

Row Adjustment of Sugarcane on the Yield of Intercropped Cane and Potato

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ABSTRACT

Experiments were conducted at the Sugarcane Research & Training Institute (SRTI) farm to study the effect of different row adjustments of sugarcane and intercrop potato. Significantly higher yield of both potato (7.8 t/ha) and cane (85.6 t/ha) were obtained where two rows of potato were grown in between two rows of cane at 100 cm vacant space. Higher adjusted cane yield of 117.1 t/ha and net profit of Tk 16782.60 /ha were also received from same treatment. There was no significant adverse effect of row arrangement on germination of cane and recoverable sucrose content. The results further indicated that the combined profit from cane and potato were always higher in the treatment where potato was grown as intercrop compared to purestand cane. Planting three rows of potato under paired row arrangement of cane at 45 cm interrow spacing in between vacant space 135 cm kept for potato were also found to give comparable yield and was found superior over purestand cane and other combinations of potato intercropping.

INTRODUCTION

Bangladesh is one of the most densely populated countries in the World. The average farm size is only 0.9 ha/house hold (Statistical Year Book of Bangladesh, 1986.) There is little scope of horizontal expansion of land for increasing production. The only way for farmers to increase their farm income is to make intensive use of land through scientific farming. Sugarcane is a long duration crop (about 16 months) grown in a considerable row distance ranging from 75 cm to 122 cm. The temporary vacant space in between two rows makes room for other short duration winter crops at the early stage of cane growth.

Intercropping with sugarcane was introduced to get several advantages. One of the most important consideration was to produce an additional crop with minimum investment without affecting the overall production of the main crop. In recent years, it has been noticed that growing of only one row of intercrop between two rows of cane fails to give satisfactory yield per unit area. Wider space is required for better performance of intercrop and to minimise competition with sugarcane for moisture and nutrient. The most significant yield increases (15-29%) above conventional spacing have been reported from planting two rows 40-50 cm apart with 150 cm between the paired row (Roach, 1977). Moreover, the paired row planting system allowed planting densities to approach the optimum in a manner compatible with modern farm machinery, particularly harvesters and haul out equipment (Matherne, 1974). Paired row system of potato planting produced significantly higher yields as compared to single row planting (Anon., 1981). In view of the above consideration, it was contemplated to devise a technique for accomodating higher number of intercrops rows in the widened interspace without affecting the overall yield of cane.

MATERIALS AND METHODS

An experiment was conducted at SRTI farm, in 1985-86 & 86-87 crop seasons with the following treatments. The experiment was laid out in a RCB design with three replications.

- T₁: Paired row of cane at 60 cm distance keeping 120 cm vacant space in between two paired rows of cane and planting two rows of potato in 120 cm vacant space.
- T₂: Paired row cane at 45 cm distance keeping 135 cm vacant space in between two paired rows of cane and planting three rows of potato in 135 cm vacant space.
- T₃: Single row cane at 90 cm apart and planting one row of potato in 90 cm vacant space.
- T₄: Single row cane at 100 cm apart and planting two rows of potato in 100 cm vacant space.
- T₅: Purestand cane at 90 cm row spacing (control).

The land was prepared mechanically and trenches for planting cane were made by spade. Soils from trenches were spread in the vacant space in between two trenches and bed was made by spade. The size of each plot was 10.8m × 8 m. Three budded cane setts of variety Isd-16 were planted in trenches following end to end method of planting. Potato (Variety-Cardinal used as intercrop) was planted on bed in between two rows of sugarcane with row and plant spacing of 30cm × 22.5 cm.

Urea, Triple Super Phosphate (TSP) and Muriate of Potash (MP) were applied @ 125-125-110 kg of N, P₂O₅ and K₂O ha⁻¹ respectively in cane. The entire quantity of TSP, one third of Urea, and half of MP were applied to sugarcane as basal dose. The remaining quantity of MP and one-third of Urea were top dressed at tillering stage of cane and the rest one-third Urea was top dressed at the time of earthingup to cane. The intercrop potato received fertilizer at the rate of 120-150-120 kg N,P₂O₅ & K₂O respectively, and was applied on the basis of plant population. In intercrop half of Urea, full TSP and MP were applied as basal dose. The remaining Urea was applied as first top dress, thirty days after planting of potato.

