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EFFECT OF IRRIGATION AND POTASSIUM FERTILIZATION ON YIELD AND QUALITY OF TWO SUGARCANE VARIETIES

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Abstract: Two field trials were carried out at Shandaweel Agricultural Research Station (Sohag Governorate) during 2003/2004 and 2004/2005 seasons. Each trail included 24 treatments represent the combination between three irrigation intervals (12, 16 and 20 days, i.e. a total number of 27, 20 and 16 irrigations), four potassium fertilizer levels (0.0, 25.0, 50.0 and 75.0 kg K_2O/fed) and two sugarcane varieties viz. G.T.54-9 and Ph.8013. Treatments were arranged in a Split-Split Plot Design with three replicates. The main plots were assigned for irrigation treatments; sugarcane varieties were distributed in the sub plots and potassium fertilizer levels were randomly distributed in the sub-sub plots. The results showed that decreasing irrigation intervals from 20 to 12 days significantly increased stalk length, stalk diameter and cane yield/fed in both seasons. Applying irrigation water every 12 and/or 16 days attained significant increase in the number of millable cane/fed and sugar yield/fed. However, both of sucrose and sugar recovery percentages were negatively and significantly affected by increasing the periods between irrigations.

All the studied traits of sugarcane were positively and significantly influenced by increasing K level from 0.0 up to 75 kg K_2O/fed.

The two sugarcane varieties differed significantly in their response to all studied characters. The commercial variety G.T.54-9 recorded higher values of stalk length and number of millable cane/fed, while the promising cane variety Ph.8013 had thicker stalks, higher sucrose and sugar recovery percentages, and sugar yields.

The present investigation showed that the planting sugarcane variety Ph.8013 irrigated every 12 or 16 days and fertilized with 75 kg K_2O/fed is recommended to obtain the highest cane and sugar yields/fed.

Key words: irrigation, potassium fertilization, yield, quality, sugarcane**.**

Introduction

Adequate water supply and potassium fertilizer rate are two major factors affecting yield and quality of sugarcane. Water present about 75% of sugarcane stalks and has a vital role in absorption and transporting of mineral nutrients from soil to plant roots and shoots. Potassium has high mobility from the old parts of the plant to the young parts. So it may be involved

with a variety of physiological functions in the plant, such as photosynthesis and respiration. This element encourages the formation of sugars, which may result in an improvement of the purity of the cane juice and rendement, sugar recovery percentage (Bakker, 1999). Wiedenfeld (1995) found that increasing irrigation levels increased sugar and cane yields and sucrose content. Ali (1996) irrigated sugarcane at 15 or 45 available soil moisture. He reported that juice quality was unaffected by irrigation treatments. El-Shafai (1996) cleared that applying irrigation at shorter intervals increased stalk diameter and applying 26 irrigations season produced the highest cane yield without significant differences with the others 20 and 17 irrigations. Gomaa (2000) irrigated sugarcane every 14, 21, 28, 35 and 42 days. The results showed significant differences among the sugarcane varieties (G.T.54-9, G.85-37, G.84-47 and F.153) for average stalk height and sucrose percentage which was increased as irrigation intervals decreased in both seasons. On the contrary, sugar recovery percentage decreased as irrigation intervals decreased. The results showed that increasing irrigation intervals caused a reduction in cane yield/fed. but this reduction was not significance, while increasing irrigation intervals decreased sugar yield/fed. significantly. Imbaby (2003) studied some sugarcane varieties and concluded that they differed statistically in growth characters, yield and its components and juice quality by irrigation treatments. Moreover, application of 22 or 19 irrigation resulted the highest cane and sugar yields. El-Geddawy *et al.* (1997) found that sugarcane varieties differed significantly in the number of millable cane at harvest. Sukhchain-Saini (1998) observed significant differences among sugarcane cultivars for cane yield, commercial cane sugar and sugar recovery. Sugarcane cultivar CoS8118 had thin stalks than the other sugarcane cultivars. Azzazy and Dergham (2000) supplied sugarcane varieties, i.e. G.85-37 and G.84-47 with 48 or 96 kg K_2O/fed. Their results showed that increasing K level from 48 to 96 K_2O/fed significantly affected increased cane and sugar yields. They showed that G.85-37 attained superiority in plant height, cane and sugar yields over G.84-47. Taha, *et al.* (2003) study the response of some sugarcane cultivars (G.T.54-9, G.87-37, G.87-55 and F.160) to different levels of K fertilizer (0, 24, 48 and 72 kg K2O/fed.). They reported that, G.T.54-9 surpassed the other 3 cultivars in stalk length, of diameter stalk, yields of millable cane and sugar. While, G.87-37 produced the highest values of sucrose percentages. Potassium application significantly increased the millable cane, stalk diameter, cane yield, sucrose percentage and sugar yield.

