EFFECT OF PLANTING DENSITY, DEPTH OF PLANTING AND CHEMICAL FERTILIZATION ON GROWTH AND FLOWERING OF *Iris hollandica*

Abdulrahman A. AlSheikhly

Assist. Prof., Horticulture & Landscape Dept., College of Agric., University of Diyala, Iraq
E.mail: abdulrahmanraheem@uodiyala.edu.iq

ABSTRACT

The experiment was conducted at a nursery in the city of Baghdad, during the time 2013/2014 season. The objective of the experiment was to study the effects of four planting density (1, 2, 3 and 4 bulbs pot^{-1}), three depth of planting (3, 6, and 9 cm) and two levels of NPK fertilization (0 and 100 mg L^{-1}) on growth and flowering of *Iris hollandica* cv. Prof. Blaauw. The studied parameters included number of days to flowering, plant height, flower diameter, flowering stem diameter, flowering stem fresh weight, vase life, fresh weight of new bulbs and fresh weight of bulblets.

Plant density at (one bulb pot^{-1}) produced the highest plant, largest flower, best stem diameter and heaviest fresh weight of flowering stem, while it gave the lowest fresh weight of bulbs and bulblets per pot. Depth of planting had a significant effects in increasing the number of days to flowering and fresh weight of the new bulbs, while it significantly decreased the fresh weight of the flowering stem. Fertilization significantly increased stem diameter, fresh weight of flowering stem and fresh weight of bulblets, while it significantly decreased the number of days to flowering. Interaction between depth of planting and fertilization and between plant density and fertilization had a significant effect on number of days for flowering and fresh weight of flowering stem respectively.

Key words: *Iris hollandica* cv. Prof. Blaauw, planting density, depth of planting, fertilization.

INTRODUCTION

Iris is a bulbous plant, its name used by Theophrastus which means the Greek goddess of rainbow, an apt name for a genus in which almost the entire color spectrum can be found, it contains more than 300 species all native to the northern hemisphere. Iris belongs to family Iridaceae, many species were found growing in north of Iraq such as *I. persica, I. barnumae* and *I. aucheri* (Bryan, 2002). *Iris hollandica* was developed from crosses between *I.xiphium praecox, I.tingitana* and *I.Iusitanica*, the most widely used cultivars are Wedgwood, Ideal, and Prof. Blaauw (Larson, 1992). Iris flower is one of the main exportable flowers and the foreign markets demands flowers with high quality, and must

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match the international standers of exportable flowers (Mahgoub *et al*., 2006). The quantity as well as the quality of flowers depends on several factors like density, depth of planting and chemical fertilization, therefore the present study was undertaken to find out the optimum plant density, proper depth of planting and fertilization.

MATERIAL AND METHODS

The experiment was conducted at a nursery in the city of Baghdad, through 2013/2014. The study consisted of four planting densities (P) 1, 2, 3 and 4 bulbs pot^{-1}, and three depths of planting (D) 3, 6 and 9 cm and two levels of NPK fertilization (F) 0 and100 mg L^{-1} (To prepare 100 liter of 100 mg L^{-1} NPK fertilization solution we have to dissolve 50 gm of NPK (20:20:20) in 100 liter of water). Locally produced bulbs of *Iris hollandica* cv. Prof. Blaauw were planted on 1st of November in 15 cm-diameter plastic pots filled with mixture of three parts loamy sand soil and 1 part sphagnum moss peat (Alsheikly, 2010). The analysis of the used medium is presented in Table 1. Max. and Min. air temperature was measured (Table 2). The routine agricultural practices were carried out as recommended for such plantation. Flowering time took place between 11 March and 5 April, the flowers were harvested in full opening stage and leaving 4 leaves on the plants as they were needed for development of the new bulb and bulblets. The following data were recorded: number of days to flowering, plant height (cm), flower diameter (cm), flowering stem diameter (mm), flowering stem fresh weight (g), vase life (day), fresh weight of new bulbs (g pot^{-1}) and fresh weight of bulblets (g pot^{-1}). The experiment layout was a randomized complete blocks design (RCBD) with three factors (4 planting densities, 3 depths of planting and 2 fertilization levels) with 24 treatments with three replicates every replicate contained 4 pots. All data were subjected to analysis of variance (ANOVA) and the means separated using Least Significant Difference test (LSD) (Gomez and Gomez, 1984).

