RESPONSE OF ALLIUM CEPA (L.) FOR IRRIGATION AND POTASSIUM QUANTITIES

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Abstract

A two-year experiment on onion cv Giza 20 was carried out during 2005/06 and 2006/07 at Agric Res. Sta. (A RC), at Gemmiza, Gharbia governorate, Egypt. The trail included two factors, viz. irrigation (I) at (80, 60 and 40% available soil moisture, ASM) and potassium (K) rate at (120, 100 and 80 K_2O/fed.). The treatment combinations were arranged in a split plot design with three replicates. Irrigation levels were randomly distributed at the main plots, meanwhile the sub ones were devoted to potassium levels. Six traits performance correlation among them, efficiencies of the use of water and K as well as some relations were studied. The results showed that the studied two factors and their interactions significantly affected all studied traits as well as use efficiency of both water and potassium. The pronounced products with all respects, either traits or efficiencies, were given by applying 1-60, K 100 and their interaction (1-60 x KI00) for water use efficiency (W.U.E). Meanwhile for potassium use efficiency (K.U.E) the treatments were 1-60, K80 and (1-60 x K80). Highest bulb yields were 19.80 and 18.33 ton/fed. in the first and second season respectively. Correlation coefficient was, in most cases, positive and highly significant. Without any exception, correlations of bulb yield with all traits were positive. The corresponding ones of total soluble solid (T.S.S) were insignificant in both seasons. Water use efficiency was 11.41 and 10.57

Kg/m^3 in the two respective seasons. The corresponding values of potassium use efficiency were 197.95 and 183.25 Kg/Kg K_2O, respectively. The curve analysis showed that the relation between bulb yield and both water consumptive use and potassium rate was a quadratic one in both seasons .

Key Words: Irrigation quantity, potassium levels and efficiency, yield, bulb quality and water use efficiency .

INTRODUCTION

Onion, Allium cepa (L.), is one of the most important vegetable crops in Egypt. It occupies the third cultivated area after tomato and potato. Also, its importance lies in exportation and local consumption. However, such consumption reached about 12.5 kg/person giving one million ton for Egypt .

Egypt is facing a great problem because the limited water resources, and the fearful increase in population. The response of onion growth and yield to irrigation was deeply studied, many decades ago. Battiloni and Lanzoni (1987) found that onion strongly responded to irrigation under maximum ET and short watering intervals. Pfulb and Zengerle (1990) reported that annually irrigation rate was 400-450 mm/ha. Some traits, as plant height, No. of leaves/plant, chlorophyll content, fresh weight and dry weight of bulbs, were positively affected by increasing soil moisture, (El-Oksk and El-Gizawy, 1993). They added that water stress in any growth stage reduced onion yield. Mateen et al (2005) approved, by irrigation at 5 day interval, pronounced results on plant height, No. of leaves/plant and bulb yield. In addition, Al-Moshileh (2007) reported that sufficient irrigation enhanced growth parameters and yield. Many researchers think that saving water is possible, however such save could by controlled by fertilizer application. Santa-Olalla et al (2004) found that the greatest volume of water during the development and ripening stages yielded high percentage of large size of bulbs. Glala et al

(2007) pointed out that sufficient irrigation improved yield, quality and storage ability of bulbs .

EI-Ganayni (2002) stated that the need of Egyptian soil to potassium (K) fertilization becomes a problem under question, because of its continuous .depletion as a result of more intensive cropping, the relative absence of the compensatory effect of Nile flow after building High Dam and for producing new crop varieties having high yield potential. Therefore, no surprise that some crops, including onion, were formerly regarded as needing little support from K, have now K requirements equaling or nearing those of the traditional K- hungry crops. In addition, potassium was considered; for a near time, in the Egyptian consideration, as a neglector fertilizer, especially in the old land. Nowadays, potassium reflects particular problem, which lies in-its depletion by some field crops including onion. Such removal of K will cause a tragic problem, if will not be compensated by K fertilization. In addition to previous specific value of K fertilization in Egyptian agriculture, potassium in general plays a remarkable role in stomotal opening and closing process, controlling evapotranspiration. Maria et al (2008) added that K promotes mineral up take, enzymes activity, the translocation of assimilates and protein synthesis. Also, AI-Jamal et al (2001) reported that K application enhanced water use efficiency .

