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Yield, Quality and Natural Infestation with Insect and Disease of Four Sugarcane Varieties as Affected by Different Levels of Potassium Fertilization

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ABSTRACT

The present experiments were carried out in El-Mattana Research Station (latitude of 25.25°N and longitude of 32.31°E), Agricultural Research Center, Luxor Governorate, Egypt. The present work was conducted on two plant cane crops grown in 2015/2016 and 2016/2017 seasons to study the yield, quality and natural of infestation with lesser sugarcane borer, *Chilo agamemnon* Bles., and pokkah boeng disease (*Fusarium moniliforme* Sheldon) and other diseases of four sugarcane varieties (G.T.54-9, G.2003-47, Ph 8013 and C. 57-14) as affected by three levels of potassium fertilization (zero, 24 and 48 kg K_2O/fed.). The results showed that the difference in mostly traits between sugarcane variety G.T.54-9 and G.2003-47 was insignificant, they surpassed the other two varieties in number of millable canes and cane and sugar yield/fed. Also, they recorded the highest percentages of infestation with *C. agamemnon* Bles., and pokkah boeng, during the two successive seasons. The sugarcane variety Ph 8013 showed significant superiority in stalk weight, sucrose% and sugar recovery%. However, the variance between the two sugarcane varieties namely Ph 8013 and G.2003-47 in sucrose% and sugar recovery% was insignificant. Increasing the applied dose of potassium fertilizer up to 48 kg K_2O/fed. was accompanied by a significant increase in the values of number of millable canes, stalk weight/plant and sugar yields as well as decreased of percentage of infestation with *C. agamemnon* Bles., and pokkah boeng disease, during the two successive seasons. However, the variance between 24 and 48 K_2O/fed. in sucrose%, sugar recovery% and cane yields/fed. was insignificant during the two successive seasons. Fertilizing sugar cane crop by 24 and 48 kg K2O/fed. increased cane yield by 6.47 % & 7.51 % during the first season and 4.51 % & 11.34 % during the second season, respectively, compared with check treatment.

Keywords: Sugarcane Varieties, Potassium Fertilization*, C. agamemnon, Fusarium moniliforme*, yield, quality.

INTRODUCTION

The commercial sugarcane variety G.T.54-9 occupies most of the area planted with sugarcane in Egypt. Recently, Sugar Crops Research Institute produced some promising genotypes of sugarcane, among them G.2003-47 and G.2003-49. They vary genetically in their growth, yield and quality characteristics all traits of cane genotypes are also affected by soil, weather factors, agronomic practices, pests and diseases, which ultimately reflected on the productivity sugar. Allabody *et al*. (2010) and Osman *et al*. (2010) found that varieties, i.e. G.T.54- 9, Ph 8013 and G.98-28 and G.84-47 of sugar cane, had significant effect on sucrose%, sugar recovery%, cane and sugar yields / fed. in the plant cane and 1st ratoon crops. G.84-47 and/or G.98- 28 surpassed the others varieties. Abd El-Aal *et al.* (2015) recorded that the tested sugarcane varieties differed significantly in their stalk number, sucrose % and cane and sugar yields whether they were grown as a plant cane or 1st and 2nd ratoon crops as well as sugar recovery % (in the 2nd crop). Promising variety G.2003-47 produced the highest sugar yield/fed. Galal *et al*. (2015) mentioned that G.T.54-9 variety was superior to the other two genotypes (G.84-47 and G.98-28) in number of millable cane/ha and cane and sugar yields. El-Geddawy *et al*. (2015) reported that the commercial sugarcane variety (G.T.54-9) is still over passed the other two promising varieties in stalk weight/plant. The promising G.2003-47 and G.2003-49 genotypes surpassed G.T.54-9 in sucrose percentages. However, G.2003-49 and G. 2003-47 genotypes significantly surpassed G.T.54-9 in sugar recovery %, cane and sugar yields/fed.

