

## Response of Three Sugar Cane Varieties to Phosphorus Bio Fertilization

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**N**OWADAYS, there is a call for the reduction of the environmental pollution resulted from over application of chemical fertilizers. Therefore, research has been done to investigate the possibility and efficiency of using bio fertilizers. This work was carried out at El-Mattana Agricultural Research Station (latitude of 25.17° N and longitude 32.33° E), Luxor Governorate, Upper Egypt during 2011-2012 season (plant cane crop) and 2012-2013 season (first ratoon crop) to study the effect of different levels of P- bio fertilizer (200, 400 and 600 g P- bio fertilizers /fad) on yield, yield components and quality of three sugarcane varieties (G.T.54-9, G.98-28 and G.99-103). P- bio fertilizer comprises an effective dissolvers strain of phosphate *Bacillus megatherium* var. *Egyptiacum*. Randomized complete block design with four replications arranged in split- plots system was used.

The results indicated that the examined sugarcane varieties differed significantly. Promising varieties G.99-103 recorded the highest values of number of millable cane / m<sup>2</sup>, millable cane height, diameter and cane yield, while G.T. 54-9 surpassed in respect to Brix, sucrose , sugar recovery percentages and sugar yield in plant cane and its ratoon crops. Increasing P-bio fertilizer levels up to 600 g/fad significantly increased in number of millable cane /m<sup>2</sup>, millable cane height, diameter, Brix % sucrose%, sugar recovery%, cane and sugar yields in plant cane and its ratoon crops.

It could be concluded that under the conditions of the present work, it is recommended to inoculate G.99-103 or G.T 54-9 sugarcane varieties cuttings by 600 g P-bio fertilizer/ fad to produce the highest cane , sugar yield, as well as decrease the environmental pollution.

**Keywords:** P-bio fertilizer, Sugar cane, Bio fertilizers.

### Introduction

Sugar cane (*Saccharum officinarum* L.) is one of the crops that need to many amounts of nutrients especially phosphorus element. So, it is better to use another substances give the nutrients for growing the plants and decrease the environmental pollution. Bio-fertilizers are part of the substances that decrease the environmental pollution, provide considerable amounts of the plant's phosphorus requirement, promote rooting and improve sugarcane growth by direct effects on metabolic processes, in addition to their role in phosphorus solubilizing. Bio-fertilizers also had an important role in the

utilization of phosphorus by sugar cane through higher biological phosphorus solubilizing and increasing the availability and uptake of phosphorus.

The environmental and economic advantages of bio-fertilizers in sugar cane phosphorus nutrition were reported by Kumaraswamy & Rajasekaran (1994), Muthukumaraswamy et al. (1994), Premono et al. (1995), Ismail et al. (2000), Shankaraiah et al. (2000), Sundara et al. (2001), Osman et al. (2004) and Ahmed (2013).

The role of sugar cane variety is considered the corner stone or the main factor in governing

the expected sugar yield. It is well known that the commercial variety G.T. 54-9 occupies most of sugar cane area planted in Egypt. Recently, Sugar Crops Research Institute produced some promising varieties of sugarcane among them G.98-28 and G.99-103. Many studies were carried out to select among the produced varieties in yield and its components, as well as, juice quality parameters among them Rizk et. al. (2004), El-Shafai & Ismail (2006), El-Labiby et al. (2011), Mohamed et al. (2012), Yousif et al. (2015) and Ahmed et al. (2016).

The objective of this study was to evaluate the productivity of three sugar cane varieties under varying Phosphatic bio-fertilizers level to determine the optimum Phosphatic bio-fertilizers for each variety and decrease the environmental pollution by chemical fertilizers.