Many authors accept the critical importance of K fertilizer for growth and yield of onion. In some cases, the relation between K amount and onion yield was a linear one. The optimum K fertilizing ranged between 80 kg/ha (Dilruba et al (2006). EI-Bassiony (2006) successfully used 100kg K/fed. as an optimal rate. Most of onion traits were significantly enhanced by K addition. However, Malakouti et al (2005) found such effect on yield and quality. EI-Desuki et al (2006) observed the positive effect of K addition on plant height, No. of leaves plant, bulb diameter, plant fresh and dry weight and yield. Noor et al (2007) gave similar results .

The goal of the present study is to evaluate the role of watering and potassium on the growth and yield of onion, to achieve the optimal treatment for onion yield.

MATERIALS AND METHODS

The present investigation was carried out at Agricultural Research Station (A.R.S.), Agric. Res. Ccn. (ARC) at Gemmiza, Gharbia Governorate, Egypt, during 2005/06 and 2006/07. In both seasons, onion cv Giza 20 (the common cultivar in Delta) was planted. The preceding crop was Egyptian clover. Transplanting of seedling was in December 15th Distance bctween rows and hills werc 50 cm and 10 cm, respectively. The experimental plot area was 12.5 m^2, consisting of 5 rows, each of 5 m. length. Harvest was carried out at yellowing and drying of the blades . Calcium super-phosphate (15.5% P_2O_5) at 23.0 Kg/fed. was added before plowing. Nitrogen was added as ammonium sulphate (20.6% N) at 40.0 Kg N/fed., in two equal rates; before the first and second irrigations. Irrigation was withheld 15 days beforc harvest. The other agricultural practiccs, except the studied ones, were carried out as usual .

Soil samples were taken at different depths to determine the physical and chemical properties of soil. Results obtained are shown in Table (1). Field capacity (F.C.) and wilting point (W. P.) were determined according to Gomma (1993). Field capacity, wilting point, available soil moisture (A.S.M) and bulk density (B. D.), as means over the two seasons were: 35.05%, 19.56%, 15.50% and 1.29 g/cm^3, respectively .

Table 1. Some physical and chemical properties of soil, average over 2005/06 and 2006/07 seasons.

Physical properties				
Depth (cm)	Texture	Silt %	Find sand %	Clay %
0- 10	Clay	32.88	14.58	52.54
11 – 20	Clay-loamy	35.40	12.03	52.57
21 - 30	Clay-loamy	27.59	11.63	60.78

Chemical properties										
Depth (cm)	pH	EC dsm^{-1}	Soluble cations (meq/L)				Soluble anions (meq/L)			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{-}	HCO_3^{-}	Cl^{-}	SO_4^{-}
0-10	8.01	2.19	2.41	1.78	16.86	0.87	Nil	3.45	14.11	4.36
11-20	8.01	1.37	1.72	0.59	8.21	0.62	Nil	2.65	6.83	1.66
21-30	8.11	1.37	1.72	0.89	8.18	0.56	Nil	2.65	5.92	2.78

Treatments and design:

Potassium sulphate (48.0% K_2O) was broadcasted at once, before Mohaya (first irrigation). Irrigation treatments were started 14 days after transp, lanting. The treatments were as follows :

I - Irrigation treatments :

1 - Irrigation at 80% available soil moisture (ASM) level (1- 80) .

2 - Irrigation at 60% available soil moisture (ASM) level (1- 60) .

3- Irrigation at 40% available soil moisture (ASM) level (1- 40) .

II - Potassium rates :

1 – 120 Kg K_2O/fed. (KI20).

2- 100 Kg K_2O/fed. (KIOO).

3- 80 Kg K_2O/fed. (K80) .

III – Combination treatments:

All possible combination treatments among the levels of the two independent factors were studied .