As a mono-cultural system, sugarcane is sensitive to a wide range of biotic stresses including insect pests and pathogens. Salman *et al*. (2014) recorded that significant differences among sugarcane genotypes, where G.T.54-9 and G.2003-47 were the most susceptible ones in the incidence of infestation (bored stalks %), intensity of infestation (bored joints %) and girdled stalks %, while G.98-28 variety was the least susceptible. Galal *et al*. (2017) mentioned that the commercial sugarcane variety G.T.54-9 surpassed the other two promising genotypes in the number of millable canes/fed., in both seasons as well as cane and sugar yields/fed., in the 1st one. Also, it recorded the highest percentages of infestation with *C. agamemnon* and *Fusarium moniliforme*, in both seasons. The promising sugarcane variety G.2003-47 showed significant superiority in sugar recovery% and cane and sugar yields/fed., in the 2nd season, as well as sucrose% and recorded the lowest percentage of infestation with *C. agamemnon* and *Fusarium moniliforme*, in both seasons. However, the variance between the two promising genotypes namely G.2003-47 and G.2003-49 in the studied traits was mostly insignificant.

It is well known that potassium plays a direct effect on translocation of sugar and carbohydrates energy transformation and enzyme action in sugar crops. Many investigation indicated to an evidence of potassium role in improving all sugarcane characters (Abo El-Wafa *et al.* 2006, Bekheet 2006, Mahmoud *et al.* 2008, Behnam *et al*. 2015 and El-Geddawy *et al*. 2015).

Many researchers showed the role of potassium to resistance pests and diseases. Potassium reduction growth of eye spot disease caused by *Helminthosporium sacchari* (Rabindra *et al*. 1978), Yellow spot disease caused by *Cercospora kopkei* (Deyin, 1983) in Sugarcane. Shalaby *et al.* (2007) showed that using the

G.T.54-9 variety and 50 kg potassium applied with the second dose of recommended nitrogen decreased the infestation by *C. agamemnon*. Elwan *et al.* (2008) showed that, application of potassium fertilizer (48% K_2O) with rate of 50 kg/fed. in autumn plant cane reduced the infestation with *C. agamemnon* to 0.90 internodes/plant compared with 1.04 internodes/plant in unfertilized plots.

Therefore, the present study was aimed to evaluate the performance of three promising sugarcane varieties compared to commercial variety under different levels of potassium fertilization to obtain the highest quantitative and qualitative criteria.

MATERIALS AND METHODS

A field experiment was carried out at El-Mattana Research Station (latitude of 25.25°N and longitude of 32.31°E), Agricultural Research Center, Luxor Governorate, Egypt during two successive seasons of 2015/2016 and 2016/2017 to find out the performance of four sugarcane varieties (G.T.54-9, G.2003-47, Ph 8013 and C. 57-14) under fertilized with three potassium levels (0, 24 and 48 kg K_2O/fed. "fed = 0.42 ha-1"). Under natural conditions of infestation with lesser sugarcane borer, *Chilo agamemnon* Bles., and pokkah boeng disease (*Fusarium moniliforme* Sheldon).

An overall dose of phosphorus fertilizer was applied during seed bed preparation at the rate of 60 kg P_2O_5/fed. as calcium super phosphate (15.5 % P_2O_5). Nitrogen fertilizer was applied as urea (46% N) at the rate of 230 kg N/fed., which was split into two doses (after the 1st and 2nd hoeing, *i.e.* 45 and 75 days from planting). A split plot design was used with three replications to allocate the studied treatments. The four sugarcane varieties were randomly distributed to the main plots, while the three potassium levels were distributed in the sub-plots, which area was 42 m^2, containing six rows of 7-m in length and 1-m in width. Chemical and physical properties for the experimental soil are presented in Table (1).

Table 1. Mechanical and chemical properties of the upper 40cm of the experimental soil sites during the two successive seasons.

Seasons		2015	2016
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
	Concentration of N (ppm)	20.0	30.0
	Concentration of P (ppm)	11.00	8.00
	Concentration of K (ppm)	35.1	31.2
	Cations meq/100g		
	Na^+ Meq/100g	0.52	0.60
	K^+ Meq/100g	0.09	0.08
	Ca^{++} Meq/100g	0.30	0.50
	Mg^{++} Meq/100g	0.19	0.30
	Anions meq/100g		
	Cl^- Meq/100g	0.23	0.42
	$So_4^=$ Meq/100g	0.27	0.37
	HCo_3 Meq/100g	0.59	0.69

The recorded Data:

At harvest (the beginning of March), four guarded rows of each treatment were harvested, topped and cleaned to estimate the following traits, which were calculated as a mean of the values measured from a stalk sample taken from one meter portion of plot:

1. Number of millable canes/fed., which was count in one square meter then converted into number per fed.
2. Millable cane weight (kg) was determined by dividing cane weight of the one meter sample by its corresponding number of millable cane.