### **Materials and Methods**

The present study was conducted at EL-Mattana Agricultural Research Station, (latitude of 25.17° N and longitude 32.33° E), Luxor Governorate, Upper Egypt during 2011-2012 season (plant crop) and 2012-2013 season (first ratoon crop). This work included nine treatments represent the combinations between three levels of P- bio fertilizer (200, 400 and 600 g /fad) and three sugarcane varieties (G.T. 54-9 as a commercial variety , G. 98-28 and G. 99-103 as promising varieties). P- bio fertilizer /fad was used at the rate of 0.5 , 1.0 and 1.5 bag /fad, (one bag = 400 g) which contains 107-109 microbes approximately. P-bio fertilizer comprises an effective dissolvers strain of phosphate *Bacillus megatherium* var. *Egyptiacum*. It was mixed with appropriate amount of fine sand and applied manually on sugar cane seeds in furrows for plant cane, irrigation was immediately practiced. In the first ratoon, the bio-fertilizer was applied with the first irrigation. The P-bio source was brought from the General Organization for Agricultural Equalization Fund (G O A E F), Agricultural Research Center, Giza.

A Randomized complete block with four replications arranged in split-plot design was used. Sugar cane varieties were allocated to the main plots, while P- bio fertilizer levels treatments were randomly distributed in the sub-plots.

Plot area was 35m<sup>2</sup> containing five rows, the length of each row is seven meters, while row

width was one meter. The dry method of planting was adopted using two row (drill) of cane cuttings. Planting took place in the 2<sup>nd</sup> week of March, 2011 while harvest was done in the 3<sup>rd</sup> week of March 2012 and 2013 in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively. All the other cultural practices were carried out as recommended in the region. The mechanical and chemical analysis of soil of the experimental sit showed that soil was clay loam, containing 61 ppm available nitrogen ,10 ppm P and 40 ppm K and PH of 7.7.

### *Data recorded*

The following data were recorded at harvest:

#### *Yield and yield components*

1. Number of millable cane/m<sup>2</sup>.
2. Millable cane length (cm) was measured from land level up to the top visible dewlap.
3. Millable cane diameter (cm) was measured at the middle part of stalks.
4. Cane yield (Tons/fad). The millable cane of three guarded rows of each sub plots were harvested, topped, cleaned, weighed and cane yield (tons/fad) was calculated.

#### *Juice quality*

A sample of 25 millable cane from each subplot were chosen immediately after harvest, cleaned and crushed through mill and juice was analyzed to determine the following parameters:

1. Brix percentage (Total soluble solids, TSS %) in juice was determined using Brix Hydrometer according to A.O.A.C. (1995).
2. Sucrose percentage was determined using Saccharometer according to A.O.A.C. (1995).
3. Sugar recovery percentage was calculated according to the following formula described by Yadav & Sharma (1980).

$$\text{Sugar recovery percentage} = [\text{Sucrose \%} - 0.4(\text{brix \%} - \text{sucrose \%})] \times 0.73$$

where:0.4 = each pound of non-sucrose solids in the juice will retain 0.4 of a pound of sucrose as outlined by Hebert (1973).

0.73=denote to a correction factor for actual milling

condition in factories that depends on the overall mean fiber percentage cane during processing as outlined by Mathur (1997).

#### *Sugar yield*

Sugar yield (tons/fad) was calculated according to the following formula described by Mathur (1997).

$$\text{Sugar yield} = \text{cane yield (tons/fad)} \times \text{sugar recovery percentage.}$$

All recorded data were statistically analyzed according to the method of Snedecor & Cochran (1981). Treatment means were compared using LSD at 5% level of significance as outlined by Steel & Torrie (1980).

#### **Results and Discussion**

##### *Number of millable cane/m<sup>2</sup>*

Data in Table 1 showed that the evaluated sugar cane cvs. differed significantly in the number of millable cane per square meter in both

seasons. The highest number of millable cane/m<sup>2</sup> was produced by G99-103 variety (7.59 and 10.04), while the lowest number was obtained from G98-28 variety (6.93 and 8.82) in plant cane and first ratoon crops, respectively. This result may reflect the capacity of G99-103 variety to produce more survival tillers at harvest time compared to other two varieties. Similar result was obtained by Rizk et. al. (2004), El-Shafai, & Ismail (2006) and Yousif et al. (2015) who found significant differences among tested sugar cane varieties in number of millable cane/m<sup>2</sup>.

Results given in the same Table increasing P-bio fertilizers level from 200 to 600 g/fad was accompanied by significant increase in the number of millable cane/m<sup>2</sup> in the plant and its ratoon crop. This result may be due to the role of phosphorus in meristematic activity of plant tissues and shoot. These results are similar with those obtained by Ismail et al. (2000) and Sundara et al. (2001) they reported that phosphate solubilizing bacteria (PSB) application enhanced tailoring and stalk population.

