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COMPARATIVE PRODUCTIVITY PERFORMANCE OF SUGARCANE (*Saccharum officinarum* L.) SOWN IN DIFFERENT PLANTING PATTERNS AT FARMER'S FIELD

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The study was designed to ascertain a suitable planting pattern for sugarcane genotype HSF-240 at chak No. 274 J.B. district Faisalabad. Different planting patterns included in the experiment were 50 cm apart 100 x 100 cm pits, 120 cm apart trench planting, 90 cm apart double row strips planting and 60 cm apart single row planting systems. Among the four planting patterns, sugarcane planted at 50 cm apart 100 x 100 cm pits gave the highest cane yield of 149.13 t ha^{-1} against 120.54 t ha^{-1}, 74.67 t ha^{-1} and 68.42 t ha^{-1} for 120 cm apart trench planting, 90 cm apart double row strips planting and 60 cm apart single row planting systems, respectively. The sucrose contents (%) were not affected significantly by different planting patterns. It was concluded that pit planting is superior in all respect.

Key words: Sugarcane, planting patterns, yield, quality and Pakistan.

INTRODUCTION

Sugarcane (*Saccharum officinarum* L.) is an important and highly valuable crop of Pakistan. It plays an important role in the economic uplift of the growers and the country. It provides basic raw material for sugar industry. In Pakistan, sugarcane is cultivated on an area of about 1074 thousand hectares with total production of 53419 thousand tonnes, thus giving an average stripped cane yield of 49.738 t ha^{-1} (Anonymous, 2004).

It has been observed that the major hurdle in the way of increasing yield at farmer's fields is low plant population and conventional method of planting. Conventional method of planting sugarcane in 60 cm spaced single row restricts sugarcane yield to a considerable extent (Shafi *et al.* 1990). Hence there is need to develop a new planting technique through which the plant population per unit area, efficient utilization of nutrients and irrigation water may be ensured. In this view, some new patterns of planting sugarcane have been developed which not only facilitate inter-tillage practices but also help in maintaining optimum plant population (Ghaffar *et al.* 2000).

Pit planting is one of the important methods of planting sugarcane, which has tremendous scope of exploiting the highest biological yield potential. Some preliminary studies have indicated that crop planted in pits or double row strips gives better yield than that raised by conventional planting of sugarcane in closely spaced rows on flat. Trench planting is considered more convenient and efficient planting system as it not only saves irrigation water but also reduces lodging due to easy inter-culture and earthing up operations (Sarwar *et al.* 1996). Pit and trench plantation of sugarcane not only facilitate inter tillage practices and effective light penetration into the crop canopy but are also helpful in maintaining desired planting density. However these new planting methods are yet to be tested against the conventional methods in all respect. The present study was therefore planned to determine the comparative productive efficiency of different planting patterns of planting sugarcane at farmer's field in district Faisalabad.

MATERIALS AND METHODS

The experiment to investigate the effect of different sowing methods on yield and quality of sugarcane was conducted at farmer's field Chak No. 274 J.B. Faisalabad. The experiment was laid out in randomized complete block design (RCBD) with four replications and having a net plot size of 10 m x 10 m. Sugarcane variety HSF-240 was included as a medium of trial. The four planting patterns in the experiment were 60 cm apart single row planting (Control), 90 cm apart double row strips planting system (30/90 cm apart), 120 cm apart trench planting and 50 cm apart 100 x 100 cm pit planting. The pits were dug 60 cm deep in the soil and refilled up to 45 cm with the same soil along with 5 kg well rotten FYM well mixed with the soil. Each pit was planted with 30 double budded setts while in case of single row planting, double row strips planting and trench planting seeding density of 75,000 double budded setts ha^{-1} from end to end were planted.

Fertilizer was used at the rate of 150-100-100 kg NPK per hectare in the form of urea, diammonium phosphate and sulphate of potash, respectively. The

whole phosphorus, potash and half of the nitrogen were applied at sowing time, while the remaining nitrogen was top-dressed at the completion of 50% tillering of the crop. The data were recorded on number of millable canes m^{-2} at harvest, Cane diameter (cm), Cane length (m), Weight per cane (kg), Stripped cane yield (t ha^{-1}), Harvest index (%), Sucrose contents in cane juice (%) and Commercial cane sugar (%)by using standard procedures.

Data collected were analyzed statistically by using Fisher's analysis of variance technique and treatment means were compared by using least significance difference (LSD) test at 5% probability level (Steel *et al.* 1997).

RESULTS AND DISCUSSION

Number of Millable Canes (m^{-2})

Data given in Table 1 revealed that the number of millable canes m^{-2} differed significantly among the different planting patterns under study. The highest number of millable canes m^{-2} (14.13) were recorded in case of 50 cm apart 100 x 100 cm pits and it was statistically on a par with 120 cm apart trench planting which modules an average number of 10.53 canes m^{-2}. Significantly the lowest number of 5.28 millable canes were recorded for 60 cm spaced single row planting system and has non-significant differences with 90 cm apart double row strips planting system. Different number of millable canes per unit area at different planting patterns has also been reported by Nazir *et al.* (1988) and Bashir (1997).

