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EFFECT OF WATER STRESS AND POTASSIUM FERTILIZER LEVELS ON GROWTH AND YIELD OF COTTON CULTIVAR GIZA 88

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ABSTRACT

The present investigation was carried out at Sakha Agricultural Research Station during 2002 and 2003 seasons of the Egyptian cotton cultivar Giza 88 (*Gossypium barbadense* L.). The aim of this investigation was to study the effect of water stress and potassium fertilization levels on growth, earliness and seed cotton yield as well as its components. A split plot design with four replication was used. The main plots was assigned to water stress treatments (irrigation intervals) i.e. irrigation every two weeks, every three weeks and every four weeks. Three potassium levels i.e. 0, 24 and 48 K_2O/feddan was assigned in the sub plots. The nitrogen fertilizer was 60 kg/fed. for all treatments.

The results of this experiments indicated that irrigation interval every two weeks increased final plant height, number of the internodes main stem, both sympodial and monopodial branches, total dry weight number of open and unopen bolls, boll weight, lint % and seed cotton yield per both plant and feddan, while it decreased main stem internode length. Number of days from sowing date to the first flower appearance and the first boll craking were significantly decreased as the irrigation intervals increased. Earliness percentage was significantly increased by increasing irrigation intervals while position of the first sympodium was not affected by irrigation intervals. Leaf area was significantly increased as irrigation intervals decreased up to two weeks.

With respect to potassium levels the results indicated that plant height, number of internodes per plant, internode length, numbers of monopodia/branch per plant, lint percentage and seed index were insignificantly affected by K rates in the two seasons. On the other hand, number of sympodium per plant, total dry weight per plant, leaf area, numbers of open and unopen boll per plant, boll weight, seed cotton yield per plant and per feddan were significantly increased by increasing potassium fertilizer rates from 24 up to 48 kg K_2O/fed.

The interaction between irrigation intervals and potassium fertilizer levels had significant effect on total dry weight, number of open bolls/plant, boll weight, seed cotton yield per plant and seed cotton yield per feddan only in 2002 season. The greatest values of these traits were obtained from the irrigation every two weeks and potassium fertilization at 48 kg K_2O/fed. Seasonal consumptive use incubic meters per feddan and water use efficiency were decreased by expanding the irrigation intervals. On the other hand, consumptive use of water was decreased by increasing potassium fertilizer levels while use of efficiency was increased in the two seasons.

INTRODUCTION

The importance of irrigation due to its role in the availability of soil moisture which is considered as a solvent for nutrients, and also necessary for building plant tissues. In Egypt, the reducing in cotton yield due to many factors such as water supply nitrogen and potassium fertilization and pest control management. Many researches were done in this field but the problem was more difficult because it concerned with the political socials and economic behavior of Egyptian farmers and in the same time the growing condition over all the seasons changed from year to year. In this respect, Chaudhry (1969) found that irrigation intervals (8, 15, 22 and 29 days) influenced plant height, numbers of branches/plant and number of node at the first sympodium. He indicated that closely spaced irrigation delayed the appearance of the first flower. Abd El-Kader (1980) found that yield earliness was slightly affected by number of irrigation. Gomaa *et al.* (1981) indicated that decreasing irrigation intervals significantly increased both boll number and weight, number of sympodia and seed cotton yield, but it decreased earliness. Kater *et al.* (1989) revealed that frequent irrigation reduced internode elongation. El-Shahawy and Abd El-Malik (1999) found that irrigation cotton every two weeks resulted in higher number of internodes at main stem monopodia, sympodia, total dry weight, number of open bolls, boll weight, lint percentage, seed index and seed cotton yield. They concluded that irrigation every two weeks raised the position of the first sympodium, increased number of days to first open flower and boll and decreased earliness percentage. On the other hand, potassium is one of the most important elements in plant nutrition, its effect on enzyme activation, water relation, energy relations and starch synthesis. It is a unique plant nutrient for cotton because of its continuous need through all growth stages and its relatively high uptake rate. Yet the cotton plant is a relatively inefficient as absorber. This might be owing to the dependence of photosynthate translocation within the plant on cell potassium concentration. Meanwhile, many workers studied the effect of potassium fertilization (Darwish, 1991, Abdel-Aal *et al.,* 1995; Abou-Zied *et al.,* 1997 and Hegazy and Genaidy, 1998) concluded a positive response of cotton plants to potassium application. Potassium fertilization significantly increased seed cotton yield, seed index and boll weight (Hamissa and El-Mowelhi, 1991). Makram and El-Shihawy (1995) found that potassium increased number of sympodia per plant, yield, yield components, lint percentage and seed index. Abou-Zeid *et al.* (1997) reported that potassium fertilizer produced taller plants with higher number of fruiting branches, less number of vegetative branches, heavier bolls, higher seed cotton yield per plant and per feddan and lint percentage.

