0.46	0.35
Bacillus megatherium	0.77	0.97	0.60	0.47	0.43	0.32

Carotenoids content

Negligible effects were observed on the effect of the different types biofertilizers and biostimulant ascobene on carotenoids content in leaves in both seasons as indicated in Table (4). However, it could be mentioned that, treating the plants with ascobene, phosphorene and *Azospirillum lipoferum* increased to some what the values compared with the control in the first season. In this regard, Abou El-Salehein and Nasr (1994) reported that treating pea plants with rhizobium increased chlorophyll a, b and total chlorophyll of plant leaves as compared with the non-inoculated plants.

Nitrogen percentage in leaves and bulbs

Data in Table (5) show that all biofertilizer treatments increased nitrogen accumulation in leaves than control in both seasons, with the exception of the effect of ascobene in the first season, however, the obtained values showed the great influence of using phosphorene in both seasons.

This treatment increased the percentage of nitrogen to 2.29 and 2.14 %DW compared with 1.38 and 1.23 % DW for the control plants in the first and second seasons, respectively. Also, treating the plants rizobacterene, *Azospirillum lipoferum* and *Bacillus megatherium* showed a favourable effect in this respect. In case of N-percentage in bulbs, data in Table (5), show that treating the plants with ascobene decreased nitrogen percentage (1.32 and 1.41 % DW) compared with 1.89 and 1.50 %DW resulted from control plants in the first and second seasons, respectively. Meanwhile, applying rizobacterene treatment showed negligible effects on the obtained values in both seasons. Whereas, the other biofertilizers treatments increased it in

both seasons.Treating the plants with *Azospirillum lipoferum* showed its superiority for increasing the N- percentage in bulbs.

Phosphorus percentage **in leaves and bulbs**

The response of phosphorus percentage in leaves and bulbs to biofertilizers and ascobene are shown in Table (5). Treating the plants with ascobene, rizobacterene or nitrobacterin decreased P-percentage in leaves in both seasons. Whereas, *Bacillus megatherium* increased it. Also,data in the same Table, revealed that there were increments in P- percentage in bulbs due to applying rizobacterene, nitrobacterene, *Azospirillum lipoferum* or *Bacillus megatherium* treatments in both seasons. Whereas, no clear trend was as noticed on the effect of ascobene or phosphorene.

Table (5): Effect of Bio-fertilizers on nitrogen, phosphorus and potassium percentages of Iris plants during the seasons of 2000/2001 and 2001/2002

Treatments	2000/2001		2001/2002	
	Leaves	Bulbs	Leaves	Bulbs
	Nitrogen content (N% D.W.)			
Control.	1.38	1.89	1.23	1.50
Ascobene	1.23	1.32	1.82	1.41
Rizobacterene	1.83	1.54	2.02	1.63
Phosphorene	2.29	2.02	2.14	1.77
Nitrobacterene	1.55	2.35	1.98	1.95
Azospirillum lipoferum	1.70	2.34	2.03	2.45
Bacillus megatherium	2.03	2.06	2.13	2.14
Phosphorus content (P% D.W.)				
Control.	0.243	0.232	0.340	0.350
Ascobene	0.234	0.241	0.230	0.310
Rizobacterene	0.230	0.310	0.210	0.380
Phosphorene	0.282	0.373	0.256	0.290
Nitrobacterene	0.230	0.370	0.220	0.353
Azospirillum lipoferum	0.350	0.364	0.280	0.372
Bacillus megatherium	0.343	0.370	0.370	0.358
Potassium content (K % D.W.)				
Control.	1.48	2.00	1.64	1.92
Ascobene	1.44	1.87	1.45	1.75
Rizobacterene	1.70	2.44	1.46	1.73
Phosphorene	1.52	1.94	1.34	1.92
Nitrobacterene	1.58	2.03	1.64	2.03
Azospirillum lipoferum	1.58	2.80	2.75	2.72
Bacillus megatherium	2.06	3.00	2.60	3.39