IV- Design:

The experimental design used was split plot with three replicates. The main plots were devoted to irrigation treatments, while the sub ones were assigned for potassium rates. The width of borders among replicates and whole plots were 2.0 m. to avoid water infiltration effects .

Studied topics :

A-Traits:

At harvest, ten guarded plants were randomly chosen from the three inner rows of each plot, to measure the studied. traits. Yields/plot were weighed, then yield/fed. was calculated. Thc studied traits were as follows :

1 - Plant height (cm). 4-Bulb weight (g) .

2- Number of leaves/plant. 5- Total soluble solid (T.S.S)

3- Bulb diameter (cm). 6-Bulb yield (ton/fed).

B- Water Relationships:

Soil moisture content was determined beginning with the first irrigation, after Mohaya, at 48 hours after irrigation, soil samples were taken with auger at 0.0 to 60.0 cm depth from each plot. Samples were immediately transferred in tightly closed of aluminium cans, weighed, and dried in an electric oven at 10S°C, until constant weight. The moisture content was determined gravimetrically. Irrigation was practiced when the needed soil moisture content was attained for every treatment separately .

Total season water consumptive use (W.C.U) at 1-80, 1-60 and 1-40 ASM were 2167.20, 1733.76 and 1300.32 m^3/fed., respectively. Water requirements as expressed in water consumptive use (W.C.U) were estimated as the amounts of irrigation water applied in the different irrigations, then summed together in m]/fed. Water consumptive use was estimated as fol1ows -:

$WCU = (Q2-Q1)/100 \times Bd \times 4200 \times D)$

Where :

Q2 = Soil moisture percent after irrigation.

Q1 = Soil moisture percent before irrigation.

Bd = Bulk density of soil (g/cm^3) .

D = The irrigation soil depth (m).

Water use efficiency (WUE, Kg/m]) was calculated according to Vites (1965) as follows.

$$W.U.E = \left(\frac{\text{Bulb yi.eld,. Kg/fed.}}{\text{WCU, } m^3\text{/fed .}} \right).$$

C-Potasslum use efficiency (K.U.E):

Potassium use efficiency (K.U.E, Kg/Kg K_2O) was calculated according to EI-Fouly[20] as follows.

$$K.U.E = \left(\frac{\text{Bulb yield, Kg/fed .}}{K_2O \text{ Kg/fed .}} \right)$$

Statistical Analysis: Data were exposed to the proper statistical analysis of variance. The means presented in the study following the same alphabetical letters were insignificantly different at the probability level of 0.05, according to LSD test. Simple correlation coefficient (r) for all possible combinations among studied onion traits were calculated, in both seasons. All statistical analyses were carried out as described by Gomez and Gomerz (1984) .

RESULTS AND DISCUSSION

A-Traits:

Data in Table (2) show the effect of irrigation, potassium and their interaction on vegetative growth traits and yield in the first and second seasons. Significancy was obtained on main effects and their interactions except No. of leaves/plant, where the differences were insignificant. Regarding irrigation, the 1-60 ASM produced the greatest values with all respects. Oppositely, the 1-40 ASM treatments gave the lowest values on all aspects except T.S.S. trait. This means that the 1-60 ASM may provided onion with its adequate water needs. Such quantity of water allowed good growth and promoted suitable development. It could be understood that cell division and elongation were promoted by sufficient water. Thereafter, taller plants were produced. No doubt, that greater No. of leaves/plant are available on tal1er plants. The good effects on plant height and No. of leaves/plant were in turn with the storage of different solids, giving sounded bulb diameter, bulb weight and consequently bulb yield/fed. These results are in good hannony with those of Al-Moshileh (2007).

Obviously, Table (2) indicates that applying l00 kg K_2O was able to give tal1est plants, greatest No. of leaves/plant, heaviest and total yield as compared to the other two treatments. The lowest finding on the traits was detected on 80 kg K_2O. It seemed that potassium plays an important role on promotion of enzymes activity and enhancing the translocation of assimilates and protein synthesis. Such positive effects are normal1y turn in vegetative growth attributes, including plant height, (EI-Bassiony (2006), No. of leaves/plant (Bloch et al, 1999 and Islam, 1999) and total bulb yield, (Al-Moshileh, 2001). Moreover, some researchers think that potassium encourages mineral up take, of them Vidigal (2002) .

