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EFFECT OF POTASSIUM FERTILIZER LEVELS ON THE PRODUCTIVITY, QUALITY AND PROFITABILITY OF PROMISING PH 8013 SUGAR CANE CLONE COMPARED WITH THE COMMERCIAL GT 54-9 SUGAR CANE CULTIVAR

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ABSTRACT

Two field trials were laid out in a split plot design at Malawi Agric. Res. Station, Minia Governorate, Egypt, during 2002/2003 and 2003/2004 seasons to study the effect of different potassium fertilizer levels *i.e.* 0.0, 24.0, 48.0 and 72.0 kg K_2O/fed. on productivity and technological quality characters of the promising Ph 8013 sugar cane clone compared with the commercial cultivar, *i.e.*G.T.54-9.The results could be summarized as follows:

1-There were significant differences between the two studied clones of sugar cane in stalk height, diameter and internodes, number of stalk, millable cane and recoverable sugar yields (ton/fed.) in both growing seasons. The same trend was also detected in the 1st season with regard to TSS%, sucrose% juice, pol% cane , rendement, quality index% cane and reducing sugars% juice ,while, in the 2nd season with regard to purity% juice gave the same result . Ph 8013 clone recorded the higher values of all aforementioned traits than G.T.54-9 cultivar except reducing sugars %juice.

2- Potassium fertilization levels exhibited significant effects on all the

studied traits such as stalk diameter, TSS%, sucrose% juice, purity% juice, pol% cane, reducing sugars% juice, rendement, and quality index% cane as well as millable cane and recoverable sugar yields(ton/fed.) in both growing seasons .

3- Significant interactions were detected between sugar cane clones x potassium fertilizer levels (AB) in the two growing seasons with regard to stalk diameter and purity% juice , in the 1st season with regard to reducing sugars% juice and in the 2nd season with regard to sucrose% juice, pol% cane , rendement, and quality index% cane .

4-It could be concluded that, under the conditions of this study, applying K_2O at 48 and 72kg /fed. for G.T.54-9 and Ph 8013 clones is recommended to achieve the highest values of millable cane and recoverable sugar yields and consequently increasing income value of the growers .

key words: *K_2O level , Ph 8013 sugar cane clone, purity %, quality index, . rendement and pol % .*

1. INTRODUCTION

Sugar cane is the main raw material for sugar industry for a long time in Egypt .It is well known that all commercial sugar cane varieties are inter-specific hybrids and consequently differ in their performance due to the great variation in their genetic make up. Nowadays, the Sugar Crop Institute is advertising the success of the promising Ph 8013 sugar cane cultivation, so that this clone could partially replace the commercial G.T. 54-9sugar cane cultivar which represents about 90 % of the sown sugar cane area in Egypt. Juice quality or chemical the composition of cane juice plays an important and direct role in the quantity of the extracted raw sugar. Meanwhile, the juice quality parameters differ among sugar cane varieties and are affected by the agronomical practices such as potassium fertilizer. Improving the productivity and quality of sugar cane could be obtained by increasing pol% of sugar cane to achieve the highest sugar recovery %, which became the main demand for the manufacturers to increase the sugar production. In addition, increasing millable cane yield will consequently increase income to the growers and reduce the cost of production (Imbaby, 2003, Mohamed *et al.*, 2004 ; Rizk, *et al.*, 2004 a&b and Ahamed & ferweez ,2004).

Sugar cane varieties differed in millable cane and recoverable sugar yields as well as Brix value and sucrose% juice (El.Geddawy *et* *al.* 1997; Ismail ,1997; Ahmed, 1998 , Abo-El.Ghait , 2000 and Gomaa , 2000) . In this respect, Rizk, *et at.* (2004 b) mentioned that tested promising sugar cane varieties *i.e.* F153, G 85-37 and G.T.54-9, significantly differed in stalk height and diameter due to varietal gene make up. In addition, Pandey and Shukla (2000) reported that sugar cane quality is greatly influenced by the different genotypes .They added that the production cost of sugar cane genotypes did not vary , while the maximum gross return was obtained with Co. Pant 90223 variety which achieved the highest value of cane yield (ton / ha.).