Table 1. Some physical and chemical properties of the used planting medium

$EC_{1:1}$ dS m^{-1}	pH	Sand	Silt	Clay	Available N	Available P	Available K
		g kg^{-1}			g kg^{-1}		
2.3	7.5	812	52	136	42.0	67.9	136.0

* Ministry of Agriculture/Agric. Res. Centre-Soil Res. Dep.-Laboratories.

Table 2. The daily means of Maximum & Minimum temperature 2013-2014 season

Month / Temp. (°C)	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May
Max.	31.6	23.8	18.8	19.5	20.6	25.1	35.3	39
Min.	18.2	6.1	1.8	2.2	3.4	6.3	17.4	22

RESULTS AND DISCUSSION

Number of days to flowering

The means of analyzed data for number of days to flowering indicated that plant density had no significant effect on this character (Table 3) which was contrary to the findings of Mane *et al.,* (2007). Deepest planting 9 cm recorded more numbers of days to flowering 126.9 days compared to the shallow depth of planting 125.25 days (Table 3). These results are in accordance with the findings of Mane *et al*., (2007) and Hatamzadeh *et al.,* (2012) on tuberose, this might be due to the late emergence of plants.

Table 3. Effect of plant density, depth of planting and fertilization on days to flowering of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	126.00	126.33	126.16
	D2	130.00	126.33	128.16
	D3	130.00	124.33	127.16
P2	D1	125.66	123.66	124.66
	D2	126.00	124.00	125.00
	D3	127.00	125.33	126.16
P3	D1	123.00	127.oo	125.00
	D2	126.33	122.66	124.50
	D3	128.00	128.00	128.00
P4	D1	125.33	125.00	125.16
	D2	126.33	125.00	125.66
	D3	128.66	124.33	126.50
L.S.D. at 0.05		NS		NS
Plant Density × Fertilization				Effect of Plant Density
P1		128.66	125.66	127.16
P2		126.22	124.33	125.27
P3		125.77	125.88	125.83
P4		126.77	124.77	125.77
L.S.D. at 0.05		NS		NS
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		125.oo	125.50	125.25
D2		127.16	124.50	125.83
D3		128.40	125.50	126.95
L.S.D. at 0.05		1.9		1.34
Effect of Fertilization		126.86	125.16	
L.S.D. at 0.05		1.09		

Data presented in Table 3 showed that fertilization led to a significant reduction in number of days to flowering 125.16 days compared to non-fertilized plants 126.86 day, these results are in line with the findings reported by sewedan (2012) on gladiolus. Interaction between depth of planting and fertilization had a significant effect on this character, 3cm depth combined with 100 mg L^{-1} NPK fertilization gave the minimum days to flowering 124.5 days whereas 9 cm with 0 mg L^{-1} NPK fertilization gave the maximum 128.41 days (Table 3).

Plant height (cm)

The mean values regarding plant height revealed that the different plant densities significantly affected the plant height, the maximum 44.44 cm was observed in those planted at 1 bulb pot^{-1}, while the shortest plants 36.00cm was in those planted at 4 bulbs pot^{-1} density (Table 4), these results were supported by Ahmed *et al*., (2010) who found that wider spaces allowed gladiolus cultivars to gain maximum plant height than narrow spaces. Depth of planting had no significant effects on plant height (Table 4). These results are in agreement with the findings of Rao *et al.*, (1991) who reported that depth of planting had no significant effects on the growth and flowering characteristics of tuberose. Data in Table 4 shows no significant response to fertilization, these results are in accordance with the findings of Alsheikly (2013) who reported that fertilization with NPK elements had no significant effects on plant height of *Iris hollandica*, also supported by the findings of Butt (2005) on gladiolus. No significant effects were found due to interactions between the studied factors (Table 4).