**TABLE 1. Number of millable canes/m<sup>2</sup> of the three sugarcane varieties as affected by P-bio levels.**

Bio-P fertilizer g/fad	2011/2012 Plant crop				2012/2013 First ratoon crop			
	Varieties				Varieties			
	GT 54-9	G98-28	G99- 103	Mean	GT 54-9	G98-28	G99- 103	Mean
200	8.65	6.00	6.59	6.39	8.00	8.63	8.70	8.44
400	7.36	6.80	7.68	7.28	9.37	8.74	10.43	9.51
600	7.99	7.99	8.50	8.16	10.37	9.09	11.00	10.24
Mean	7.31	6.93	7.59		9.25	8.82	10.04	
LSD 5% for:								
Varieties (V)				0.29				0.33
P-bio fertilizer (P)				0.80				0.86
(V)×(P)				1.68				1.81

Data in the same table revealed that number of millable cane/m<sup>2</sup> was significantly affected by the interaction between the two studied factors. It is clear from the data in both seasons that the tested varieties respond to the increase in P-bio fertilizer rate. It could be noted that G99-103 promising variety recorded the highest millable cane number (8.50 and 11.00) in both cane and ratoon crops respectively, with 600 g/fad of phosphorus bio-fertilizers.

##### *Millable cane height*

Results in Table 2 showed that the tested sugar cane varieties differed significantly in millable cane height in both seasons. Variety G.99-103 gave the tallest millable cane (288 and 300). While G.98-28 variety gave the shortest millable cane (246 and 261) in first and second seasons, respectively. 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 accordance with those reported by El-Shafai, & Ismail (2006) , El-Labbody et al. (2011) and Yousif et al. (2015)

who found that the tested varieties significantly differed in stalk height.

**TABLE 2.Millable cane height (cm) of the three sugarcane varieties as affected by P –bio levels.**

Bio-P fertilizer g/fad	Plant crop (2011/2012)			First ratoon crop (2012/2013)			Mean	
	Varieties			Varieties				
	GT 54-9	G98- 28	G99- 103	GT 54-9	G98-28	G99- 103		
200	238	232	256	242	258	238	271.	
400	252	240	272	255	269	251	299	
600	302	267	337	302	302	290	331	
Mean	264	246	288		275	261	308	
L S D 5% for:								
Varieties (V)			10.6				9.1	
P-bio fertilizer (B)			15.8				10.8	
(V) x(P)			21.9				19.9	

The results given in the same table revealed that increasing P-bio fertilizer from 200 to 400 and 600 g/fad led to a significant and gradual increasing in millable cane height in the 1<sup>st</sup> and 2<sup>nd</sup> growing seasons. This result could be due to the production of Phytohormones substances resulted from microbial activity in root zone which may be enhanced growth of cane plants. These results are in harmony with those obtained by Ismail et al. (2000) and Osman et al. (2004) they noted that sugar cane P- bio fertilizers treatments affected significantly stalk height.

Interaction between tested sugar cane varieties and bio-P fertilizer had a significant effect on the millable cane height in both seasons. Generally the tallest millable cane (337 and 331cm) were obtained from planting G.99-103 variety with 600 g bio-P fertilizer /fad in 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively.

#### *Millable cane diameter*

The results in Table 3 showed that sugar cane varieties significantly in millable cane diameter in the 1<sup>st</sup> and 2<sup>nd</sup> seasons. Sugarcane variety G99-103 recorded the thickest millable cane (3.33and 3.18) followed by G.T.54-9 (3.11and 2.96). While G.98-28 variety had the lowest value (2.79 and 2.73) of this trait, respectively. The superiority of G99-103 variety in millable cane diameter may be controlled by genetic make-up. Significant differences among cane varieties in this trait were

also reported by El-Shafai, & Ismail (2006), Mohamed et al. (2012) and Yousif et al. (2015) they obtained significant differences among studied varieties in stalk diameter. revealed that sugar cane varieties differed significantly in millable cane diameter.