Potassium percentage in leaves and bulbs

The obtained results indicated in the first season that the highest K percentage in leaves was recorded with the application of *Bacillus megatherium* and rizobacterene, whereas, in the second season, *Azospirillum lipoferum Bacillus megatherium* gave the highest values comparing with the control. Also, it could be mentioned that most of the biofertilizer treatments increased K- percentage in bulbs, with the exception of using ascobene , which decreased it comparing with the control in both

seasons , treating Iris plants with the two strains of either *Azospirillum lipoferum* or *Bacillus megatherium* greatly influenced the potassium accumulation in bulbs. These treatments increased the rate of potassium accumulation in the bulbs to 2.80 and 2.72 % for *Azospirillum lipoferum* treatment and to 3.00 and 3.39 %DW for *Bacillus megatherium* treatment comparing with 2.00 and 1.92 % for the control plants in the first and second seasons, respectively. Generally, treating Iris plant with *Azospirillum lipoferum, Bacillus megatherium* and phosphorene as well as rizobacterene had great effects on increasing the percentages of N, P and K in leaves and bulbs. These results are in agreement with those obtained by El-Naggar (1998) on tuberose and Prassad, *et al.* (2000) on gladiolus plants.

Total carbohydrates in leaves and bulbs

Data on the effect of biofertilizers treatments on total carbohydrates in leaves and bulbs of Iris plants are arranged in Table (6) : In the first season, treating the plants with all biofertilizers treatments (except *Azospirillum lipoferum* treatment) and ascobene increased the total carbohydrates percentage in leaves compared with the control and phosphorene proved its superiority in this concern, which increased the value to 24.48 %D.W. compared with 15.45 %. D.W. for the control plants in the first season. Also, the treatment of nitrobacterene resulted in a great increase in the content of total carbohydrates in leaves (22.88% DW). In the second season, the total carbohydrates percentage in leaves was the highest with nitrobacterene , *a*scobene and phosphorene treatments.

Table (6) : Effect of bio-fertilizers on total carbohydrates percentage (% D.W.) of Iris plants during the seasons of 2000/2001 and 2001/2002.

Treatments	Leaves		Bulbs	
	2000/01	2001/02	2000/01	2001/02
Control.	15.45	16.51	36.13	33.24
Ascobene	21.10	19.72	27.66	30.39
Rizobacterene	20.07	16.44	35.59	30.66
Phosphorene	24.48	21.54	46.18	49.74
Nitrobacterene	22.88	21.02	40.09	28.66
Azospirillum lipoferum	15.64	15.91	33.37	37.60
Bacillus megatherium	18.51	17.84	45.40	47.63

Concerning the total carbohydrates percentage in bulbs in response to the different types of biofertilizers treatments as well as ascobene, data showed that, in the first season, the plants receiving phosphorene, nitrobacterene and *Bacillus megatherium* treatments increased total carbohydrates accumulation in the bulbs comparing that obtained in the control. The contrary action was detected resulting from applying ascobene,rizobacterene and *Azospirillum lipoferum* treatments, which decreased the accumulation rate of total carbohydrate in bulbs comparing with the control.In the second season, the treatment of phosphorene and *Bacillus megatherium* treatments were the most effective treatments in this respect,whereas nitrobacterene treatment drecreased it to the minimum value (28.66% DW) against 33.24% DW for the control plants. In conclusion,

treating Iris plant with *Azospirillum lipoferum*, *Bacillus megatherium* ascobene and nitrobacterene were the most effective treatments in increasing the total carbohydrates content in bulbs and leaves of plants. These results are in agreement with those obtained by Abdulla (1999) on potato tubers and Dessouky (2002) on *Borago officinalis.*

Conclusively , Treating the Iris plants with phosphorene , ascobene and rizobacterene increased the plant height, the formation of leaves, and the dry weight of plants . Applying biofertilizers treatments increased the stem diameter, fresh weight and length of inflorescence . The treatment of *Bacillus megatherium* produced the largest bulbs, increased the formation of bulblets , and gave the highest content of chlorophyll-a . All the biofertilizers used increased the content of N in leaves and K content in bulbs.