A representative sample of 20 millable canes from each plot was taken at random, stripped, cleaned and squeezed by an electric mill and the extracted juice was screened to determine the following traits:

3. Sucrose percentage, which was determined using "Sacharemeter" according to Association of official analytical chemists (A.O.A.C. 1995).
4. Sugar recovery percentage was calculated as described by Yadav and Sharma (1980):

Sugar recovery % =[sucrose %-0.4(brix %-sucrose %) × 0.73].

5. Cane yield (tons/fed.), which was determined from the weight of the four middle guarded rows of each plot converted into value per fed.
6. Sugar yield (tons/fed) was estimated as follows:

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

Determination of the infestation of canes with *Chilo agamemnon* Bles., *Fusarium moniliforme* under field conditions and natural inoculation:

***Fusarium moniliforme* Sheldon:**

Percentage of infected plants was calculated according to the following equation:

$$\%\ \text{of infected plants} = \frac{\text{Number of naturally infected plants}}{\text{Number of total grown plants}} \times 100$$

***Chilo agamemnon* Bles.,:**

Samples of 20 stalks were taken randomly from the middle row in each plot of the three replicates in the beginning of August, at 7 and 30 day intervals up to harvesting time on 1st of March, 2016 and 2017. Cane stalks examined for various noticeable signs of infestation with C. agamemnon using the following formula, according to Mendes *et al*. (1980):

1. Percentage of bored stalks (infestation incidence %)

Infestation incidence%= No. of bored stalks/ No. of examined stalks × 100.

2. Percentage of bored joints (infestation intensity %).

Infestation intensity% = No. of bored Joints / No. of examined joints ×100.

Statistical analysis:

The collected data were statistically analyzed according to the procedures outlined by Snedecor and Cochran (1981). Means of significant variance were separated using LSD test at 5% probability level.

RESULTS AND DISCUSSION

1. Number of millable canes/fed.:

Data illustrated in Table (2) exhibited significant differences among the studied sugarcane varieties in number of millable canes/fed. in both seasons.

Sugarcane variety G.T.54-9 gave the highest number of millable canes/fed. (58.13 thousand /fed.) during the first season, while sugarcane variety G.2003-47 produced the highest number of millable canes/fed. (57.78 thousand /fed.) during the second season. Meanwhile, the variance in this trait between sugarcane variety G.T.54-9 and G.2003-47 was insignificant, during the second season. The variation among sugarcane varieties in number of millable canes/fed. may be due to their variable genetic structures which reflected their tillering abilities. Similar results were obtained by Abd El-Aal *et al.* (2015) and Galal *et al.* (2015).

In the same Table results show that increasing the applied K levels up to 48 kg K2O/fed. led to a significant increase in number of millable canes/fed. in both seasons. Fertilizing sugarcane by 48 kg K2O/fed. increased number of millable canes /fed. by 2.17 and 6.76 thousand /fed. during the first season and 2.52 and 5.42 thousand /fed. during the second season compared with 24 and zero kg K2O/fed., respectively. This effect may be du to the role of potassium in transportation process which increased the maturing stalk at harvest which reflected on the values of millable cane at harvest. These results agree with those of Abo El-Wafa *et al.* (2006) and El-Geddawy *et al.* (2015)

Number of millable canes was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels in both seasons. The highest number of millable canes/fed. (63.00 thousand /fed.) was obtained from G.T.54-9 variety when it was supplied with 48 kg K2O/fed. during the first season, while the highest number of millable canes/fed. (60.00 thousand /fed.) was obtained from G.2003-47 variety when it was supplied with 24 kg K2O/fed. during the second season.

