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Effect of row spacing and seed rate on the yield of sugarcane variety ISD-16

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ABSTRACT

An experiment was conducted to study the effect of row spacing and seed rate on the potential yield of ISD-16. Highest yield of cane and number of millable cane/ha and lowest sucrose concentration were obtained at row spacing, 60 cm and seed rate 30 setts/row. Highest sucrose concentration was obtained at row spacing 120 cm and seed rate 40 setts/row. Highest sugar yield/ha was obtained from row spacing 60 cm and seed rate 40 setts/row. Cane yield was found directly associated with the stalk population. Lower sucrose concentration was found at higher population. Sugar yield was found to be positively correlated with the sucrose concentration and number of millable cane.

INTRODUCTION

Yield of sugarcane is positively correlated with the final stalk population (Bull, 1975). The latter is mainly governed by interrow spacing (Bull, 1975), variety grown and seed rate used (Kanwar and Sharma, 1974). Stalk population increases per unit area as the interrow spacing decreases (Matherne, 1974; Matherne and Irvine, 1978). Conventional interrow spacing varies in different countries. In South Africa, conventional row spacing is 140 cm and yield may be increased by about 5% for every 30 cm reduction in interrow spacing down to 60 cm (Thompson, 1962). In tropical areas, interrow spacing varies from 120 to 150 cm. In India, in the tropical cane growing belt, interrow spacing of 120 cm is practised. In North India, a row spacing of 90 cm and particularly in Punjab state, a row spacing of 60 cm is used (Kanwar and Sharma, 1974). In Bangladesh, a row spacing from 60 cm to 105 cm is followed. Yield potential of this variety is greater than that of all other commercial vaireties now grown in Bangladesh (Anon., 1981). The present experiment aims at determining the optimum row spacing and seed rate for maximum yield.

MATERIALS AND METHODS

A trial with 9 treatment combinations was conducted during crop year 1979-80 at Sugarcane Research Institute. Three row spacings like 60, 90 and 120 cm and three seed

rates like 20, 30 and 40 setts/row were maintained. Each sett contained 3 buds. The treatment combinations were as follows :

A. Row spacing 60 cm, seed rate 20 setts/row (S_1M_1).
B. Row spacing 60 cm, seed rate 30 setts/row (S_1M_2).
C. Row spacing 60 cm, seed rate 40 setts/row (S_1M_3).
D. Row spacing 90 cm, seed rate 20 setts/row (S_2M_1).
E. Row spacing 90 cm, seed rate 30 setts/row (S_2M_2).
F. Row spacing 90 cm, seed rate 40 setts/row (S_2M_3).
G. Row spacing 120 cm, seed rate 20 setts/row (S_3M_1).
H. Row spacing 120 cm, seed rate 30 setts/row (S_3M_2).
I. Row spacing 120 cm, seed rate 40 setts/row (S_3M_3).

The planting densities of the above treatments were 4.63, 6.94, 9.26, 3.09, 4.63, 6.17, 2.31, 3.47 and 4.63 setts/m^2 respectively. The experiment was laid out in a randomized complete block design with 3 replications. The plot size was 7.2mx7.2m. Recommended doses of fertilizers were applied. Intercultural operations were done as and when necessary. Chemical analysis was carried out at an interval of 30 days starting from November, 1980 to February, 1981. Sugar yield/ha was calculated by using mean sucrose concentration of 4 months' analysis.

RESULTS AND DISCUSSION

Row spacing and seed rate were found to have significant effect on yield of cane, number of millable stalks and yield of sugar/ha. The results of the experiment are shown in table 1. Significantly higher yield was obtained at the closest row spacing (60 cm).

Table 1. Effect of row spacing and seed rate on yield of cane, sugar, number of millable cane/ha and sucrose concentration.

