EFFECT OF SEEDING RATE AND POTASSIUM FERTILIZER ON YIELD AND YIELD COMPONENTS OF SOME SUGARCANE VARIETIES

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Abstract

This investigation was carried out in El-Mattana Research Station, Luxor Governorate during the two seasons (2009/2010 and 2010/2011) to study the effect of seeding rate (8400 & 12600 and 16800 cuttings/fad.), potassium fertilizer rate (25, 50 and 75 kg /fad.) and their interactions on yield and yield components of three sugarcane varieties (G. 84-47& Phil 8013 and the commercial variety G.T. 54-9). The results indicated that the tested sugarcane varieties significantly differed in millable cane length, diameter of millable cane, cane and sugar yields /fad. and sugar recovery percentage in the two seasons, as well as millable cane weight in the first season only. Sugar cane variety G. 84-47 produced the highest cane yield/fad. in the two seasons , as well as sugar yield /fad. and sugar recovery percentage in the second season only, while sugar cane variety Phil 8013 produced the highest sugar yield /fad. and sugar recovery percentage in the first season only. The length of millable cane significantly increased by increasing number of cuttings/fad. up to 16800 cuttings/fad. in the two seasons. Planting sugarcane using 16800 cuttings/fad. gave the highest millable cane length in two seasons, as well as cane and sugar yield /fad. in the first season only while planting sugarcane using 8400 cuttings/fad. gave the highest millable cane diameter and weight in the two seasons. Increasing potassium fertilizer rate form 25 up to 75 Kg /fad. significantly increased the millable cane weight, cane and sugar yields /fad. in both seasons, as well as millable cane length in the second season only. The interaction between varieties and seeding rate on millable cane length was significant in the two seasons, as well as number of millable cane/fad. and millable cane diameter in the first season only. The interaction between varieties and potassium fertilizer rate on sugar recovery percentage was significant in the tow seasons as well as sugar yield /fad. in the first season only. Number of millable cane in the first

season and millable cane diameter in the second seasons were significantly affected by the interaction between seeding rate and potassium fertilizer rate. Interaction between varieties, seeding rate and potassium fertilizer rate on diameter of millable cane, millable cane weight and sugar recovery percentage were significant in second season only as well as number of millable cane /fad. in the first season only. Planting sugar cane variety G.T. 54-9 gave the highest values in millable cane weight when planting at 8400 cuttings/fad. with application of 75 kg K /fad. The highest millable cane diameter was obtained from planting sugar cane variety Phil 8013 at 8400 cuttings/fad. with application 75 kg K /fad. in second season.

CONCLUSION

The conclusion from the research planting sugar cane variety G. 84-47 at 16800 cuttings/fad. and potassium fertilizer rate 75 kg /fad. in El-Mattana Region - Luxor Governorate - A.R.E.

INTRODUCTION

Sugar is considered one of the most important strategic commodity for the populations all over the world and comes in the second order after wheat in Europe, North and South America and Australia, and it comes also after rice in Asian countries. Sugar industry largely depends on sugarcane crop. Egypt has the first position in sugar production and in the fourth position in the world sugar consumption. However, there is a gap between the production and consumption that adds load on the budget. To decrease this gap, it is necessary to increase the production of sugar cane through studying the factors affecting the productivity such as varieties, seeding rates and potassium fertilizer rates, etc. The present acreage of sugar cane in A.R.E. reaches about 325742 fad. in 2013*, with mean yield 47.739 tons/fad., while the acreage in Luxor governorate reaches about 61907 fad. in 2013, with mean yield 47.996 tons/fad. Sugar cane production in Egypt has suffered in the last few years from aserious deterioration such as unbalanced application of potassium of low yielding some varieties, neglected use of plant population and unapplication of the new cultural practices, which lead to a continuous decline in the annual sugar production.

* Report of the Inst. Of Economics, Agric. Res. Center, Ministry of Agriculture, A.R.E. Using the promising variety (Phil 8013 and G. 84-47) is one of the best ways to get high production and quality of sugar. The research team in sugar crops research institute released some of promising varieties in addition to the commercial one (Giza-Taiwan-54-9) through breeding promising, as well as introduction and the exchange with sugarcane growing countries. Cane and sugar yield as well as juice quality could be affected by potassium fertilizer rates. The issue of the nitrogen nutrition of sugar plants has been controversial because views vary as regards the form of potassium that is utilized best by plants. The results obtained by **El-Geddawy *et al.* (1997)** indicated that sugarcane variety G.T. 54/9 surpassed the other two varieties (F.153 and G.74/96) in cane and sugar yields. **Yousef *et al.* (2000)** pointed out that G. 85/37 and G. 87/55 cultivars surpassed the other (G.T. 54-9, G. 84-47, F. 153 and G. 75-368) cultivars in the studied traits(number of millable cane/m2, millable cane length, diameter and net cane and sugar yield /fad.). **Taha *et al.* (2003)** found that G.T 54-9 variety surpassed the other three varieties (G. 87/37 , G. 87/55 and F.160) in number of millable cane /m2 , length , diameter and yield of millable cane and sugar. **Ahmed (2005)** showed that G. 84/47 variety surpassed the other four varieties(G.T.54/9, F.160, G.95/19 and Ph 8013) in the number of millable cane/m2,length , cane and sugar yields /fad. **Bekheet (2006)** revealed that the commercial cultivars G.T.54-9 recorded higher values of stalk length and number of millable canes/fad., while the promising cane cultivar Phil 8013 had thicker stalks and sugar yields. **Ahmed and Khaled (2009)** found that sugarcane variety G.T.54-9 yielded the highest values of cane and sugar yields/fad. The number of millable stalks was higher for G.84-47 variety. **Bekheet (2011)** stated that sugarcane G.84-47 variety showed significant superiority on commercial, G.T.54-9 variety and Phil 8013 in the number of millable canes and cane and sugar yields/fad. under the conditions of the present investigation. With regard to seeding rates effect **Yousef *et al.* (2000)** noticed that 102 buds/row(length of each ridge was seven meters while ridge width was one meter) gave the best values of number of millable cane /m2 , millable cane length , net cane yield . While using 81 bud / row gave the highest values of millable cane diameter. **Ahmed (2003)** indicated that the seeding rate of 50400 buds / fad. gave the highest values of the number

