PRODUCTIVITY AND PROFITABILITY OF SUGARCANE AS AFFECTED BY DIFFERENT PLANTING PATTERNS

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Received: 25-01-2012
Accepted: 19-06-2012

ABSTRACT
A field experiment to investigate the effect of different planting patterns on production and economics of sugarcane (Saccharum spp. hybrid complex) was conducted at CCS Haryana Agricultural University, Regional Research Station, Karnal-132001 during autumn season of 2004-06 and 2005-07. Experiment consisting of five treatments viz. flat planting at row spacing of 75, 90, 105 & 120 cm and pit planting at centre to centre distance of 120 cm between two pits was conducted in randomized block design with four replications. Highest cane yield, sugar yield, variable cost, net returns and B:C ratio was recorded in pit planting followed by planting of sugarcane at row spacing of 75, 90 & 105 cm and lowest in case of planting at 120 cm spacing. Planting of sugarcane at row pacing of 75 and 90 cm being at par produced significantly higher cane and sugar yield, net returns and B:C ratio as compared to planting at 105 and 120 cm row spacing. Commercial cane sugar (%) was not affected significantly by different planting patterns.

Key words: Sugarcane, Cane yield, Economics, Pit planting, Sugar yield.

INTRODUCTION
Sugarcane is cultivated on an average area of 4.2 million hectares in India with an average productivity of 68 t/ha. Conventional method of planting of sugarcane at 60-75 cm spacing restricts the cane yield to a considerable extent hence, there is a need to develop planting technique through which the maximum plant population per unit area with higher cane weight be obtained and efficient utilization of nutrients, irrigation water and other inputs may be ensured. In this regard pit planting method of sugarcane have been developed which helps in maintaining optimum plant population with maximum utilization of nutrient and water (Yadav and Singh, 1986). Pit planting of sugarcane is becoming popular due to availability of tractor operated pit digger which facilitates mechanized digging of pits. Pit planting of sugarcane has been reported to give 1.5 to 2.5 times higher cane yield as compare to conventional flat planting (Mehar Chand, 2010) and (Yadav, 2004). But this technology still needs to be standardized and compared in terms of economic aspect with conventional method of planting. The present study was, therefore, undertaken to determine the productive efficiency of pit planting method in comparison to conventional (flat) planting of sugarcane at different row spacing.

MATERIALS AND METHODS
A field experiment to study the effect of different planting pattern/methods on productivity and economics of sugarcane was conducted at Regional Research Station, Karnal of CCS Haryana Agricultural University during 2004-06 and 2005-07 in autumn planted season. Sugarcane (CoH 119) was planted on October 27, 2004 and October 7, 2005 during first and second year, respectively. The experimental field was clay loam in texture having pH 8.7 & 8.6; EC 0.35 & 0.37 dS/m; organic carbon 0.38 & 0.35 % available P (Olsen) 12& 14 kg/ha, available K 160 and 180 kg/ha during 2004-06 and 2005-07, respectively. The experiment consisting of five methods/pattern of planting i.e. flat planting at row spacings of 75, 90, 105 & 120 cm and pit planting was laid down in RBD design with four replications. Tractor drawn pit digger was used to dig the pits at centre to centre distance of 120 cm, 45 cm deep with 67.5 cm diameter. FYM, Urea and DAP were applied @ 4 kg, 45 g and 45 g/pit.
respectively before planting the setts. Each pit was planted with 21 two budded setts which were placed in cyclic ring fashion followed by spraying of Chlorpyriphos@5.0 litres/ha for the control of early shoot borer and termites followed by light irrigation in individual pit. At 60-70 days after planting second dose of nitrogen i.e. 25 g urea per pit was applied and pits were filled up with loose soil up to half of the cane height. Third dose of nitrogen was applied in the end of June i.e. 25 g urea per pit along with 4.5 g phorate 10G/pit and each pit was filled up with loose soil up to ground level. Sugarcane in conventional planting was raised as per the package of practices of the region. The percentage of sucrose and commercial cane sugar (CCS %) in juice were determined by the methods of Meade and Chen (1977). The sugar yield was calculated by multiplying the CCS per cent with cane yield. The plant crop was harvested during the month of December in both the years. Expenditure on digging of pits was calculated on the basis of available pit digger by calculating the consumption of diesel /hour while taking into account the time taken for digging of 100 pits. The economic parameters were calculated considering the prevailing market rate for different inputs, produce and field operations.