Arzola-Pina (1996) fertilized sugarcane cv. P.R.-980 with 0, 100 or 200 kg K_2O/ha. Potassium fertilizer increased cane yield and sugar content and the highest sugar content required a slightly higher K rate than that required for the highest cane yield. Chatterjee *et al*. (1998) supplied sugarcane with potassium at concentrations of 0.01, 0.05, 0.5, 1, 4, 8 and 16 mM Their results showed that deficiency of potassium (<8 mM) depressed the growth, and number of millable canes. Visible foliar symptoms of low K were observed on plants receiving 0.01 to 1 mM K supply. The yield of millable canes decreased markedly in potassium deficient plants, but the maximum yield was obtained at 8 mM K rather than 4 mM. The sucrose concentration in cane juice was the highest at 8 mM K and it decreased at lower and higher levels. Singh, *et al*. (1999) cleared that cane yield was the highest (67.8 tons/ha) with application 125 % of the recommended potash rate (70 kg K_2O/ha). Potassium application increased cane juice sucrose and commercial cane sugar content with up to 75% of the recommended potash rate. Tiwari, *et al*. (2000) reported that sugarcane yield increased gradually as 64.5, 78.0 and 79.0 tons/ha with the application of 0, 50.4 and 100.8 K_2O/ha. Perez and Melgar (2000) showed that when sugarcane was fertilized with 0-240 kg K_2O/ha, cane yield and sugar content varied greatly. El-Tilib, *et al.* (2004) indicated that potassium application affected significantly plant density and stalk diameter. The yields of cane and sugar increased significantly in response to potassium application in the plant cane and ratoon. Potassium increased significantly the yield of cane and sugar.

Materials and Methods

Two field trials were carried out at Shandaweel Agricultural Research Station (Sohag Governorate) during 2003/2004 and 2004/2005 seasons. Each trail included 24 treatments represent the combination between three irrigation intervals (12, 16 and 20 days, i.e. a total number of 27, 20 and 16 irrigations), four potassium fertilizer levels (0, 25, 50 and 75 kg K_2O/fed) and two sugarcane varieties viz. G.T.54-9 and Ph.8013. Treatments were arranged in a Split-Split Plot Design with four replicates. The main plots were assigned for irrigation treatments, sugarcane varieties were distributed in the sub plots and potassium fertilizer levels were randomly distributed in the sub-sub plots. Irrigation was withholded 30 days before cutting. Soil surface was leveled at 0.05 % using Laser technique. To avoid water seepage between irrigation treatments, borders of 2-m apart were left fallow between them. Potassium fertilizer levels were applied once as potassium sulphate

(48 % K_2O) with the second addition of nitrogen fertilizer. The experimental unit area was 21 m^2 including 6 ridges of 3.5 m in length and 1.0 m apart. Sugarcane varieties were planted on the 15th of March and harvested after 12 months in both seasons. An overall nitrogen rate of 210 kg N/fed. was added as urea (46%N) in two equal doses after 60 days from planting and 45 days later. Also, 30 kg P_2O_5/fed. as calcium superphosphate (15% P_2O_5) was generally applied during seed bed preparation. All other agricultural practices were carried out as recommended.

Chemical and physical properties of the experimental soil are presented in Table (1).

Table(1): Physical and Chemical properties of the upper 40 cm of the experimental soil sites.

Physical analysis			Chemical analysis		
Character	First season	Second season	Character	First season	Second season
Fine sand	21%	37%	T.S.S.%	0.12	0.119
Coars sand	1.46%	1.14%	PH	7.20	7.40
Silt	42.00%	32.0%	$CO_3^{=}$ Meq/100g	Absent	Absent
Clay	35.54%	29.86%	HCO_3 Meq/100g	0.30	0.221
Soil texture	Clay Loam	Clay Loam	Cl^- Meq/100g	0.337	0.242
$CaCO_3$	1.38%	1.28%	$SO_4^{=}$ Meq/100g	0.70	0.600
O.M	0.80%	0.80%	Ca^{++} Meq/100g	0.602	0.500
			Mg^{++} Meq/100g	0.42	0.300
			Na^+ Meq/100g	0.300	0.163
			K^+ Meq/100g	0.115	0.100

Values of the field capacity and bulk density for the experimental site (average of the two seasons were (36, 1.19), (34, 1.22), (32, 1.26) and (30, 1.32) for soil depths 0-15, 15-30, 30-45 and 45-60 cm, respectively.

At harvest, a 20-stalks representative sample from each treatment were taken at random and the following data were recorded:

1. Stalk length (cm) was measured from soil surface to the top point of visible dewlap.

2. Stalk diameter (cm) was measured at the middle part of stalk.

3. Sucrose/100 cm^3 of juice was determined using Sacharemeter according to A.O.A.C. (1995).

4. Sugar recovery percentage was calculated according to the following equation:

Sugar recovery % = richness % x purity %.

Where: richness = (sucrose/100 g cane juice x factor)/100.