The importance of potassium fertilization in Egyptian agriculture has arised since the completion of the High Dam, due to the suspended Nile silt which was the main source to supply the Egyptian soils with K-bearing minerals during the seasonal floods. Potassium is known for its role in sucrose transportation and accumulation in storage tissues of plants. It is one of the major elements needed for vegetative growth and sugar synthesis . Each 100 tons of cane removes 80 to 200 kg K_2O /ha from the soil that needs to be an average application of 150 – 200 kg K_2O /ha (Fauconnier1993). Abou-Salama(1995) reported that potassium application of 50-100 kg K_2O/fed. exhibited a significant effect on net cane and sugar yields. Besides, Nassar (1996) and Abd El.Latif & Ismail (2000) demonstrated that increasing K-level up to 72 kg K_2O/fed. significantly increased cane yield, sugar yield(ton/fed.) and quality of cane juice. Moreover, the current recommendations for potassium fertilization in Egypt are 48 kg K_2O /ha applied with the first dose of nitrogen fertilizer (CCSC, 2005).

This study was carried out to define the optimal potassium fertilizer level which achieves the highest productivity, quality and profitability for the promising PH 80-13 sugar cane clone as compared with the commercial G.T.54-9 cultivar.

2. MATERIALS AND METHODS

This work was conducted at Mallawi Agric. Res. Station, El Minia Governorate, Egypt, during 2002/2003 and 2003/2004 seasons on plant cane crops to study the effect of different levels of potassium fertilizer (0.0, 24.0, 48.0 and 72.0 kg K_2O/fed.) on the productivity and quality characters of two sugar cane clones ,*i.e.*, Ph 8013 and G.T.54-9.

A split plot design with four replicates was used where the two sugar cane clones were arranged in the main plots and the four potassium levels as potassium sulphate (48% K_2O)allocated in the sub plots. Planting dates were on the 27^{th} and 25^{th} March, while harvest was carried out on 3[rd] and 5[th]April during 2002/2003 and 2003/2004 seasons, respectively. The sub-plot area was 35 m^2 (five ridges 7 meters long,100 cm wide). Phosphorus fertilizer was broadcasted after ridging and before planting at the rate of 400kg/fed as calcium superphosphate(15.5% P_2O_5). Potassium fertilizer was applied as side dressing in cane ridges after 50 days from planting. Nitrogen fertilizer as urea (46.5%N) was added at the recommended rate of 210 kg N /fed in two equal doses as side dressing (the first dose after full emergence of cane plants and the second one month later).The chemical and physical properties of the experimental soil before soil preparation according to the procedures outlined by Jackson (1967) are shown in Table (1).

The following data were recorded at harvest

2.1.Vegetative characters

2.1.1. Millable stalk height (cm) was measured from ground level to top visible dewlap (TVD).

2.1.2. Millable stalk diameter (cm) was measured at the middle part of stalk.

2.1.3. Number of internodes / stalk.

2.2. Quality parameters

2.2.1. Total soluble solids (TSS%) was determined using "Brix hydrometer" standardized at 20 ^{0}C .

2.2.2. Sucrose % of cane juice(sucrose%juice) was determined using succharometer as described in AOAC (1995).

2.2.3. Purity % of cane juice (purity % juice) was calculated as the following formula:

Purity % = sucrose % x 100 ÷ TSS%

2.2.4. Richness of cane stalks (Pol% cane) was calculated by the following equation:

Pol % cane=sucrose% X Pol coefficient % 100

2.2.5. Sugar recovery % or rendement was calculated by the following equation according to the outlined procedures of Sugar and Integrated Industries Co.

Sugar recovery %= {(Pol% cane - 0.8 ÷ Purity% juice) x (Purity% juice – 40 ÷ 100 - 40)}x100

2.2.6. Reducing sugars% of cane juice (reducing sugars% juice) was determined by the method described in AOAC (1995).

2.6.7. Quality index of cane stalks (quality index% cane) was calculated by the following equation:

Quality index = Sugar recovery% or rendement x 100 ÷ Pol% cane.

2.3. Productivity traits

2.3.1. Millable cane yield (ton/fed): cane stalks of the three inner ridges in each plot were harvested, topped, cleaned, weighted and cane yield was calculated as ton / fed.

2.3.2. Recoverable sugar yield (ton/fed) was estimated according to Mathur (1981) using the following equation: Recoverable sugar yield (ton/fed) = Millable cane yield (ton/fed) x Rendement

Table (1): Some physical and chemical properties of the experimental soils.