It could be noted that applied P-bio fertilizer levels had a significant effect on millable cane diameter. also data cleared that increasing P-bio fertilizer level from 200 to 600 g/fad significantly and gradual increased the millable cane diameter and the highest value (3.21 and 3.17) was recorded when plants received 600 g/fed. in the two seasons, respectively . This result may be due to the role of phosphorus is required more by meristic activity of plant tissues and shoot phosphorus concentration declines with age. This result is in agreement with that found by Premono et al. (1995), Shankaraiah et al. (1995) and Ahmed (2013) who found that increasing P- bio fertilizer level from zero to 800g /fad resulted in a significant increase in millable cane diameter.

Also, data showed that millable cane diameter significantly responded to the interaction between factors. In 1<sup>st</sup> and 2<sup>nd</sup> seasons promising sugar cane variety G.99/103 recorded the thickest millable cane (3.43 and 3.31) when fertilized with 600 g Phosphobacterin/fed in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively.

**TABLE 3.** Millable cane diameter (cm) of the three sugarcane varieties as affected by P –bio levels.

Bio-P fertilizer g/fad	Plant crop (2011/2012)			First ratoon crop (2012/2013)			Mean	
	Varieties			Varieties				
	GT 54-9	G98- 28	G99-103	GT 54-9	G98- 28	G99- 103		
200	3.06	2.60	3.20	2.95	2.68	200	3.00	2.74
400	3.11	2.75	3.35	3.07	3.01	400	3.22	2.98
600	3.16	3.03	3.43	3.21	3.19	600	3.31	3.17
Mean	3.11	2.79	3.33		2.96	2.73	3.18	

L S D 5% for:

Varieties (V)	0.22	0.17
P-bio fertilizer (B)	0.19	0.16
(V) x(P)	0.40	0.34

*Cane yield*

Data presented in Table 4 revealed that the examined sugarcane varieties differed significantly in cane yield in both the plant cane and first ratoon crops. Promising variety G.99-103 out yielded the two commercial varieties G.T.54-9, and G.98-28 by 5.64 and 15.33%, respectively, in the plant cane, and by 5.95 and 18.13%, respectively, in

the first ratoon. These results could be attributed to their superiority in number of millable canes/m<sup>2</sup>, millable canes height and diameter (Tables 1, 2 and 3). Differences in cane yield among genotypes were also found by El-Shafai & Ismail (2006) and Yousif et al. (2015) they found that tested sugar cane varieties differed significantly in cane yield significant differences among the tested sugar cane varieties in cane yield.

**TABLE 4.** Cane yield tons/fad of the three sugarcane varieties as affected by P –bio levels.

Bio-P fertilizer g/fad	Plant crop (2011/2012)			Mean	First ratoon crop (2012/2013)			Mean		
	Varieties				Varieties					
	G.T. 54-9	G.98- 28	G.99- 103		G.T. 54-9	G.98- 28	G.99- 103			
200	26.10	23.70	28.66	26.15	37.90	33.17	39.87	36.98		
400	30.50	26.08	30.67	30.08	38.33	36.10	42.23	38.89		
600	33.33	32.61	35.68	33.87	43.70	38.30	44.97	42.32		
Mean	29.98	27.46	31.67		39.98	35.86	42.36			

L S D 5% for:

Varieties (V)	1.09	1.23
P-biofertilizer (P)	1.40	1.41
(V) x(P)	2.41	2.43

Cane yield was significantly affected by the applied P-bio fertilizers levels. Data revealed that applying 600 g P-bio fertilizer/fad to sugar cane increased cane yield by 7.72 and 3.79 tons/fad, in the 1<sup>st</sup> season, corresponding to 5.34 and 3.49 tons/fad, in the 2<sup>nd</sup> one, compensate with 200 and 400 g P-bio fertilizer/fad, respectively. These results may be due to the essential favorable effect of phosphorus on the vegetative growth and tillering capacity of sugar cane plants. These results are in harmony with those mentioned by Kumaraswamy & Rajasekaran(1994), Muthukumaraswamy et al. (1994) and Ahmed

(2013) who found that the applied P-bio fertilizers had a significant effect on cane yield in the two seasons.