Table 4. Effect of plant density, depth of planting and fertilization on Plant height (cm) of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Interaction between Plant Density and Depth of Planting
		F0	F1	
P1	D1	43.66	48.00	45.83
	D2	42.66	45.33	44.00
	D3	44.33	42.66	43.50
P2	D1	37.00	42.66	39.83
	D2	39.33	39.33	39.33
	D3	41.33	41.00	41.16
P3	D1	37.33	39.00	38.16
	D2	37.33	42.00	39.66
	D3	38.00	39.33	38.66
P4	D1	35.00	37.00	36.00
	D2	33.00	40.00	36.50
	D3	34.33	36.66	35.50
L.S.D. at 0.05		NS		NS
Plant Density × Fertilization				Effect of Plant Density
P1		43.55	45.33	44.44
P2		39.22	41.00	40.11
P3		37.55	40.11	38.83
P4		34.11	37.88	36.00
L.S.D. at 0.05		NS		1.92
Planting depth × Fertilization				Effect of Depth of Planting
D1		38.25	41.66	39.95
D2		38.08	41.66	39.87
D3		39.50	39.91	39.70
L.S.D. at 0.05		NS		NS
Effect of Fertilization		38.61	41.08	
L.S.D. at 0.05		1.35		

Flower diameter (cm)

The data presented in Table 5 revealed that decreased plant density led to a significant increase in the flower diameter, the maximum 9.68 cm was obtained at the density of 1 bulb pot^{-1} while the minimum 8.87cm was observed when planting at the density of 4 bulbs pot^{-1}. These results are supported by Bhat *et al.*, (2010) who reported that wider spacing significantly increased floret diameter of gladiolus. No significant differences in flower diameter were found due to depth of planting (Table 5), these results are in harmony with those obtained by Rao *et al*., (1991) on tuberose. Fertilization had no significant effects on this character

(Table 5). These results are supported by the findings of Alsheikly (2013) who found no significant differences in flower diameter due to fertilization of *Iris hollandica.* No significant effects were found due to interactions between the studied factors (Table 5).

Table 5. Effect of plant density, depth of planting and fertilization on flower diameter (cm) of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of planting
		F0	F1	
P1	D1	9.50	9.86	9.68
	D2	9.53	9.90	9.71
	D3	9.46	9.83	9.65
P2	D1	9.23	9.26	9.25
	D2	9.50	9.50	9.50
	D3	9.16	9.60	9.38
P3	D1	8.96	9.16	9.06
	D2	9.16	9.23	9.20
	D3	9.23	9.10	9.16
P4	D1	8.80	8.73	8.76
	D2	9.20	8.93	9.06
	D3	8.83	8.76	8.80
L.S.D. at 0.05		NS		NS
Plant Density×Fertilization				Effect of Plant Density
P1		9.50	9.86	9.68
P2		9.30	9.45	9.37
P3		9.12	9.16	9.14
P4		8.94	8.81	8.87
L.S.D. at 0.05		NS		0.22
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		9.12	9.25	9.19
D2		9.35	9.39	9.37
D3		9.17	9.32	9.25
L.S.D. at 0.05		NS		NS
Effect of Fertilization		9.21	9.32	
L.S.D. at 0.05		NS		

Flowering stem diameter (cm)

Planting density had a significant effect on the flowering stem diameter of *Iris hollandica* cv. Prof. Blaauw, the maximum flowering stem diameter was observed in those planted at a density of 1 bulb pot^{-1} 6.90 mm, while the minimum was in those planted at density of 4 bulbs pot^{-1} 5.75 mm (Table 6).

These results are in line with the findings of Khalaj and Edrisi (2012) on tuberose and Amjad and Ahmad (2012) on lilium. Depth of planting had no significant effects on flowering stem diameter (Table 6). These results are in harmony with those obtained by Rao *et al.*, (1991) on tuberose. Fertilization with 100 mg L^{-1} (NPK) gave the maximum flowering stem diameter 6.51mm compared to 5.95mm for those non fertilized (Table 6). These findings are in agreement with those obtained by Alsheikly (2013) on *Iris hollandica*. No significant effects were found due to interactions between the studied factors (Table 6).