There are obvious parallels and interaction between the effects of water stress (irrigation intervals) and potassium fertilization on most internal physiological process especially photosynthetic rate.

The aim of this investigation is to evaluate the optimum potassium level which minimize water deficiency of cotton plants.

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station in 2002 and 2003 seasons to study the effect of water stress (irrigation intervals), potassium fertilizer levels and their interaction on growth, earliness, seed cotton yield and yield components of cotton cultivar Giza 88. Cotton seeds were planted in the last week of March in hills spaced 20 cm. and the plots were irrigated immediately after sowing. The preceding crop was rice (*Oryza sativa*, L.) in the two seasons. Plants thinned at two plants per hill at thinning time without replanting.

The experimental design was split-plot with four replications. The main plot were assigned for the three irrigation intervals, i.e., every two, three or four weeks (Table 1), while potassium fertilizer was levels 0, 24 and 48 K_2O/feddan and occupied in the sub-plots. The area of experimental plot was 19.5 m^2 (5 m. length and 3.9 m. width) included 6 rows at 65 cm apart. Plots were isolated by deep channels of 2 m width to avoid the effect of lateral movement of irrigated water. Soil sample for moisture determination were taken by auger from 0.60 cm depths. The amount of consumptive use is assumed to be equal to the difference between both soil moisture content at 48 hours after irrigation and just before the next irrigation (field capacity and wilting point). The quantities of consumptive use were calculated for soil depth i.e. 0-15, 15-30, 30-45 and 45-60 cm) according to (Israelson and Hanson, 1962) as follows:

$CU = \theta_2 - \theta_1/100 \times Bd \times 60/100 \times 4200$ Cu = Amount of consumptive use
Bd = Bulk density in g.c/m θ_2 = Soil moisture after irrigation
θ_1 = Soil moisture before, irrigation

Table 1:Number of irrigation over all the growing seasons.

Seasons / Irrigation intervals	2002			2003		
	2 weeks	**3 weeks**	**4 weeks**	**2 weeks**	**3 weeks**	**4 weeks**
Number of irrigation	10	7	5	10	7	5

Water use efficiency (WUE) was calculated according to (Vites, 1965) as follows: WUE = Seed cotton yield (kg/fed) related to consumptive use (m^3/fed). Chemical analysis of the experimental soil were determined by soil Research Department at Sakha Agricultural Research Station as shown in Table 2. Calcium superphosphate (15.5% P_2O_5) was applied before sowing at the rate of 150 kg/feddan besides 60 kg/fed before the first irrigation. Ten guarded plants were chosen at random from each subplot to study the following characters:

A. Growth traits: Final plant height (cm), number of internodes on the main stem/plant, internode length (cm), number of sympodia and monopodia per plant, dry weight of plant (g) and leaf area (DC^2).
B. Earliness: Node position of the first sympodium, days to first flower appearance, days to first cracking boll and earliness percentage (yield of the first pick/total yield).
C. Yield components: number of open and unopen bolls per plant, boll weight (g) and seed cotton yield per plant (g), seed cotton yield per feddan was estimated from the four inner rows of each sub/plot in order to avoid any border effect. The data obtained were subjected to statistical analysis according to procedure outlined by Snedecor and Cochran (1981) by using L.S.D. at 5% level.