Properties	Season 2002/3	Season 2003/4
Texture analysis:		
Clay %	35.60	37.25
Silt %	53.09	53.51
Sand %	11.31	9.24
Texture grade:	**Silty clay loam**	**Silty clay loam**
Organic matter %	1.18	1.17
pH (1:1 suspention)	8.10	8.00
Ec m.mohs (1:1)	1.11	1.09
Soluble cations:		
K^+ meq/L.	0.22	0.21
Na^+ meq/L.	3.35	3.33
Ca^+ meq/L.	6.69	6.50
Mg^{++} meq/L.	0.81	0.78
Soluble anions:		
CO_3^{-2} meq/L.	-	-
HCO_3^- meq/L.	2.16	2.06
Cl^- meq/L.	2.88	2.78
SO_4^{-2} meq/L.	6.05	6.00
Total N %	0.11	0.10
Available P (ppm)	10.0	9.5
Exchangeable K (ppm)	178	165

2.4. Economics of sugar cane productivity

The cost of production of the studied sugar cane clones at different potassium levels was calculated as described in Pandey and Shukla (2000) . Total and net returns were obtained on market price of sugar cane. Net profit ,retun – cost ratio, yield (ton)/ 1000 m^3 , sugar(ton)/ 1000 m^3 and net profit (LE)/ 1000 m^3 was also worked out .

The proper statistical analysis of all data was carried out according to Gomez and Gomez (1984).The differences between treatment means were compared using the least significant difference (LSD) at 5% level of probability.

3.RESULTS AND DISCUSSION

3.1.Vegetative characters

The results in Tables (2-4) indicated significant differences in the vegetative traits, *i.e.* stalk height, diameter and internodes number of stalk between clones of sugar cane in the two growing seasons. The data showed that all the vegetative traits of Ph 8013 surpassed those of G.T.54-9 cultivar. These results might be explained by the differences in the genetic structure and its reaction with the environmental conditions between the two studied clones of sugar cane .This result is in harmony with that reported by Mohamed (2001) and Taha, *et al.* (2003) who found differences in the vegetative traits, *i.e.*, height and diameter of stalk, among the studied sugar cane varieties.

Table (2): Effect of potassium fertilization levels on stalk height (cm) of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones. (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	269.83	309.00	302.92	293.93	300.00	296.97
24 kg K_2O /fed.	297.60	309.47	303.53	294.97	301.00	297.98
48 kg K_2O /fed.	296.60	309.20	302.90	295.73	300.93	298.33
72 kg K_2O /fed.	299.33	309.77	304.55	294.77	304.77	299.77
Mean	297.57	309.36	303.48	294.85	301.68	298.27
LSD .05	A=2.21	B=NS	AB= NS	A= 1.56	B= NS	AB= NS

Potassium fertilization levels exhibited a significant effects on plant diameter, while insignificant effects on height and internodes number of cane stalk have been detected in the two growing seasons as shown in Tables (2-4). It could be noticed from the results that applying K_2O at 48 and 72 kg /fed gave the highest values of plant diameter in the two growing seasons . In this subject, Taha, *et al.*(2003) reported that millable cane diameter was significantly affected by potassium fertilizer levels.

Table (3): Effect of potassium fertilization levels on stalk diameter (cm) of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane cultivars (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	2.61	2.93	2.77	2.60	2.96	2.78
24 kg K_2O /fed.	2.66	3.00	2.83	2.62	2.97	2.80
48 kg K_2O /fed.	2.70	3.00	2.85	2.71	3.00	2.86
72 kg K_2O /fed.	2.62	3.08	2.85	2.64	3.08	2.86
Mean	2.65	3.00	2.83	2.64	3.00	2.82
LSD .05	A=0.13	B=0.04	AB=0.05	A= 0.06	B= 0.05	AB=0.07

Table (4) : Effect of potassium fertilization levels on stalk internode number of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane cultivars (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	18.31	18.77	18.54	18.18	18.56	18.37
24 kg K_2O /fed.	18.27	18.77	18.52	18.17	18.57	18.37
48 kg K_2O /fed.	18.53	18.70	18.62	18.20	18.55	18.38
72 kg K_2O /fed.	18.20	18.77	18.49	18.19	18.50	18.35
Mean	18.33	18.75	18.54	18.19	18.55	18.37
LSD .05	A=0.31	B= NS	AB= NS	A= 0.30	B= NS	AB= NS

Significant interactions in the two growing seasons with regard to plant diameter between sugar cane clones x potassium fertilization levels (AB) were found in Table (3).The highest values of stalk diameter were scored for G.T.54-9 and Ph 8013 clones with applying K_2O at 48 and 72kg /fed , respectively .