Factor =100 - [fiber % + physical impurities % + water free sugar%].

5. Number of millable cane/fed (in thousands) was counted.

6. Cane stalks of each plot were off cleaned from trash, weighed and cane yield (tons/fed) was calculated.

7. Sugar yield (tons/fed) was estimated according to the following equation:

Raw sugar yield = cane yield (tons/fed) x sugar recovery %.

The collected data were statistically analyzed according to Snedecor and Cochran (1981).

Results and Discussion

1. Stalk length

The results in Table (2) cleared that increasing irrigation frequency, i.e. shortening irrigation intervals to 12 and 16 days led to a significant increase in stalk length by 17.52 and 4.97 cm as compared with that recorded when irrigation was given at 20 days intervals in the 1st season corresponding to 13.70 and 1.58 cm in the 2nd season, respectively. These results are in accordance with those reported by Gomaa (2000). This finding may be due to that short irrigation intervals ensures a continuous and adequate water supply for plants enhances cell division and elongation leading to an increase in stalk length.

Data in Table (2) showed that potassium fertilizer level attained a positive and significant effect on stalk length, where a gradual increase in stalk length was detected as the applied K-dose was increased from 0.0 up to 75 kg K_2O/fed. These results were true in both seasons.

The results revealed that the two sugarcane varieties differed significantly in stalk length in both seasons. The commercial variety G.T54-9 had taller stalks than Ph 8013.

Regarding the effect of irrigation intervals x cane varieties, the results showed significant differences in stalk length of the two varieties as affected by the three irrigation intervals. Meanwhile, insignificant variation in stalk length was found between the two varieties under any of the irrigation intervals, in the 1st season. In the 2nd season, the differences in stalk length were significant between the two varieties when they were irrigated at 12 and / or 16 days intervals, but

Table(2): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the stalk length (cm).

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	297.67	280.50	289.08	301.00	288.50	294.75
	25	310.50	317.00	313.75	308.17	307.67	307.92
	50	322.00	320.00	321.00	311.97	310.00	310.98
	75	318.83	321.50	320.17	313.53	311.93	312.73
Average		312.25	309.75	311.00	308.67	304.53	306.60
16 days	0.0	296.50	291.67	294.08	294.03	289.47	291.75
	25	298.00	294.27	296.13	294.33	290.50	292.42
	50	301.67	299.27	300.47	296.27	294.27	295.27
	75	304.00	302.20	303.10	300.00	297.00	298.50
Average		300.04	296.85	298.45	296.16	292.81	294.48
20 days	0.0	290.33	286.67	288.50	289.00	286.20	287.60
	25	293.33	293.00	293.17	290.90	289.60	290.25
	50	295.83	293.00	294.42	296.27	293.87	295.07
	75	298.00	297.67	297.83	300.33	297.00	298.67
Average		294.38	292.58	293.48	294.13	291.67	292.90
Average of K levels	0.0	294.83	286.28	290.56	294.68	288.06	291.37
	25	300.61	301.42	301.02	297.80	295.92	296.86
	50	306.50	304.09	305.29	301.50	299.38	300.44
	75	306.94	307.12	307.03	304.62	301.98	303.30
varieties average		302.22	299.73	300.98	299.65	296.33	297.99
LSD at 0.5 level for:							
Irrigation (A)				2.90			1.53
Potassium (B)				1.29			1.30
Varieties (C)				2.04			1.50
A x B				NS			NS
A x C				3.53			2.60
B x C				2.88			2.13
A x B x C				8.24			3.68

insignificant difference were recorded in this trait between varieties when irrigation was given every 20 days. In addition, No significant difference in this trait was found in stalk length in case of applying water at 16 and/or 20 days for each of the two sugarcane varieties.

Stalk length was significantly influenced by the interactions between K-levels and sugarcane varieties in both seasons. However, in the 1st season, insignificant difference in this trait was observed between the two varieties under all K levels except zero level. Moreover, insignificant difference was detected in stalk length of G.T.54-9 when it was fertilized with 50 or 75 kg K_2O/fed as well as Ph.8013 supplied with 25 or 50 kg K_2O/fed in the 1st season. In the 2nd one, the differences between varieties were significant when they were fertilized with 0.0 or 75.0 kg K_2O/fed and insignificant when 25 and/or 50 kg K_2O/fed were applied.

The interactions among the three factors had significant effects on stalk length in both seasons. The tallest stalks were produced by irrigating sugarcane variety G.T.54-9 every 12 days and supplying it with 50 kg K_2O/fed (in the 1st season) or 75 kg K_2O/fed (in the 2nd season).

2. Stalk diameter:

Data given in Table (3) showed that the studied irrigation intervals had a significant effect on stalk diameter in both season. Applying irrigation water at intervals of 12 days mostly resulted in the thickest stalks compared with 16 or 20 days. These results matched those reported by El-Shafai (1996).

