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IMPACT OF FLAT AND PIT PLANTATION TECHNOLOGY ON PRODUCTIVITY OF SPRING PLANTED SUGARCANE

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Effect of various planting techniques on growth, cane yield and juice quality of spring planted sugarcane *(Sacchant17l officinarum* L.) was investigated at the Agronomic Research Area, University of Agriculture, Faisalabad, Sugarcane planted diagonally in 100 cm spaced 100 x 100 cm pits produced the highest cane yield (153.2 t ha-l) as against the lowest of 68.3 t ha-l for cane planted in 90 cm spaced double-row strips, flat plantation. Maximum number of millable canes 01-1 (15.3) was also recorded for crop planted in 100 cm spaced 100 x 100 spaced in a diagonal fashion. In general, pit plantation proved to be more productive than Oat planting. However, no significant effect of planting technique was observed on cane juice quality.

INTRODUCTION

Currently, only 40% of the total yield potential of existing sugarcane varieties is being harvested and the emaining 60% may be explored by adapting new production technology and high rated crop.managcmcm (Nazir *et al.,* 1990). Among the cultural practices, an appropriate planting geometry and population density unir!, area are of great significance because of their high contribution in the formulation of final yield of sugarcane, . Nandihalli and Singh (1982) found that cane yield of sugarcane variety CO 1148 increased from 78.91 to 109.0 t ha-l by changing row spacing from 45 cm to 90 cm. They also reported similar trend with regard to quality of sugarcane. The row spacings (45 or 60 cm) had no significant effect on cane yield and quality of cv BD 91 (Singh *et al.,* 1987). Sugarcane planted in 90 cm spaced double row strips produced significantly higher cane yield ha-I and greater number of millable canes unlr ! area than that either in 120 cm spaced triple row strips or 60 cm spaced single rows (Nazir *et al.,* 1988). Narrow base plOIS (140 cm apart rows) gave slightly higher yields as compared to wide base plots (185 cm apart rows) (Picxoto *cl al.,*]l)RR).

Normal rows (Rn + Rn cm) or paired rows (40 + RO + 40 cm) had no significant effect on juice quality of sugarcane (Dcvaraj and Shanmugasundarall1, 19~N). Sixty fll1 tow spacing gave the best results with reg~rd to yield and quality as compared to 75 or 90 cm spacing (Mandloi *etat.,* 1989). Sugarcane varietyBF 162 planted in pits significantly performed better than'pla"t~~ in flat plantation regarding num8Qt~f millable canes m^{-2}, cane length, average cane weight, cane yield and harvest index. However, different planting techniques had no significant effect on sucrose content(Nazir, 1990).

It is evident from the above information that selection of a proper planting technique is of great importance as it determines the plant density unit' area which ultimately leads to final cane yield. This study was, therefore, designed to find out the most appropriate planting technique for spring sugarcane leading to higher cane yield of good quality under the irrgated conditions at Faisalabad.'

MATERIALS AND METHODS

Effect of flat and pit planting technique on the growth, yield and juice quality of spring planted sugarcane was investigated at the Agronomic Research Area, University of Agriculture, Faisalabad on a sandy clay loam soil. The experiment was quadruplicated in a randomized complete block design. The planting techniques comprised 90 cm spaced double row strips (control), 100 cm spaced 100 X 100 cm pits, 100 cm spaced 100 x 100 cm pits in a diagonal fashion, 90 cm spaced 90 x 90 cm pits, 90 cm spaced 100 x 100 cm pits, 70 cm spaced 100 x 100 cm pits and 50 cm spaced 100 x 100 cm pits.

Pits in all the treatments were dug to a depth of 60 cm and then again filled up to 45 cm with the same soil putting the upper 30 cm soil at bottom and the subsoil at the upper part of pit along with 5 kg of well-rotten farm yard manure. pir! which was well mixed with soil. Pits were dug manually with a spade. No hoeing and earthing up was done to pit planted sugarcane while fait planted crop was given normal tillage operations including hoeing and earthing up.

Sugarcane variety BF 162 was planted on March 11, 1989. Planting density was 30 two-budded setts plr! while in 90 cm spaced double-row strip planting system, 10 two-budded setts m^{-2} were placed. A basal fertilizer dose of 150-100-100 N, P_2O_5 and K_2O ha^{-1} in the form of urea, DAP and SOP, respectively was used. 16 irrigations of 10 cm each were applied throughout the growth period. Number of millable canes m^{-2}, cane length, cane diameter, weight cane!, harvest index and cane yield ha! were recorded for comparison of treatment. Sucrose content (%) were determined by Horn's dry lead acetate method of sugar analysis (Mathur, 1981). The data obtained were subjected to Fischer's analysis of variance technique and treatments' means were compared by using Least Significant Difference (LSD) test at P = 0.05 (Steel and Torrie, 1(80).

RESULTS AND DISCUSSION

The results pertaining to yield and various yield components of spring planted sugarcane as influenced by flat and pit planting technique are presented *in* Table 1.

Number of millable canes: Number of millablc canes m^{-2} was significantly affected by various planting techniques under study. The highest number of millable canes m^{-2} was recorded in case of 100 cm spaced 100 x 100 cm pits in a diagonal fashion against the lowest of 7.19 canes m^{-2} produced by flat plantation in 90 cm spaced double-row strips which, in turn, was statistically equal to 100 cm spaced 100 X 100 cm pits. Differences in the number of canes m^{-2} among various planting techniques were attributed to variable number of seed setts planted in each treatment. Variable number of canes unir ! area at different spatial arrangements has also been reported by Nazir (1<)<)0).