Table 2: Chemical analysis of soil at the experimental sites in 2002 and 2003 seasons.

Soil contains Seasons	Soil structure	pH	T.S.S	Organic matter %	N ppm	P ppm	K ppm
2002	Clay	8.6	0.6	1.9	12.3	9.3	224.0
2003	Clay	8.2	0.5	1.7	11.8	9.4	280.0

Data of temperature and air humidity above were daily taken and calculated as an average per month (cited after Sakha Weather Station) (Table 3).

Table 3: Monthly air temperature and relative humidity (R.H) in 2002 and 2003 seasons.

Seasons	2002				2003			
	Air temp.ºC		R.H. %		Air temp.ºC		R.H. %	
Months	Max.	Min.	9.30	13.30	Max.	Min.	9.30	13.30
March	23.0	9.0	71.6	51.0	20.1	7.1	80.0	52.0
April	26.0	11.2	67.0	43.0	26.4	11.2	75.0	45.5
May	30.2	13.6	71.0	39.5	32.2	15.0	84.7	54.2
June	32.3	18.4	75.0	51.6	33.5	18.7	86.2	43.7
July	34.4	21.0	83.0	52.3	32.6	19.7	84.4	52.6
Aug.	33.6	20.3	82.3	48.3	33.7	19.9	91.3	55.0
Sept.	34.0	19.8	79.0	43.8	33.0	18.0	88.3	48.9
Oct.	28.9	16.0	68.4	48.4	30.0	15.1	81.5	47.3

RESULTS AND DISCUSSION

A.Growth characters:

The results in Table 4 show that most growth traits under study were significantly increased as irrigation intervals were decreased in the two growing seasons.

The irrigation every two weeks interval gave the tallest plants due to shorter internodes with higher node number in addition to more number of monopodia and sympodia which in turn maximized total dry matter of plants. The reverse trend was detected with prolonging irrigation intervals up to four weeks intervals. These results may be due to the sufficient water irrigation supply which was necessary to provide the cotton plants with its requirements of water to activate vital processes such as metabolism which reflected on growth, development and total dry matter weight of plants. The pronounced reduction in vegetative growth in favour of prolonged irrigation intervals suggests a differential sensitivity existed between the plant water deficient required to inhibit growth and that required to cause stonatal closure which may affect assimilate translocation and accumulation (Hsiao, 1973).

Kater and Meredilh (1990) stated that sever water stress at any time other than boll opening will decrease leaf function and growth. Similar finding were obtained by Hamilton *et al.* (1956), Kater *et al.* (1989), Radin *et al.* (1992) and El-Shahawy *et al.* (2000).

Table 4: Effect of irrigation intervals, potassium levels and on some growth traits in 2002 and 2003 seasons.

Treatments Characters	Seasons	Irrigation intervals 2 weeks	3 weeks	4 weeks	Sig.	L.S.D. 5%	Potassium levels 0 kg	24 kg	48 kg	Sig.	L.S.D. 5%	Inter. I x K
Plant height (cm)	2002	128.5	123.2	119.6	*	2.1	123.0	123.7	124.6	NS	-	NS
	2003	129.0	125.3	120.4	*	2.3	124.0	124.6	125.2	NS	-	NS
Number of internodes per plant	2002	20.2	19.4	18.5	*	0.3	19.0	19.3	19.8	NS	-	NS
	2003	21.3	19.5	18.7	*	0.2	18.7	19.8	21.0	NS	-	NS
Internode length (cm)	2002	6.9	6.4	6.5	*	0.1	6.5	6.4	6.4	NS	-	NS
	2003	6.1	6.4	6.9	*	0.1	6.6	6.3	5.9	NS	-	NS
Numbers of monopodia per plant	2002	1.5	1.2	1.1	NS	-	1.6	1.2	1.0	NS	-	NS
	2003	0.7	0.4	0.4	NS	-	1.7	1.4	1.2	NS	-	NS
Numbers of sympodia per plant	2002	12.4	11.7	11.0	*	0.4	11.0	11.8	12.1	*	0.8	*
	2003	13.6	12.0	11.4	*	0.7	11.0	12.1	13.4	*	0.9	N.S
Total dry weight/plant (g)	2002	122.2	115.1	99.5	*	3.5	98.5	114.7	123.6	*	6.1	*
	2003	123.1	117.3	101.3	*	4.1	98.8	118.6	124.3	*	3.8	N.S
Leaf area (DC^2)	2002	5.6	4.8	3.9	*	0.5	3.8	4.8	5.7	*	0.8	*
	2003	5.7	4.7	4.1	*	0.3	3.7	4.9	5.8	*	0.6	N.S