Table 6. Effect of plant density, depth of planting and fertilization on flowering stem diameter (mm) of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	6.70	7.33	7.01
	D2	6.30	7.33	6.81
	D3	6.60	7.16	6.88
P2	D1	6.50	6.50	6.50
	D2	6.16	6.83	6.50
	D3	5.83	6.50	6.16
P3	D1	5.66	6.50	6.08
	D2	5.66	6.33	6.00
	D3	5.50	5.66	5.58
P4	D1	5.00	6.00	5.50
	D2	5.66	6.00	5.83
	D3	5.83	6.00	5.91
L.S.D. at 0.05		NS		Ns
Plant Density × Fertilization				Effect of Plant Density
P1		6.53	7.27	6.90
P2		6.16	6.61	6.38
P3		5.61	6.16	5.88
P4		5.50	6.00	5.75
L.S.D. at 0.05		NS		0.347
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		5.96	6.58	6.27
D2		5.95	6.62	6.28
D3		5.94	6.33	6.13
L.S.D. at 0.05		NS		NS
Effect of Fertilization		5.95	6.51	
L.S.D. at 0.05		0.245		

Fresh weight of flowering stem (gm)

Planting density had a significant effect on this character, the maximum fresh weight of flowering stem 14.88 gm was obtained in those planted at a density of 1 bulb pot^{-1}, while the minimum 9.27 gm observed at 4 bulbs pot^{-1} (Table 7). This increase in weight was a reflection of increment in length and diameter of the flowering stem that obtained in low planting density, these results are supported by the findings of Amjad and Ahmad (2012) on lilium.

Table 7. Effect of plant density, depth of planting and fertilization on fresh weight of the flowering stem (gm) of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	14.00	17.00	15.50
	D2	14.00	17.33	15.66
	D3	11.33	15.66	13.50
P2	D1	12.66	11.66	12.16
	D2	10.33	12.33	11.33
	D3	9.66	11.66	10.66
P3	D1	9.00	11.66	10.33
	D2	9.66	10.33	10.00
	D3	9.66	9.33	9.50
P4	D1	8.66	10.33	9.50
	D2	9.66	9.00	9.33
	D3	9.00	9.00	9.00
L.S.D. at 0.05		NS		NS
Plant Density×Fertilization				Effect of Plant Density
P1		13.11	16.66	14.88
P2		10.88	11.88	11.38
P3		9.44	10.44	9.94
P4		9.11	9.44	9.27
L.S.D. at 0.05		1.57		1.11
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		11.08	12.66	11.87
D2		10.91	12.25	11.58
D3		9.91	11.41	10.66
L.S.D. at 0.05		NS		0.96
Effect of Fertilization		10.36	12.11	
L.S.D. at 0.05		0.78		

Fresh weight of flowering stem was influenced significantly by depth of planting, the shallow planting gave the highest fresh weight 11.87 gm compared to 10.66 gm produced by deep planting, these results are in agreement with the

findings of Hatamzadeh *et al*., (2012) who reported that the fresh weights of tuberose flowering stems were negatively correlated with the plant depth. Fertilization with 100 mg L^{-1} (NPK) significantly increased the fresh weight of the flowering stem 12.11gm compared to 10.63 gm produced by non-fertilized plants. These results are supported by the findings of Alsheikly (2013) on *Iris hollandica*. Interaction between planting density and fertilization had a significant effect on this character, 1 bulb pot^{-1} density combined with 100 mg L^{-1} NPK fertilization gave the maximum fresh weight of the flowering stem 16.66 gm while the minimum obtained by using 4 bulbs pot^{-1} density with 100 mg L^{-1} NPK fertilization 9.11 gm (Table 7).