of millable cane / m2 , cane and sugar yields / fad. . **El-Sogheir and Mohamed (2003)** cleared that planting sugarcane using 50 400 buds / fad attained significantly higher values of millable cane height, number of millable cane/m2, cane and sugar yields compared with 37800 buds / fad. in both seasons. They added that thicker stalk were significantly produced in case of 37800 buds / fad. in both seasons. **El-Geddawy *et al.* (2005)** grewing sugar cane at three sowing rates (25 200, 37 800 and 50 400 buds/fad.) and cleared that the sowing rate of 50 400 buds/fad. recorded the highest values for number of millable cane length, cane and sugar yields . With regard to potassium fertilizer effect **Taha *et al.* (2003)** reported that the K application significantly increased the number of millable cane/m2, millable cane diameter, cane and sugar yields. In general, all traits increased by increasing K application compared to the control. The highest theoretical sugar yield (72 kg K /fad.) was obtained from G.T.54-9, in plant crop. **Abo El-Wafa *et al.* (2006)** found that the application of 48 and 72 kg k/fed. recorded the highest millable cane and recoverable sugar yields. **Bekheet (2011)** stated that raising K-fertilizer level from 48 to 72 and 96 kg K /fad. led to a gradual increase in stalk height and diameter, number of millable canes and cane and sugar yields/fad. Under the conditions of the present investigation. This study aims to study the effect of seeding rates and potassium fertilizer rate on yield and its components of some sugarcane varieties.

MATERIALS AND METHODS

Two field experiments were conducted in El-Mattana Research Station, Luxor Governorate in 2009/2010 and 2010/2011 growing seasons . Each trial included twenty seven treatments represent the combination between three varieties (G.T. 54/9 , G. 84/47 and Phil 8013) , three seeding rates ((8400, 12600 and 16800 cuttings/fad.) and three potassium fertilizer rates (25, 50 and 75 kg /fad.) (each cutting consisted of three buds)

A split-split plot design with three replications was used in this work, where the main plots were randomly distributed for studied varieties while the seeding rates were assigned as sub-plot and potassium fertilizer rates were allocated as sub-sub plot .Plot area was 35 m2 containing five ridges, length of each ridge was seven meters while ridge width was one meter . Sugar cane was cultivated in the 2nd week of march in spring season in both seasons .The potassium fertilizer was applied once as potassium

sulphate (48% K_2O) with the second addition of nitrogen fertilizer for the plant crop. Fixed doses of phosphorus and nitrogen fertilizers were applied at rate of 60 kg P_2O_5 /fad. and 210 kg N/fad. Phosphorus was applied during land preparation as calcium super phosphate (15.5%P_2O_5). The nitrogen fertilizer was added as urea (46% N) were splitted into two equal doses, the first application was added after 60 days from planting. while, the second one was applied after 30 days later. All other agricultural practices were carried out as recommended under luxor conditions

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

		2009/2010 season	2010/2011 season
Mechanical analysis	Sand %	70.12	67.32
	Silt %	19.00	21.00
	Clay %	10.88	11.68
Soil texture		Sand loam	Sand loam
Chemical analysis	pH	8.1	7.7
	N (ppm)	20	30
	P (ppm)	11.00	8.00
	K (ppm)	35.1	31.2

Recorded data:

A. yield and its components:

At harvest, the following characters were determined:

- **Number of millable cane/fad.** It was counted on one square meter base then converted into number per fad.

A Sample of ten millable canes from each treatment was randomly taken to determine the following characters :

- **Millable cane length (cm):** It was measured from land level up to the top visible dewlap.
- **Millable cane diameter (cm):**It was measured at the middle part of stalk.
- **Millable cane weight (kg)**: was determined by determining the cane weight of the ten stalke then dividing it by its number of millable cane.
- **Cane yield (ton/fad.):** it was determined from the weight of the three middle guarded ridges of each plot converted into value per fad.

- **Sugar recovery percentage:** it was calculated as follows:
  Sugar recovery % = [sucrose % - 0.4 (brix % - sucrose %) × 0.73].
  (Yadav and Sharma, 1980).
- **Sugar yield (ton/fad.):** it was estimated according to the following equation:

Sugar yield (ton/fad) = cane yield (ton/fad) x sugar recovery %.