With respect to potassium fertilizer levels the results illustrated in Table 4 clear that final plant height, number of internodes of the main stem, main stem internodal length and number of monopodia per plant were insignificantly affected by potassium fertilization in both seasons. On the other hand, it is apparent that potassium fertilization had a significant effect on number of sympodia per plant, total dry weight plant and leaf area. Comparing with the unfertilized plants, adding potassium fertilization produced the tallest plants with less numbers of monopodia and high number of sympodia, total dry weight/plant and leaf area. Cadema and Lyda (1989) reported that where not K was supplied a general decrease in plant growth was observed.

The results in Table 4 show that potassium fertilizer levels had a significant effect on dry matter of different plant organs in the two seasons. Dry weight production as well as K absorption was affected in all plant parts. The dry matter accumulation is a good result to the favourable effect of this element of the photosynthesis activity of leaves, promotion of CO_2 assimilation and the translocation of carbohydrates from the leaves to the reproductive organs (Hartt, 1969). Similar results were obtained by Makram *et al.* (1994), Makram and El-Shihawy (1995) and Abou-Zeid *et al.* (1997).

B.Earliness measurements:

The results in Table 5 indicate that position of the first sympodium, days from sowing date to the fist flower appearance, first days to the first cracking boll and earliness percentage were significantly influenced by irrigation intervals in favor of the long irrigation intervals. These results may be due to water stress decreases overall metabolism and the leaf cuticle thickness in response to more limited water availability resulting in less uptake caused more rapid drying. These results could be ascribed on the bases that plants grown with low water supply produced fewer nodes, fewer fruiting branches and fewer fruiting forms, but retained a high percentage of squares. Since growth of fruiting branches was also restricted by water deficit, a high percentage of bolls were located at the first fruiting position, illustrating the importance of high fruit set from early flowers for water-limited situations (Mauney and Stewart, 1986). Similar results were obtained by Chaudhry (1969), Abd El-Kader (1980) and El-Shahawy and Abd El-Malik (1999). On the other hand, potassium fertilizer levels had not significant effect on position of first sympodium, days to first flower appearance and days to first cracking boll but earliness percentage was significantly increased by increasing potassium fertilizer level up to 48 kg K_2O /fed. These results indicate that potassium fertilization prolonged the vegetative growth period and consequently delayed flowering of plants. Cadema and Lyda (1989) reported that where no K was applied a general decrease in plant growth was observed. These results were in good agreement with those reported by El-Sayed (1996).

Table 5: Effect of irrigation intervals, potassium fertilizer levels on some earliness measurements in 2002 and 2003 seasons.