The results in Table (3) showed that potassium fertilizer levels significantly effected on stalk diameter in both seasons. Increasing the applied K doses from 0.0 up to 75 kg K_2O/fed. increased stalk diameter gradually. This result is in agreement with that reported by Taha, *et al.* (2003).

Data in Table (3) showed a significant difference between the two varieties in stalk diameter in both season. The promising variety Ph.8013 had thicker stalks compared with the commercial sugarcane variety G.T.54-9.

Stalk diameter was significantly affected by the interactions among irrigation intervals and K levels in the 1st season only. However, insignifcant difference in stalk diamter was found between 12 and 16 days irrigation intervals when no K fertlizer and/or 25 kg K_2O/fed were added for both varieteies. The interaction between irrgation intervals x cane varieties affected stalk diameter significantly in both seasons. However, in the 1st season, insignificant differences were repoeted in stalk diameter of G.T.54-9 variety when it was irrigated every 16 or 20 days. In the 2nd season, insignificant differences were fownd in stalk diameter of G.T.54-9 or Ph.8013 in case of irrigating them every 12 or 20 days.

Table(3): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the stalk diameter (cm)**.**

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	2.63	2.67	2.65	2.64	2.68	2.66
	25	2.70	2.78	2.74	2.64	2.72	2.68
	50	2.79	2.85	2.82	2.74	2.80	2.77
	75	2.90	3.03	2.96	2.77	2.81	2.79
Average		2.76	2.83	2.79	2.70	2.75	2.73
16 days	0.0	2.63	2.70	2.67	2.66	2.75	2.71
	25	2.67	2.79	2.73	2.76	2.76	2.76
	50	2.69	2.81	2.75	2.79	2.85	2.82
	75	2.77	2.85	2.81	2.76	2.82	2.79
Average		2.69	2.79	2.74	2.74	2.79	2.77
20 days	0.0	2.62	2.55	2.59	2.59	2.68	2.63
	25	2.69	2.58	2.63	2.66	2.78	2.72
	50	2.71	2.67	2.69	2.66	2.80	2.73
	75	2.81	2.75	2.78	2.77	2.84	2.80
Average		2.71	2.64	2.67	2.67	2.77	2.72
Average of K levels	0.0	2.63	2.64	2.63	2.63	2.70	2.67
	25	2.68	2.72	2.70	2.69	2.75	2.72
	50	2.73	2.78	2.76	2.73	2.82	2.77
	75	2.83	2.88	2.85	2.77	2.82	2.79
Varieties average		2.72	2.75	2.74	2.70	2.77	2.74
LSD at 0.5 level for:							
Irrigation (A)				0.02			0.03
Potassium (B)				0.02			0.02
Varieties (C)				0.04			0.02
A x B				0.04			NS
A x C				0.06			0.04
B x C				NS			NS
A x B x C				NS			NS

3. Sucrose percentage:

Data in Table (4) revealed that irrigation of sugarcane plants at 20 days caused significant increase in sucrose percentage, while applying water at 12 days intervals recorded the lowest values of this trait in both seasons. This result may be due to that increasing irrigation frequency, i.e. at shorter intervals, increased water content in stalks and hence decreased sucrose percentage. Same result obtained by Gomaa (2000).

The results showed that sucrose percentage responded positively and gradually to the increase in the applied doses of potassium up to 75 kg K_2O/fed in the two seasons. This result could be attributed to the role of potassium (Bakker, 1999). The present results are in general agreement with those reported by Arzola-Pina (1996).

The results in Table (4) cleared that the two sugarcane varieties differed significantly in sucrose percentage. The promising sugarcane variety Ph.8013 recorded higher values of sucrose % as compared with G.T54-9 in both seasons. This result may indicate that sucrose percentage is mainly affected by genetic make-up.

Sucrose% was significantly affected by the interactions between irrigation intervals and K levels in the 2nd season only. However, insignificant difference in sucrose% was found when sugarcane was irrigated every 16 and 20 days and fertilized with 75 and 50 kg K_2O/fed, respectively. Also, no significant difference was detected in case of irrigating sugar at the same intervals and fertilized with 50 and 25 kg K_2O/fed. Sucrose% was significantly influenced by the interaction between irrigation intervals and sugarcane varieties in both seasons. However, insignificant difference in sucrose% was recorded between G.T.54-9 irrigated at 20 days intervals and Ph.8013 irrigated every 16 days in both seasons. Sucrose% was significantly affected by the interaction between K levels and sugarcane varieties in the 1st season only. Meanwhile, insignificant variations in this trait were found between G.T. 54-9 and Ph.813 when they were fertilized with 50 kg K_2O/fed.

4. Sugar recovery percentage SR%:

The results in Table (5) cleared that there was a general to increase in the values of S.R% by increasing the irrigation intervals up to 20 days in both season. This finding was in agreement with that reported by Gomaa (2000).