Statistical analysis:

The collected data were subjected to the proper statistical analysis of A split-split plot design according to the procedures outlined by **Snedecor and Cochran (1981).** The comparison among means was done using L.S.D at 0.05 level of probability. as odtained by **Steel and Torrie (1980).**

RESULTS AND DISCUSSION

1- Number of millable cane /fad.:

Effect of seeding rate and potassium fertilizer rate as well as their interaction on Number of millable cane /fad. of some sugarcane varieties in 2009/2010 ,2010/2011 seasons are shown in Table (2).The differences between sugar cane varieties on Number of millable cane /fad. was insignificant in the both seasons. planting sugar cane at 16800 cutting/fad. attained markedly higher number of millable cane /fad. (60629 /fad.) in the first season, whilein the second season, planting sugar cane at 12600 and 16800 cutting/fad. gave the higher number of millable cane /fad. (58800 and 57384 /fad.) respectively. It is clear from the data 12600 cutting/fad. differed insignificantly in number of millable cane than the 16800 cutting/fad. Similar results were obtained by **Yousef *et al* (2000)** and **El-Geddawy *et al.* (2005)**. The effect of potassium fertilizer rates on number of millable cane /fad. was insignificant in the both seasons. The interaction between varieties and seeding rates on number of millable cane /fad. was significant in the first season only. Results presented in Table (2) show that the higher number of millable cane /fad. (66901 millable cane /fad.) was produced by planting sugar cane variety G.84-47 at 12600 cutting/fad.

The interaction between varieties and potassium fertilizer rate was insignificantly in the both seasons. In addition, number of millable cane/fad. was significantly affected by the interaction between seeding rates and potassium fertilizer rate in the first season only. Results present in Table (2) indicate that the highest values of number of millable cane/fad.

(64811) was recorded from planting at 16800 cutting/fad. with 75 kg K /fad. for the first season . Moreover, the interaction between varieties, seeding rates and potassium fertilizer rates on number of millable cane/fad. was significant in first season only. Results presented in Table (2) show that the highest number of millable cane/fad. (78400) was obtained from planting sugar cane variety G.T. 54-9 at 16800 cutting/fad. with application 75 kg K /fad. for the first season.

2- Millable cane length (cm)

Effect of seeding rate and potassium fertilizer rate as well as their interaction on millable cane length of some sugar cane varieties in the two seasons (2009/2010 and 2010 /2011) are shown in Table (3).

Sugar cane variety G.T. 54-9 had the tallest millable cane (274.63 cm) in the first season, while G.84-47 variety gave the tallest millable cane (293.15 cm) in the second season. Also, it is clear from the data that G.T.54/9 variety differed insignificantly in millable cane length than G.84/47 verity, while Phil 8013 variety differed significantly than the other two varieties. This result may be due to the genetic differences among varieties in their ability of the formation of internodes and /or determination of their length. This result is in line with obtained by **Yousef *et al.* (2000) , Taha *et al.*(2003) , Abo El-Wafa *et al.* (2006) and Bekheet (2006).** Results given in the same Table reveal that the length of millable cane significantly increased as number of cuttings/row was increased up to 16800 cutting/fad. in the two seasons.

Similar results were obtained by **Yousef *et al.* (2000) , El-Sogheir and Mohamed (2003) and El-Geddawy *et al.* (2005).** Increasing potassium fertilizer rate from 25 up to 75 Kg/fad. significantly increased the millable cane length (291.85cm) in the second season. This result may be due to the role of potassium in physiological processes in sugar cane plants. This is in harmony with those obtained by **Azzazy and Elham (2000) , Bekheet (2011) and Indirajith and Natarajan (2011).** The interaction between varieties and seeding rate on millable cane length was significant in the two seasons. Results presented in Table (3) show that the tallest millable cane (282.78 and 301.11 cm) respectively, was produced by planting sugar cane variety G.T. 54-9 at 16800 cutting/fad. Similar results were obtained by **Ahmed (2005).**The other interaction was insignificant in both seasons.

Table (2) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on number of millable cane /fad. of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	50176	50176	43904	48085	49980	50960	49980	50307
	12600	47040	59584	45472	50699	56840	57820	56840	57167
	16800	64288	54880	78400	65856	51940	58800	55860	55533
mean		53835	54880	55925	54880	52920	55860	54227	54336
G84-47	8400	40768	50176	45472	45472	52920	49980	53900	52267
	12600	62720	67424	70560	66901	60760	62720	64680	62720
	16800	58016	61152	72128	63765	70560	55860	60760	62393
mean		53835	59584	62720	58713	61413	56187	59780	59127
Phil 8013	8400	50176	39200	29792	39723	52920	46060	55860	51613
	12600	45472	58016	70560	58016	48020	62720	58800	56513
	16800	64288	48608	43904	52267	53900	52920	55860	54227
mean		53312	48608	48085	50002	51613	53900	56840	54118
Over all mean for S.	8400	47040	46517	39723	44427	51940	49000	53247	51396
	12600	51744	61675	62197	58539	55207	61087	60107	58800
	16800	62197	54880	64811	60629	58800	55860	57493	57384
mean		53660	54357	55577	54532	55316	55316	56949	55860

LSD at 0.05 level		
Sugar cane varieties (V)	N.S	N.S
Seeding rate (S)	3967.41	4394.41
Potassium rate (K)	N.S	N.S
VXS	6871.75	N.S
V X K	N.S	N.S
S X K	7675.56	N.S
V X S X K	13294.46	N.S

Table (3) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on millable cane length (cm) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	260.00	266.67	268.33	265.00	278.33	283.33	283.33	281.67
	12600	270.00	278.33	280.00	276.11	288.33	291.67	300.00	293.33
	16800	276.67	285.00	286.67	282.78	295.00	303.33	305.00	301.11
mean		268.89	276.67	278.33	274.63	287.22	292.78	296.11	292.04
G84-47	8400	256.67	268.33	271.67	265.56	281.67	285.00	288.33	285.00
	12600	268.33	275.00	281.67	275.00	291.67	293.33	298.33	294.44
	16800	276.67	283.33	283.33	281.11	293.33	301.67	305.00	300.00
mean		267.22	275.56	278.89	273.89	288.89	293.33	297.22	293.15
Phil 8013	8400	238.33	236.67	246.67	240.56	253.33	263.33	270.00	262.22
	12600	251.67	253.33	245.00	250.00	261.67	268.33	283.33	271.11
	16800	250.00	260.00	263.33	257.78	280.00	285.00	293.33	286.11
Mean		246.67	250.00	251.67	249.44	265.00	272.22	282.22	273.15
Over all mean for S.	8400	251.67	257.22	262.22	257.04	271.11	277.22	280.56	276.30
	12600	263.33	268.89	268.89	267.04	280.56	284.44	293.89	286.30
	16800	267.78	276.11	277.78	273.89	289.44	296.67	301.11	295.74
Mean		260.93	267.41	269.63	265.99	280.37	286.11	291.85	286.11