Cane yields of the plant cane and the 1<sup>st</sup> ratoon crops were significantly influenced by the interaction between sugarcane varieties and bio P -fertilizer levels with a general trend of increase with different magnitudes, as bio P –fertilizer level was increased. In general, the maximum values of cane yields (35.87 and 44.97 ton/fad) were obtained from G.99-103 variety when it received 600 g /fad, in plant cane and first ratoon crops, respectively.

*Brix percentage*

Data in Table 5 revealed that Brix percentage was significantly affected by the examined sugar cane varieties in the plant cane and the 1<sup>st</sup> ratoon crops. These results may be due to differences in growth and their reaction to recorded among the studied cane varieties. It was found that G.T. 54-9 variety gave the highest Brix values (20.74 and 21.44 %) in first and second season, the surrounding environmental conditions prevailing during maturity development of soluble solids in plants. These results are in harmony with those reported by Rizk et al.(2004) Mohamed et al. (2012) and Ahmed et

al. (2016) who found that differences in Brix% among sugar cane varieties.

Results showed that increasing P-bio fertilizer levels up to 600 g/fad significantly increased the values of Brix percentage in first and second seasons. This results may be the fact that phosphorus increases the vegetative growth of plants and consequently resulted in more metabolites required for the formation of soluble solids. The effective role of P-bio fertilizer levels on Brix percentage has been reported by Sundara, et al. (2001) who found that P-bio fertilizer levels significantly affected Brix.

**TABLE 5.** Brix percentage of the three sugarcane varieties as affected by P –bio levels.

Bio-P fertilizer g/fad	Plant crop (2011/2012)				First ratoon crop (2012/2013)			
	Varieties			Mean	Varieties			Mean
	GT 54-9	G98-28	G99-103		GT 54-9	G98- 28	G99- 103	
200	19.79	19.29	19.66	19.58	21.12	20.81	20.44	20.79
400	20.69	19.60	20.50	20.33	21.70	21.09	20.59	21.13
600	21.75	20.87	21.25	21.29	21.98	21.65	20.90	21.51
Mean	20.74	19.90	20.47		21.44	21.18	20.64	

L S D 5% for:

Varieties (V)	0.31	0.39
P-biofertilizer (B)	0.17	0.21
(V) x(P)	1.29	1.46

A speculative view to the interaction effect between two studied factors was significant. Increasing P-bio fertilizer levels up to 600 g/ fad for G.T. 54 - 9 variety caused the greatest increasing in Brix percentage in both seasons.

*Sucrose percentage*

Data presented in Table 6 indicate that the evaluated cane varieties differed significantly in sucrose percentage in the plant and first ratoon crops. Sugar cane G.T.54-9 variety recorded the highest value of this trait (16.94 and 17.14) in the plant cane and first ratoon crops, respectively. The differences among the studied varieties in sucrose percentage are mainly due to their gene make-up. These results are in agreement with those obtained by El-Shafai & Ismail (2006), El-Labiby et al. (2011) and Ahmed et al. (2016) who found that sucrose values broadly and significantly differed among the tested sugar cane varieties.

Also the data cleared that the effect of P-bio fertilizer levels on sucrose percentage was significant in first and second seasons. Highest values (17.26 % and 17.22 %) were recorded when plants received 600 g /fad in the cane and first ratoon crops, respectively. These results was in harmony with those obtained by Kumaraswamy & Rajasekaran (1994) who found that bio-fertilization with phosphorn significantly increased sucrose%.

The results revealed that sucrose percentage was significantly affected by the interactions between P-bio fertilizers and sugarcane varieties in the. In general Sugar cane variety of G.T.54-9 received 600 g P-bio fertilizer/ fad produced the highest sucrose percentage (17.89 and 18.12) in the 1<sup>st</sup> and 2<sup>nd</sup> seasons, respectively.

TABLE 6. Sucrose percentage of the three sugarcane varieties as affected by P –bio levels.