The available data showed that potassium fertilizer levels has significantly effect on sugar recovery percentage SR% in both season. Increasing potassium application up to 75 kg K_2O/fed. produced gradual increment in sugar recovery values.

Table(4): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the sucrose percentage**.**

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	17.84	18.33	18.09	18.03	18.35	18.19
	25	18.59	19.07	18.83	19.03	19.73	19.38
	50	19.70	20.14	19.92	19.90	20.55	20.23
	75	20.45	20.95	20.70	20.78	21.07	20.92
Average		19.14	19.62	19.39	19.43	19.92	19.68
16 days	0.0	18.78	19.10	18.94	19.81	20.00	19.90
	25	19.69	20.08	19.88	20.29	20.39	20.34
	50	20.31	20.57	20.44	20.99	21.20	21.09
	75	21.06	21.50	21.28	21.26	21.54	21.40
Average		19.96	20.31	20.14	20.59	20.78	20.68
20 days	0.0	19.45	19.73	19.59	19.78	20.42	20.10
	25	20.23	20.69	20.46	20.95	21.21	21.08
	50	20.93	20.66	20.80	21.19	21.48	21.34
	75	21.11	21.70	21.41	21.43	21.73	21.58
Average		20.43	20.70	20.56	20.84	21.21	21.03
Average of K levels	0.0	18.69	19.05	18.87	19.20	19.59	19.40
	25	19.50	19.95	19.72	20.09	20.44	20.27
	50	20.31	20.46	20.39	20.69	21.08	20.89
	75	20.87	21.38	21.13	21.16	21.45	21.30
Average		19.85	20.21	20.03	20.29	20.64	20.46
LSD at 0.5 level for:							
Irrigation (A)			0.14			0.13	
Potassium (B)			0.10			0.08	
Varieties (C)			0.11			0.12	
A x B			NS			0.15	
A x C			0.19			0.22	
B x C			0.16			NS	
A x B x C			NS			NS	

Table(5): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the sugar recovery**.**

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	12.08	12.37	12.23	12.22	12.40	12.31
	25	12.54	12.81	12.68	12.79	13.18	12.98
	50	13.16	13.41	13.29	13.28	13.64	13.46
	75	13.58	13.85	13.72	13.76	13.91	13.84
Average		12.84	13.11	12.98	13.01	13.28	13.15
16 days	0.0	12.65	12.82	12.74	13.22	13.33	13.28
	25	13.16	13.37	13.26	13.49	13.54	13.52
	50	13.50	13.68	13.59	14.12	13.99	14.05
	75	13.91	14.15	14.03	14.02	14.17	14.10
Average		13.31	13.51	13.41	13.71	13.76	13.74
20 days	0.0	13.02	13.18	13.10	13.21	13.56	13.38
	25	13.46	13.71	13.58	13.86	14.00	13.93
	50	13.84	13.70	13.77	13.90	14.04	13.97
	75	13.95	14.26	14.10	13.94	14.02	13.98
Average		13.57	13.71	13.64	13.72	13.91	13.82
Average of K levels	0.0	12.59	12.79	12.69	12.88	13.10	12.99
	25	13.05	13.30	13.17	13.38	13.58	13.48
	50	13.50	13.60	13.55	13.76	13.89	13.83
	75	13.81	14.08	13.95	13.91	14.03	13.97
Average		13.24	13.44	13.34	13.48	13.65	13.57
LSD at 0.5 level for:							
Irrigation (A)				0.08			0.12
Potassium (B)				0.06			0.07
Varieties (C)				0.06			0.11
A x B				NS			0.12
A x C				0.11			0.19
B x C				NS			NS
A x B x C				NS			NS

Data in Table (5) exhibited that the two sugarcane varieties differed significantly in sugar recovery percentage in both season. The sugarcane variety Ph 8013 surpassed variety G.T. 54-9. Same conclusion reported by Sukhchain-Saini (1998).

Sugar recovery% was significantly affected by the interactions between irrigation intervals and K levels in the 2nd season only. However, insignificant differences in sugar recovery% were found when sugarcane was irrigated every 16 days with 50 and 75 kg K_2O/fed, respectively. Also, no significant differences in this trait were found between irrigating sugarcane at 12 and/or 16 days when fertilized with 50 K_2O or zero level. Sugar recovery% was significantly influenced by the interaction between irrigation intervals and sugarcane varieties in both seasons.

5. Number of millable cane/ feddan.

The results in Table (6) obtained that the differences between the studied irrigation intervals were significantly in both seasons. Irrigation of sugarcane plants at 16 days reveled significant increase in number of millable cane/fed. This finding was true in the 1st season. While in the 2nd season irrigation of sugarcane plants at 12 days increased the number of millable cane/fed.

The available data showed that increasing the dose of potassium up to 75 kg K_2O/fed. significantly improved the number of millable cane/fed. in both seasons.