LSD at 0.05 level		
Sugar cane varieties (V)	5.74	6.82
Seeding rate (S)	3.72	3.32
Potassium rate (K)	N.S	6.10
VXS	6.45	5.74
V X K	N.S	N.S
S X K	N.S	N.S
V X S X K	N.S	N.S

3. Millable cane diameter (cm):

Effect of seeding rate and potassium fertilizer rate as well as their interaction on diameter of millable cane of some sugar cane varieties in the two seasons (2009/2010 and 2010 /2011) are shown in Table (4).

The millable cane diameter was significantly by sugar cane varieties. Sugar cane variety Phil 8013 had the thickest stalk (2.83 and 3.03 cm.) in the two seasons, respectively compared with the other varieties.

This result may be due to the more vigorous growth of plants of Phil 8013 variety. This variety had less tiller which might account much in this respect. This variety cane be characterized as having less stand density which increases the diameter of millable cane. This result is in line with those obtained by **Yousef *et al.* (2000) , Taha *et al.* (2003) and Abo El-Wafa *et al.* (2006)**.

Given results in the same Table revealed that planting sugar cane at 8400 cuttings/fad. attained markedly the thicker millable cane (2.75 and 2.90 cm) in the two seasons, respectively. This result may be attributed to the greater plant competition for light and nutrients as well as mutual shading in case of higher seeding rate at 16800 cutting/fad. Similar results were obtained by **Yousef *et al.* (2000) and El-Sogheir and Mohamed (2003).**

The effect of potassium fertilizer rates on millable cane diameter was insignificant in both seasons.

The interaction between varieties and seeding rates on millable cane diameter was significant in the 1st season only. Results present in Table (4) showed that the thicker millable cane (2.89 cm) was produced by planting sugar cane variety Phil 8013 at 8400 cuttings/fad. in the 1st season.

In addition, the interaction between sugar cane varieties and potassium fertilizer rate on millable cane diameter was significant in first season only. The highest values of millable cane diameter (2.90cm) was recorded by Phil 8013 variety with application 75 kg K/fad. in first season. Diameter of millable cane was significantly by the interaction between seeding rates and potassium fertilizer rates in the second seasons only. Results presented in Table (4) indicated that the highest values of millable cane diameter(2.92 cm) was recorded from planting at 8400 cutting/fad. with 50 kg K /fad. for the second season. results in Table (4) show that the Interaction between varieties, seeding rate and potassium fertilizer rate on millable cane diameter was significant in the second season only. The highest

millable cane diameter (3.23cm) was obtained from planting sugar cane variety Phil 8013 at 8400 cutting/fad. with application of 75 kg K /fad. for the second season.

Table (4) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on millable cane diameter (cm) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	2.80	2.87	2.87	2.84	2.97	3.07	3.00	3.01
	12600	2.77	2.67	2.83	2.76	3.07	2.83	3.03	2.98
	16800	2.67	2.70	2.73	2.70	2.70	2.97	2.80	2.82
Mean		2.74	2.74	2.81	2.77	2.91	2.96	2.94	2.94
G84-47	8400	2.53	2.50	2.50	2.51	2.67	2.63	2.47	2.59
	12600	2.40	2.52	2.43	2.45	2.43	2.43	2.60	2.49
	16800	2.37	2.50	2.43	2.43	2.37	2.53	2.43	2.44
Mean		2.43	2.51	2.46	2.46	2.49	2.53	2.50	2.51
Phil 8013	8400	2.83	2.90	2.93	2.89	3.03	3.07	3.23	3.11
	12600	2.80	2.80	2.87	2.82	3.13	2.87	3.10	3.03
	16800	2.77	2.70	2.90	2.79	3.03	3.00	2.83	2.96
Mean		2.80	2.80	2.90	2.83	3.07	2.98	3.06	3.03
Over all mean for S.	8400	2.72	2.76	2.77	2.75	2.89	2.92	2.90	2.90
	12600	2.66	2.66	2.71	2.68	2.88	2.71	2.91	2.83
	16800	2.60	2.63	2.69	2.64	2.70	2.83	2.69	2.74
Mean		2.66	2.68	2.72	2.69	2.82	2.82	2.83	2.83

LSD at 0.05 level		
Sugar cane varieties (V)	0.09	0.08
Seeding rate (S)	0.07	0.06
Potassium rate (K)	N.S	N.S
VXS	0.12	N.S
V X K	0.07	N.S
S X K	N.S	0.10
V X S X K	N.S	0.17

4- Millable cane weight (kg):

Effect of seeding rate and potassium fertilizer rate as well as their interaction on Millable cane weight (kg) of some sugar cane varieties in the two seasons (2009/2010 and 2010/2011) are Presented in Table (5).