Cane length: Sugarcane planted in 70 cm spaced 100 X 100 pits produced significantly longer canes (2.87 m) than that planted in 100 cm spaced 100 X 100 cm pits or 90 cm spaced 90 X 90 cm pits or 90 cm spaced double row strips but was statistically at par with rest of the planting treatments. In general, pit plantation produced significantly longer canes as compared to flat plantation which might be attributed to an efficient utilization of soil and water resources towards cane development.

Cane diameter: There were non-significant differences in cane diameter among different planting techniques. However, cane diameter ranged between 2.10 and 2.26 cm. These results are not in line with those of Nazir (1990) who reported that cane diameter was generally reduced by pit-plantation in autumn planted sugarcane.

Tahle 1. Yield and yield parameters of sugarcane as affected hy different planting techniques

Treatment	Number of miUoblc canes m-2	Cane length (m)	Cane diameter (cm)	Weight cane -I (kg)	Cane yield (t ha -j	Sucrose content (%)	HOrvCHI index (%)
90 cm spaced double row strips	7.2 e	2.36 d	2.25NS	O.92e	68.3 d	17,59NS	71,9 d
100 cm spaced lOOx lOOcm pits	7.6 e	2.64 rjr	2.21	1,08 rjr	82.2 cd	17.85	73.8 cd
lOOcm spaced lOOx lOOcm pits in a diagonal fashion	15.3 a	2.85 a	2.10	1,0ld	153.2 a	17.70	76.0 rjr
90 cm spaced 90 x 90 cm pits	9.2 cd	2.53 cd	2.25	1,12 an	103.0 h	18.79	78.1 ab
90 cm spaced 100 x 100 cm pits	8.7 d	2.79 an	2.22	1,17a	101,2 b	17.28	71).3 a
70 cm spaced 100 x lOOcm pits	9.9 c	2.87 a	2.26	1,09 he	107,4 b	18.17	77,2 ab
50 cm spaced 100 x lOOcm pits	13,7 b	2.84 a	2.15	1,04 cd	144.2 a	18,51	78,4 a

Any Iwo means not sharing a letter differ significantly at P = 0.05; NS = Non-significant.

Cane weight: Cane weight has a direct bearing on the final stripped cane yield unit-1 area. Sugarcane planted in 90 cm spaced 100 x 100 cm pits produced the highest cane weight (I.l7 kg) but was statistically equal to 90 cm spaced 90 x 90 pits. The differences among the planting treatments of 50 cm spaced 100 x 100 cm pits, 70 cm spaced 100 x 100 pits and t00 cm spaced 100 x t0o cm pits were found to be non-significant but all these treatments were significantly better than the treatments of 100 cm spaced 100 x 100 cm pits in a diagonal fashion and 90 cm spaced double row strips planting system. The latter two treatments also significantly differed with each other.

Cane yield: Sugarcane planted in 100 cm spaced t00 x 100 cm pits in a diagonal fashion produced the highest stripped cane yield (153.2 t ha-I) but was statistically equal to that planted in 50 cm spaced 100 x 100 cm pits. Higher cane yield in these two treatments was due to more number of rnillahle canes m-2. In contrast, the lowest cane yield of 68.3 t ha-I in case of cane planted in 90 cm spaced double-row strips was attributed to the minimum number of canes m-2. These results suggest that plant population unir area is the key determinant of final cane yield ha:'. Similar results have been reported by Mandloi *et al.* (19X9) and Nazir (1990). Moreover, pit plantation produced significantly higher cane yield than Oat planting in double row strips.

Sucrose content: Sucrose content of cane juice were not affected significantly by various planting techniques. However, sucrose content varied from 17.28 to 18.79%. This was due to similar crop growth period and uniform development of cane in all the planting techniques. Similar results were reported by devaraj and Shanmugasundaram (1989) and Nazir (1990). However, these results are not in conformity with those of Nandihalli and Singh (1982).

Harvest index: Harvest index (HI) determines the ability of a crop plant to partition the available photoassimilates between its economic and non-economic parts. Planting techniques had a significant effect on the HI of sugarcanc variety BF]62. Maximum HI (79.28%) was obtained in case of sugarcane planted in 90 cm spaced 100 x 100 cm pits while the minimum HI of 71.88% was

Table 2. Economic analysis of different planting techniques

Treatment	Income (Rs, ha-I)	Expenditure (Rs. ha-I)	Net income (Rs. ha-I)
,90 cm spaced double row strips	27396	19679	7717
100 cm spaced 100 x 100 cm pits	32954	24799	HISS
100 cm spaced 100 x 100 cm pits in a diagonal fashion	61425	43081	18344
90 cm spaced 90 x 90 cm pits	41323	29405	11916
90 cm spaced 100 x 100 cm pits	40577	27532	13045
70 cm spaced 100 x 100 cm pits	43055	31681	11374
50 cm spaced 100 x 100 cm pits	57816	39554	18262

recorded for sugarcane planted in 90 cm spaced double row strips. In general, pit plantation produced higher HI than flat plantation. These results are in line with those reported by Nazir (1990).

Economic analysis:' The superiority of a planting technique is reflected by the net return ha^{-1} obtained. Pit plantation treatments gave higher net return ha^{-1} than the flat plantation in 90 cm spaced double row strips (Table 2). Sugarcane planted in 50 cm spaced 100 x 100 cm pits or 100 cm spaced 100 x 100 cm pits in a diagonal fashion gave about 58% higher net return than that planted in 90 cm spaced double row strips. However, 100 cm spaced 100 x 100 cm pit plantation exhibited only 5.37% increase over control.

CONCLUSIONS

Pit plantation of sugarcane is much superior to the flat plantation, especially plantation in 50 cm spaced 100 x 100 cm pits and 100 cm spaced 100 x 100 cm pits in a diagonal fashion.

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