Vase life (day)

Data presented in Table 8 shows no significant effects due to different planting densities. These results are in agreement with the findings of Khalaj and Edrisi (2012) who found that planting tuberose at a density of (10×10, 15×15, 20×20) cm had no significant effects on the flowers vase life. Different levels of planting depth had no significant differences on this character. These results were in line with the findings of Mane *et al.*, (2007) on tuberose. Fertilization levels did not affect Iris vase life. Similar findings to these results have been reported by Alsheikly (2013). No significant differences were found due to interactions between the studied factors (Table 8).

Fresh weight of new bulbs (gm)

Planting density significantly increased the fresh weight of the new bulbs, the maximum 29.77 gm was obtained by a density of 4 bulbs pot^{-1} while the minimum 12.77 gm was obtained when planted at 1 bulb pot^{-1} density (Table 9). These results were in the same line with Bhat *et al.*, (2010) who reported that high plant density produced the maximum yield of gladiolus corms per m^2. Deep planting produced the maximum fresh weights of bulbs pot^{-1} 23.75 gm compared to 19.45 gm produced by shallow planting (Table 9). These results are confirmed by the findings of Barbara *et al*., (2013) who reported a significant increase in bulbs fresh weights of tulip due to deeper planting, this could be refer to the fact that, the increasing of depth lead to the decrease in temperature which reduces the respiration rate which mean provision of stored food consequently high corms fresh weights produced. N P K Fertilization had no significant effects on this character (Table 9). Similar results were obtained by Alsheikly (2013) on *Iris hollandica* cv. Prof. Blaauw. No significant differences were found due to interactions between the studied factors (Table 9).

Table 8. Effect of plant density, depth of planting and fertilization on the vase life (day) of *Iris hollandica* plants

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	5.33	5.66	5.50
	D2	5.33	6.00	5.66
	D3	5.66	5.33	5.50
P2	D1	5.33	5.33	5.33
	D2	5.33	5.33	5.33
	D3	5.00	5.00	5.00
P3	D1	5.33	5.33	5.33
	D2	5.66	5.33	5.50
	D3	5.33	5.00	5.16
P4	D1	5.00	5.00	5.00
	D2	5.00	5.00	5.00
	D3	5.66	5.00	5.16
L.S.D. at 0.05		NS		NS
Plant Density × Fertilization				Effect of Plant Density
P1		5.44	5.66	5.55
P2		5.22	5.22	5.22
P3		5.44	5.22	5.33
P4		5.11	5.00	5.05
L.S.D. at 0.05		NS		NS
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		5.25	5.33	5.29
D2		5.33	5.41	5.37
D3		5.33	5.08	5.20
L.S.D. at 0.05		NS		NS
Effect of Fertilization		5.30	5.27	
L.S.D. at 0.05		NS		

Table 9. Effect of plant density, depth of planting and fertilization on fresh weight of new bulbs (gm) of *Iris hollandica* plants

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	11.00	12.00	11.50
	D2	12.66	13.66	13.16
	D3	10.33	17.00	13.66
P2	D1	18.00	16.66	17.33
	D2	19.33	21.33	20.33
	D3	21.33	24.00	22.66
P3	D1	22.00	24.00	23.00
	D2	27.00	27.00	27.00
	D3	25.00	25.33	25.16
P4	D1	28.00	24.00	26.00
	D2	32.00	30.66	31.33
	D3	32.00	32.00	32.00
L.S.D. at 0.05		NS		NS
Plant Density × Fertilization				Effect of Plant Density
P1		11.33	14.22	12.77
P2		19.55	20.66	20.11
P3		24.66	25.44	25.05
P4		30.66	28.88	29.77
L.S.D. at 0.05		NS		2.15
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		19.75	19.16	19.45
D2		22.75	23.16	22.95
D3		22.16	24.58	23.37
L.S.D. at 0.05		NS		1.86
Effect of Fertilization		21.55	22.30	
L.S.D. at 0.05		NS		

Fresh weight of bulblets (gm)

Data in Table 10 show that high plant density produced the maximum fresh weights of bulblets 11.61 gm compared to 7.27 gm produced by low plant density of 1 bulb pot^{-1}. Depth of planting had no significant effects on this character, while fertilization significantly affected the fresh weights of bulblets, no significant differences were found due to interactions between the studied factors (Table 10).