Bio-P fertilizer g/fad	Plant crop (2011/2012)			First ratoon crop (2012/2013)				
	Varieties			Mean	Varieties			Mean
	GT 54-9	G98-28	G99-103		GT 54-9	G98- 28	G99- 103	
200	16.13	16.08	15.80	16.00	16.51	16.42	15.74	16.22
400	16.81	16.15	16.58	16.51	16.79	16.58	16.16	16.51
600	17.89	16.84	17.04	17.26	18.12	17.03	16.50	17.22
Mean	16.94	16.36	16.47		17.14	16.68	16.13	

L S D 5% for:

Varieties (V)	0.42	0.46
P-biofertilizer (P)	0.30	0.30
(V) x(P)	0.88	0.91

*Sugar Recovery percentage*

Data collected in Table 7 pointed out that sugar recovery percentage was markedly affected by tested sugarcane varieties. Sugar cane variety G.T.54-9 surpassed the other varieties in sugar recovery percentage (11.26 %) followed by G.98-28 (10.90 %) in plant cane crops, while in the ratoon crop, G.T.54-9 variety recorded the highest value percentage (11.21 %) followed by G.98-28 variety (10.85 %). This result may be due variation in genetic structure among tested sugar cane varieties. These results are in agreement with those of Rizk et. al.(2004), El-Shafai & Ismail (2006) Mohamed et al. (2012) and Ahmed et al. (2016) they found that

statistical differences in sugar recovery percentage were recorded among the studied varieties.

It is clear that the sugar recovery percentage was significantly affected by the applied P-bio fertilizers levels. These is true in both seasons. It was noticed from results that the increasing the applied P-bio fertilizers application up to 600g/fad produced increment in sugar recovery values. This result is in partial agreement with that obtained by Muthukumaraswamy et al. (1994), Premono et al. (1995) and Ahmed (2013) who found that sugar recovery% was significantly affected by the applied P- bio fertilizer

TABLE 7. Sugar Recovery percentage of the three sugarcane varieties as affected by P –bio levels.

Bio-P fertilizer g/fad	Plant crop (2011/2012)			First ratoon crop (2012/2013)				
	Varieties			Mean	Varieties			Mean
	GT 54-9	G98-28	G99-103		GT 54-9	G98- 28	G99- 103	
200	10.71	10.80	10.41	10.64	10.71	10.70	10.17	10.53
400	11.14	10.78	10.96	10.96	10.82	10.78	10.50	10.70
600	11.93	11.12	11.20	11.42	12.10	11.08	10.76	11.31
Mean	11.26	10.90	10.86		11.21	10.85	10.48	

L S D 5% for:

Varieties (V)	0.35	0.33
P-biofertilizer (P)	0.47	0.41
(V) x(P)	1.18	1.16

Sugar recovery percentage was significantly affected by the interaction between studied factors. Sugar cane varieties G.T.54-9 recorded the highest sugar recovery percentage (11.93 and 12.10 %) when supplied with 600 g P-bio fertilizer /fad in plant cane and first ratoon crops respectively.

#### *Sugar yield*

Data in Table 8 showed that the tested sugar cane varieties differed significantly in sugar yield in both seasons. Sugar cane variety G.99-103 surpassed G.T.54-9 and G.98-28 varieties by 0.057 and 0.448 tons of sugar/fad, in the plant cane crop. While in the 1st ratoon crop sugarcane variety G.T.54-9 surpassed G.99-103 and G.98-28 varieties by 0.055 and 0.592 ton/fad. This superiority of G.T.54-9 and G.99-103 variety in sugar yield mainly attributed with the increase in recovery sugar and cane yield (Tables 7 and 4). The variation among sugar cane varieties in sugar yield

has been reported by Mohamed et al. (2012), El-Labiby et al. (2011) and Ahmed et al. (2016) who reported that G.98-28 sugar cane variety recorded the highest sugar yields/fad in the plant cane and 1<sup>st</sup> ratoon crops over the other two varieties.

Data in the same table showed that sugar yield was significantly increased as the level of P-bio fertilizer levels increased up to 600 g /fad this finding was true in both seasons. The highest value of sugar yield was obtained by using 600 g /fad where it gave (1.087 - 0. 676 ton/fad) and (0. 902 -0.622 tons/fad) more than levels of 200 and 400 g/ fad in plant cane and 1<sup>st</sup> ratoon crops, respectively. 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 Premono et al. (1995), Shankara & Nagaraju (2000) and Ahmed (2013) who reported that inoculation by phosphorus significant influence on sugar yield.