3.2. Quality traits

The data in Tables (5-11) indicate significant differences in the 1st season with regard to the total soluble solids % (TSS%), sucrose % juice, pol % cane, reducing sugars % juice, rendement and quality index %cane as well as in the 2nd season with regard to purity % juice between the studied two clones of sugar cane. Ph 8013 clones showed the higher values of TSS %, sucrose % juice, purity % juice, pol % cane, rendement and quality index % cane and the lower values of reducing sugars % juice than the other cultivar in the two growing seasons. These results might be attributed to the genetic make up of both Ph 8013 and G.T.54-9 clones.Similar results were reported by Gomaa (2000) and Mohamed (2001) who noted significant differences between the studied sugar cane varieties in quality parameters such as TSS% and sucrose % juice.

Table (5): Effect of potassium fertilization levels on the total soluble solids % (TSS%) of the studied sugar cane clones.

Potassium Fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	18.82	20.07	19.44	19.07	20.17	19.62
24 kg K_2O /fed.	21.10	21.73	21.42	21.10	21.37	21.23
48 kg K_2O /fed.	22.43	22.83	22.63	22.60	22.40	22.50
72 kg K_2O /fed.	22.67	23.40	23.03	22.63	23.47	23.05
Mean	21.25	22.01	21.63	21.35	21.85	21.60
LSD .05	A=0.16	B=0.41	AB= NS	A= NS	B= 0.48	AB= NS

Table (6): Effect of potassium fertilization levels on sucrose% juice of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	15.05	16.19	15.62	15.25	16.24	15.75
24 kg K_2O /fed.	17.04	17.59	17.31	17.03	17.31	17.17
48 kg K_2O /fed.	18.44	18.72	18.58	18.58	18.37	18.48
72 kg K_2O /fed.	18.48	19.35	18.92	18.46	19.43	18.95
Mean	17.25	17.96	17.61	17.33	17.84	17.59
LSD .05	A=0.14	B=0.32	AB= NS	A= NS	B= 0.40	AB=0.56

Table (7): Effect of potassium fertilization levels on purity% juice of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	80.01	80.68	80.34	80.00	80.55	80.27
24 kg K_2O /fed.	80.74	80.93	80.84	80.71	81.03	80.87
48 kg K_2O /fed.	82.18	82.00	82.09	82.23	82.00	82.11
72 kg K_2O /fed.	80.68	82.71	82.13	81.55	82.81	82.18
Mean	81.12	81.58	81.35	81.12	81.60	81.36
LSD .05	A= NS	B=0.31	AB=0.44	A= 0.12	B= 0.15	AB=0.22

Table (8): Effect of potassium fertilization levels on pol% cane of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	12.64	13.52	13.08	12.81	13.58	13.19
24 kg K_2O /fed.	14.22	14.66	14.44	14.22	14.41	14.32
48 kg K_2O /fed.	15.21	15.47	15.34	15.33	15.18	15.25
72 kg K_2O /fed.	15.33	15.90	15.62	15.30	15.95	15.63
Mean	14.35	14.89	14.62	14.41	14.78	14.60
LSD .05	A=0.10	B=0.31	AB= NS	A= NS	B= 0.33	AB=0.46

Table (9): Effect of potassium fertilization levels on reducing sugars % juice of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	0.52	0.42	0.47	0.51	0.44	0.47
24 kg K_2O /fed.	0.35	0.28	0.32	0.32	0.25	0.29
48 kg K_2O /fed.	0.19	0.19	0.19	0.22	0.19	0.20
72 kg K_2O /fed.	0.22	0.17	0.19	0.23	0.16	0.20
Mean	0.32	0.27	0.30	0.32	0.26	0.29
LSD .05	A=0.04	B=0.03	AB=0.04	A= NS	B= 0.04	AB=0.05

It is evident from the results in Tables (5-11) that potassium fertilization levels exhibited significant effects on TSS %, sucrose % juice, purity % juice, pol % cane, reducing sugars % juice, rendement and quality index% of sugar cane in the two growing seasons. Applying K_2O at 72 kg /fed gave the highest values of TSS %, sucrose % juice, purity % juice, pol % cane, reducing sugars % juice, rendement and quality index % of sugar cane as well as the lowest values of reducing sugars % juice as compared with the used other levels. Such data confirmed the previous reports of Alexander (1973), Luttge & Pitman (1976) and Mondal *et al.*(1978) who revealed that potassium works in moving sucrose through phloem tubes towards the storage tissues. This result might be due to the role of K_2O which encourage sugars to translocate to store tissue in cane stalks, as well as the transformation of simple sugars to sucrose that cause the increase in TSS % , purity %, pol, %, and rendement of cane stalks, where potassium is used as Co-Enzyme with phosphorase to form sucrose. Moreover, potassium is well known for its vital role in sucrose transportation and accumulation in storage tissues of plants.