2- Stalk weight:

Data presented in Table (2) suggested that, sugarcane varieties significantly differed in their influence on stalk weight in both seasons. Sugarcane variety Ph 8013 had the highest average stalk weight compared with the other varieties. However, the variance in stalk weight between G.T.54-9 and G.2003-47 was insignificant, in both seasons. These results were in agreement with those reported by El-Geddawy *et al.* (2015) and Galal *et al.* (2017).

As for potassium fertilization effect on stalk weight, results obtained in Table (2) pointed out that fertilizing sugarcane by 48 kg K2O/fed. increased stalk weight by 0.05 and 0.14 kg during the first season and 0.08 and 0.18 kg during the second season compared with 24 and zero kg K2O/fed., respectively. This results mainly due to the distinct influence of potassium fertilization on stalk dimensions and the capability and role of potassium in transporting and storing of assimilation products to the cane stalk which in turn reflected on the final weight of cane stalk. This result is in line with those obtained by Mahmoud *et al.* (2008) and El-Geddawy *et al.* (2015).

Table 2. Number of millable canes, stalk weight, sucrose% and sugar recovery% of sugarcane varieties as affected by potassium levels during the two successive seasons 2015/2016 and 2016/2017.

Varieties	K fertilizer	Number of millable canes (1000/fed)		Stalk weight (kg)		Sucrose %		Sugar recovery %	
		A	B	A	B	A	B	A	B
G.T.54-9	0	53.42	49.33	1.12	1.27	14.98	14.89	9.86	9.75
	24	57.96	52.00	1.31	1.34	15.64	15.55	10.43	10.24
	48	63.00	58.67	1.33	1.33	16.23	16.59	10.71	11.24
Mean		58.13	53.33	1.25	1.31	15.62	15.68	10.33	10.41
G.2003-47	0	49.39	56.00	1.14	1.31	15.93	16.92	10.29	11.45
	24	56.95	60.00	1.22	1.34	17.21	17.04	11.51	11.50
	48	58.46	57.33	1.23	1.35	17.33	17.54	11.59	11.94
Mean		54.94	57.78	1.20	1.33	16.82	17.17	11.13	11.63
Ph 8013	0	44.09	46.40	1.24	1.24	16.07	15.10	10.44	10.14
	24	46.72	48.33	1.31	1.52	16.94	18.19	11.18	12.67
	48	47.17	52.00	1.37	1.52	17.78	18.57	12.00	13.10
Mean		45.99	48.91	1.31	1.43	16.93	17.28	11.20	11.97
Copa 57-14	0	45.36	43.80	1.22	1.16	16.65	14.32	11.22	9.52
	24	49.00	46.80	1.26	1.17	16.84	16.34	11.34	11.31
	48	50.68	49.20	1.34	1.46	16.84	16.23	11.30	11.17
Mean		48.35	46.60	1.27	1.26	16.78	15.63	11.29	10.66
K	0	48.07	48.88	1.18	1.24	15.91	15.31	10.45	10.22
	24	52.66	51.78	1.27	1.34	16.66	16.78	11.12	11.43
	48	54.83	54.30	1.32	1.42	17.04	17.23	11.40	11.86
LSD 5%	V	1.46	5.85	0.07	0.10	0.73	0.86	0.56	0.63
	K	1.47	1.69	0.04	0.03	0.48	0.60	0.48	0.52
	VxK	2.94	3.39	Ns	0.07	Ns	1.19	Ns	1.05

A = first season 2015/2016 B = second season 2016/2017.

Stalk weight was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels during the second season only, the highest average stalk weight (1.52 kg) was obtained from Ph 8013 variety when it was supplied with 24 or 48 kg K_2O/fed. during the second season.

3- Sucrose percentage

Results given in Table (2) show that sucrose percentage affected significantly by the tested sugarcane varieties, sugarcane variety Ph 8013 and G.2003-47 surpassed in sucrose % recording significant increases amounted to 1.31 and 1.20% higher thane those produced by commercial variety G.T.54-9, respectively, during the first season, corresponding to 1.60 and 1.49%, during the second one. However, the variance in this trait between the three varieties namely Ph 8013, G.2003-47 and C.57-14 was insignificant, during the first season only. The difference between sugarcane varieties had been reported by Allabody *et al*. (2010), Osman *et al*. (2010) and Abd El-Aal *et al.* (2015).