**TABLE 8. Sugaryield tons/fed. of the three sugarcane varieties as affected by P- bio levels.**

Bio-P fertilizer g/fad	Plant crop (2011/2012)			First ratoon crop (2012/2013)			Mean	
	Varieties			Varieties				
	G.T. 54-9	G.98-28	G.99- 103	G.T. 54-9	G.98- 28	G.99- 103		
200	2.795	2.559	2.984	2.779	4.059	3.549	3.888	
400	3.398	2.811	3.361	3.190	4.147	3.924	4.168	
600	3.976	3.626	3.996	3.866	5.288	4.244	4.839	
Mean	3.390	2.999	3.447		4.498	3.906	4.443	

L S D 5% for:

Varieties (V)	0.41	0.35
P-bio-fertilizer (P)	0.48	0.44
(V) x(P)	1.26	1.39

Sugar yield significantly responded to the interaction between the two factors studied in the two seasons. The highest sugar yields (3.996 and 5.288 tons/fad) were obtained by inoculated G.99-103 and G.T 54-9 variety with 600 g /fad in the plant cane 1<sup>st</sup> ratoon crops, respectively.

#### **Conclusion**

It could be concluded that under the conditions of the present work, it is recommended to inoculate G.99-103 or G.T 54-9 sugar cane varieties cuttings by 600 g P-bio fertilizer/fad to produce the highest

cane , sugar yield. and decrease the environmental pollution.

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## استجابة ثلاثة أصناف قصب سكر للتسميد الحيوي الفوسفاتي

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ففي الاونة الاخيرة تزايـدـتـ الدعـواتـ لـتـقـليلـ تـلـوـثـ البـيـئـةـ النـاجـمـ عـنـ اـسـتـخـادـ الـاسـمـدةـ الـكـيـاـنـيـةـ،ـ لـذـاـ تمـ تـنـفـيـذـ العـدـيدـ مـنـ الـابـاحـاتـ لـدـرـاسـةـ اـمـكـانـيـةـ وـ فـعـالـيـةـ اـسـتـخـادـ الـاسـمـدةـ الـحـيـوـيـةـ.ـ وـ تـمـشـيـاـ مـعـ هـذـاـ التـوـجـهـ اـجـرـيـتـ هـذـهـ الـدـرـاسـةـ بـمـزـرـعـةـ بـحـثـةـ الـبـحـوتـ الزـرـاعـيـةـ بـالـمـطـاعـنـةـ (ـدـائـرـةـ عـرـضـ 25,17°ـ شـمـالـ وـ خـطـ الطـولـ 32,33°ـ شـرقـ)ـ،ـ مـحـافـظـةـ الـاقـصـرـ بـمـصـرـ عـلـىـ فـيـ مـوـسـمـ الـزـرـاعـةـ 2011/2012ـ وـ 2013/2012ـ لـمـحـصـولـ غـرسـ وـخـلـفـةـ اـولـىـ.ـ لـدـرـاسـةـ تـأـثـيرـ اـسـتـخـادـ مـسـتـوـيـاتـ مـخـلـفـةـ مـنـ السـمـادـ الـفـوـسـفـاتـ الـحـيـوـيـ (ـ200ـ,ـ400ـ,ـ600ـ جـرامـ فـوـسـفـورـينـ لـلـفـدانـ)ـ عـلـىـ صـفـاتـ الـمـحـصـولـ وـمـكـونـاتـهـ وـصـفـاتـ الـجـوـدـةـ لـثـلـاثـةـ اـصـنـافـ مـنـ قـصـبـ السـكـرـ (ـجيـزةـ تـاـبـوـانـ 9ـ,ـ 54ـ,ـ 99ـ وـجيـزةـ 98ـ,ـ 103ـ).ـ وـ قـدـ اـسـتـخـادـ تـصـمـيمـ الـقـطـعـاتـ الـكـامـلـةـ الـعـشـواـيـةـ فـيـ اـرـبـعـةـ مـكـرـرـاتـ مـرـتـبـةـ فـيـ صـورـةـ قـطـعـ مـنـشـقـةـ مـرـةـ وـاحـدـةـ حـيـثـ خـصـصـتـ الـقـطـعـ الرـئـيـسـيـ لـلـاـصـنـافـ بـيـنـمـاـ وـزـعـتـ مـعـدـلـاتـ التـقـيـيـمـ الـبـكـتـيرـيـ بـالـفـوـسـفـوكـتـرـيـنـ فـيـ الـقـطـعـ الشـقـيـةـ.ـ اوـضـحـتـ النـتـائـجـ مـاـ يـلـيـ::