Significant interactions between sugar cane clones x potassium fertilization levels (AB) with regard to purity % juice in the two growing seasons, only significant interactions with regard to reducing sugars % juice in the 1st season , with regard to sucrose% juice, pol % cane, rendement and quality index % of sugar cane in the 2nd season were found in Tables (6-10). The highest values of purity % juice , sucrose % juice, pol % cane. rendement and quality index % cane as well as the lowest values of reducing sugars % juice were scored for G.T.54-9 and Ph 80-13 clones with applying K_2O at 48 and 72 kg/fed, respectively. Thes results are in accordance with that of Abayomi, (1987) and Ismail (1991) who mentioned that juice quality was enhanced with the increase in potassium fertilization levels up72 kg K_2O / fed .

3.3. Productivity traits

Data in Tables (12&13) indicated significant differences in millable cane and recoverable sugar yields (ton/fed.) between the clones of sugar cane in the two growing seasons. Ph 80-13 clone scored the higher values of millable cane and recoverable sugar yields than the clone. G.T.54-9, in the two growing seasons . These results might be due to that Ph 80-13 clone contained the higher values of

Table (10): Effect of potassium fertilization levels on rendement of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	9.86	10.69	10.28	10.01	10.72	10.36
24 kg K_2O /fed.	11.19	11.68	11.44	11.28	11.49	11.39
48 kg K_2O /fed.	12.33	12.53	12.43	12.43	12.27	12.35
72 kg K_2O /fed.	12.34	13.00	12.67	12.32	13.06	12.69
Mean	11.43	11.97	11.70	11.51	11.89	11.70
LSD .05	A=0.20	B=0.22	AB= NS	A= NS	B= 0.28	AB=0.39

Table (11): Effect of potassium fertilization levels on quality index% cane of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	78.01	79.07	78.54	78.14	78.94	78.54
24 kg K_2O /fed.	78.69	79.67	79.18	79.33	79.74	79.54
48 kg K_2O /fed.	81.07	81.00	81.04	81.08	80.83	80.96
72 kg K_2O /fed.	80.50	81.76	81.13	80.52	81.88	81.20
Mean	79.57	80.38	79.97	79.77	80.35	80.06
LSD .05	A=0.65	B=0.84	AB= NS	A= NS	B= 0.96	AB=1.19

stalk height, diameter and internodes number of stalks as well as pol%cane (Tables, 2-4 and 8). These findings are in the same line with those obtained by Ismail (1997) and Abo El Ghait (2000) who indicated that cane yield (ton/fed.) differed between the studied varieties of sugar cane.

The results in Tables (12&13) revealed that potassium fertilization levels exhibited a significant effects on millable cane and recoverable sugar yields (ton/fed.) of sugar cane in the two growing seasons . Applying K_2O at 48 and 72 kg /fed gave the highest values of millable cane and recoverable sugar yields (ton/fed.)of sugar cane over applied other levels. This might be due to adequate potassium supply having an ecological importance in increasing the efficiency of N uptake and use. Consequently, increasing the stalk diameter and weight as a result of the potassium role in the physiological processes in plants such as translocation of sugars and carbohydrates . In the same subject, the increase in recoverable sugar yield (ton/fed) of sugar cane might be due to the increase in both of millable cane (ton/fed) and pol, % . This finding is in a good accordance with those reported by Alexander, (1973), Luttge & Pitman (1976) ; Mondal, *et al.*(1978); Chawdhury & Rahman, (1990); Korndorfer (1990) and Abou-Salama (1995) who revealed that each 100 tons of cane removes 80 to 200 kg K_2O /ha from the soil that needs to be an average application of 150 – 200 kg K_2O /ha (Fauconnier1993). This result is in the same line with that reported by Nabhan *et al.* (1989) who indicated that sugar cane yield was affected by the level of potassium fertilizer. Also, Taha *et al.* (2003) indicated that the highest level of potassium (72 kg K_2O /fed.) maximized cane yield of plant crop .