Data presented in Table (2) indicated to a positive and statistical increase in the values of sucrose % was accompanied to the increase in the applied dose of potassium during the two successive seasons. This result is mainly due to the pronounced influence of potassium element due to its importance in transportation process in the storied crops. These results are in agreement with that reported by Bekheet (2006) and El-Geddawy *et al.* (2015).

Sucrose percentage was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels during the second season only, the highest average sucrose % (18.19 and 18.57%) was obtained from Ph 8013 variety when it was supplied with 24 and 48 kg K_2O/fed., respectively, the difference between Ph 8013 and G.2003-47 in Sucrose% was insignificant when they fertilized by 24 and/or 48 kg K_2O/fed. However, G.2003-47 surpassed Ph 8013 in this trait when they fertilized by zero kg K_2O/fed.

4- Sugar recovery percentage:

Data arranged in Table (2) showed that sugar recovery % affected significantly by the tested sugarcane varieties, sugarcane variety Ph8013 and G.2003-47 surpassed in sugar recovery % recording significant increases amounted to 0.87 and 0.80 % higher thane those produced by commercial variety G.T.54-9, respectively, during the first season, corresponding to 1.56 and 1.22 %, during the second one. However, the variance in this trait between the three varieties namely Ph 8013, G.2003-47 and C. 57-14 was insignificant, during the first season only. The difference between sugarcane varieties had been reported by Abd El-Aal *et al.* (2015) and El-Geddawy *et al*. (2015).

As for potassium fertilization effect on sugar recovery %, results obtained in Table (2) pointed out that fertilizing sugarcane by 24 and 48 kg K2O/fed. increased sugar recovery % by 0.67 and 0.95% during the first season and 1.21 and 1.64% during the second season compared with check treatment. Moreover, it was found that the variance between 24 and 48 K2O/fed. in this trait was insignificant in both seasons. The influence of potassium fertilization on sugar recovery is a reflection to the positive influence of potassium fertilizer on sucrose % (Table 2). This result coincided with that reported by Abo El-Wafa *et al.* (2006) and Bekheet (2006).

Sugar recovery % was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels during the second season only, the highest sugar recovery % (12.67 and 13.10%) was obtained from Ph 8013 variety when it was supplied with 24 and 48 kg K2O/fed., respectively.

5. Cane yield/fed.:

Data illustrated in Table (3) cleared that cane yield significantly affected by the examined varieties, sugarcane G.T.54-9 variety exhibited the superiority in cane yield recording significant increases amounted to 4.96 and 5.73 tons/fed. higher than those produced by Ph 8013 and C. 57-14 varieties, respectively, during the first season, corresponding to 9.96 and 13.05 tons/fed, during the second one. However, the variance in this trait between the two varieties namely G.T.54-9 and G.2003-47 was insignificant, in both seasons. Meanwhile, it was found that C. 57-14 variety had the lowest cane yield, in both seasons. Such varietals differences were reported by Galal *et al.* (2017).

Cane yield responded significantly to the applied potassium levels. Increasing K levels to 24 and to 48 kg K2O/fed. increased cane yield by 6.47 and 7.51 tons/fed., compared with check treatment during the first season, respectively, corresponding to 4.51 and 11.34 tons /fed. during the second season (Table 3). These results are probably due to the increase in number of millable canes /fed. and stalk weight (Table 2). These results are in agreement with those reported by El-Geddawy *et al.* (2015) and Behnam *et al.* (2015).

Cane yield was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels in both seasons, the difference between G.T.54-9 and G.2003-47 in cane yield was insignificant when they fertilized by 48 kg K2O/fed. However, G.T.54-9 exceeded G.2003-47 significantly in this trait when not to add potassium fertilization. With the different varieties, increasing potassium fertilizer level was accompanied to significant increase in the values of cane yield.

6- Sugar yield /fed.:

Data in Table (3) indicated that sugar cane varieties significantly differed in their influence on sugar yield in both seasons. Sugarcane G.2003-47 variety had the highest sugar yield compared with the other varieties. This result could be attributed to higher values of sugar recovery % and cane yield by G.2003-47 variety. Varietals differences in sugar yield ton /fed. were also found by Abd El-Aal *et al.* (2015) and El-Geddawy *et al.* (2015).

