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Original Research Article

Performance of Some Sugar Cane Promising Varieties under Different Seed Sett Rates and Potassium Fertilization

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A B S T R A C T

Two field experiments were carried out at Shandaweel Agric. Res. Station, Sohag Governorate, Egypt (latitude 26.33 N & longitude 31.42 E) during the two successive seasons of 2013/2014 and 2014/2015 to find out the performance of three sugar cane varieties (G.T.54-9, G.2003-47 and G.2003-49) under two planting densities (1.5 drills and 2 drills) and fertilized with three K levels (0, 32 and 64 kg K_2O/fed). The important results could be summarized as follow: The commercial sugar cane variety (G.T.54-9) is still over passed the other two promising varieties in stalk length and thickness and stalk weight/plant. The promising varieties *i.e.* G.2003-47 and G.2003-49 surpassed the commercial variety (G.T.54-9) in brix and sucrose percentages, however, purity % insignificantly affected by the examined varieties in both seasons. Sugar cane variety G.2003-49 over passed the other varieties in the value of number of millable cane/fed. The two promising sugar cane varieties *i.e.* G.2003-49 and G.2003-47 significantly sure passed on the commercial one in respect to cane yield/fed, sugar recovery % and sugar yield/fed. Increasing the applied dose of potassium fertilizer was accompanied by a significant increase in the values of stalk length, stalk thickness and stalk weight/plant in both seasons. Brix and sucrose percentages, sugar recovery % and millable cane number significantly and positively responded to the increasing in potassium levels up to 64 kg K_2O/fed, however, 32 kg K_2O/fed was enough to recorded the highest significant values of purity in both seasons. Fertilizing sugar cane crop by 32 and 64 kg K_2O/fed increased sugar yield by 21.09 % & 26.48 % in the 1st season and 17.44 % & 28.35 % in the 2nd season, respectively, compared with check treatment. Dual drilling of seed sett cane increased number of millable cane, cane yield and sugar yield. Concerning to the economical view for potassium application, adding 32 kg K_2O/fed its price L.E. 360 attained an additional increase in cane yield amounted by 3.55 ton/fed its value L.E. 1420 and additional increase in sugar production 1.02 ton/fed its value L.E. 2874.6, whereas, raising the addition level of potassium up 64 kg K_2O/fed its price L.E. 720 attained an additional increase in cane yield/fed amounted by 5.75 ton/fed its value L.E. 2300 and addition increase in sugar production 1.61 ton/fed its value L.E. 4537.3.

Keywords

Sugar cane, Varieties, Seed setts rate, Fertilization, yield

Introduction

Sugarcane (*Saccharum officinarum L.*) is a vegetative propagated, perennial crop which has a high leaf area index and a high photosynthetic efficiency under strong sunshine, more than any other crop in the tropics (Bassham, 1978). The yield of sugarcane is greatly affected by different factors. Among these, lack of study based planting population is the important one (Azhar *et al.,* 2007). Establishing an optimum plant population in any crop is vital for achieving maximum production and sugarcane is not an exception. The yield of sugarcane partly depends on the initial stand density of primary shoots and their tillers onwards. These, in turn, are influenced by the number and quality of setts planted (Kakde, 1985). According to Collins (2002), plant density is a function of inter and intra-row spacing. The individual and combined effects of certain management practices planting date, row spacing, planting depth, fertilizer rate, pest control and irrigation have a great impact on the growth and yield of sugar cane. The number of plants at harvest time is a major determinant of biomass yield and a density of 50 –70,000 plants/ha was recommended by Tran Van Soi (1988). This was a general recommendation to account for factors such as variety, branching ability, climate and soil conditions. If the plants are too close, there may be too many shoots which will reduce the efficiency of the parent plants and class 1 branches while too large a space between rows will lead to a waste of the area and of solar energy (Duong Duc Thang, 1991). In the hilly land of Vietnam, higher production was obtained with the same plant density but arranged in narrower rows (Nguyen Huy Uoc, 1987) compared to the traditional method of planting. Other researchers also reported higher yields from narrow spacing (90 and 60 cm) compared with wide spacing (130, 140 and 180 cm) (Sharma, 1982; Irvine *et al.,* 1984; Singh and Singh, 1984; Gonzalez Teller *et al.,* 1989; Arvind Misra *et al.,* 1990). The amount of setts required for planting a unit area depends on the way the cane setts are arranged in the furrow during planting. The importance of optimal planting density is to obtain optimum sprouts for an adequate initial stand establishment. High density planting results in higher cane population with weak and thinner stalks (Rao, 1990). Furthermore, high density planting reduces the number of tillers produced per each planting material due to mutual shading and competition for light, nutrients and water (Verma, 2004). On the other hand, sub- optimal density planting results in a loss of yield due to inefficient use of the land space (Azhar *et al.,* 2007). Some Studies in other countries indicated that with low density planting, it was possible to minimize the planting material required per unit area (Ayele *et al.,* 2014).

An experiment conducted on plant cane and ratoon cane with pre-seasonal planting indicated that cane girth, number of millable canes per clump and average cane weight were significantly higher at the intra-row spacing of 90 cm rather than at the intra-row spacing off 30 cm and 60 cm (Raskar and Bhoi, 2003). This indicated that naturally sugarcane has the capacity to compensate for population densities and maintain potential yield under different plant spacings. Ayele *et al.* (2014) studied the effect of five intra-row sett spacings [10 cm between setts, 5 cm between setts, setts placed end to end, setts placed ear-to ear (5 cm overlapping) and setts placed ear-to-ear (10 cm overlapping)] on the performance of three sugarcane varieties (B52/298, NCo334 and B41227). They concluded that sucrose content, cane yield, and estimated commercial cane sugar were not statistically different from the control treatment, which indicates that closer sett spacing results in the same final yield as in wider sett spacing. The absence of interaction effect of sett spacing with varieties showed that none of the varieties needs different sett spacing for attaining its maximum cane and sugar yields. Therefore, they recommended that the intra-row spacing of 10 cm between setts for all three varieties should be used instead of the conventional ear-to-ear (5 cm overlapping) setts intra-row spacing because the former requires less planting materials without compromising cane and sugar yields. Furthermore, the study indicated the possibility of reducing the amount of seed cane from 21 to 33%, by shifting from the 5 cm overlapping to end to end (butt-to-butt) alignment (Girma, 1997).