وـجـدـتـ فـروـقـ مـعـنـوـيـةـ فـيـ بـيـنـ الـاـصـنـافـ مـحـلـ الـدـرـاسـةـ،ـ وـ قـدـ أـظـهـرـ الصـنـفـ الـمـبـشـرـ جـيـزةـ 103ـ,ـ 99ـ تـفـوقـاـ مـلـحوـظـاـ فـيـ عـدـدـ الـنـبـاتـ الـصـالـحةـ لـلـعـصـرـ بـالـمـترـ الـمـرـبـعـ،ـ اـرـتـقـاعـ وـ قـطـرـ الـنـبـاتـ الـصـالـحةـ لـلـعـصـرـ وـ اـيـضاـ مـحـصـولـ الـقـصـبـ الـنـظـيفـ بـالـطـنـ لـلـفـدانـ.ـ بـيـنـماـ نـقـوـقـ الصـنـفـ الـتـجـارـىـ جـيـزةـ تـاـبـوـانـ 9ـ,ـ 54ـ فـيـ صـفـاتـ الـنـسـبـةـ الـمـؤـنـيـةـ لـلـمـوـادـ الـصـلـبةـ الـذـائـبـ الـكـلـيـةـ (ـبـرـكـسـ)،ـ وـ النـسـبـةـ الـمـؤـنـيـةـ لـلـسـكـرـوـزـ وـ النـسـبـةـ الـمـؤـنـيـةـ لـنـاتـجـ السـكـرـ الـنـظـريـ وـ مـحـصـولـ السـكـرـ بـالـطـنـ لـلـفـدانـ.

وـأـوـضـحـتـ الـدـرـاسـةـ أـنـ زـيـادـةـ فـيـ مـسـتـوـيـاتـ الـتـسـمـيدـ الـفـوـسـفـاتـ الـحـيـوـيـ حـتـىـ 600ـ جـرامـ لـلـفـدانـ أـدـتـ إـلـىـ زـيـادـةـ مـعـنـوـيـةـ فـيـ عـدـدـ الـنـبـاتـ الـصـالـحةـ لـلـعـصـرـ بـالـمـترـ الـمـرـبـعـ،ـ اـرـتـقـاعـ وـ قـطـرـ الـنـبـاتـ الـصـالـحةـ لـلـعـصـرـ،ـ النـسـبـةـ الـمـؤـنـيـةـ لـلـمـوـادـ الـصـلـبةـ الـذـائـبـ الـكـلـيـةـ (ـبـرـكـسـ)،ـ وـ النـسـبـةـ الـمـؤـنـيـةـ لـلـسـكـرـوـزـ وـ النـسـبـةـ الـمـؤـنـيـةـ لـنـاتـجـ السـكـرـ الـنـظـريـ وـ أـيـضاـ مـحـصـولـ الـقـصـبـ الـنـظـيفـ وـالـسـكـرـ بـالـطـنـ لـلـفـدانـ.

وـيـمـكـنـنـاـ انـ نـسـتـجـ مـاـيـلـيـ:

تحـتـ مـثـلـ ظـرـوفـ هـذـاـ بـحـثـ يـوصـىـ الـبـاحـثـ بـزـرـاعـةـ الصـنـفـ الـتـجـارـىـ جـيـزةـ تـاـبـوـانـ 9ـ,ـ 54ـ اوـ الصـنـفـ الـمـبـشـرـ جـيـزةـ 99ـ,ـ 103ـ معـ الـتـسـمـيدـ بـمـعـدـلـ 600ـ جـرامـ فـوـسـفـاتـ حـيـوـيـ لـلـحـصـولـ عـلـىـ اـعـلـىـ مـحـصـولـ قـصـبـ وـ سـكـرـ بـالـطـنـ لـلـفـدانـ وـ تـقـلـيلـ تـلـوـثـ الـبـيـئـيـ.