Results obtained in Table (3) pointed out that fertilizing sugarcane crop by 48 kg K2O/fed. increased sugar yield by 0.26 and 1.26 ton during the first season and 1.04 and 2.09 ton during the second season compared with 24 kg K2O/fed and check treatment, respectively. This result coincided with that reported by Bekheet (2006), Mahmoud *et al.* (2008) and El-Geddawy *et al.* (2015).

Sugar yield was significantly influenced by the interaction between the tested cane varieties and potassium fertilization levels during the first season only, the highest Sugar yield ton/fed. (6.04 and 6.21

tons/fed.) was obtained from G.2003-47 variety when it was supplied with 24 and 48 kg K2O/fed., respectively.

7- Bored stalks percentage:

Data arranged in Table (3) showed that the sugarcane varieties differed significantly in their susceptibility to *C. agamemnon* infestation. The highest bored stalks% (55.56 and 30.62%) was observed in G.3003-47 and G.T.54-9 varieties during the first and second season respectively. Mean while the lowest bored stalks% (17.35 and 18.64) was recorded with Ph 8013 variety in both seasons, respectively. The differences among sugarcane varieties in this respect were reported by Salman *et al.* (2014).

Table 3. Cane yield, sugar yield and percentage of (bored stalks%, bored joints and pokkah boeng disease) of sugarcane varieties as affected by potassium levels during the two successive seasons 2015/2016 and 2016/2017.

Varieties	K fertilizer	Cane yield (tons/fed.)		Sugar yield (ton/fed.)		Bored stalks %		Bored joints %		Pokka boeng %	
		A	B	A	B	A	B	A	B	A	B
	0	44.84	53.42	4.42	5.21	76.67	36.67	7.48	5.10	20.00	25.00
G.T.54-9	24	52.85	56.35	5.51	5.77	25.00	29.26	2.70	4.47	12.33	15.00
	48	53.45	64.44	5.72	7.25	20.00	25.93	2.26	3.19	9.667	6.67
Mean		50.38	58.07	5.22	6.08	40.56	30.62	4.14	4.25	14.00	15.56
	0	43.59	48.18	4.48	5.52	83.33	30.74	5.17	4.39	18.33	20.00
G.2003-47	24	52.50	60.35	6.04	6.94	53.33	26.59	4.58	3.54	13.00	12.67
	48	53.53	65.07	6.21	7.77	30.00	23.70	2.87	2.76	7.667	5.00
Mean		49.87	57.87	5.58	6.75	55.56	27.01	4.21	3.56	13.00	12.56
	0	41.95	46.76	4.38	4.73	21.79	25.56	3.03	3.49	15.00	11.67
Ph 8013	24	47.80	47.17	5.33	5.98	15.64	17.78	1.89	2.12	12.00	10.00
	48	46.50	50.40	5.58	6.61	14.62	12.59	1.88	1.77	5.00	3.33
Mean		45.42	48.11	5.09	5.77	17.35	18.64	2.26	2.46	10.67	8.33
	0	41.30	39.58	4.63	3.76	27.18	29.26	4.05	3.89	12.67	10.00
Copa 57-14	24	44.42	42.09	5.03	4.76	23.08	26.30	3.05	3.61	10.00	8.00
	48	48.22	53.39	5.45	5.96	16.49	24.07	2.82	3.35	3.00	2.00
Mean		44.65	45.02	5.04	4.83	22.25	26.54	3.31	3.62	8.56	6.67
	0	42.92	46.98	4.48	4.81	52.24	30.56	4.93	4.22	16.50	16.67
K	24	49.39	51.49	5.48	5.86	29.26	24.98	3.06	3.43	11.83	11.42
	48	50.43	58.32	5.74	6.90	20.28	21.57	2.46	2.76	6.33	4.25
	V	2.12	3.15	0.32	0.37	4.15	1.56	1.15	0.70	1.052	0.959
LSD 5%	K	1.46	2.34	0.23	0.39	5.38	1.61	0.80	0.55	0.7	0.757
	VxK	2.92	4.69	0.46	Ns	10.76	3.22	1.60	Ns	1.39	1.51

A = first season 2015/2016 B = second season 2016/2017.