Treatments	Seasons	Irrigation intervals			Sig.	L.S.D	Potassium levels			Sig.	L.S.D	Inter.
Characters		2 weeks	3 weeks	4 weeks			0 kg	24 kg	48 kg			
Position of first sympodium	2002	6.7	6.6	6.4	*	0.1	6.5	6.6	6.6	NS	-	NS
	2003	6.7	6.5	6.4	*	0.1	6.4	6.7	6.5	NS	-	NS
Days to first flower appearance	2002	82.2	79.8	78.2	*	1.1	82.3	78.6	79.2	NS	-	NS
	2003	81.9	80.3	79.5	*	0.7	83.0	79.8	78.9	NS	-	NS
Days to first cracking boll	2002	133.2	131.8	129.2	*	0.3	132.3	129.6	131.2	NS	-	NS
	2003	132.9	130.6	129.0	*	0.9	134.0	130.0	129.9	NS	-	NS
Earliness percentage	2002	60.1	61.3	62.2	NS	-	60.3	62.3	61.0	*	1.2	NS
	2003	59.3	62.7	63.9	*	1.0	58.9	63.2	63.7	*	0.4	NS

C. Yield and its components:

The results in Table 6 show that seed cotton yield per plant and feddan were significantly increased by close irrigation intervals in the two seasons as a result of the higher of number of open bolls per plant and heavier boll weight. These results may be due to water irrigation supply in case of close intervals (every two weeks) gave cotton plants of Giza 88 cultivar which had the sufficient water led to an increase in total dry weight per plant and fruiting set as a result of increase leaf area and metabolism process while the excessive or insufficient water can be deleterious the yield and maturity (Ali, 2002). These results were in agreement with those obtained by El-Shahawy *et al.* (2000). Number of open bolls, unopen bolls per plant and boll weight were significantly decreased by expanding irrigation intervals. Similar results were also obtained by Ali (1990). Lint percentage and seed index were not significantly affected by irrigation intervals. On the other hand, potassium levels had a significant effect on seed cotton yield per plant and feddan, number of open bolls per plant, unopen bolls per plant, and boll weight in favor of the high dose of potassium in both seasons, while lint percentage and seed index were not significantly affected by increasing potassium fertilization. The increment in the characters, i.e., seed cotton yield/plant and boll weight may be due to the role of potassium fertilizer in encouraging early growth and increasing its elongation as well as early appearance of bolls of cotton plants (El-Sayed and El-Menshawi (2001). The interaction between irrigation intervals and potassium levels had significant effect on number of sympodia per plant, total dry weight of plant, leaf area, umber of open bolls per plant, boll weight, seed cotton yield per plant and feddan in 2002 season. The data presented in Table 7 show that the greatest values of these traits were optioned from the irrigation every two weeks and potassium at 48 kg while the irrigation every four weeks and potassium level at 0 kg/feddan resulted low values of these traits. Similar results were found by Chaudhry (1969), while Mahrous (1977) and Ali (1990) findings had reverse trend.

Table 6: Effect of irrigation intervals, potassium levels on yield and its components in 2002 and 2003 seasons.

Treatments / characters	Seasons	Irrigation intervals 2 weeks	3 weeks	4 weeks	Sig.	L.S.D.	Potassium levels 0 kg	24 kg	48 kg	Sig.	L.S.D.	Inter. I x K
No. of open bolls/plant	2002 2003	12.3 11.9	11.0 10.2	10.2 9.5	* *	0.5 0.4	10.2 9.9	11.3 10.6	12.0 11.0	* *	0.1 0.2	* N.S
No. of unopen bolls per plant	2002 2003	1.8 1.6	1.3 1.2	0.8 0.9	* *	0.3 0.2	1.6 1.5	1.3 1.2	1.1 1.1	* *	0.1 0.1	NS NS
Boll weight (g)	2002 2003	2.2 2.3	1.8 2.0	1.6 1.9	* *	0.1 0.1	1.6 1.8	1.9 2.1	2.1 2.3	* *	0.1 0.1	* N.S
Seed cotton yield per plant (g)	2002 2003	27.0 27.9	20.3 20.4	16.1 18.5	* *	3.5 1.2	16.3 18.1	21.7 22.2	25.3 26.3	* *	2.1 3.1	* N.S
Seed cotton yield/feddan (kentar)	2002 2003	8.5 7.9	6.1 6.0	5.2 5.2	* *	0.5 0.6	5.4 5.3	6.8 6.2	7.6 7.6	* *	0.3 0.2	* N.S
Lint percentage	2002 2003	38.9 38.8	38.7 38.7	38.2 38.3	NS NS	- -	38.1 38.2	38.5 38.6	39.2 39.0	NS NS	- -	NS NS
Seed index (g/100 seeds)	2002 2003	9.3 9.2	9.3 9.2	9.4 9.3	NS NS	- -	9.3 9.2	9.3 9.3	9.4 9.2	NS NS	- -	NS NS