Treatment	Yield of cane/ha (m. ton)	No. of millable cane/ha x 1000	Sucrose concentration	Yield of sugar/ha. (m. ton)
S_1M_1	76.35 abc*	68.08 ab	10.78 ab	8.22 abc
S_1M_2	91.76 c	81.35 c	10.34 a	9.48 c
S_1M_3	88.00 bc	79.54 bc	10.86 ab	9.51 c
S_2M_1	72.40 ab	60.92 a	10.80 ab	7.80 ab
S_2M_2	76.49 abc	68.21 ab	10.97 ab	8.38 abc
S_2M_3	76.52 abc	64.72 a	10.67 ab	8.15 abc
S_3M_1	65.32 a	56.06 a	10.60 ab	6.89 a
S_3M_2	80.37 abc	67.27 ab	10.64 ab	8.54 bc
S_3M_3	74.77 abc	62.28 a	11.09 b	8.29 abc

*Means followed by the same letter are not significatvel different at the 5% level of probability as determined by the Duncan's New Muitiple Range test.

Highest cane yield was found from highest number of millable cane obtained at row spacing 60 cm and seed rate 30 setts/row (Planting density, 6.94 setts/m^2). Second highest yield of cane was also obtained from second highest number of millable cane at row spacing 60 cm and seed rate 40 setts/row (Planting density 9.26 setts/m^2). Widest row spacing (120 cm) produced significantly lower yield. Lowest yield resulted from the lowest number of millabie cane of row spacing 120 cm and seed rate 20 setts/row (Planting density 2.31 setts/m^2). Similar results were reported by several authors (Bains, 1959: Boyce, 1968; Bull, 1975; Matherne, 1971; 1974 ; Matherne and Irvine, 1978; Kanwar and Sharma, 1974; Rice, 1978). Higher yield of cane was obtained at row spacing 60 cm compared to 90 cm as shown by Bains (1959). In South Africa, Boyce (1968) found 4.5 ton/ha increased yield per year for each 30 cm decrease in row width. In Australia, Bull (1975) observed that close row spacing prompted rapid development of stalk population and he obtained 100% increase in yield of plant crop at row spacing 50 cm and planting density 7.4 setts/m^2. He noted that this response to reduction in interrow spacing varied with the cultivar. Higher yield of sugarcane could be obtained by increasing plant population as a result of varying interrow spacings and planting rates (Matherne, 1971). Rows of 90 cm and 110 cm wide resulted in the highest population and yield campared to 180 cm row spacing (Matherne, 1974). In Louisiana, highly significant correlation coefficient between stalk population and yield of cane was observed by Matherne and Irvine (1978). Rice (1978) obtained 5% increased yield of cane at row spacing 90 cm than at 150 cm row spacing. In India, Kanwar and Sharma (1974) obtained higher stalk populatian and yield at 60 cm and 90 cm row spacing and lowest at 180 cm. It was, thus, observed that higher population was essential for higher cane yield which can easily be achieved by reduction of row spacing and increase of seed rate. But this will reduce the prospect of raising intercrops in between two rows due to rapid cane growth at earlier stage.

Lower sucrose concentration was observed at higher population in closer row spacing and thereby restricted the yield of sugar/ha. Lowest sucrose concentration was obtained at row spacing 60 cm and seed rate 30 setts/row but sugar yield/ha was found signifcantly higher (2nd highest), due to highest number of millable cane and yield/ha. Highest sucrose concentration was found at row spacing 120 cm and seed rate 40 setts/row but yield of sugar/ha did not differ significantly due to significantly lower number of millable cane/ha.

Sugar yield was found directly associated with the sucrose concentration and number of millable cane. Higher sucrose concentration and yield of sugar were found at row spacing 150 cm than at 90 cm (Rice, 1978). This worker believed this reduction in sucrose concentration at 90 cm row spacing to be due to higher population per unit area. Results, however, differed from the results of Matherne (1974) and Matherne and Irvine (1978), where they stated that closer row spacing did not result in a reduction of sucrose concentration. At widest row spacing, sucrose concentration was found highest but yield of sugar did not differ significantly from the highest yield of sugar obtained at closer row spacing. It, thus, indicated a great prospect for raising intercrops between the rows. Another advantage appeared noticeable that higher tonnage of sugar extraction may be possible by crushing less tonnage of cane with consequent cost reduction. The present study points out to the immediate needs on further economic appraisal between single "cane cultivation" with narrow spacing and "cane with intercrops" at wider spacing.

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