As for potassium fertilization effect on bored stalks% , results obtained in Table (3) pointed out that fertilizing sugarcane by 48 kg K_2O/fed. decreased bored stalks% by 8.98 and 31.96% during the first season and 3.41 and 8.99% during the second season compared with fertilizer by 24 kg K_2O/fed. and check treatment. This effect may be due to potassium may promote the development of thicker outer walls in epidermal cells, thus preventing disease attack. Similar result was recorded by Shalaby *et al.* (2007).

Concerning, the interaction between sugarcane varieties and levels of K fertilizer showed the significant differences in both seasons. The highest percentage of bored stalks% (76.67 and 36.67%) was recorded at G.T.54-9 variety under application zero of K, during the first and second season, respectively. While the lowest percentage of bored stalks (14.62 and 12.59%) was recorded at Ph 8013 under application 48 kg K/fed. during the first and second season, respectively.

8- Bored joints percentage:

Data illustrated in Table (3) recorded that the sugarcane varieties differed significantly in their susceptibility to C. agamemnon infestation. The highest bored joints% (4.21 and 4.25) was observed in G.2003-47 and G.T.54-9 varieties during the first and second season, respectively. Whereas the lowest bored joints% (2.26 and 2.46%) was observed in Ph 8013 variety in both seasons respectively. The present results are in agreement with those of Galal *et al*. (2017).

As for potassium fertilization effect on bored joints%, results obtained in Table (3) pointed out that fertilizing sugarcane by 48 kg K2O/fed. decreased bored joints% by 0.6 and 2.47% during the first season and 0.67 and 1.46% during the second season compared with fertilizer by 24 kg K2O/fed and check treatment. Similar result was recorded by Elwan *et al*. (2008).

The interaction between sugarcane varieties and levels of K fertilizer on bored joints% were significant during the first season only. The highest percentage of bored joints (7.48%) was recorded at G.T.54-9 variety under application zero of K, during the first season, while the lowest percentage of bored joints (1.88%) was recorded at Ph 8013 under application 48 kg K/fed. during the first season only.

9- Pokkah boeng disease percentage:

Reaction of four sugarcane varieties (G.T.54-9, G.2003-47, Ph 8013 and C. 57-14) to infection with the pokkah boeng disease at applied three levels of K (0, 24 and 48 kg K/fed.). Percentage of pokkah boeng disease

was recorded under open field conditions and natural inoculation with pokkah boeng disease caused by Fusarium sp during the two successive seasons 2015/2016 and 2016/2017.

Data presented in Table (3) suggested that, the tested sugarcane varieties were susceptible to infection with pokkah boeng disease with different degrees of susceptibility. The variance between sugarcane varieties to infection with pathogen was significant, in both seasons. In the two tested seasons, G.T.54-9 variety show high susceptibility to infection with pokkah boeng disease (14.00 and 15.56%), respectively, followed by G. 2003-47 (13.00 and 12.56 %), while the lowest infection percentage was recorded by C. 57-14 variety in both tested seasons (8.56 and 6.67%) respectively. The variation among sugarcane varieties in infection with pokkah boeng disease may be due to their variable genetic structures. Galal *et al*. (2017).

In the same table show that increasing the applied of K levels up to 48 kg K/fed. led to a significant decreased percentage of infection with pokkah boeng disease in both tested seasons. Application of 48 kg K/fed. caused the highest reduction of pokkah boeng disease on sugarcane plants compared with 24 kg K/fed. and untreated plants in both seasons. On the other hand, the lowest reduction of disease percentage was found at untreated sugarcane plants with K during the first and second season. This effect may be due to potassium nutrition increases the content of phenols which can also play a beneficial role in plant resistance. Potassium affects plant morphology, hardening the tissues with resulting improvement in resistance to disease penetration. Stomata are open for longer than necessary in potassium deficiency and increasing the chances of disease penetration. Potassium reduction growth of eye spot disease caused by Helminthosporium sacchari (Rabindra *et al*., 1978). Yellow spot disease caused by Cercospora kopkei (Deyin, 1983) in sugarcane.