On the other hand, irrigation every four weeks and fertilization with 48 kg K_2O/fed potassium produced high value of these traits, it is indicated that the high dose of potassium prevent water deficiency of cotton plants. This might be due to the dependence of photosynthate translocation within the plant on cell potassium concentration. However, recently, positive response of cotton plants to potassium fertilization has been documented (Darwish, 1991) and Abd-Aal *et al.* (1995).

Table 7:Numbers of sympodia per plant, total dry weight plant, leaf area, No. of open bolls per plant, boll weight, seed cotton yield per plant and feddan as affected by the interaction between the irrigation intervals and potassium fertilizer levels in 2002 season.

Characters	Irrigation intervals potassium levels	Sig.	L..S.D 5%	2 weeks	3 weeks	4 weeks
No. of sympodia per plant	0 potassium 24 kg potassium 48 kg potassium	*	0.8	11.7 12.1 12.3	11.3 11.7 11.9	11.0 11.4 11.5
Total dry weight of plant	0 potassium 24 kg potassium 48 kg potassium	*	4.1	110.3 118.4 122.9	106.8 114.9 119.3	100.1 109.9 112.8
Leaf area $(DC)^2$	0 potassium 24 kg potassium 48 kg potassium	*	0.2	4.7 5.2 5.6	4.3 4.8 5.2	3.9 4.3 4.8
No. of open bolls per plant	0 potassium 24 kg potassium 48 kg potassium	*	0.5	11.2 11.8 12.1	10.6 11.1 11.5	10.2 10.7 11.1
Boll weight (g)	0 potassium 24 kg potassium 48 kg potassium	*	0.3	1.9 2.0 2.1	1.7 1.8 1.9	1.5 1.7 1.8
Seed cotton yield per plant	0 potassium 24 kg potassium 48 kg potassium	*	4.2	21.6 24.3 26.1	18.3 21.0 22.8	16.2 18.9 20.7
Seed cotton yield/fed.	0 potassium 24 kg potassium 48 kg potassium	*	1.2	7.0 7.6 8.0	5.7 6.4 6.8	5.3 6.0 6.4

D.Water relations:

The results in Table 8 indicate that consumptive use of water and water use efficiency were decreased by expanding the irrigation intervals. These results may be due to the fewer number of irrigation over all the growing season. The above reduction of WUE might be explained on the basis that plant water deficits over a long period of time can maintain an unbalanced vegetative and reproductive growth that imposed in seed cotton yield reduction. Similar results were obtained by Hamilton *et al.* (1956), Gomaa *et al.* (1981), El-Shahawy and Abd El-Malik (1999), El-Shahawy *et al.* (2000) and Ali (2002). On the other hand, consumptive use of water was decreased by increasing potassium levels while water use of efficiency was increased in the two seasons. These results may be due to the role of potassium fertilizer in encouraging root hairs to grow early and increasing its elongation and the role of K_2O which affects respiration and carbohydrate metabolism, which associate with protein synthesis and water relation in plant (Chapman and Pratt, 1961).

Table 8:Consumptive use of water and water use efficiency as affected by irrigation intervals and potassium levels in 2002 and 2003 seasons.