Cane Length (m)

Cane length is a major yield component, which determines the utilization of resources for cane development. The data given in Table 1 indicates that there were highly significant differences among various treatments. Maximum cane length (2.24 m) was recorded in case of 50 cm spaced 100 x 100 cm pits and has non-significant difference with 120 cm spaced trench planting (2.23 m). Cane grown in pattern of 90 cm apart double row strips planting system was significantly taller (1.97 m) than those in case of 60 cm apart single row planting which produced the shortest cane (1.79 m). These results were in accordance with Nazir *et al.* (1988) who reported variable cane length in different planting patterns.

Weight Per Cane (kg)

The data on weight per cane presented in Table 1 revealed that there were highly significant differences among various planting patterns under study. Sugarcane planted in 50 cm spaced 100 x 100 cm pits gave significantly the highest cane weight (1.46 kg) and minimum weight per cane (0.98 kg) was recorded in case of 60 cm spaced single row planting system. The variation in weight per cane is attributed to variation in cane length attained during the crop growth period in different planting patterns. The results are in conformity with those of Nazir *et al.* (1990), Chattha *et al.* (1991) and Afghan *et al.* (1996).

Table 1. Yield and quality components of sugarcane as affected by different planting patterns

Planting patterns	No.of millable canes (m^{-2})	Cane length (m)	Weight per cane (kg)	Stripped cane weight (t ha^{-1})	Sucrose contents (%)	Commercial cane sugar (%)	Harvest index (%)
60cm apart single row planting	5.28c	1.79c	0.98 d	68.42d	18.46	13.71	74.68
90cm apart double row strips planting	7.58bc	1.97b	1.12c	74.64c	18.84	13.98	75.68
120cm apart trench planting	10.53ab	2.23a	1.36b	120.54b	18.44	13.80	74.73
50cm apart 100x100 pits	14.13a	2.24a	1.46a	149.13a	18.57	14.14	76.09

Any two mean not sharing a letter differ significantly at 0.01 and 0.05 probability level.

Stripped Cane Weight (t ha^{-1})

It is evident from the Table 1 that there were highly significant differences among different planting patterns under study. Sugarcane planted in 50 cm spaced 100 x 100 cm pits on account of greater number of millable canes m^{-2} and cane length gave significantly the highest cane yield of 149.13 t ha^{-1} followed by 120.54 t ha^{-1} in case of 120 cm spaced trench planting. The lowest stripped cane yield of 68.42 t ha^{-1} was obtained is case of 60 cm spaced single row planting pattern which was attributed to comparatively

lower number of millable canes m^{-2}. The reason of highly significant differences in stripped cane weight per hectare among various planting patterns is efficient utilization of all given inputs and environmental factors to explore the genetic potential of cane during the developmental period.

Sucrose Contents (%)

Cane maturity and its quality are mainly determined by sucrose contents in cane juice. Data regarding sucrose contents in cane juice as affected by different planting patterns presented in Table 1 indicated non-significant differences among all planting patterns. However, the sucrose contents in cane juice on an average ranged from 18.44 to 18.84 percent showing maximum percentage of sucrose contents in case of 90 cm spaced double row strips planting system while minimum was in case of 120 cm trench planting. Statistically non-significant behaviour was probably attributed to almost similar growth and development of cane in all treatments. Similar results were obtained by Shafi *et al.* (1990) who reported that different planting patterns had non-significant effect on sucrose contents of cane juice.

Commercial Cane Sugar (%) and Harvest index (%)

Data regarding the commercial cane sugar as influenced by different planting patterns are presented in Table 1. It is clear from the table that there were non-significant differences among different planting patterns. The commercial cane sugar on an average ranged from 13.71 to 14.14 percent under the different planting patterns. The non-significant differences among all the planting patterns were probably attributed to almost uniform maturity of cane in all treatments.

Harvest index determines the extent of production efficiency of a crop. The data revealed that there were non-significant differences among the various planting patterns under study. The harvest index ranged from maximum 74.68 percent to 76.09 percent, under different planting patterns. These findings are in agreement with those of Abid (1990) who reported different row spacing had no significant effect on harvest index (%).

CONCLUSION

- The highest number of 14.13 millable-canes m^{-2} were recorded in case of 50 cm spaced 100 x 100 cm pits as compared to the lowest of 5.28 canes m^{-2} in case of 60 cm spaced single row planting.
- Sugarcane planted in 50 cm 100 x 100 cm pits gave significantly the highest cane yield of 149.13 t ha^{-1}, followed by 120.54 t ha^{-1} in case of 120 cm spaced trench planting against the lowest of 68.42 t ha^{-1} in case of 60 cm spaced single row planting.
- Both the sucrose contents in cane juice and commercial cane sugar (C.C.S.) percentage were not affected significantly by the different planting patterns.
- The different planting patterns did not affect the harvest index.

In conclusion, sugarcane plantation in 50 cm spaced 100 x 100 cm pits appeared to be superior in all respect.

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