Insignificant interactions between sugar cane clones x potassium fertilization levels (AB) with regard to millable cane and recoverable sugar yields of sugar cane have been detected as shown in Tables (12&13).

Table (12): Effect of potassium fertilization levels on millable cane yield (ton/fed) of the studied sugar cane clones.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	45.13	46.30	45.72	44.52	45.22	44.87
24 kg K_2O /fed.	47.37	48.27	47.82	46.90	47.42	47.16
48 kg K_2O /fed.	49.88	50.58	50.23	49.30	50.50	49.90
72 kg K_2O /fed.	48.78	52.47	50.98	48.67	51.50	50.09
Mean	47.79	49.41	48.69	47.35	48.66	48.01
LSD .05	A=1.50	B=2.56	AB=NS	A= 0.91	B= 2.67	AB= NS

Table (13): Effect of potassium fertilization levels on recoverable sugar yield (ton/fed) of the studied sugar cane cultivars.

Potassium fertilization levels (B)	Plant cane 2002/2003			Plant cane 2003/2004		
	Sugar cane clones. (A)					
	G.T.54-9	Ph 8013	Mean	G.T.54-9	Ph 8013	Mean
0 kg K_2O /fed.	4.45	4.95	4.70	4.46	4.85	4.66
24 kg K_2O /fed.	5.30	5.64	5.47	5.29	5.45	5.37
48 kg K_2O /fed.	6.15	6.34	6.25	6.13	6.20	6.17
72 kg K_2O /fed.	6.02	6.82	6.42	6.00	6.73	6.37
Mean	5.48	5.94	5.71	5.47	5.81	5.64
LSD .05	A=0.14	B=0.37	AB= NS	A= 0.19	B= 0.36	AB= NS

3.4. Economics of sugar cane clones productivity per fed. at the studied potassium levels

The obtained results in Table (14) clarified that applying K_2O at 48 and 72 kg /fed. for G.T.54-9 and Ph 80-13 clones gave the highest values of total return and net profit per fed. as well as millable cane yield in ton/1000m^3 of water and sugar yield (in ton) /1000m^3 of water, respectively. These results might be due to that G.T.54-9 and Ph 80-13 clones exhibited the higher values of millable cane and recoverable sugar yields (ton/fed.) with applying K_2O at 48 and 72 kg /fed over the other K_2O rates.

In this subject , Johnston (1997) indicated that potassium has regulating and catalytic roles on plant metabolism and is involved in numerous functions in the plant such as enzyme activation, cation-anion balance, stomata movement, phloem loading assimilate translocation that catalyze the metabolic activities at the cellular and organ levels which could be translated at the whole plant into promotion in energy conversion , carbohydrated assimilation and translocation and nutrient uptake, transfer and metabolism towards better quality . Also Pandey and Shukla (2000) reached the same results.

Table (14): Economics of sugar cane productivity per faddan at the studied potassium fertilizer levels. (Average data of 2 years).

Items	G.T.54-9 cultivar					Ph 80-13 clone		
	Potassium fertilizer levels							
	0 K_2O kg/fed.	24 K_2O kg/fed.	48 K_2O kg/fed.	72 K_2O kg/fed.	0 K_2O kg/fed.	24 K_2O kg/fed.	48 K_2O kg/fed.	72 K_2O kg/fed.
Costs (L.E.)**								
Variable costs**								
i.e. irrig., hoeing, etc	1500.00							
K fertilizer	00.00	50.00	100.00	150.00	00.00	50.00	100.00	150.00
Fixed costs:**								
Overhead	365.00							
Rental value	2500.00							
Total costs.	4365.00	4415.00	4465.00	4515.00	4365.00	4415.00	4465.00	4515.00
Productivity (ton):								
Millable cane	44.68	47.14	49.59	48.73	45.76	47.85	50.54	51.99
Sugar	4.46	5.30	6.14	6.01	4.90	5.55	6.27	6.78
Prices (L.E./ton)**								
Millable cane	130.00	130.00	130.00	130.00	130.00	130.00	130.00	130.00
Total Return (L.E./fed.):								
Millable cane	5808.4	6128.20	6446.7	6334.90	5948.80	6220.50	6570.20	6758.70
Net profit (L.E.)	1443.4	1713.20	1981.70	1819.90	1583.80	1805.50	2105.20	2243.70
Return-cost ratio	1.33	1.39	1.44	1.40	1.36	1.41	1.47	1.50
Quantity of water m^3:	12000							
Yield(ton)/1000m^3	3.72	3.93	4.13	4.06	3.81	3.99	4.21	4.33
Sugar(ton)/1000m^3	0.37	0.44	0.51	0.50	0.41	0.46	0.52	0.57
Net-profit(L.E.)/1000m^3	120.28	142.77	165.14	151.66	131.98	150.46	175.43	186.98

According to CCSC (2005). ** L.E. = Egyptian pound.