Treatments	Seasons	Irrigation intervals			Potassium levels		
		2 weeks	3 weeks	4 weeks	0	24 kg	48 kg
Consumptive use of water (m^3/feddan)	2002 2003	3011.0 2935.0	2645.0 2662.0	2388.0 2443.0	3235.0 2916.0	2715.0 2667.0	2094.0 2457.0
Water use efficiency (kg/m^3)	2002 2003	0.47 0.49	0.45 0.46	0.41 0.42	0.29 0.30	0.48 0.47	0.56 0.60

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تأثير الإجهاد المائى ومستويات التسميد البوتاسي على النمو والمحصول لصنف القطن جيزه ٨٨

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أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسخا خلال الموسمين الصيفيين ٢٠٠٢/٢٠٠٣م لدراسة تأثير الإجهاد المائى (فترات الرى) ومستويات التسميد البوتاسي على النمو والتبكير والمحصول ومكوناته على صنف القطن المصرى جيزه ٨٨. تم تنفيذ التجارب فى تصميم قطع منشقة مرة واحدة فى أربع مكررات حيث خصصت القطع الرئيسية لفترات الرى (كل أسبوعين ، كل ثلاثة أسابيع ، وكل أربعة أسابيع) فى حين خصصت القطع الشقية للثلاث مستويات من التسميد البوتاسى صفر ، ٢٤ ، ٤٨كجم بو$_٢$أ/ف. وقد أوضحت النتائج:

١-أن الرى كل أسبوعين زاد من طول النبات النهائى وعدد سلاميات الساق الرئيسية وعدد الأفرع الثمرية والوزن الجاف الكلى للنبات وعدد اللوز المتفتح وغير المتفتح ووزن اللوزة وتصافى الحليج ومحصول القطن الزهر للنبات والفدان بينما أنقص طول سلاميات الساق الرئيسية. وقد أدت هذه المعاملة أيضا لتأخير النضج بحيث زادت فى عدد الأيام حتى تفتح أول زهرة وأول لوزة وارتفاع عقدة أول فرع ثمرى وقد زادت أيضا مساحة الأوراق بالرى كل أسبوعين. ولم يتأثر عدد الأفرع الخضرية على النبات والنسبة المئوية للشعر ومعامل البذرة بتلك المعاملات.

٢-وأشارت النتائج الى انه لم يتأثر طول النبات النهائى وعدد سلاميات الساق الرئيسية وطول السلامية وعدد الأفرع الخضرية على النبات وموقع أول فرع ثمرى وعدد الأيام لتفتح أول زهرة وأول لوزة والنسبة المئوية للشعر ومعامل البذرة لم يتأثر وذلك بمستويات التسميد البوتاسى لقد أدت زيادة التسميد البوتاسى إلى ٤٨كجم بو$_٢$أ/ف إلى زيادة معنوية فى عدد الأفرع الثمرية على النبات والوزن الجاف الكلى للنبات ومساحة الأوراق وعدد اللوز المتفتح على النبات ووزن اللوزة ومحصول النبات والفدان وزيادة نسبة التبكير وأدت إلى نقص فى عدد اللوز الغير متفتح على النبات.

٣-كان للتفاعل بين معاملات الرى (الإجهاد المائى) ومعاملات التسميد البوتاسى تأثير معنوى على بعض الصفات تحت الدراسة مثل عدد الأفرع الثمرية على النبات والوزن الجاف الكلى للنبات ومساحة الأوراق وعدد اللوز المتفتح على النبات ووزن اللوزة ومحصول النبات والفدان وذلك فى موسم ٢٠٠٢ فقط. وأدت زيادة معدل البوتاسيوم إلى التقليل من الإجهاد المائى وهذا واتضح فى وجود تفاعل ما بين المستوى العالي من التسميد البوتاسى (٤٨كجم بو$_٢$أ /ف) وطول فتره الرى (كل ٤ أسابيع).

وقد نقص كل من الاستهلاك المائى (متر مكعب للفدان) وكذلك كفاءة استخدام الماء مع زيادة فترات الرى ، بينما أدى زيادة مستويات السماد البوتاسى إلى نقص الاستهلاك المائى وزيادة كفاءة استخدام الماء