Table (2): Studied traits as affected by irrigation. potassium levels and their interactions in the two seasons .

Treatments	Plant height (cm)		No. of leaves/plant		Bulb dilmeter (cm)		Bulb weight	
	season1	season	season	season	season1	season2	season1	season2
1-80	56.3 b	51.9 b	12.3 b	11.6 b	5.79 b	6.22 b	127.25 b	123.33 b
1- 60	57.8 a	55.5 a	13.5 a	12.3 a	6.49 a	6.91 a	155.93 a	143.33 a
1- 40	53.8 c	50.7 c	11.0 c	10.5 c	5.28 c	5.71 c	118.53 c	110.82 c
LSD at a	0.111	0.588	0.588	0.588	0.023	0.176	2.065	2.893
K 120	55.5 b	53.5 b	12.1 b	11.5 b	5.87 b	6.22 b	133.85 b	123.33 b
K 100	57.9 a	56.0 a	13.0 a	12.0 a	6.12 a	6.62 a	136.48 a	130.82 a
K 80	54.4 c	48.7 c	11.6 c	11.0 c	5.59 c	6.01 c	131.37 c	123.33 b
LSD at a	0.368	0.726	0.334	0.334	0.018	0.155	1.045	1.645
1- 80 X K 120	55.1 e	52.0 d	12.0	12.0	5.81 e	6.22 d	127.46 d	120.00 d
1- 80 X K 100	59.0 b	53.5	13.0	12.0	5.98 d	6.34 c	128.70 d	130.00 c
1- 80 X K 80	54.8 e	50.2 e	12.0	11.0	5.59 f	6.11 d	125.58 e	120.00 d
1- 60 X K 120	57.4 c	58.2 b	13.5	12.0	6.49 b	6.74 b	155.64 b	140.00 b
1- 60 X K 100	60.1 a	60.0 a	14.0	13.0	6.88 a	7.45 a	160.00 a	150.00 a
1- 60 X K 80	56.0 d	48.5 f	13.0	12.0	6.12 c	6.54 b	152.14 c	140.00 b
1- 40 X K 120	54.1 f	50.2 e	11.0	10.5	5.31 b	5.69 e	118.46 g	110.00 e
1- 40 X K 100	54.7 e	54.5 c	12.0	11.0	5.49 g	6.08 d	120.73 f	112.47 e
1- 40 X K 80	52.5 g	47.5 f	10.0	10.0	5.06 i	5.37 f	116.38 b	110.00 e
LSD at a	0.638	1.257	N.S	N.S	0.032	0.268	1.810	2.849