Therefore, applying K_2O at 48 and 72 kg /fed for G.T.54-9 and Ph 8013 clones representing optimal potassium fertilizer levels which achieved the highest productivity and quality and are recommended to achieve the highest values of millable cane and recoverable sugar yields and consequently increasing income value of grower and helping in reducing the vast gap between sugar consumption and production.

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تأثير مستويات السماد البوتاسى على إنتاجية ، جودة وربحية سلالة قصب السكر الواعدة Ph 8013
مقارنة بالصنف التجاري جيزة – تايوان ٥٤-٩

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ملخص

أقيمت تجربتين حقليتين بمحطة البحوث الزراعية بملوى ،محافظة المنيا ،مصر خلال موسمى٢٠٠٢ /٢٠٠٣، ٢٠٠٣/٢٠٠٤ لدراسة تأثير المستويات المختلفة من السماد البوتاسى (صفر، ٢٤ ، ٤٨و٧٢ كجم وحدة بوتاسيوم / فدان) على إنتاجية و صفات الجودة التكنولوجية والربحية لسلالة قصب السكر الواعدة Ph80-13 مقارنة بالصنف التجاري جيزة – تايوان ٥٤-٩ لمحصول الغرس واستخدم في ذلك تصميم قطع منشقة مرة واحدة .

ويمكن تلخيص نتائج الدراسة فيما يلى:

١ –أوضحت النتائج المتحصل عليها وجود فروق معنوية بين صنفي سلالتى القصب المدروسين في طول ، قطر وعدد سلاميات العود ، وكذلك نواتج العيدان القابلة للعصير و السكر القابل للاستخراج (طن /فدان) فى كلا الموسمين الزراعيين.

ظهر نفس الاتجاة في الموسم الأول بالنسبة إلى نسبة المواد الصلبة الذائبة الكليــة ، نسبة السكروز%عصير ، نسبة السكروز% القصب ، نسبة استخراج السكر ، معامل جودة% القصب ، ونسبة السكريات المختزلة%عصير ، فــي الموســم الثــاني بالنسبة الى النقاوة % عصير . وسجلت سلالة قصب السكر الواعدة Ph 13 80تفوقا ملحوظا في جميع الصفات السابقة عــن الصـــنف التجــاري عــدا نســبة السكريات المختزلة%عصير .

٢- أدت إضافة السماد البوتاسي إلى زيادة معنوية في قطر العود ، نسبة المواد الصلبة الذائبة الكلية ، نسبة السكروز%عصير ، نسبة السكروز% القصـــب ، ونسبة النقاوة % عصير ، نسبة استخراج السكر ، معامل جودة %القصــب ونسبة السكريات المختزلة%عصير وكذلك نواتج العيــدان النظيفــة القابلــة للعصير و السكر القابل للاستخراج (طن /فدان) في كلا الموسمين الزراعيين.

٣- سجلت تفاعلات معنوية بين سلالات قصب السكر و إضافة السماد البوتاسي في كلا الموسمين الزراعيين بالنسبة الى قطر العود ، وفــي الموســم الاول بالنسبة إلى نسبة السكريات المختزلة%عصير، في الموسم الثاني بالنسبة الى نسبة السكروز% القصب، نسبة استخراج السكر و معامل جودة %القصب .

٤- تؤكد النتائج تحت ظروف الدراسة أهمية إضافة السماد البوتاســي بمعــدلات ٤٨ و ٧٢ وحدة للفدان من السماد البوتاسي لصنف جيزة - تايوان ٥٤- ٩ التجاري و سلالة قصب السكر الواعد Ph80 13 لتحقيق القيم الأعلى مــن صفات ناتج العيدان النظيفة القابلة للعصر و ناتج السكر القابل للاســتخراج (طن /فدان) وبالتالي زيادة قيمة دخل المزارع .

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