Results in Table (5) exhibited significant differences among the studied sugarcane varieties in millable cane weight (kg) in first season only. Sugar cane variety G.T.54-9 produced the highest millable cane weight (1.76 kg) for the first season. This result may be due to the best millable cane length recorded by this variety (Table 3). Highly significant positive correlation between millable cane weight and millable cane length was reported by **Hogarth (1971).** These result are in agreement with those obtained by these results are in agreement with those obtained by **Mohamed and Ahmed (2002).**

Given results in the same Table Millable cane weight (kg) was significantly affected by seeding rates in the two seasons. The planting sugar cane at 8400 cuttings/fad. attained markedly the highest millable cane weight (kg) (1.48 and 1.55 kg) in the first and second seasons, respectively. This due to the best diameter and lowest number of millable cane respectively were recorded by1st seeding rate (Table 4 and 2). Highly significant negative correlation between millable weight and number of millable cane was reported by **Hogarth (1971).**

This is in harmony with those obtained by **Ahmed (2003) and El-Geddawy *et al.*(2005).**

Millable cane weight (kg) was significantly by potassium rates in the two seasons. The highest values of Millable cane weight (kg) was obtained with application of 75 Kg K /fad. for two seasons. This result may be due to the role of potassium in physiological processes in sugar cane plants. These result are in agreement with those obtained by **Indirajith and Natarajan (2011)** found that increasing K fertilizer rates significantly increased the millable cane weight (kg) up to 75 Kg K /fad.

The interaction between varieties and seeding rate on millable cane weight (kg) was insignificantly in the both seasons.The interaction between sugar cane varieties and potassium fertilizer rates on millable cane weight (kg) was significant in the second season only. Results in Table (5) reported that the highest values of millable cane weight (1.92kg) was recorded by G.T.54-9 variety with application 75 kg K/fad. for the second seasons.The interaction between potassium fertilizer rate and seeding rate on millable cane weight (kg) was insignificantly affected in the both seasons.Moreover, the interaction between varieties, seeding rate and potassium fertilization rate on millable cane weight was significant in second seasons only. the highest millable cane weight (2.06 kg) was obtained from planting sugar

cane variety G.T.54-9 at 8400 cuttings/fad. with application of 75 kg K /fad. for the second season.

Table (5) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on millable cane weight (kg) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	1.67	1.87	2.02	1.85	1.49	1.24	2.06	1.60
	12600	1.65	1.84	1.84	1.78	1.38	1.39	1.82	1.53
	16800	1.50	1.70	1.78	1.66	1.08	1.43	1.89	1.47
Mean		1.61	1.80	1.88	1.76	1.32	1.35	1.92	1.53
G84-47	8400	1.28	1.42	1.53	1.41	1.50	1.53	1.50	1.51
	12600	1.45	1.32	1.31	1.36	1.55	1.41	1.52	1.49
	16800	1.14	1.05	1.19	1.12	1.43	1.44	1.27	1.38
Mean		1.29	1.26	1.35	1.30	1.49	1.46	1.43	1.46
Phil 8013	8400	1.18	1.24	1.11	1.18	1.54	1.64	1.40	1.53
	12600	1.09	1.10	1.30	1.16	1.60	1.46	1.51	1.52
	16800	1.05	1.21	1.19	1.15	1.35	1.36	1.63	1.45
Mean		1.10	1.18	1.20	1.16	1.50	1.49	1.51	1.50
Over all mean for S.	8400	1.37	1.51	1.56	1.48	1.51	1.47	1.65	1.55
	12600	1.40	1.42	1.48	1.43	1.51	1.42	1.61	1.51
	16800	1.23	1.32	1.39	1.31	1.29	1.41	1.59	1.43
Mean		1.33	1.42	1.48	1.41	1.43	1.44	1.62	1.50

LSD at 0.05 level		
Sugar cane varietles (V)	0.17	N.S
Seeding rate (S)	0.09	0.10
Potassium rate (K)	0.10	0.07
VXS	N.S	N.S
V X K	N.S	0.11
S X K	N.S	N.S
V X S X K	N.S	0.20

5- Cane yield (ton/fad.):

Effect of seeding rate and potassium fertilizer rate as well as their interaction on cane yield (ton/fad.) of some sugar cane varieties in the two seasons are presented in Table (6)

Results in Table (6) exhibited significant differences among the studied sugarcane varieties in cane yield in the two seasons. Sugar cane variety G. 84-47 produced the highest cane yield 49.87 and 47.03 tons/fad. in the first and second seasons, respectively. These results could be attributed to higher values of millable cane length and number of millable canes/fed. (Tables 2 and 3, respectively)

These results are in agreement with those obtained by **Mohamed and Ahmed (2002) , Ahmed and Khaled (2009) and Bekheet (2011).**

Cane yield (ton/fad.) was significantly affected by seeding rate in the first season only. Results in Table (6) show that the highest values were obtained from planting at 16800 cuttings/fad. which gave 48.70 ton/fad., These results could be probably due to that planting at 16800 cuttings/fad. gave more millable cane /fad. and consequently gave higher cane yield/fad. This is in harmony with those obtained by **Ahmed (2003) and El-Geddawy *et al.*(2005).**

Cane yield (ton/fad.) was significantly affected by potassium rate in the two seasons. The highest values of cane yield was obtained by application of 75 Kg K /fad. for two seasons. The superiority of rate 75 Kg K /fad. over the other two rates of K/fad. is probably attributed to its highest values of millable cane length , millable cane weight (Tables 3 and 5) compared to the other two rates of K/fad. These results are in agreement with those obtained by **Bekheet (2011)**.

These results indicated that the all possible interactions among them were insignificant on cane yield /fad. in two seasons.