As for the influence of cane varieties, Ahmed *et al.* (2011) reported that the promising sugar cane variety G.95–21 significantly surpassed G.95–19 in the number of millable cane /fed, stalk height, millable cane diameter, TSS% and cane yield/fed. Moreover, they showed that sugar cane varieties were significantly differed in stalk diameter, sucrose% and sugar yield ton/fed in the 2nd season only, however, cane yield was significantly affected by the grown varieties in both seasons. Phil 8013 variety showed superiority in all significant traits. El-Geddawy *et al.* (2012) The results indicated that Variety G.54-9 surpassed the other varieties in plant height, stalk fresh weight, number of millable canes/fed and cane and sugar yields (ton/fed), whereas, Giza 2000-5 variety gave the highest stalk diameter. Abd El-Aal *et al.* (2015) found that the tested sugar cane varieties differed significantly in their stalk number and diameter, 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.

The functions of potassium in sugarcane are many and have been extensively reviewed by Filho (1985). Among those functions which may be singled out is the main role of K as an enzyme activator in plant metabolisms such as in photosynthesis, protein synthesis, starch formation and translocation of proteins and sugars. Without an adequate K in the plant, some of the sugar may remain in the leaves instead of being transported, stored and harvested in the stalks. Furthermore, if the K supply is inadequate, hydrolytic activity of invertase may be intensified resulting in cane with high reducing sugars but low sucrose level (Filho, 1985). As a consequence of active uptake of potassium and its accumulation in the cell, osmotic potential decreases, water moves in and increases the turgid pressure in the cell which is responsible for growth. Positive effect of potash fertilizer and FYM application occurred on cane yield and sugar contents confirming earlier reports (Kumar *et al.*, 2001).

Verma *et al.* (1998) reported that potassium application gave higher cane yield but had no effect on sugar content. Application of 50 kg and 199 kg K/ha of muriate of potash showed that cane yield increased with increase in potassium fertilizer (Yanan *et al.*, 1997). Singh *et al.* (1999) reported that potassium application had no significant effect on cane yield but increased commercial cane sugar content. El-Geddawy *et al.* (2005) found that application of 72 kg k_2O/fed favored cane growth and produced the highest yield of millable cane and sugar/fed, while application of 36 kg k2O/fed increased juice quality traits in terms of Brix, sucrose and sugar recovery percentages. Reduction in values of purity and reducing sugar% as k levels increased was also noticed. Abo El-Wafa *et al.* (2006) found that the application of 72 kg K_2O/fed gave the highest values of TSS, sucrose and juice purity %. K_2O at 48 and 72 kg/fed recorded the highest millable cane and recoverable sugar yields. Bekheet (2006) showed that increasing the applied K levels up to 75 kg K_2O/fed increased stalk length, sucrose and sugar recovery percentages and yields of cane and sugar. Mahmoud *et al.* (2008)

found that increasing potassium levels significantly increased stalk length, stalk diameter, stalk weight, number of stalk/m^2, millable cane and yields of cane and sugar. Ahmed *et al.* (2013) studied all possible combinations of three planting parts (top, middle and bottom), three K-application rates (0, 60 and 90 kg/ha^{-1}) and two varieties of sugarcane (NCS 008 and Bida local). They concluded that the top part (apex) of sugarcane stalk proved superior among the middle and bottom part. Also, Potassium application of 90 kg/ha^{-1} is recommended for optimal growth and yield.

Materials and Methods

Two plant cane field trials were conducted in Shandaweel Agric. Res. Station, Sohag Governorate, Egypt (latitude 26.33 N and longitude 31.42 E) during the two successive seasons of 2013/2014 and 2014/2015 to find out the performance of three sugar cane varieties (G.T.54-9, G.2003-47 and G.2003-49) under two planting densities (1.5 drills "37800 buds/fed" and 2 drills "50400 buds/fed") and fertilized with three potassium levels (0, 32 and 64 kg K_2O/fed "fed = 0.42 ha^{-1}").

The present study was arranged in split-split-plot design with three replications. The varieties were allocated in main plots, mean while seed sett rate (planting densities) occupied the sub–plot and potassium levels were randomly distributed in the sub–sub plot. Sub plot area was 35 m^2 included five rows seven m in length and one m in width. Planting date was on the 2nd week of March and harvested twelve months age in both seasons, the preceding cultivated crop was maize followed by fallow.

Nitrogen fertilization was applied at 200 kg N/fed as urea (46.5% N) in two equal doses, the 1st one after two months from planting and the 2nd one month later. Phosphorus fertilizer was added during land preparation at 31 kg P_2O_5/fed as calcium super phosphate (15.5 % P_2O_5), meanwhile, potassium fertilizer was added at 48 K_2O/fed as potassium sulphate (48 % K_2O) once with the first dose of nitrogen.

All the other agricultural practices in sugar cane field were carried out as usual according Sugar Crops Res. Inst. recommendations. Physical and chemical properties of the upper 40 cm of the experimental soil sites are presented in table 1.

Recorded data

At harvest plants of each plot were harvested, cleaning, toped to determine the following characteristics

1. Number of millable cane **(**thousand/fed**)**.
2. Cane yield (ton/fed).

A sample of 30 stalks from each treatment was randomly taken at harvest to determine the following parameters:

1. Stalk length (cm) was measured from land surface to the top visible dewlap.
2. Stalk diameter (cm) in the middle part of the stalk.
3. Stalk weight (g).
4. Brix % of juice was determined by using Brix hydrometer standardized at 20°C according to A.O.A.C. (1995).
5. Sucrose % of juice was determined using saccharometer according to A.O.A.C. (1995).
6. Purity % was calculated according to the following equation:

Purity % = sucrose / brix % x 100

7. Sugar recovery % was calculated by the following equation:

Sugar recovery % = Richness % x Purity %

Where Richness = (sucrose in 100 grams x factor) / 100
Factor = 100 - [fiber % + physical impurities % + percent water free from sugar].
8. Sugar yield (ton/fed) = cane yield (ton/fed) x sugar recovery %.

Statistical analysis

The collected data were statistically analyzed according to Snedecor and Cochran (1981). Least Significant Difference (LSD) method was used to compare the differences between treatment means at 5 % level of probability as mentioned by Waller and Duncan (1969).