Traits / Treatments	T. S.S.		Bulb yield Ton / fed.		W. U. E.		K . U. E.	
	season1	season	season	season	season1	season2	season1	season2
1- 80	12.3 c	11.0 c	15.5 b	13.9 b	7.19 c	6.45 c	159.33 b	143.22 b
1- 60	14.4 a	12.4 a	18.8 a	17.1 a	10.88 a	9.91 a	193.62 a	175.62 a
1 - 40	13.3 b	11.8 b	13.0 c	12.0 c	10.06 b	9.23 b	133.22 c	122.56 c
LSD at < 0.05	0.157	0.369	0.056	0.111	0.056	0.056	0.667	0.892
K 120	12.6 c	11.5 b	15.7 b	14.3 b	9.36 b	8.54 b	131.59 c	119.65 c
K 100	14.0 a	11.9 a	16.8 a	15.1 a	9.98 a	9.00 a	168.47 b	151.79 b
K 80	13.4 b	11.8 a	14.8 c	13.6 c	8.78 c	8.05 c	186.10 a	169.96 a
LSD at a	0.148 b	0.161	0.055	0.084	0.037	0.055	0.591	0.889
1- 80 X K 120	11.8 b	10.7 d	15.5 e	13.7 e	7.19 b	6.35 b	129.75 b	114.58 b
1- 80 X K 100	12.8 e	11.4 c	16.6 d	14.6 d	7.68 g	6.78 g	166.30 d	146.75 d
1- 80 X K 80	12.2 g	11.0 d	14.5 f	13.4 f	6.72 i	6.22 i	181.94 c	168.31 c
1- 60 X K 120	13.5 d	12.4 a	18.4 b	17.1 b	10.65 c	9.88 b	153.92 e	142.67 e
1- 60 X K 100	15.2 a	12.5 a	19.8 a	18.3 a	11.41 a	10.57 a	197.95 b	183.25 b
1- 60 X K 80	14.5 b	12.5 a	18.3 c	16.0 c	10.57 d	9.27 e	228.99 a	200.94 a
1- 40 X K 120	12.5 f	11.5 c	13.3 b	12.2 b	10.26 e	9.39 d	111.11 i	101.69 i
1- 40 X K 100	14.0 c	12.0 b	14.1 g	12.5 g	10.85 b	9.64 c	141.15 g	125.36 g
1- 40 X K 80	13.5 d	12.0 b	11.7 i	11.2 i	9.07 f	8.65 f	147.39 f	140.63 f
LSD at a	0.257	0.279	0.095	0.145	0.063	0.095	1.024	1.540

The combination (1-60 x K 100) clearly produced the greatest findings with all respects. Such combination yielded about 19.80 and 18.33 ton/fed, in the first and second seasons, respectively. Lowest products were obtained on the combination (1-40 x K 80). These results mean that potassium levels succeeded to

interact with the corresponding ones of irrigation. Such successful was flashable with (I-M x K 100). The present results are in line with those of Abd EI-Hadi (2004) who reported that potassium improves drought tolerance of some field crops. In additions, Maria et al (2008) found similar results on sunflower .

B-Wafer Relationships :

Water use efficiency (W.U.E): Water use efficiency showed expected results. However, such relation is a ratio between bulbs yield kg/fed. and water consumptive use (W.C.U), m^3/fed. In other words, the value of W.U.E could be greater if the yield increases or (W.C.U) decreases. Thereafter, in Table (2), lower (W.U.E) could be obtained by using irrigation at 1-80 or K80. Consequentially, the highest W.U.E among irrigation treatments, viz. 10.88 and 9.91 kg/m^3 in the two respective seasons were detected on 1-60. Similarly, the best W.U.E among potassium levels viz 9.98 and 9.00 kg/m^3 in the two respective seasons were observed on K100 .

Through the same think, the greatest W.U.E among the combinations of the levels of the two factors were 11.41 and 10.57 kg/m^3. Such superior values were produced by (1-60 x K 100), which produced highest yield and moderate water consumption, in reverse to the combination of higher watering (1-80) and lower yield (K80), Table (2). Results are in agreement with the finding of AI-Jamal *et al* (2004) and Marwa M Abdel-Baset (2009).

C- Potassium Use Efficiency (K.U.E):

Table (2) gives the obtained values of K.U.E under the effects of irrigation and potassium and their interactions. It is clear that potassium efficiency was the greatest when applying 1-60 (193.62, 175.62), K80 (186.10 , 169.96) and their interaction (228.99, 200.94) in the two successive seasons. These results indicate that previous treatments are secure means for rising up the efficiency of potassium use. Such treatments may be recommended herein .

D-Association :

1- Correlation:

Table (3) represents the simple correlation coefficients among the studied traits in the two seasons. It is obvious that in the first season, among 15 coefficients, two ones were insignificant calculated on T.S.S correlations. In the second season, three coefficients were insignificant, on T .S.S too. It seemed that the positive and high significant correlation of yield trait with most of yield components reflect the close relation among them .

Table (3): Simple correlation coefficients (r) among the studied traits in the two seasons .