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تأثير التسميد الحيوى و الاسكوبين على النمو و التزهير نباتات الايرس صنف WEDGWOOD

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اجريت هذه الدراسة بمشتل قسم بساتين الزينة- كلية الزراعة- جامعة القاهرة خلال موسمى ٢٠٠١-٢٠٠٢و٢٠٠٢-٢٠٠٣، وكان الهدف من البحث هو دراسة مدى تأثير التسميد الحيوى والأسكوبين على النمو والازهار وانتاج الابصال والمحتوى الكيماوى فى نباتات الايرس صنف- Wedgwood- و تم زراعة الأبصال فى ١٤ أكتوبر ٢٠٠١ فى أصص فخارية ٣٠ سم وتم ملئها بمخلوط طمى:رمل بنسبة 1:2 (بمعدل٣ أبصال/أصيص). وكانت محاليل الأسمدة الحيوية المستخدمة هى سلالات الآزوسبريلليم والباسيلس والفوسفورين والنتروباكترين والريزوباكترين وتم المعاملة بالمنشط الحيوي الأسكوبين والتى أضيفت للنباتات بعد شهرين من الزراعة ثم بعد ذلك تمت المعاملة مرتين كل ٢١ يوم مع ماء الرى .

ويمكن تلخيص النتائج المتحصل عليها كالتالى :

- أدى استخدام الفوسفورين والأسكوبين والريزوباكترين الى أفضل زيادة فى ارتفاع النبات – كما ان معاملة نباتات الايرس بالأسمدة الحيوية أدى الى زيادة معنوية فى تكوين الأوراق وكذلك الوزن الجاف للنباتات.وزيادة سمك ساق الحامل النورى وطوله وكذلك الوزن الطازج للحوامل الزهرية
- كما ادت معاملة الأيرس بالباسيلس ميجاثيريم والفوسفورين والأسكوبين الي الحصول علي أفضل زيادة الوزن الجاف للحوامل الزهرية.
- المعاملة بالميجاثيريم أدت الى انتاج أكبر الأبصال وتبعتها فى ذلك المعاملة بالآزوسبريلليم والريزوباكترين- كما ان المعاملة بسلالتى الباسيلس والآزوسبريلليم ادت الي الحصول علي زيادة في انتاج البصيلات . والمعاملة بالسلالاتين وكذلك الفوسفورين ادت الي زيادة الوزن الطازج للأبصال زيادة معنوية – كما ان الفوسفورين والآزوسبريلليم والريزوباكترين كان لها أفضل الاثر فى زيادة الوزن الجاف للأبصال
- أدت المعاملة بالباسيلس الى زيادة كلورفيل أ بينما معاملات الريزوباكترين والباسيلس كان لها أعظم الأثر على كلورفيل ب . كل المعاملات ادت الي زيادة النتروجين فى الأوراق (عدا الأسكوبين فى الموسم الأول) والريزوباكترين والفوسفورين والباسيلس كانت أفضل المعاملات
- والأسكوبين أدى الى تقليل محتوى النتروجين فى الأبصال و باقى معاملات الأسمدة الحيوية أدت الى زيادته . كما ان معاملة النباتات بالفوسفورين والريزوباكترين أو النيتروباكترين والآزوسبريللم أو الباسيلس ادت الي زيادة الفوسفور بألابصال كما ادت المعاملة بالباسيلس والفوسفورين والنيتروبكترين الى ارتفاع محتوى بوتاسيوم فى الأوراق، -

معظم الأسمدة الحيوية المستخدمة ادت الي زيادة محتوى البوتاسيوم فى الأبصال ماعدا الأسكوبين- ومعاملات النيتروبكترين والأسكوبين والفوسفورين سجلت اكبرزيادة فى محتوى الكربوهيدرات الكلية فى الأوراق بينما الفوسفورين والنيتروباكترين والباسيلس كان لهم اكبرالأثر فى زيادة الكربوهيدرات الكلية فى الأبصال .