Results and Discussion

Morphological characteristics

Stalk characteristics are one of the reflected mirrors to the expected yield, so it is will be useful to throw some light around such criteria in varietal selection program.

Stalk height (cm)

Results in table 2 cleared that stake length significantly affected by the examined varieties, the commercial sugar cane varieties (G.T.54-9) is still over passed the other two promising varieties in this respect however; sugar cane variety G. 2003-49 significantly surpassed G. 2003-47 variety in stalk length. This finding was completely true in both seasons. This result is in agreement with that reported by Ahmed *et al.* (2011) and El-Geddawy *et al.* (2012).

Concerning to seed sett rate on the values of stalk length, the available results in the two growing seasons showed that drilling sugar cane crop by using two rows significantly attained higher stalk length.

As for potassium fertilization treatments on stalk length, the collected data in table 2 pointed out that increasing the applied dose of potassium fertilizer was accompanied by a significant increase in the values of stalk length in both seasons. The effective role of potassium on stalk length come through the influence of potassium in storing materials of metabolic process which may be used partially in plant growth in terms of stalk length and thickness. This result coincides with those found by Mahmoud *et al.* (2008) and Ahmed *et al.* (2013).

The interaction between the examined variety and seed sett rate significantly effected on stalk length in the 1st season only, however, increasing seed sett rate always had increased the stalk length under the examined varieties.

Once more, the 1st order interaction between the examined varieties and potassium fertilizer level appeared a significant effect on stalk length in the 1st season too; meanwhile this effect was insignificantly in the 2nd season. Regardless the significance effect of this combination, it could be also noted that increasing the applied dose of potassium increased stalk length under the examined varieties

The 2nd order interaction between seed sett rate and potassium fertilization significantly increased stalk length in both seasons, raising potassium fertilizer rate attained a significant increase in stalk length under the two seed drill in both season and the highest stalk length was found the combination between two seed setts drill with 64 kg K_2O/fed.

The 2nd order interaction between the studied factors cleared that drilling sugar cane variety G.2003-49 using two rows and 64 kg K_2O/fed produced the highest stalk length this increase was statistically in the 1st season only.

Stalk thickness (cm)

Figures in table 2 showed that there is a significant difference between the studied varieties in respect to their thickness, sugar cane variety G.T.54-9 significantly over passed the tow promising varieties in this respect in both seasons. It seems that trait more attributed by gen make up for the examined varieties. Similar result was recorded by El-Geddawy *et al.* (2012) and Abd El-Aal *et al.* (2015).

As to, the effect of seed sett rate on stalk thickness, the collected data revealed that the differences between the studied seed sett rate did not reach the level of significance in both seasons.

As to, Potassium influence on sugar cane thickness, the results obtained cleared that increasing the applied dose of potassium let to significant increase in the values of stalk thickness in the two growing seasons. This result could be evident as a result to the pronounced role of potassium in storage process which effect on plant growth. This result is in agreement with that reported by Mahmoud *et al.* (2008).

Concerning the interaction between the examined varieties and seed sett rate, it could be noted that sugar cane variety G.T.54-9 recorded the highest values of stalk thickness in the two growing season when drilling by 1.5 rows. This finding may be reflected the bad effect of the heavier seed sett (2 rows) on plant growth as a result to the higher competition between the plants grown on ecological elements.

Belong to the 1st order interaction between sugar cane varieties and potassium fertilizer rate, the results showed that as the applied dose of potassium increase the values of stalk thickness increased, however this result was significant in the 1st season only.

Once more, under the two seed sett increasing potassium application let to accompanied increase in the values of cane thickness with significant difference in the 1st season only. Figures in table 2 cleared that the 2nd order interaction between the studied factors insignificantly influenced on sugar cane thickness.

Stalk weight/plant (g)

Data illustrated in table 2 stalk weight significantly influenced by the examined varieties, sugar cane variety G.T.54-9 attained the highest stalk weight in both seasons. This result is in agreement with those reported by El-Geddawy *et al.* (2012).

Results given in table 2 cleared that stalk weight/plant of sugar cane insignificantly affected by the studied seed sett rate in the two growing seasons.

Concerning the influence of potassium fertilization on stalk weight/ plant, the available data pointed out that there was a gradual and significant increase in stalk weight/plant was accompanied to the addition increase in the applied dose of potassium up to 64 kg K_2O/fed. This results mainly due to the distinct influence of potassium fertilization on stalk dimensions (Table 2) 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. Effect of potassium fertilization on sugar cane growth had been reported by Mahmoud *et al.* (2008) and Ahmed *et al.* (2013).

As to the effect of the interaction between the studied varieties and seed sett rate on stalk weight / plant, the results obtained showed that as sugar cane varieties G.T.54-9 and G.2003-47 recorded the highest stalk weight with seed sett rate 1.5 rows, however, sugar cane variety G.2003-49 recorded the highest value of this trait when planted by 2 rows of seed sett. This observation was fairly true in the two growing season but significantly in the 2nd season only. This result may be due to gen make up effect for the examined varieties.

Belong to the influence of the 1st order interaction between sugar cane varieties and potassium rates on stalk weight/plant, the collected data revealed that with the studied sugar cane varieties increasing the applied dose of potassium almost increased stalk weight/plant. This finding was significantly in the 2nd season only. The highest value of stalk weight/plant was produced with the combination between sugar cane variety G. 2003-49 and 64 kg K_2O/fed in both seasons.

The 1st order interaction between potassium fertilizer rate and seed sett rate was insignificant in respect to its influence on stalk weight/ plant in the two growing seasons. However, the second order interaction between the studied factors showed that planting sugar cane variety G.2003-79 using two seed sett rows and 64 kg K_2O/fed attained the highest values of stalk weight/plant in both seasons, however, this effect was statistically in the 2nd season only.

Juice quality

Brix percentage

Table 3 shows the influence of seed sett and potassium fertilization rate on juice quality of some sugar cane varieties. Results given demonstrated a significant difference in the values of brix percentage due to the examined varieties, both promising varieties viz G.2003-47 and G.2003-49 over passed the commercial variety in this respect.

Data obtained in table 3 cleared that seed sett rate significantly affected on the percent of brix in the two growing seasons drilling sugar cane seed sett in two rows raised the values of brix %.