Table (6) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on cane yield (ton/fad.) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	39.70	40.17	39.77	39.88	40.33	47.67	47.67	45.22
	12600	40.10	40.50	49.60	43.40	36.33	53.33	46.33	45.33
	16800	37.00	44.97	49.80	43.92	47.93	44.00	53.20	48.38
Mean		38.93	41.88	46.39	42.40	41.53	48.33	49.07	46.31
G84-47	8400	44.93	46.17	53.93	48.34	40.67	46.33	49.67	45.56
	12600	48.40	46.10	51.57	48.69	40.67	43.33	52.33	45.44
	16800	47.40	55.27	55.10	52.59	47.00	52.27	51.00	50.09
Mean		46.91	49.18	53.53	49.87	42.78	47.31	51.00	47.03
Phil 8013	8400	39.43	44.93	49.33	44.57	37.00	40.33	45.47	40.93
	12600	41.50	47.10	53.60	47.40	39.00	39.20	54.27	44.16
	16800	44.30	46.63	57.83	49.59	40.00	48.80	52.67	47.16
Mean		41.74	46.22	53.59	47.19	38.67	42.78	50.80	44.08
Over all mean for S.	8400	41.36	43.76	47.68	44.26	39.33	44.78	47.60	43.90
	12600	43.33	44.57	51.59	46.50	38.67	45.29	50.98	44.98
	16800	42.90	48.96	54.24	48.70	44.98	48.36	52.29	48.54
Mean		42.53	45.76	51.17	46.49	40.99	46.14	50.29	45.81

LSD at 0.05 level		
Sugar cane varieties (V)	1.22	1.36
Seeding rate (S)	2.85	N.S
Potassium rate (K)	2.92	3.63
VXS	N.S	N.S
V X K	N.S	N.S
S X K	N.S	N.S
V X S X K	N.S	N.S

6- Sugar recovery percentage (SR%):

Effect of seeding rate and potassium fertilizer rate as well as their interaction on sugar recovery percentage of some sugar cane varieties in the two seasons (2009/2010 and 2010 /2011) are shown in Table (7).

Sugar recovery percentage was significantly affected by sugar cane varieties in the two seasons. The highest values of sugar recovery percentage (11.26 %) producing by sugar cane varieties Phil 8013 in first season. While Sugar cane variety G. 84-47 produced the highest values of sugar recovery percentage (12.30%) in the second season. This is in harmony with those obtained by **Bekheet (2006)** revealed that The commercial cultivars G.T.54-9 recorded higher values of sucrose and sugar recovery percentages

Seeding rate significantly affected of sugar recovery percentage in the second season only. Results given in Table (7) reported that the highest sugar recovery percentage (12.22 %) was recorded from using 16800 cuttings/fad. This is in harmony with those obtained by **Osman *et al.* (2004)** showed that the rate of buds (50 400 buds/fed surpassed 37 800 buds/fad) in reducing sugar, purity and sugar recovery percentages .

The effect of potassium fertilizer rate had no significant affect on sugar recovery percentage in tow seasons.

The interaction between varieties and seeding rate on sugar recovery percentage was significant in the second season only. Results presented in Table (7) show that the highest value of sugar recovery percentage (12.58 %) was produced from planting sugar cane variety Phil 8013 at 12600 cutting/fad.

As shown in Table (7) the interaction between varieties and potassium fertilizer rate on sugar recovery percentage was significant in the tow seasons. Sugar cane variety Phil 8013 produced the highest value of sugar

recovery percentage (11.66 %) in 1st season, when it was fertilized with application 75Kg K /fad. While G.84-47 variety gave the highest value of sugar recovery percentage (12.50%) in 2nd seasons, when it was fertilized with application 75Kg K /fad.

The interaction between seeding rate and potassium fertilizer rate had no significant affect on sugar recovery percentage in the tow seasons.

Moreover, the interaction between the three factors on sugar recovery percentage was significant in the second season only. The highest values of sugar recovery percentage (13.21%), from planting sugar cane variety G.84-47 at 12600 cutting/fad. with application 50 Kg K/fad.

Table (7) : Effect of seeding rate and potassium fertilizer rate as well as their interaction on sugar recovery percentage of some sugar cane varieties in 2009/2010 and 2010/2011 seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	10.17	9.71	11.51	10.46	11.17	11.62	10.52	11.10
	12600	11.41	10.90	11.64	11.32	11.73	10.68	11.82	11.41
	16800	11.67	10.85	11.44	11.32	11.93	12.18	12.36	12.16
Mean		11.08	10.49	11.53	11.03	11.61	11.50	11.57	11.56
G84-47	8400	10.49	11.01	10.04	10.51	11.61	12.12	12.30	12.01
	12600	11.18	10.30	10.03	10.50	11.67	13.21	12.27	12.38
	16800	11.49	11.76	8.99	10.75	12.44	12.17	12.92	12.51
Mean		11.05	11.02	9.69	10.59	11.91	12.50	12.50	12.30
Phil 8013	8400	10.27	10.54	11.51	10.77	11.89	12.14	11.93	11.99
	12600	10.35	11.80	11.41	11.19	12.97	12.09	12.67	12.58
	16800	12.32	11.08	12.06	11.82	12.32	11.49	12.16	11.99
Mean		10.98	11.14	11.66	11.26	12.39	11.91	12.25	12.19
Over all mean for S.	8400	10.31	10.42	11.02	10.58	11.55	11.96	11.58	11.70
	12600	10.98	11.00	11.03	11.00	12.12	12.00	12.25	12.12
	16800	11.82	11.23	10.83	11.30	12.23	11.95	12.48	12.22
Mean		11.04	10.88	10.96	10.96	11.97	11.97	12.11	12.01

LSD at 0.05 level		
Sugar cane varieties (V)	0.24	0.44
Seeding rate (S)	N.S	0.41
Potassium rate (K)	N.S	N.S
V X S	N.S	0.72
V X K	0.89	0.46
S X K	N.S	N.S
V X S X K	N.S	0.79

7- Sugar yield (ton/fad.):

Results in Table (8) reveal the effect of seeding rates and potassium fertilizer rates as well as the interactions among them on sugar yield (ton/fad.) of some sugar cane varieties in two seasons.