RESULTS AND DISCUSSION

The germination and other crop growth parameters were comparatively higher in crop season 2005-07 mainly due to early planting as compared to 2004-06 (Table 1). Cane height and cane girth of sugarcane were significantly higher in pit planting as compared to planting of sugarcane in flat system but reverse was true in case of shoot counted in July during both the years. There was a significant reduction in tillers and millable canes with increase in spacing beyond 90 cm in case of conventional method of planting whereas, cane height, cane girth and cane weight did not influence with increase in spacing(Table 1). Row spacing of 75 and 90 cm being at par produced significantly higher cane yield over 105 and 120 cm spacing (Table 2) due to satisfactory plant stand. Number of millable canes has been reported to play major role for deciding the productivity in subtropical environment particularly under conventional method of planting (Singh et al., 2008). Pit method of planting produced significantly highest cane yield due to higher cane height and cane weight over rest of the treatments.
TABLE 2: Effect of different planting patterns on CCS (%), sugar yield and economic parameters of autumn planted sugarcane.

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<tr>
<td>CCS (%)</td>
<td>123</td>
<td>121</td>
<td>124</td>
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<td>122</td>
<td>125</td>
<td>26</td>
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<tr>
<td>Sugar Yield (t/ha)</td>
<td>98</td>
<td>110</td>
<td>97</td>
<td>109</td>
<td>92</td>
<td>85</td>
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<td>B: C Ratio</td>
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<td>Variable cost (Rs/ha)</td>
<td>1030.66</td>
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<td>Gross returns (Rs/ha)</td>
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<td>Returns over variable cost (Rs/ha)</td>
<td>12944</td>
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<td>Net returns (Rs/ha)</td>
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The higher value of yield attributing characters i.e. cane height and cane weight in pit planting were mainly due to taking the benefit of mother shoots only, efficient utilization of nutrients, better light penetration and better rhizospheric environment due to localized application of FYM and other nutrients (Bhullar et al., 2008) and (Yadav, 2004). Similarly higher cane yield in pit planting over conventional planting have been reported by (Mehar Chand, 2010), (Singh et al. 2008) and (Yadav, 2004). CCS % was not affected significantly due to different planting methods since quality parameters are mostly genetically controlled and are less affected by change in environment. Since sugar yield is the resultant of CCS% and cane yield threfore significantly highest sugar yield was produced in pit planting followed by flat planting at row spacing of 75, 90, and 105 cm and lowest in case of 120 cm spacing. Similar results have been reported by Mehar Chand (2010) and Singh et al. (2008).

**Economics:** Higher values of total variable cost return over variable cost and B: C ratios in 2005-07 as compared to 2004-06 were due to higher price of sugarcane seed, labour, cane price and higher cane yield (Table 2). The variation in total variable cost even among different spacings of conventional method of planting was due to difference in cane yield, harvesting charges and transportation charges. Variable cost, gross returns, returns over variable cost and B: C ratio increased gradually with the increase in row spacing under conventional planting of sugarcane. Highest total variable cost, return over variable cost and B: C ratios were observed in pit planting followed by 75 cm, 90 cm, 105 cm and 120 cm conventional planting. Higher values of total variable cost in pit planting were due to higher expenditure on seed, fertilizer, harvesting charges and transportation charges as compared to conventional method of planting. Higher net returns in pit planting were due to higher cane yield. Similar findings of higher returns in pit planting as compared to conventional planting have also been reported by Mehar Chand et al. (2010), Singh et al. (2008) and Yadav (2004).

**CONCLUSION**

Two years study indicated that highest cane yield, sugar yield and returns can be obtained with in pit planting method as compared to conventional planting of sugarcane.
REFERENCES