Figures in table 3 pointed out that brix % significantly and positively responded to the increasing in potassium levels. This observation was fairly true in the two seasons; this increment was distinctly up to the highest dose of potassium i.e. 64 kg K2O/fed. It is well known that the important role of potassium for the storied crop such as sugar cane. The effective role of potassium on sugar content has been reported by Singh *et al.* (1999).

As for the various interaction between the studied factors, the results in table 3 showed that the 1st order interaction between the examined varieties and seed sett rate significantly influenced on brix % increasing planting density (two rows of seed sett) always had let to additional increase in brix % with the different varieties, however, this increment was statistically in the 1st season only.

The 1st order interaction between the tested varieties and potassium fertilizer level, the results showed brix % positively and significantly increased by increasing the additional dose of potassium fertilizer. This result was fairly true under the different varieties in the two growing seasons.

Figures in table 3 showed the 1st order interaction between seed sett rate and potassium fertilizer as well as the 2nd order interaction between the studied factors insignificantly affected on brix %.

Sucrose percentage

Results given in table 3 revealed that sucrose percentage affected significantly by the tested sugar cane varieties, it could be noted that both of the promising varieties *i.e.* G.2003-47 and 2003-49 surpassed the commercial variety (G.T.54-9) in this respect. The difference between sugar cane varieties had been reported by Abd El-Aal *et al.* (2015).

As for the influence of seed sett rate on the values of sucrose %, results illustrated in table 3 cleared a significant response in the values of sucrose % due to seed sett rate, drilling seed sett by using two rows of seed cutting raised the values of sucrose % in the two growing seasons.

Figures in table 3 indicated to a positive and statistical increase in the values of sucrose % was accompanied to the increase in the applied dose of potassium in the two seasons. This result is mainly due to the pronounced influence of potassium element due to its importance in transportation process in the storied crops. This result is in agreement with that reported by Abo El-Wafa *et al.* (2006) and Bekheet (2006).

The 1st order interaction between the studied varieties and seed sett rate appeared a positive increase in the values of sucrose % in both seasons; however the increase in drilling rate of seed cutting did not reach the level of significance in the 2nd season.

Regarding the influence of the interaction between sugar cane varieties and potassium fertilizer levels, the available results pointed out that with different varieties increasing the applied dose of potassium fertilizer level attained a significant increase in sucrose % in the two seasons. This result reassured the distinct role of potassium element in sugar accumulation.

Data illustrated in table 3 recorded insignificant effect on sucrose % in the two growing seasons due to the interaction between seed sett rate and potassium fertilizer levels.

Once more, the 2nd order interaction between the studied factors cleared a significant effect on sucrose % in the 2nd season only. Regardless the significance effect of the studied factors, the highest value of sucrose % to be realized when the sugar cane variety G.2003-49 drilling by two rows of seed cutting and fertilized by 64 kg K_2O/fed.

Purity percentage

Purity percentage is considered the reflected mirror for both brix % and sucrose % and the effect of the studied factor singly or in combination with each other was as similar as what was found in brix % and sucrose %. Figures in table 3 pointed out that the values of purity % insignificantly affected by the examined varieties in both seasons. Effect of varieties on purity percentage had been reported by Ahmed *et al.* (2011).

Effect of seed sett rate on the values of purity % was significant in the 1st season only; drilling sugar cane cutting in dual model attained the highest purity (%).

Once more, results given in table 3 showed significant influence on purity % due to the applied dose of potassium. Application of 32 kg K_2O/fed was enough to recorded the highest significant values in both seasons. This finding may be indicate to the excess application of potassium which in fact reflected on higher values in brix (%) and sucrose (%), however, reduce purity (%) as a results to the increase in impurities such as potassium which reflect negatively on the values of purity (%).

Drilling seed cutting in dual model almost attained the highest purity (%) with the various sugar cane varieties under study in both season, mean while the significant effect was in the 1st season only.

As to the 1st order interaction between the examined varieties and potassium application levels, the collected data showed that there is a different response between sugar cane varieties to potassium application. As sugar cane variety G.T 54 -9 and G.2003-47 recorded positive response to potassium fertilizer levels up to 32 kg K_2O/fed, sugar cane variety G.2003-49 appeared a positive effect on purity % up to 64 kg.K_2O /fed. However, this influence was significantly in the 2nd season only.

The 1st order interaction between seed sett rate and potassium application levels insignificantly effected on the values of purity % in both seasons. Moreover, the 2nd order interaction between the studied factors significantly influenced on purity (%) in the 2nd season only, however it could be noted in both season that the commercial variety *i.e.* with any of the two seed sett rate and 32 kg K_2O /fed attained the highest values of purity (%).

Cane yield and its attributes:

Number of millable cane/fed

Results given in table 4 pointed out that number of millable cane/fed significantly influenced by the examined sugar cane varieties in both seasons, sugar cane variety G.2003-49 over passed the other varieties in the value of number of millable cane/fed. The differences between varieties in this trait mainly due to the capability of the variety itself in teller production which in turn reflected on the final number of millable cane/fed.

Concerning the influence of seed sett rate on the values of millable cane/fed, the collected results proved that dual drilling of sugar cane seed cutting significantly raised the values of this trait in both seasons dual drilling attained a superiority in the number of millable cane compared by 4.84 and 3.5 thousand plant/fed in the 1st and 2nd season, respectively. This finding is evidentially as a result to the heavier drilling of seed sett at planting. The influence of seed sett rate on number of millable cane had been reported by Rao (1990).

As for, the effect of potassium fertilizer levels on the miallable cane/fed, the available data revealed that increasing the applied dose of potassium fertilizer was accompanied by significant increase in the number of millable cane /fed. This increment amounted by 1.53 and 3.04 thousand/fed in the 1st season and 1.46 and 2.41 thousand /fed in the 2nd season compared to check treatment with 32 and 64 kg K_2O/fed, respectively. This effect may be due 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. Effect of potassium fertilization on number of millable cane had been reported by Abo El-Wafa *et al.* (2006) and Mahmoud *et al.* (2008).

The 1st order interaction between the examined varieties and seed sett rate produced higher millable cane value. Planting sugar cane by dual seed cutting increased the values of millable cane, this finding was completely true under the various varieties. This increase was significant in the 2nd season only.

The other combination had no significant influence on the value of millable cane/ fed.