Given data revealed that sugarcane varieties significantly effected on the number of millable cane in both seasons. The commercial sugarcane variety G.T54-9 surpassed the variety Ph8013 in the two seasons. This result may be assured that the millable cane number is basically affected by genetic make-up more than the other factors. This finding was in agreement with that reported by El-Geddawy *et al.* (1997).

Number of millable cane was significantly influenced by the interaction between irrigation intervals and sugarcane varieties in both seasons.

Table(6): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the number of millable cane/fed.

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	47.27	46.47	46.87	47.13	47.00	47.07
	25	47.43	47.03	47.23	48.33	48.27	48.30
	50	47.63	47.20	47.42	49.80	49.33	49.57
	75	47.37	48.33	47.85	51.20	50.73	50.97
Average		47.43	47.26	47.34	49.12	48.83	48.98
16 days	0.0	47.00	45.86	46.43	46.40	45.73	46.06
	25	47.67	47.18	47.42	48.00	46.80	47.40
	50	48.45	48.07	48.26	49.87	49.53	49.70
	75	49.53	48.89	49.21	50.73	50.27	50.50
Average		48.16	47.50	47.83	48.75	48.08	48.42
20 days	0.0	43.87	44.00	43.93	45.30	45.00	45.15
	25	45.80	44.80	45.30	46.80	46.60	46.70
	50	47.73	46.36	47.04	47.62	47.20	47.41
	75	49.13	48.57	48.85	49.96	49.20	49.58
Average		46.63	45.93	46.28	47.42	47.00	47.21
Average of K levels	0.0	46.04	45.44	45.74	46.28	45.91	46.09
	25	46.97	46.34	46.65	47.71	47.22	47.47
	50	47.94	47.21	47.57	49.09	48.69	48.89
	75	48.68	48.60	48.64	50.63	50.07	50.35
Average		47.41	46.90	47.15	48.43	47.97	48.20
LSD at 0.5 level for:							
Irrigation (A)				0.54			0.38
Potassium (B)				0.32			0.36
Varieties (C)				0.41			0.38
A x B				NS			NS
A x C				0.71			0.66
B x C				NS			NS
A x B x C				NS			NS

6. Cane yield:

The results in Table (7) showed that the differences between the studied irrigation intervals were significantly in both seasons. Shortening irrigation intervals to 12 days caused increase in cane yield, the slightly increment in cane yield may due to sufficient water with 12 days interval compared with the other irrigation intervals, 16 or 20 days. Applied water in the short irrigation intervals i.e 12 days surpassed the other two irrigation intervals i.e 16 and 20 days by (4.67, 7.28 and 0.73, 8.88%) in the first and second season respectively. This result is in line with that reported by Gomaa (2000).

Data in Table 7 distinctly show that potassium fertilizer levels had a positive effect on cane yield in both seasons. Increasing the applied dose of potassium from 0.0 up to 75 kg K_2O/fed. gradually increased cane yield. This result is in accordance with Azzazy and Dergham (2000).

Data in Table 7 revealed that significant differences were reported between the two varieties in cane yield in both seasons. The sugarcane yield of variety Ph 8013 surpassed the other variety G.T54-9 by 0.98 and 1.00 ton/fed. in the first and second season respectively.

Cane yield was significantly influenced by the interactions between irrigation intervals and K levels in the 2nd season only. Cane yield was significantly influenced by the interactions between irrigation intervals and sugarcane varieties in the 2nd season only. Cane yield was significantly influenced by the interactions between K levels and sugarcane varieties in the 2nd season only.

7. Sugar yield:

The results in Table (8) showed that the differences in the sugar yield between the studied irrigation intervals were significant in both seasons. However, it could be noticed that shortening irrigation intervals to 12 days caused a relative increase in the sugar yield in the first season, while, in the second season the 16 days irrigation intervals relative increase in the values of sugar yield combined the 20 days irrigation intervals in both seasons. This result is in accordance with Gomaa (2000) .

The data in Table (8) showed that there was a positive response on sugar yield due to potassium application in both seasons. Increasing the applied doses of potassium from 0.0 up to 75 kg K_2O/fed. gradually increased sugar yield, this increment amounted by (15.88 and 14.74%) in both season respectively. This result is in line with that reported by Azzazy and Dergham (2000).

Data in Table (8) reveal that the two sugarcane varieties differed significantly in their sugar yield in

both season. The promising sugarcane variety Ph.8013 surpassed the commercial variety G.T54-9.

Sugar yield/fed. was significantly influenced by the interaction between irrigation intervals and sugarcane varieties in both seasons.

Table(7): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the cane yield ton/fed.