Results in Table (8) exhibited significant differences among the studied sugarcane varieties in sugar yield in two seasons. Sugar cane variety Phil 8013 produced the highest sugar yield (5.33 tons/fad.) for 1st season, while G.84-47 variets gave the highest sugar yield (5.81 tons/fad.) for second season. This due to the highest sugar recovery percentage which recorded for these varieties (Table 7) since the sugar recovery percentage is one of two components determing sugar yield. These results are in agreement with those obtained by **El-Geddawy *et al.* (1997), Yousef *et al.* (2000) , Ahmed and Khaled (2009) and Bekheet (2011).**

Sugar yield (ton/fad.) was significantly affected by seeding rate in the 1st season only. Results in Table (8) showed that the highest of sugar yield were obtained from planting at 16800 cuttings/fad. which gave 5.50 ton/fad. for 1st season. The increase in sugar yield may be due to increase of cane yield and better growth characters as mentioned before. Similar results were obtained by **Ahmed (2003), El-Sogheir and Mohamed (2003) and El-Geddawy *et al.* (2005).**

Sugar yield was significantly affected by potassium rates in the two seasons. Application of potassium at the rate of 75 Kg /fad., resulted the highest sugar yield (5.60 and 6.11 tons/fad.) in the 1st and 2nd seasons, respectively. This result could be attributed to the important role of potassium fertilizer in physiological processes in sugar cane plants such as translocation of sugar and carbohydrate. These results agreement with those suggested by **Bekheet (2011)**.

These results indicated out that the effect of the all possible interactions among them were insignificant on sugar yield ton/fad. in tow seasons except, the interaction between varieties and potassium fertilizer rates was significant in the 1st season only. Related results in Table (8) reported that the highest values of sugar yield (6.25 ton/fad.) was recorded from planting sugar cane variety Phil 8013 with application of 75 kg K/fad. for 1st season.

Table (8) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on sugar yield (ton/fad.) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	4.04	3.90	4.58	4.17	4.50	5.53	5.03	5.02
	12600	4.57	4.41	5.78	4.92	4.26	5.68	5.52	5.15
	16800	4.32	4.98	5.70	5.00	5.71	5.35	6.57	5.88
Mean		4.31	4.43	5.35	4.70	4.82	5.52	5.70	5.35
G84-47	8400	4.70	5.10	5.42	5.07	4.71	5.64	6.15	5.50
	12600	5.39	4.74	5.18	5.10	4.76	5.75	6.42	5.64
	16800	5.45	6.49	5.00	5.64	5.89	6.36	6.60	6.28
Mean		5.18	5.44	5.20	5.27	5.12	5.92	6.39	5.81
Phil 8013	8400	4.05	4.73	5.68	4.82	4.40	4.89	5.43	4.91
	12600	4.30	5.53	6.12	5.32	5.07	4.74	6.88	5.56
	16800	5.46	5.19	6.97	5.87	4.92	5.68	6.42	5.67
Mean		4.60	5.15	6.25	5.33	4.80	5.10	6.24	5.38
Over all mean for S.	8400	4.26	4.58	5.22	4.69	4.54	5.36	5.53	5.14
	12600	4.75	4.89	5.69	5.11	4.69	5.39	6.27	5.45
	16800	5.07	5.55	5.89	5.50	5.51	5.80	6.53	5.94
Mean		4.70	5.01	5.60	5.10	4.91	5.51	6.11	5.51

LSD at 0.05 level		
Sugar cane varieties (V)	0.16	0.30
Seeding rate (S)	0.42	N.S
Potassium rate (K)	0.43	0.46
VXS	N.S	N.S
V X K	0.74	N.S
S X K	N.S	N.S
V X S X K	N.S	N.S

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Table (8) : Effect of seeding rate and Potassium fertilizer rate as well as their interaction on sugar yield (ton/fad.) of some sugar cane varieties in 2009/2010 and 2010/2011seasons.

Varieties (V)	Seeding rate (S) (cuttings/fad.)	2009/2010 season				2010/2011 season			
		Potassium rate Kg / fad. (K)							
		25	50	75	Mean	25	50	75	Mean
G.T54-9	8400	4.04	3.90	4.58	4.17	4.50	5.53	5.03	5.02
	12600	4.57	4.41	5.78	4.92	4.26	5.68	5.52	5.15
	16800	4.32	4.98	5.70	5.00	5.71	5.35	6.57	5.88
Mean		4.31	4.43	5.35	4.70	4.82	5.52	5.70	5.35
G84-47	8400	4.70	5.10	5.42	5.07	4.71	5.64	6.15	5.50
	12600	5.39	4.74	5.18	5.10	4.76	5.75	6.42	5.64
	16800	5.45	6.49	5.00	5.64	5.89	6.36	6.60	6.28
Mean		5.18	5.44	5.20	5.27	5.12	5.92	6.39	5.81
Phil 8013	8400	4.05	4.73	5.68	4.82	4.40	4.89	5.43	4.91
	12600	4.30	5.53	6.12	5.32	5.07	4.74	6.88	5.56
	16800	5.46	5.19	6.97	5.87	4.92	5.68	6.42	5.67
Mean		4.60	5.15	6.25	5.33	4.80	5.10	6.24	5.38
Over all mean for S.	8400	4.26	4.58	5.22	4.69	4.54	5.36	5.53	5.14
	12600	4.75	4.89	5.69	5.11	4.69	5.39	6.27	5.45
	16800	5.07	5.55	5.89	5.50	5.51	5.80	6.53	5.94
Mean		4.70	5.01	5.60	5.10	4.91	5.51	6.11	5.51