Cane yield (ton/fed):

Figures in table 4 demonstrated that cane yield affected by the examined sugar cane varieties in both season, however, it was significant in the 1st season only, the two promising sugar cane varieties G.2003-47 and G.2003-49 significantly sure passed on the commercial one. This finding due to the superiority both varieties on the commercial variety in the millable cane value (Table 3). The influence of varieties had been reported by Ahmed *et al.* (2011) and Abd El-Aal *et al.* (2015).

Results obtained in table 4 clearly show that seed sett rate had a distinct and significant effect on the yield of sugar cane, drilling sugar cane in dual seed sett produced higher cane yield in both season and attained addition increment over drilling seed sett by 1.5 rows amounted by 4.34 and 3.08 thousand ton/fed in the 1st and 2nd season, respectively. The increase in cane yield by using dual seed sett is due to the positive effect of this drilling method on the number of millable cane which in turn reflected on cane yield. Effect of plant density of sugar cane seed cutting was reported by Sharma (1982) and Rao (1990).

Figures illustrated in table 4 pointed out that fertilizing sugar cane plants by 32 and 64 kg K_2O/fed increased cane yield by 3.66 and 5.62 in the 1st season and 3.35 and 5.89 in the 2nd season compared with check treatment. The pronounced effect of potassium on cane yield came throughout its effective role on stalk length, stalk thickness and stalk weight/plant (Table 2) and number of millable cane (Table 4). This result coincided with that reported by Mahmoud *et al.* (2008) and Ahmed *et al.* (2013).

Most of the interactions between the studied factors were insignificantly on cane yield/fed, except, that between seed sett rate and potassium level, where increasing the applied dose of potassium raised the cane yield/fed. This result was true under the two seed sett rate in both season and significant in the 1st season only. Once more, it could be noted from the results of the 2nd order interaction that drilling sugar cane seed sett by dual method with 64 kg K_2O/fed recorded the highest cane yield (57.28 and 57.84 ton/fed.) in both season respectively. However, it could be noted that such effect as statistically in the 2nd season only.

Sugar recovery %

Table 5 shows the influence of seed sett rate and potassium fertilizer levels on sugar recovery % of some sugar cane varieties.

Figures obtained in table 5 showed significant difference between the examined varieties with respect to sugar recovery %. The two promising varieties sure passed significantly the commercial variety (G.T.54-9); however, the different between the two promising varieties was insignificantly in this respect. The difference between the two promising varieties did not reach to the level of significance. The variation between varieties in sugar recovery (%) is mainly due to gen make up effect**.** The difference between sugar cane varieties had been reported by El-Geddawy *et al.* (2012) and Abd El-Aal *et al.* (2015).

As to the influence of seed sett rate on the values of sugar recovery %, the results obtained cleared that the heavier, the seed sett rate, the higher, the value of sugar recovery in both growing seasons. However, the difference between the two seed sett rate was significantly in the 1st season only.

Concerning potassium effect on sugar recovery %, it could be distinctly note that the pronounced influence on this measurement was positively responded to the additional increase in potassium levels in both seasons. The distinguish increase in sugar recovery amounted by 8.88 % & 13.79 in the 1st season and 10.08 % & 15 % in the 2nd season when the plant fertilized by 32 and 64 kg K_2O/fed. The influence of potassium fertilization on sugar recovery is a reflection to the positive influence of potassium fertilizer on sucrose % (Table 3). This result coincided with that reported by Bekheet (2006).

The interaction between the tested sugar cane variety and seed sett rate appeared significant effect on sugar recovery (%) in the 1st season, increasing seed sett rate was attendant to the increase in the value of sugar recovery (%). This finding was true with the various sugar cane varieties.

Similar results was found with the interaction between the studied sugar cane and potassium fertilizer levels, the increase in sugar recovery (%) was companionship to the applied dose of potassium.

Results cleared that the 1st order interaction between seed sett rate and potassium fertilizer level insignificantly influenced on sugar recovery % in both seasons. The 2nd order interaction between the studied factors proved that increasing seed sett with the various sugar cane varieties let to a distinct increase in the values of sugar recovery (%) with the increase in the applied dose of potassium levels. This result was true in both seasons and significant in the 2nd season only. The highest sugar recovery was obtained with the promising variety G.2003-49 when seed cutting drilling drilled in two rows.

Table.1 Physical and chemical properties of the upper 40 cm of the experimental soil sites

Season		**2013/2014**	**2014/2015**
Physical analysis	**Sand%**	56.34	51.57
	Silt	28.44	26.30
	Clay	15.22	22.13
Soil texture		Sandy loam	Sandy loam
Chemical analysis	**N Available(ppm)**	0.20	0.17
	$CaCO_3$%	1.20	1.34
	$CO_{3\ Meq/100g}$	0	0
	$HCO_{3\ Meq/100g}$	0.30	0. 26
	$CL^{-}_{Meq/100g}$	0.89	0.79
	$SO_4^{=}{}_{Meq/100g}$	1.02	1.02
	$Ca^{++}_{Meq/100g}$	0.53	0.50
	$Mg^{++}_{Meq/100g}$	0.27	0.23
	$Na^{+}_{Meq/100g}$	1.25	1.19
	$K^{+}_{Meq/100g}$	0.16	0.15
	EC(ds/m) (1:5)	0.24	0.23
	pH	7.5	7.6

Table.2 Stalk height, stalk thickness and stalk weight/plant of sugar cane varieties as affected by seed sett rates and potassium levels (2013/2014 and 2014/2015)