Seasons		2003/2004			2004/2005		
Irrigation	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	51.25	52.19	51.72	51.37	51.93	51.65
	25	52.42	53.71	53.07	52.79	52.96	52.87
	50	53.54	54.52	54.03	53.31	54.26	53.78
	75	5.26	55.41	55.033	54.53	54.97	54.75
Average		53.12	53.96	53.54	53.00	53.53	53.26
16 days	0.0	48.18	49.00	48.59	50.33	50.84	50.59
	25	50.35	51.45	50.90	51.41	52.58	51.99
	50	51.29	52.03	51.66	52.70	54.54	53.62
	75	52.30	53.71	53.00	54.56	56.03	55.29
Average		50.53	51.55	51.04	52.25	53.50	52.87
20 days	0.0	46.99	48.09	47.54	45.83	46.58	46.20
	25	48.60	50.01	49.31	46.91	48.51	47.71
	50	49.78	50.60	50.19	47.75	49.38	48.57
	75	51.04	52.04	51.54	51.19	52.09	51.64
Average		49.10	50.19	49.64	47.92	49.14	48.53
Average of K levels	0.0	48.81	49.76	49.28	49.18	49.78	49.48
	25	50.46	51.73	51.09	50.37	51.35	50.86
	50	51.54	52.38	51.96	51.25	52.73	51.99
	75	52.87	53.72	53.29	53.43	54.36	53.89
varieties average		50.92	51.90	51.41	51.06	52.06	51.56
LSD at 0.5 level for:							
Irrigation (A)				0.52			0.47
Potassium (B)				0.36			0.24
Varieties (C)				0.34			0.30
A x B				NS			0.42
A x C				NS			0.52
B x C				NS			0.43
A x B x C				NS			NS

Table(8): Effect of irrigation intervals, potassium fertilizer levels, sugarcane varieties and their interactions on the sugar yield ton/fed.

Seasons		2003/2004			2004/2005		
Irrigation intervals	K levels kg K_2O/fed	Sugarcane varieties		Average	Sugarcane varieties		Average
		G.T. 54-9	Ph 8013		G.T. 54-9	Ph 8013	
12 days	0.0	6.19	6.45	6.32	6.28	6.44	6.36
	25	6.57	6.88	6.73	6.75	6.98	6.87
	50	7.05	7.31	7.18	7.08	7.40	7.24
	75	7.51	7.67	7.59	7.50	7.65	7.58
Average		6.83	7.08	6.96	6.90	7.12	7.01
16 days	0.0	6.10	6.28	6.19	6.66	6.78	6.72
	25	6.62	6.88	6.75	6.94	7.12	7.03
	50	6.93	7.12	7.02	7.44	7.63	7.53
	75	7.28	7.60	7.44	7.65	7.94	7.80
Average		6.73	6.97	6.85	7.17	7.37	7.27
20 days	0.0	6.12	6.34	6.23	6.05	6.32	6.18
	25	6.54	6.86	6.70	6.50	6.79	6.65
	50	6.89	6.93	6.91	6.64	6.93	6.78
	75	7.12	7.42	7.27	7.13	7.30	7.22
Average		6.67	6.89	6.78	6.58	6.84	6.71
Average of K levels	0.0	6.14	6.36	6.25	6.33	6.51	6.42
	25	6.58	6.87	6.73	6.73	6.96	6.85
	50	6.95	7.12	7.04	7.05	7.32	7.19
	75	7.30	7.56	7.43	7.43	7.63	7.53
Average		6.74	6.98	6.86	6.88	7.11	7.00
LSD at 0.5 level for:							
Irrigation (A)				0.10			0.08
Potassium (B)				0.07			0.06
Varieties (C)				0.06			0.06
A x B				NS			NS
A x C				0.10			0.09
B x C				NS			NS
A x B x C				NS			NS

References

Ali, S.A. (1996). Response of varying of nitrogen and soil moisture regimes on sugarcane Ceop. Bharatiya Sugar. 22(4): 7-10.

Arzola-Pina, N. (1996). Effect of potassium fertilizer application on cane sugar content. Cuba. Centro-Azucar. 23(1): 49-53.

Assciation of Official Agricultural Chemists (A.O.A.C.) (1995). Official methods of analysis, puplished by the A.O.A.C., Box 540, Washington, D.C.

Azzazy, N.B. and Elham A. Dergham (2000). Effect of nitrogen and potassium fertilization on yield and quality of two sugar cane promising varieties. Egyptian. J. Agric. Res. 78(2): 745-758.

Bakker, H. (1999), "Sugarcane cultivation and management", P. 158. Kluwer Academic/Plenum Publishers, New York, London, Moscow.

Chatterjee, C.; N. Nautiyal and B.K. Dube (1998). Effects of potassium concentration on biochemistry, yield and sucrose concentration in sugarcane . India . Sugar-Cane. (5): 12-15.

El-Geddawy, I.H.; A.S. El-Debaby; A.M.M. Saad and N.B. Azzazy (1997). Irrigation systems and nitrogen fertilizer in relation to yield and quality of sugarcane varieties. Egypt. J. Agric. Res., 75 (4): 1037-1053.

EL-Shafai, A.M.A. (1996). Water requirements of sugarcane under different levels of nitrogen fertilization. Ph.D. Thesis, Agron. Dept. Fac. Agric. Moshtohor, Zagazig Univ. Egypt.