The interaction between sugarcane varieties and levels of K on infection with pokkah boeng disease were significant during the first and second season. The highest percentage to infection with pokkah boeng disease (20.00 and 25.00 %) was recorded at G.T.54-9 variety under application zero of K, during the first and second season, respectively, while the lowest percentage (3.00 and 2.00 %) to infection was recorded at C. 57-14 under application 48 kg K/fed. during the first and second season, respectively.

CONCLUSION

Under the conditions of this work, planting the commercial variety G.T.54-9 and/or promising variety G.2003-47 can be recommended to get the highest cane and sugar yields/fed. Application of potassium fertilization to sugarcane increased the cane and sugar yields/fed and decreased the infestation with lesser sugarcane borer, *C. agamemnon* Bles., and pokkah boeng disease, *Fusarium moniliforme* Sheldon, compared to check treatment. However, application of 24 kg K_2O/fed. was enough to recorded the highest significant values in both seasons.

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المحصول و الجودة و الإصابة الطبيعية الحشرية و المرضية لأربعة أصناف قصب سكر تحت تأثير مستويات مختلفة من التسميد البوتاسى

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نفذ هذا البحث بمحطة البحوث الزراعية بالمطاعنة (خط عرض 25, 25° شمالا وخط عرض 31 ,32° شرقا) محافظة الأقصر- مركز البحوث الزراعية – مصر.تم إجراء هذا البحث خلال موسمى غرس 2016/2015 و 2017/2016 لدراسة المحصول والجوده والإصابة الطبيعية بدودة القصب الصغيرة ومرض البوكابوينج لأربعة أصناف قصب سكر (جيزة 2003-47 و فلبينى 8013 و كوبا 57-14 والصنف التجارى جيزة تايوان 54-9) تحت تأثير ثلاث مستويات من التسميد البوتاسى (صفر, 24 و 48 كجم بوتاسيوم للفدان).أظهرت النتائج أن هناك فرق غير معنوى فى معظم الصفات بين الصنف التجارى جيزة تايوان 54-9 والصنف جيزة 2003-47, كما أنهما تفوقا على الصنفين الآخرين فى عدد العيدان القابلة للعصر ومحصولى القصب والسكر للفدان, كما سجلا ايضا أعلى نسبة إصابة بدودة القصب الصغيرة ومرض البوكابوينج فى الموسمين. تفوق الصنف فلبينى 8013 فى متوسط وزن العود و النسبه المئويه للسكروز وناتج السكر النظرى ومع ذلك لم يكن هناك اختلاف معنوى بين الصنف فلبينى 8013 والصنف جيزة 2003-47 فى النسبه المئويه للسكروز و ناتج السكر النظرى.أدت زيادة اضافة البوتاسيوم حتى 48 كجم بوتاسيوم للفدان الى زيادة كبيرة فى عدد العيدان القابلة للعصر، متوسط وزن العود ومحصول السكر بالإضافة الى خفض نسبة الإصابة بدودة القصب الصغيرة ومرض البوكابوينج. لم يكن هناك فرق معنوى بين إضافة 24 أو 48 كجم بوتاسيوم للفدان بالنسبة لصفات النسبه المئويه للسكروز و النسبه المئويه لناتج السكر النظرى و محصول القصب فى الموسمين.أدى تسميد قصب السكر بمعدل 24 و 48 كجم بوتاسيوم للفدان الى زيادة محصول القصب بحوالى 6,47 و 7,51 طن فى الموسم الأول و 4,51 و 11,34طن فى الموسم الثانى مقارنة بعدم إضافة البوتاسيوم.تحت ظروف هذا البحث يوصى بزراعة الصنف التجارى جيزة تايوان 54-9 أو الصنف المبشر جيزة 2003- 47 للحصول على أعلى حاصل قصب وسكر, كما أن إضافة البوتاسيوم بمعدل24 أو 48 كجم بوتاسيوم للفدان أعطت أعلى حاصل عيدان وسكر وكانت أقل حساسية للإصابة بدودة القصب الصغيرة ومرض البوكابوينج مقارنة بعدم إضافة البوتاسيوم.