Treatments		Stalk height (cm)							
		1st Season (2013/2014)				2nd Season (2014/2015)			
Varieties (A)	Seed sett rate (B)	Potassium levels (kg K_2O/fed) (C)							
		0	32	64	Mean	0	32	64	Mean
G.T- 54-9	1.5	280.00	296.67	300.00	292.22	283.33	291.67	302.33	292.44
	2.0	293.33	306.67	311.67	303.89	299.33	310.00	313.33	307.56
Mean		286.67	301.67	305.83	298.06	291.33	300.83	307.83	300.00
G. 2003-47	1.5	274.67	282.33	290.00	282.33	276.67	288.33	302.33	289.11
	2.0	282.33	296.67	302.33	293.78	299.00	305.00	310.00	304.67
Mean		278.50	289.50	296.17	288.06	287.83	296.67	306.17	296.89
G. 2003-49	1.5	274.33	283.33	295.00	284.22	276.67	288.33	303.33	289.44
	2.0	300.00	306.67	312.67	306.44	301.00	308.33	311.67	307.00
Mean		287.17	295.00	303.83	295.33	288.83	298.33	307.50	298.22
B x C	1.5	276.33	287.44	295.00	286.26	278.89	289.44	302.67	290.33
	2.0	291.89	303.33	308.89	301.37	299.78	307.78	311.67	306.41
Mean		284.11	295.39	301.94		289.33	298.61	307.17	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		2.049		A x C	2.584	A	1.054	A x C	NS
Plant density (B)		1.673		B x C	NS	B	2.296	B x C	3.134
Potassium level C)		1.492		AxBxC	3.655	C	2.216	AxBxC	NS
A x B		2.898				A x B	NS		
Stalk thickness (cm)									
G.T- 54-9	1.5	2.52	2.60	2.76	2.63	2.59	2.66	2.69	2.64
	2.0	2.51	2.54	2.59	2.55	2.56	2.63	2.67	2.62
Mean		2.51	2.57	2.68	2.59	2.58	2.64	2.68	2.63
G. 2003-47	1.5	2.47	2.50	2.54	2.50	2.44	2.50	2.59	2.51
	2.0	2.52	2.55	2.51	2.53	2.52	2.61	2.65	2.60
Mean		2.49	2.53	2.53	2.51	2.48	2.56	2.62	2.55
G. 2003-49	1.5	2.42	2.49	2.57	2.49	2.46	2.53	2.63	2.54
	2.0	2.45	2.50	2.56	2.50	2.49	2.52	2.59	2.53
Mean		2.43	2.49	2.57	2.50	2.48	2.53	2.61	2.54
B x C	1.5	2.47	2.53	2.62	2.54	2.50	2.57	2.63	2.57
	2.0	2.49	2.53	2.56	2.53	2.53	2.59	2.64	2.58
Mean		2.48	2.53	2.59		2.51	2.58	2.64	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.029		A x C	0.029	A	0.036	A x C	NS
Plant density (B)		NS		B x C	0.024	B	NS	B x C	NS
Potassium level C)		0.017		AxBxC	NS	C	0.022	AxBxC	NS
A x B		0.025				A x B	0.013		
Stalk weight (kg/plant)									
G.T- 54-9	1.5	0.997	1.129	1.167	1.098	0.988	1.075	1.113	1.059
	2.0	1.008	1.075	1.133	1.072	0.993	1.092	1.048	1.044
Mean		1.003	1.102	1.150	1.085	0.991	1.084	1.081	1.052
G. 2003-47	1.5	0.954	1.063	1.127	1.048	1.007	1.100	1.063	1.057
	2.0	0.933	1.077	1.112	1.041	0.920	1.089	1.085	1.031
Mean		0.944	1.070	1.120	1.044	0.964	1.095	1.074	1.044
G. 2003-49	1.5	0.940	1.037	1.117	1.031	0.968	1.037	1.117	1.041
	2.0	0.970	1.050	1.123	1.048	1.012	1.095	1.138	1.082
Mean		0.955	1.044	1.120	1.040	0.990	1.066	1.128	1.061
B x C	1.5	0.964	1.076	1.137	1.059	0.988	1.071	1.098	1.052
	2.0	0.970	1.067	1.123	1.053	0.975	1.092	1.090	1.052
Mean		0.967	1.072	1.130		0.981	1.081	1.094	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.018		A x C	NS	A	0.010	A x C	0.037
Plant density (B)		NS		B x C	NS	B	NS	B x C	NS
Potassium level C)		0.030		AxBxC	NS	C	0.021	AxBxC	0.052
A x B		NS				A x B	0.036		

Table.3 Brix, sucrose and purity percentages of sugar cane varieties as affected by seed sett rates and potassium levels (2013/2014 and 2014/2015)

Treatments		Brix %							
		1st Season (2013/2014)				2nd Season (2014/2015)			
Varieties (A)	Plant density (B)	Potassium levels (kg K_2O/fed) (C)							
		0	32	64	Mean	0	32	64	Mean
G.T- 54-9	1.5	18.47	19.68	20.72	19.62	18.55	19.82	20.83	19.73
	2.0	18.68	19.78	20.80	19.76	18.78	20.20	21.00	19.99
Mean		18.58	19.73	20.76	19.69	18.67	20.01	20.92	19.86
G. 2003-47	1.5	19.37	20.90	22.30	20.86	19.60	21.13	22.52	21.08
	2.0	19.70	21.07	22.43	21.07	19.73	21.30	22.70	21.24
Mean		19.53	20.98	22.37	20.96	19.67	21.22	22.61	21.16
G. 2003-49	1.5	19.40	20.85	22.10	20.78	19.53	21.20	22.27	21.00
	2.0	19.60	21.40	22.47	21.16	19.70	21.47	22.60	21.26
Mean		19.50	21.13	22.28	20.97	19.62	21.33	22.43	21.13
B x C	1.5	19.08	20.48	21.71	20.42	19.23	20.72	21.87	20.61
	2.0	19.33	20.75	21.90	20.66	19.41	20.99	22.10	20.83
Mean		19.20	20.61	21.80		19.32	20.85	21.99	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.081		A x C	0.196	A	0.186	A x C	0.144
Plant density (B)		0.045		B x C	NS	B	0.093	B x C	NS
Potassium level C)		0.113		AxBxC	NS	C	0.083	AxBxC	NS
A x B		0.078				A x B	NS		
		Sucrose %							
G.T- 54-9	1.5	16.04	17.37	17.76	17.06	16.29	17.56	17.98	17.28
	2.0	16.29	17.43	17.92	17.21	16.39	17.87	18.36	17.54
Mean		16.16	17.40	17.84	17.13	16.34	17.72	18.17	17.41
G. 2003-47	1.5	16.81	18.05	19.29	18.05	16.86	18.56	19.67	18.36
	2.0	17.08	18.41	19.51	18.33	17.17	18.68	19.84	18.56
Mean		16.95	18.23	19.40	18.19	17.01	18.62	19.76	18.46
G. 2003-49	1.5	16.74	17.98	19.17	17.96	16.85	18.49	19.72	18.35
	2.0	16.99	18.81	19.81	18.54	17.08	18.56	19.56	18.40
Mean		16.87	18.40	19.49	18.25	16.97	18.53	19.64	18.38
B x C	1.5	16.53	17.80	18.74	17.69	16.66	18.20	19.12	18.00
	2.0	16.79	18.21	19.08	18.03	16.88	18.37	19.25	18.17
Mean		16.66	18.01	18.91		16.77	18.29	19.19	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.092		A x C	0.265	A	0.322	A x C	0.142
Plant density (B)		0.073		B x C	NS	B	0.134	B x C	NS
Potassium level C)		0.153		AxBxC	NS	C	0.082	AxBxC	0.201
A x B		0.126				A x B	NS		
	Purity %								
G.T- 54-9	1.5	86.84	88.26	85.71	86.94	87.83	88.63	86.30	87.59
	2.0	87.18	88.09	86.16	87.14	87.24	88.48	87.46	87.73
Mean		87.01	88.18	85.94	87.04	87.54	88.56	86.88	87.66
G. 2003-47	1.5	86.79	86.38	86.51	86.56	86.00	87.80	87.36	87.06
	2.0	86.69	87.38	86.96	87.01	87.00	87.72	87.43	87.38
Mean		86.74	86.88	86.74	86.79	86.50	87.76	87.39	87.22
G. 2003-49	1.5	86.31	86.24	86.72	86.42	86.23	87.21	88.56	87.33
	2.0	86.69	87.91	88.18	87.59	86.71	86.47	86.53	86.57
Mean		86.50	87.07	87.45	87.01	86.47	86.84	87.54	86.95
B x C	1.5	86.65	86.96	86.32	86.64	86.69	87.88	87.41	87.33
	2.0	86.85	87.79	87.10	87.25	86.98	87.56	87.14	87.23
Mean		86.75	87.38	86.71		86.84	87.72	87.27	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		NS		A x C	NS	A	NS	A x C	0.549
Plant density (B)		0.261		B x C	NS	B	NS	B x C	NS
Potassium level C)		0.328		AxBxC	NS	C	0.317	AxBxC	0.777
A x B		0.452				A x B	NS		