El-Tilib, M.A.; M.H. Elnasikh and E.A. Elamin (2004). Phosphorus and potassium fertilization effects on growth attributes and yield of two sugarcane varieties grown on three soil series. J. Plant-Nutrition. Khartoum, Sudan 27(4): 663-699.

Gomaa, A.M.E.G. (2000). Physiological studies on the response of sugarcane to irrigation. Ph.D. Thesis, Agron. Dept. Fac. Agric. AL-Azhar, Univ., Egypt.

Imbaby, M.M.M. (2003). Evaluation of some sugar cane varieties under different irrigation treatments. Ph.D. Thesis, Fac. Agric., El-Minia Univ., Egypt.

Maliwal, G.L.; H.C. Parmar; R.R. Kaswala and S. Raman (1999). Effect of irrigation, mulching and other agronomic manipulation on yield and water economy in sugarcane. Annals Agric. Res., 20 (1): 118-119.

Patro, N. (1998). Response of sugarcane to applied potassium in Orissa. Fertiliser-Marketing-News. 29 (8): 1-7.

Perez, O. and M. Melgar (2000). Sugar cane response to potassium fertilization on andisol, entisol, and mollisol soils of Guatemala. Guatemala. Better-Crops-International. 14(1): 20-22

Singh, K.D.N.; G.K. Mishra and J.B. Ojha (1999). Effect of potassium and their modes of application on yield and quality of sugarcane in calciorthents. Indian-Sugar. 49(7): 499-507.

Snedecor, G.W. and W.G. Cochran (1981). Statistical Methods. Seventh Ed. Iowa State Univ. Press, Ames, Iowa, USA.

Sukhchain-Saini A.K. (1998). Effect of waterlogging and water table on vatietal performance in sugarcane. Sugar Cane No. 1: 15-16.

Taha, E. M.; A. Z. Ahmed and K. S. EL-Sagheir (2003): Response of four sugar cane varieties to potassium fertilization. Egyptian-Journal of Agricultural-Research, 81(1):151-161.

Tiwari, R.J.; G.K. Nema; O.P. Rathore and R.K. Sharma (2000). Response of sugarcane (*Saccharum officinarum*) to levels and time of potassium application. Indian. J. of Agric. Scie. 70(6): 407-409.

Wiedenfeld, R.P. (1995). Effects of irrigation and N fertilizer application on sugarcane yield and quality. Field Crops Research 43(2-3): 101-108.

تأثير الرى والتسميد البوتاسى على محصول وجودة صنفين من قصب السكر.

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أجريت تجربتان حقليتان بمحطة البحوث الزراعية بسوهاج وذلك فى موسمى 2004/2003 ، 2005/2004. وذلك لدراسة تأثير الفترة بين الريات والتسميد البوتاسى على محصول وجودة بعض أصناف قصب السكر. واشتملت الدراسة على ثلاثة عوامل هى (1). الرى (رى كل 12 ، 16 ، 20 يوم) (2). أصناف قصب السكر (الصنف جيزة 54-9 والصنف Ph8013)(3). معدلات البوتاسيوم (بدون ، 25 ، 50 ، 75 كجم ثانى اكسيد البوتاسيوم للفدان) وذلك باستخدام تصميم القطع المنشقة مرتين حيث وضعت معاملات الرى فى القطع الرئيسية بينما وضعت الأصناف فى القطع المنشقة الأولى ووزعت معدلات التسميد البوتاسى عشوائيا فى القطع االمنشقة مرتين.

أوضحت النتائج أن تقصير فترات الرى من 20 إلى 12 يوم أدت إلى زيادة معنوية فى ارتفاع وقطر العود ومحصول العيدان بالطن فى كلا الموسمين.

حققت إضافة الرى كل 12 أو 16 يوم زيادة معنوية فى عدد العيدان القابلة للعصير ومحصول السكر طن/فدان. بينما تأثرت النسبة المئوية لكلا من السكروز وناتج السكر سلبيا ومعنويا بزيادة الفترة بين الريات.

تأثرت كل صفات قصب السكر المدروسة إيجابيا ومعنويا بزيادة مستويات البوتاسيوم من عدم إضافة إلى 75 كجم بو2أ للفدان.

اختلفت أصناف قصب السكر معنويا فى كل الصفات المدروسة وسجل الصنف التجارى جيزة 54-9 قيما أعلى لارتفاع العود وعدد العيان القابلة للعصير فى الفدان. بينما أعطى الصنف Ph.8013 عيدان اكثر سمكا ونسبة أعلى فى السكروز وناتج السكر ومحصول العيدان والسكر.

تحت ظروف هذه الدراسة يوصى زراعة الصنف Ph.8013 وريه كل 12 أو 16 يوم مسمدا 75 كجم بوتاسيوم للفدان للحصول على أعلى محصول عيدان وسكر.