LSD at 0.05 level		
Sugar cane varieties (V)	**0.16**	**0.30**
Seeding rate (S)	**0.42**	**N.S**
Potassium rate (K)	**0.43**	**0.46**
VXS	**N.S**	**N.S**
V X K	**0.74**	**N.S**
S X K	**N.S**	**N.S**
V X S X K	**N.S**	**N.S**

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الملخص العربي

تأثير معدل التقاوى والسماد البوتاسى على المحصول ومكوناته لبعض أصناف قصب السكر

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أجرى هذا البحث بمحطة البحوث الزراعية بالمطاعنه بمحافظة الاقصر خلال موسمي غرس ٢٠٠٩ / ٢٠١٠م و ٢٠١٠ /٢٠١١م لدراسة تأثير ثلاث معدلات تقاوي ٨٤٠٠ عقلة/فدان ، ١٢٦٠٠ عقلة/فدان ، ١٦٨٠٠ عقلة/فدان وثلاث معدلات من السماد البوتاسي (٢٥ ، ٥٠ ، ٧٥ كجم) / فدان والتفاعل بينهم علي الناتج ومكوناته لثلاثة أصناف من قصب السكر هم (الفلبيني ٨٠١٣ وجيزة ٨٤-٤٧ و الصنف التجاري جيزة تايوان ٥٤-٩).

- أوضحت النتائج أن هناك اختلافات معنوية بين الأصناف المختبرة فى طول وسمك العود ومحصولى القصب والسكر والنسبة المؤية لناتج السكر النظرى فى الموسمين بالأضافة الى متوسط وزن العود فى الموسم الأول فقط .
- أنتج الصنف جيزة ٨٤-٤٧ أعلى محصول قصب / فدان فى الموسمين بالإضافة الى محصول السكر/ فدان والنسبة المؤية لناتج السكر النظرى فى الموسم الثانى فقط بينما أنتج الصنف الفليبينى ٨٠١٣ أعلى محصول سكر/ فدان وأعلى نسبة مؤية لناتج السكر النظرى فى الموسم الآول فقط.
- أظهرت النتائج أن طول العود زاد زيادة معنوية بزيادة عدد عقل التقاوى لكل فدان حتى ١٦٨٠٠عقلة خلال الموسمين .
- أعطت الزراعة بـ ١٦٨٠٠ عقلة للفدان أعلى القيم لطول العود فى الموسمين بالإضافة الى محصول القصب والسكر (طن/فدان) فى الموسم الأول فقط بينما أعطت الزراعة بـ ٨٤٠٠ عقلة للفدان أعلى القيم لسمك العود ومتوسط وزن العود فى الموسمين .
- كانت هناك زيادة معنوية لمتوسط وزن العود ومحصولى القصب والسكر (طن/فدان) للموسمين بالإضافة الى طول العود للموسم الثانى فقط وذلك بزيادة معدل السماد البوتاسى من ٢٥ كجم حتى ٧٥ كجم بوتاسيوم للفدان.
- كان تأثير التفاعل بين الاصناف ومعدلات التقاوي معنوياً على صفة طول العود فى الموسمين بالإضافة الى صفتى عدد العيدان القابلة للعصير / فدان وسمك العود فى الموسم الأول فقط .
- كان تأثير التفاعل بين الاصناف ومعدلات السماد البوتاسي معنوياً لصفة النسبة المؤية لناتج السكر النظرى فى الموسمين بالأضافة الى محصول السكر/ فدان فى الموسم الاول فقط
- كان تأثير التفاعل بين معدلات التقاوي ومعدلات السماد البوتاسي معنوياً على صفتى عدد العيدان القابلة للعصير/ فدان فى الموسم الأول وسمك العود فى الموسم الثانى.
- كان تأثير التفاعل بين الاصناف ومعدلات التقاوي ومعدلات السماد البوتاسي معنوياً على صفة سمك العود ومتوسط وزن العود والنسبة المؤية لناتج السكر النظرى فى الموسم الثانى فقط بالأضافة الى صفة عدد العيدان القابلة للعصير لكل فدان فى الموسم الأول فقط .
- أعطت زراعة الصنف جيزة تايوان ٥٤-٩ أعلى القيم لصفة متوسط وزن العود عند زراعته بـ ٨٤٠٠ عقلة للفدان مع إضافة ٧٥ كجم سماد بوتاسى للفدان .
- تم الحصول على أعلى سمك للعود عند زراعة الصنف الفليبينى ٨٠١٣ بـ ٨٤٠٠ عقلة للفدان مع إضافة ٧٥ كجم سماد بوتاسى للفدان فى الموسم الثانى فقط .

الخلاصة

الخلاصة من البحث يمكن التوصية بزراعة الصنف جيزة ٨٤-٤٧ بمعدل تقاوى ١٦٨٠٠ عقلة/فدان والسماد البوتاسى بمعدل ٧٥ كجم للفدان وذلك فى منطقة المطاعنه بمحافظة الاقصر بجمهورية مصر العربية