Table.4 Number of millable, cane yield of sugar cane varieties as affected by seed sett rates and potassium levels (2013/2014 and 2014/2015)

Treatments		Number of millable cane (thousand /fed)							
		1st Season (2013/2014)				2nd Season (2014/2015)			
Varieties (A)	Plant density (B)	Potassium levels (kg K_2O/fed) (C)							
		0	32	64	Mean	0	32	64	Mean
G.T- 54-9	1.5	43.42	44.81	46.53	44.92	45.34	46.27	47.76	46.46
	2.0	47.75	49.24	50.84	49.28	49.03	50.39	51.44	50.29
Mean		45.58	47.03	48.69	47.10	47.19	48.33	49.60	48.37
G. 2003-47	1.5	43.81	45.70	47.09	45.53	45.02	46.82	47.95	46.60
	2.0	48.72	49.93	51.49	50.05	50.21	50.80	51.68	50.90
Mean		46.26	47.81	49.29	47.79	47.62	48.81	49.82	48.75
G. 2003-49	1.5	43.40	45.46	46.71	45.19	48.18	50.48	50.68	49.78
	2.0	49.56	50.73	52.22	50.83	50.60	52.43	53.37	52.14
Mean		46.48	48.09	49.46	48.01	49.39	51.46	52.03	50.96
B x C	1.5	43.54	45.32	46.78	45.21	46.18	47.86	48.80	47.61
	2.0	48.67	49.97	51.52	50.05	49.95	51.21	52.16	51.11
Mean		46.11	47.64	49.15		48.07	49.53	50.48	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.702		A x C	NS	A	0.558	A x C	NS
Plant density (B)		0.669		B x C	NS	B	0.388	B x C	NS
Potassium level C)		0.511		AxBxC	NS	C	0.363	AxBxC	NS
A x B		NS				A x B	0.672		
						Cane yield (ton/fed)			
G.T- 54-9	1.5	45.77	48.68	51.41	48.62	48.17	51.32	56.07	51.85
	2.0	50.17	55.41	55.31	53.63	52.20	56.97	57.48	55.55
Mean		47.97	52.04	53.36	51.12	50.19	54.15	56.78	53.70
G. 2003-47	1.5	48.24	50.55	53.81	50.87	48.54	51.87	55.68	52.03
	2.0	51.84	55.56	56.07	54.49	52.71	55.40	57.20	55.10
Mean		50.04	53.05	54.94	52.68	50.62	53.63	56.44	53.57
G. 2003-49	1.5	46.27	51.14	54.03	50.48	49.67	53.05	54.21	52.31
	2.0	51.91	55.41	57.28	54.86	51.81	54.64	57.84	54.76
Mean		49.09	53.27	55.65	52.67	50.74	53.84	56.02	53.54
B x C	1.5	46.76	50.12	53.08	49.99	48.79	52.08	55.32	52.06
	2.0	51.31	55.46	56.22	54.33	52.24	55.67	57.51	55.14
Mean		49.03	52.79	54.65		50.52	53.87	56.41	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		1.138		A x C	NS	A	NS	A x C	NS
Plant density (B)		0.553		B x C	0.953	B	0.595	B x C	NS
Potassium level C)		0.674		AxBxC	NS	C	0.738	AxBxC	1.807
A x B		NS				A x B	NS		

Table.5 Sugar recovery, sugar yield of sugar cane varieties as affected by seed sett rates and potassium levels (2013/2014 and 2014/2015)