Traits		Plant height (cm)		No. of Leaves/plant		Bulb diameter (cm)		Bulb weight (g)		Tss	
		S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2	S_1	S_2
	S_1	0.87**		0.96**		0.98**		0.95**		0.5**	
	S_2		0.72**		0.90**		0.96**		0.98**		0.5**
	S_1	0.43		0.46		0.53		0.64			
	S_2		035		0.25		0.44		0.55		
	S_1	0.73**		0.86**		0.94**					
	S_2		0.62		0.88**		0.92**				
	S_1	0.90**		0.94**							
	S_2		0.79**		0.93**						
	S_1	0.91**									
	S_2		0.68**								

2 - RelatIon Between Bulb Yield and Both W.c.u and K Rate:

Figure (I) from A to D declares that the relations were quadratic with R^2 =1 it is well known that most of biological relations are quadratic. Similar trends were obtained by Abdou (2005). On the other band, Dilruba et al (2006) found such relation as a linear one .

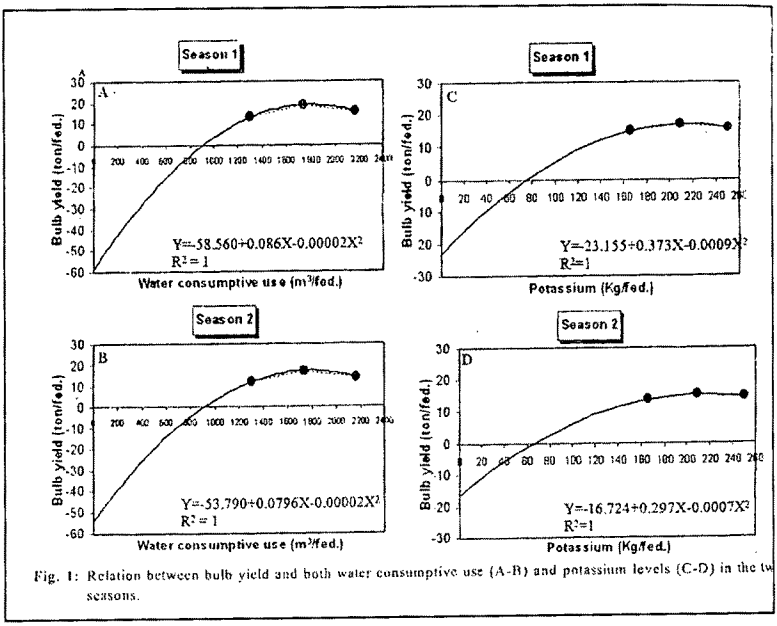

Fig. 1: Relation between bulb yield and both water consumptive use (A-B) and potassium levels (C-D) in the two seasons.

- Irrigation, potassium and their interaction play a remarkable and constructive role in onion production.
- For pronounced onion yield, the treatments 1-60 x K100 and their interaction (1-60 x K 100) coud be recommended.

Fig.1. Relation between bulb yield and both water consumptive use (A-B) and potassium levels (C-D) in the two seasons.

From all the above mentioned results, it may be concluded the followings:

- The same treatments previously mentioned had also a main role for good water use efficiency.
- The corresponding treatments in KUE could be 1-60, K80 and (I-60 x K80).
- Correlation among bulb yield and its contributors could be positive and significant.
- Relation between bulb yield and each W.U. E. and K rate could be a quadratic one .