Table 10. Effect of plant density, depth of planting and fertilization on fresh weight of bulblets (gm) of *Iris hollandica*

Plant Density	Depth of Planting	Fertilization		Plant Density × Depth of Planting
		F0	F1	
P1	D1	6.66	8.66	7.66
	D2	6.33	8.33	7.33
	D3	5.00	8.66	6.83
P2	D1	7.33	10.66	9.00
	D2	9.33	9.00	9.16
	D3	6.66	10.33	8.50
P3	D1	8.33	12.33	10.33
	D2	8.33	10.33	9.33
	D3	7.33	11.00	9.16
P4	D1	12.00	12.66	12.33
	D2	9.66	11.66	10.66
	D3	11.33	12.33	11.83
L.S.D. at 0.05		NS		NS
Plant Density × Fertilization				Effect of Plant Density
P1		6.00	8.55	7.27
P2		7.70	10.00	8.88
P3		8.00	11.22	9.61
P4		11.00	12.22	11.61
L.S.D. at 0.05		NS		1.07
Depth of Planting × Fertilization				Effect of Depth of Planting
D1		8.58	11.08	9.83
D2		8.41	9.83	9.12
D3		7.58	10.58	9.08
L.S.D. at 0.05		NS		NS
Effect of Fertilization		8.19	10.50	
L.S.D. at 0.05		0.76		

In general, flower quality improved when planting density decreased, this may probably be due to less competition between plants for water, nutrients, light, and more area for better root growth. Depth of planting show limited effects on the studied characters. These results confirmed by Rao *et al*., (1991) who reported that depth of plating have no significant differences on characteristics of growth and flowering. Some of the studied characters didn't response significantly to fertilization, this may be explain that iris is a bulbous plant and has enough food materials to supply the growing plant with nutrients.

CONCLUSION

1- Reducing planting density improves flowers quality of *Iris hollandica* cv. Prof. Blaauw.
2- Planting density of 3-4 bulbs pot^{-1} seems to be suitable for pot plant production and improve bulbs and bulblets production.
3- Chemical fertilization is recommended to be used at a concentration of 100 mg L^{-1}.

REFERENCES

Ahmed, M. J., M. Ahmad, T. Bashir, A.Yagoob, M. S. Jillani and M. Saeed. 2010. Effect of plant spacing on vegetative and reproductive growth of gladiolus cultivars. *Sarhad J. Agric.* 26(4): 539-543.

Alsheikly, A. A. 2013. Effect of bulb size and chemical fertilization on growth, flowering and bulbs production of *Iris hollandica. Diyala Agric. Sci.J.* 5(2): 581-592.

Alsheikly, A. A. 2010. Effect of growing media on growth, flowering and bulbs production of *Iris hollandica*. *Diyala Agric. Sci. J.* 2(2): 108-116.

Amjad, A. and I. Ahmad. 2012. Optimizing plant density, planting depth and postharvest Preservatives for *Lilium longiflorum. Journal of ornamental and horticultural plants* 2(1): 13-20.

Barbara, M., B. Hetman and D. Kozak. 2013. Influence of cultivation method and bulbs planting depth on the growth and yielding of tulips. *Acta Sci. Pol., Hortorum Cultus* 12(5): 97-110.

Bhat, Z. A., T. M. Paul and M. A. A. Siddiqui. 2010. Influence of spacing and bulb size on growth, development, flowering and corm production of Gladiolus (*Gladiolus grandiflorus*) cv. White prosperty. *Research Journal of Agricultural sciences* 1(3): 282- 283.

Bryan, J. E. 2002. Bulbs. Revised edition. Timber Press, Portland, Oregon U.S.A.

Butt, S. J. 2005. Effect of N, P, K on some flower quality and corm yield characteristics of *Gladiolus*. *Journal of Tekirdag Agricultural Faculty* 2(3): 212-214.

Gomez, K.A. and A. A. Gomez. 1984. Statistical Procedures for Agricultural Research 2nd Ed.John wiley, New York, USA.