Treatments		Sugar recovery %							
		1st Season (2013/2014)				2nd Season (2014/2015)			
Varieties (A)	Plant density (B)	Potassium levels (kg K_2O/fed) (C)							
		0	32	64	Mean	0	32	64	Mean
G.T- 54-9	1.5	11.28	12.42	12.33	12.01	11.59	12.61	12.57	12.26
	2.0	11.50	12.44	12.51	12.15	11.58	12.81	13.01	12.47
Mean		11.39	12.43	12.42	12.08	11.59	12.71	12.79	12.36
G. 2003-47	1.5	11.82	12.63	13.52	12.66	11.74	13.20	13.92	12.95
	2.0	11.99	13.03	13.74	12.92	12.10	13.27	14.05	13.14
Mean		11.91	12.83	13.63	12.79	11.92	13.24	13.99	13.05
G. 2003-49	1.5	11.71	12.56	13.46	12.58	11.76	13.06	14.15	12.99
	2.0	11.93	13.40	14.15	13.16	12.00	13.00	13.71	12.90
Mean		11.82	12.98	13.81	12.87	11.88	13.03	13.93	12.95
B x C	1.5	11.60	12.54	13.10	12.42	11.70	12.96	13.54	12.73
	2.0	11.81	12.95	13.47	12.74	11.89	13.03	13.59	12.84
Mean		11.71	12.75	13.29		11.80	12.99	13.57	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.100		A x C	0.260	A	0.344	A x C	0.152
Plant density (B)		0.083		B x C	NS	B	NS	B x C	NS
Potassium level C)		0.150		AxBxC	NS	C	0.088	AxBxC	0.214
A x B		0.144				A x B	NS		
Sugar yield (ton/fed)									
G.T- 54-9	1.5	5.16	6.05	6.34	5.85	5.59	6.47	7.05	6.37
	2.0	5.77	6.89	6.92	6.53	6.05	7.30	7.48	6.94
Mean		5.47	6.47	6.63	6.19	5.82	6.88	7.26	6.65
G. 2003-47	1.5	5.70	6.39	7.28	6.45	5.70	6.85	7.75	6.77
	2.0	6.22	7.24	7.71	7.05	6.38	7.35	8.04	7.26
Mean		5.96	6.81	7.49	6.75	6.04	7.10	7.90	7.01
G. 2003-49	1.5	5.42	6.42	7.21	6.35	5.85	6.93	7.67	6.82
	2.0	6.19	7.42	8.11	7.24	6.22	7.10	7.93	7.08
Mean		5.80	6.92	7.66	6.80	6.03	7.02	7.80	6.95
B x C	1.5	5.43	6.29	6.94	6.22	5.71	6.75	7.49	6.65
	2.0	6.06	7.19	7.58	6.94	6.21	7.25	7.82	7.09
Mean		5.74	6.74	7.26		5.96	7.00	7.65	
LSD at 0.05 level (1st and 2nd seasons) for:									
Varieties (A)		0.121		A x C	0.208	A	0.224	A x C	0.190
Plant density (B)		0.095		B x C	0.170	B	0.146	B x C	NS
Potassium level C)		0.120		AxBxC	NS	C	0.109	AxBxC	NS
A x B		NS				A x B	NS		

Table.6 Production and revenue of potassium application (average of 2013/2014 and 2014/2015)

Potassium levels K_2O			Total revenue LE*		
0	32	64	0	32	64
Cane yield (ton/fed)					
49.78	53.33	55.53	19912	21332	22212
Sugar yield (ton/fed)					
5.85	6.87	7.46	16486.47	19361.03	21023.77

- *: Total revenue: included net income in addition total cost of production.
- Based upon the average of total cost of one fed = L.E 12000, Raw material of sugar cane price = L.E.400/ton (cited after SCRC, 2015) and refining sugar = L.E.2818.2/ton (according the national price, 2015)..
- Potassium's price= L.E. 270/50 Kg. potassium sulphate (48 % K_2O).

Sugar yield (ton/fed)

The available results in table 5 showed that there was a significant difference between the studied sugar cane varieties in respect to sugar yield. These differences mainly due to the variation between them in cane yield and sugar recovery as well as number of millable cane/fed which shared together to make this difference in addition to most of such characteristics greatly affected by gen make up. The two promising sugar cane varieties G.2003-47 and G.2003049 sure passed the commercial varieties in sugar yield/fed, however the difference between the promising varieties itself was insignificantly. The difference between sugar cane varieties had been reported by Abd El-Aal *et al.* (2015).

Concerning the effect of seed sett rate on sugar yield, the collected data appeared a distinct and significant superiority in sugar yield due to drilling seed cutting in two rows; it is seemed that the superior reasons are similar as that of varietal differences. The influence of plant density of sugar cane seed sett had been reported by Sharma (1982) and Rao (1990). As for potassium fertilization effect on sugar yield, results obtained in table 4 pointed out that fertilizing sugar cane crop by 32 and 64 kg K_2O/fed increased sugar yield by 21.09 % & 26.48 % in the 1st season and 17.44 % & 28.35 % in the 2nd season compared with check treatment. This increment is considerable and indicates to the relative important to potassium application especially for stored crops such as sugar cane. These results are in agreement with those given by Bekheet (2006) and Mahmoud *et al.* (2008).

The 1st order interaction between sugar cane varieties and potassium fertilizer rate significantly influenced the sugar yield. With the different varieties, increasing potassium fertilizer level was accompanied to significant increase in the values of sugar yield. This observation was completely true in both seasons.

Once more the 1st order interaction between seed sett rate and potassium fertilizer levels proved that potassium element plays an important role in sugar accumulation. The results obtained cleared that under the studied seed sett rates, raising the additional dose of potassium fertilizer significantly increased sugar yield in both seasons. The 2nd order interaction between the three studied factors insignificantly influenced on sugar yield.

Economical view for potassium application:

Results given in table 6 showed that there is a distinct benefit due to potassium application whether in the level of growers and/or in the level of sugar production in both seasons. Adding 32 kg K_2O/fed its price L.E. 360 attained an additional increase in cane yield amounted by 3.55 ton/fed its value L.E. 1420 and additional increase in sugar production 1.02 ton/fed its value L.E. 2874.6, whereas, raising the addition level of potassium up 64 kg K_2O/fed its price L.E. 720 attained an additional increase in cane yield/fed amounted by 5.75 ton/fed its value L.E. 2300 and addition increase in sugar production 1.61 ton/fed its value L.E. 4537.3.

Conclusion

It is well known that cane and sugar yield as well as sugar recovery are the important elements for growers and sugar factories. The results obtained pointed out that in addition to the relative important of gen make up effect representing in the cultivated varieties, potassium element was the highest common factor attained a significant effectiveness on cane and sugar yield and their attributes. The functions of potassium (K) in sugarcane are many and have been extensively reviewed by Filho (1985). Among those functions which may be singled out is the main role of K as an enzyme activator in plant metabolisms such as in photosynthesis, protein synthesis, starch formation and translocation of proteins and sugars. Without an adequate K in the plant, some of the sugar may remain in the leaves instead of being transported, stored and harvested in the stalks. Furthermore, if the K supply is inadequate, hydrolytic activity of invertase may be intensified resulting in cane with high reducing sugars but low sucrose level (Filho, 1985). In the same time, potassium plays vital role in plant growth and development (De Boer, 1999).

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