REFERENCES

1. Battilani, A. and Lanzoni, L. 1987. Onion irrigation determination of watering volumes and intervals. Irrigazion-e-Drenggio, 34(2): 11-16 [CF. irrigation and Drainage Abs. 14: 1358] .
2. Pfulb, E. and Zcngerlc, K.H. 1990. Watcr consumption and .irrigation .of summer onions. Gcmuse, 26(9): 435-439 .
3. EI-Oksh, 1.1., EI-Gizawy, A.M, AbdaIlah, M.M.F. Mohamcd A.R.A.G. and Abdalla, A.A.G. 1993. Effect of soil moisture and nitrogen fertilizer levels on onion grown in mixture of tafla and sand (1:7. B ulletin-of-Faculty-o f-Agriculture, University Cairo, 44(1): 145-]56 .
4. Gary, Q.P, Robert, M. Brian G.L. and Cristoti, A.R . 2004. Effects of watcr stress at specific growth stages on onion bulb yield and quality. Agricultural Water Management, 68: 107-115 .
5. Mateen ul Hassan Khan, Muhammad Imran and Tahir Hussain Chattha, 2005. Effect of irrigation intervals on growth and yield of onion varieties Swat-I and Phulkara Journal of Applied Sciences Research, 1(2): 112-116 .
6. AI-Moshileh, A.M., 2007. Effects of planting date and irrigation water Icvcl on onion (Allium cepa L.) production under central Audi Arabian conditions. Scientific Journal of 'King Faisal Univcrsity (Basic and Applied Scienccs), 8(1): 1428H .
7. Santa-Olalla, F.M. dc, Domingucz-Padilla, A. and Lopez, R. 2004. Production and quality of the onion crop (Allium cepa L.) cultivated under controllcd deficit irrigation conditions in a semiiarid climate Agricultural- Water-Managemcnt, 68(1): 77-89 .
8. G1ala A.A., Ezzo M.I. and Saleh, S.A. 2007 .Approaching to determine the optimum onion cultivar and water management in newly reclaimed sandy soil condition "EI-Bostan region. Annals of Agric. Se. Moshtohor, 45(3): 1199-1214 .
9. EI-Ganayni, A.A., 2000. Scheduling irrigation using Pan evaporation under some potassium levels in flicia faba L. J. Agric. Sci. Mansoura, 25(3): 1523-1538 .

10. Maria M. Benlloch-Gonza'lcz, Octavio Arquero, Josc' Man'a Fournier, Diego Barranco, Manuel BenIloch, 2008. K+ starvation inhibits water induced stomatal closure. Journal of Plant Physiology, 165: 623-630 .
11. AI-Jamal, M.S, Ball S. and Sammis, T.W. 2001 .Comparison of sprinkler, trickle and furrow irrigation efficiencies for onion production. Agricultural·Water-Management, 46(3): 253-266 .
12. Dilruba, S., Alam, M.M. Rahman M.A. and Hasan M.F . 2006. Influence of nitrogen and potassium on yield contributing bulb traits of onion. International Journal of Agricultural Research, Le J. 85-90, ISSN 1816-4897 .
13. Abdulsalam M.A. AL and Hamaiel, A.F. 2004 .Effect of planting dates and compounded fertilizers on growth, yield and quality of Hassawi onion under AI-Hassa Oasis conditions. Scientific Journal of King Faisal University (Basic and Applied Sciences), 5(1):]4-25 .
14. EI-Bassiony, A.M., 2006. Effect of potassium fertilization on growth, yield and quality of onion plants. Journal of Applied Sciences Research, 2(10): 780-785 .
15. IS. Malakouti, M.J., Bybodi, A. Ranjbar, R. Nouri, A.A . 2005. The Role of Zinc (Zn) and Potassium (K) on the Reduction of Nitrate (NO,) and Cadmium (Cd) Contaminants in Potato and Onion. [Online]. Available at http://www. zinc-crops.org! Z n Crop s2 0-0 7/ PO F /2007 zinccrop s 2007-malakouti-abstract.pdf .
16. EI-Desuki, M., Abdel-Mouty M.M. and Ali, A.H. 2006. Response of onion plants to additional dose of potassium application. Journal of Applied Science Research, 2(9): 592-597.
17. Noor, S., Khan, M.S. Shil, N.C. and M. Talukder, R . 2008. Integrated nutrient management for sustainable yield of major spice crops in Bangladesh. Bangladesh J. Agric. and Environ. 4: 95-] 13, Special Issue .
18. Gomma, F.A., 1993. Comparison between different field and laboratory methods for soil physical analysis and measurements. Ph. O. Thesis, Fac. of Agric., Cairo Univ., Giza, Egypt .
19. Vites,. F.G. Jr.,]965. Increasing water use efficiency by soil management. Amer. Soc. Agron., Madison, Wise: 259·274 .