Hatamzadeh, A., A. Tehranifar and R. Akbari. 2012. Effect of planting depth, bulb size and their interactions on growth and flowering of tuberose (*Polianthus tuberosa* L). *Am-Euras. J. Agric.& Environ. Sci.* 12(11): 1452-1456.

Khalaj, M. A. and B. Edrisi. 2012. Effect of plant spacing and nitrogen levels on quantity and quality characteristics of tuberose (*Polianthus tuberosa* L.) under field experiment. *Inter. J. Agric. Sci.* 2(3): 244-255.

Larson, R. A. 1992. Introduction to Floriculture. Academic Press, Inc. San Diego. CA.

Mahgoub, H. J., R. A. Eid and B. H. Abou Leila. 2006. Response of *Iris* bulbs grown in sandy soil to nitrogen and potassium fertilization. *J. Appl. Sci. Res*., 2(11): 899-903.

Mane, P.K., G. Banker and S. S. Makne. 2007. Influence of spacing, bulb size and depth of planting on flower yield and quality of tuberose (*Polianthus tuberosa* L.) cv. Single. *Indian J. Agric. Res*., 41(1): 71-74.

Rao, D.V.R., K. B. Redd, L. N. Naidu and V. Suryanarayana.1991. Effect of bulb size and depth of planting on growth and flowering of tuberose (*Polianthus tuberosa* L.) cv. Single. *Hort.Sci.* 39(3): 143-145.

Sewedan, E., H. El-Naggar and A. Osman. 2012. Effect of nitrogen and diphenylamine on *Gladiolus hybrida* cv. Sancerre production. *J. Hort. Sci. & Ornamen. Plants*, 4(3): 267-274.

تأثير كثافة الزراعة واعماقها والتسميد الكيميائي في نمو الايرس الهولندي *Iris hollandica* وإزهاره

عبدالرحمن عبدالقادر الشيخلي

استاذ مساعد، قسم البستنة وهندسة الحدائق- كلية الزراعة – جامعة ديالى، العراق

المستخلص

نُفذت التجربة في مشتل للزهور في مدينة بغداد خلال الموسم 2013-2014، الهدف من التجربة هو دراسة تأثير اربع كثافات زراعة (1 ،2 ،3 ،4) بصلة أصيص$^{-1}$، وثلاثة أعماق للزراعة (3 ، 6 ، 9) سم ومستويين من التسميد الكيميائي المركب NPK (0 ، 100) ملغم لتر$^{-1}$ في صفات النمو والإزهار لنباتات الايرس الهولندي صنف Prof. Blaauw، وقد اشتملت القياسات على: عدد الأيام لغاية الإزهار، ارتفاع النبات، قطر الزهرة، قطر الساق الزهري، الوزن الطري للساق الزهري، العمر المزهري، الوزن الطري للبصلة الجديدة والوزن الطري للبصيلات. كان لكثافة الزراعة (1 بصلة أصيص$^{-1}$) تأثيرٌ معنويٌ في إعطاء أفضل النتائج لصفات ارتفاع النبات، وقطر الزهرة، وقطر الساق، والوزن الطري للساق الزهري، بينما اعطت اقل القيم لصفتي الوزن الطري للبصلة الجديدة والوزن الطري للبصيلات. كان لعمق الزراعة تأثيرا معنويا في تأخير الإزهار وزيادة الوزن الطري للأبصال الجديدة وقلل معنوياً الوزن الطري للساق الزهري، التسميد الكيميائي زاد معنويا من قطر الساق، والوزن الطري للساق الزهري، والوزن الطري للبصيلات، وخفض معنويا من عدد الأيام لغاية الإزهار. التداخل بين عمق الزراعة والتسميد الكيميائي وكذلك بين كثافة الزراعة والتسميد الكيميائي كان لهما تأثيرا معنويا في عدد الايام لغاية الإزهار والوزن الطري للساق الزهري على التوالي.

الكلمات المفتاحية: زهرة السوسن، كثافة الزراعة، عمق الزراعة، تسميد.