20. EI-Fouly M.M. 1976. Project of micronutrients and plant nutrition problems in Egypt. A join project GTZ, National research centre Egypt .
21. Gomez, K.A. and Gomez, A.A. 1984. Statistical procedures for agricultural research. John WHey & Sons, Inc. New York, USA .
22. Baloch, M.A., Baloch, A.F. Gohrma A.H. Baloch Ansar and Ayyam, S.M.Q.]991. Growth and yield response of onion to different nitrogen and potassium fertilizer combination levels. Sarhad J. Agric., 7: 63-66. (C.F. hort. Abst, 63(]): 258, 1993) .
23. Islam, M.A., \999. Growth and yield response of onion to different sources of potassium and application methods. 11. Yield attributes and potassium uptake. Thai-Journal of Agric. Sci., 32: 443-452 .
24. AI-Moshileh, AM., 2001. Effect of nitrogen, phosphorus and potassium fertilizers on onion productivity in central region of Saudi Arabia. Assiut J. Agric. ScL, 32: 29]-305 .
25. Vidigal, S.M., P.R.G. Pereira and Pacheco, D.D. 2002. Mineral nutrition and fertilization of onion. Informe. Agropecuario., 23(2] 8): 36-50 .
26. Abd EI-Hadi A.H., 2004. Country Report on Egyptian Agriculture Soils, Water& Environment Research Institute, ARC, Giza-Egypt. IPI regional workshop on Potassium and Fertigation development in West Asia and North Africa, Rabat, Morocco, 24-28 .
27. Marwa, M. Abdel-Baset, 2009. Effect of technical operating conditions of central pivot irrigation system on optimizing water use for onion crop. M. Se. Thesis, Fac. of Agric., Ain Shams Univ., Cairo, Egypt .
28. Abdou, M.A.A, 2005. Studies on some experimental factors in corn plants grown under different conditions of water supply and potash fertilization. Ph. O. Thesis, Fac. Agric., Cairo Univ., Giza, Egypt .

استجابة البصل لكميات مياه الرى والتسميد البوتاسى

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أجريت تجربة حقلية على صنف البصل جيزة ٢٠ خلال الموسمين ٢٠٠٥ / ٢٠٠٦ و ٢٠٠٦ /٢٠٠٧ فى مركز البحوث الزراعية بمحطة الجميزة محافظة الغربية – مصر . تضمنت الدراسة عاملين ، الأول الرى عند ثلاثة مستويات من الرطوبة الأرضية المتاحة ASM (٨٠ ، ٦٠ ، ٤%) والثانى عنصر البوتاسيوم (K) بمعدلات (١٢٠ ، ١٠٠ ، ٨٠ كجم أكسيد بوتاسيوم/فدان). رتبت معاملات الرى فى القطع الرئيسية لتصميم قطع منشقة بينما وزعت معاملات البوتاسيوم فى القطع الشقية . درست كفاءة استخدام كل من الماء والبوتاسوم إلى جانب ست صفات أخرى .

أوضحت النتائج أن العطاءات المتميزة على الصفات وكذا كفاءة استخدام المياه كان من الممكن تحقيقها مع المعاملتين ، الرى عند ٦٠% ASM و ١٠٠ K والتفاعل بينهما ، أما أعلى كفاءة لاستخدام البوتاسيوم يفقد تحققت مع ذات معاملة الرى 60% ASM وإن تراجع معدل البوتاسيوم إلى (K80) .

- تراوح محصول البصل بين١٨,٣٣ إلى ١٩,٨٠ طن / فدان فى الموسمين على التوالى.
- كان معامل الارتباط البسيط بين المحصول وباقى الصفات موجباً وعالى المعنوية . على النقيض من نظيره عند استبدال المحصول بصفة المواد الصلبة الذاتية (TSS).
- تراوحت كفاءة استخدام المياه بين ١٠,٥٧ – ١١,٤١ كجم .
- بين تحليل منحنى العلاقة بين المحصول وكل من كفاءتى استخدام المياه والبوتاسيوم أنها علاقة من الدرجة الثانية (التربيعية) Quadratic .

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