All normal cultural practices appropriate for both cane and potato were done. Both potato and sugarcane were grown under rainfed condition utilizing residual soil moisture.

RESULTS AND DISCUSSION

Data in respect of cane and potato were recorded, tabulated, analysed using proper statistical methods, and have been presented in the Table 1. It was observed that there was no significant difference in germination of sugarcane buds among the treatments (Table 1). But increased germination (39.4%) were obtained where two rows of potato were grown in between two rows of cane at 100 cm space followed by paired row of cane at 45 cm, and three rows of potato at 135 cm space. Statistically identical tiller and millable canes were produced among the treatments. Higher number of tillers ($188.0 \times 10^3 \text{ ha}^{-1}$) and millable cane ($73.5 \times 10^3 \text{ ha}^{-1}$) were produced by the treatment where on potato in between two rows of cane at 90 cm had been planted (control). The lowest number of tillers ($159.9 \times 10^3 \text{ ha}^{-1}$) were produced by the treatment where two rows of potato were planted in between two rows of cane at 100 cm vacant space.

Table 1. Effect of different row arrangement of sugarcane on yield and yield contributing factors of intercropped cane & Potato.

Treatments	Germination (%) of cane	Tiller ($\times 10^3 \text{ ha}^{-1}$)	Millable cane ($\times 10^3 \times \text{ha}^{-1}$)	Yield of cane (TCH)	Yield of Potato (MT/ha)	Recoverable Sugar (%)
T ₁ : Paired row of cane at 60 cm distance keeping 120 cm vacant space in between two paired rows of cane and planting two rows of potato in 120 cm vacant space	33.0a*	172.2 a	71.7 a	81.0 a	4.3 b	10.2 a
T ₂ : Paired row cane at 45 cm distance keeping 135 cm vacant space in between two paired rows of cane and planting 3 rows of potato in 135 cm vacant space	37.0 a	180.9 a	68.9 a	83.3 a	5.5 ab	10.3 a
T ₃ : Single row cane at 90 cm apart and planting one row of potato in 90 cm vacant space	36.0 a	188.0 a	73.5 a	82.0 a	4.7 ab	10.5 a
T ₄ : Single row cane at 100 cm apart and planting of two rows of potato in 100 cm vacant space	39.4 a	159.9 a	73.2 a	85.6 a	7.8 a	10.0 a
T ₅ : Purestand cane at 90 cm row spacing (control)	36.7 a	174.8a	66.3 a	62.2 b	—	10.4 a

*In a column, values followed by similar letters do not differ significantly at 5% level of significance.

Significantly higher yield of potato was produced (7.8 t/ha) by the treatment where two rows of potato were grown in 100 cm vacant space followed by paired row cane at 45 cm three rows of potato planted in 135 cm vacant space. The higher yield of potato in these two treatments may be attributed to higher number of plant population per unit area. These results confirmed the findings of Anon, 1981 who reported increased potato plant population between the rows of sugarcane either by decreasing interrow spacing or adopting paired row system of potato planting to get increased tuber yield. The other treatments although has produced the identical yield but lower yield (4.3 t/ha) of potato was obtained from the treatment where two rows of potato was grown in the vacant space of 120 cm between paired rows of cane at 60 cm.

Cane yield : It was further revealed from the table that intercropping of potato with sugarcane increased substantial cane yield compared to purestand cane irrespective of different row arrangement. This result was in agreement with Singh and Singh (1973) who found increased cane yield by 64.3% at Pantnagar from intercropping potato with sugarcane. Rath and Singh (1980) reported that in the intercropping sequence of sugarcane + potato there has been an increase in cane yield in comparison to purestand autumn cane as well as to spring planted cane after harvest of potato. Imam *et al.* (1987) found that cane yield increases when potato was grown as intercrop with sugarcane. Rath and Singh (1980) reported that cane yield increased due to residual effect of fertilizer applied to potato and improvement in physical,

Table 2. Economic profitability of paired row cane and potato intercrop.

Treatments	Adjusted yield (TCH)	Gross income cane+Potato (Tk/ha)	Cost of cultivation (Cane+Potato) (Tk/ha)	Net profit (Tk/ha)	Profit/loss over control (Tk/ha)
T ₁ Paired row of cane at 60 cm distance keeping 120 cm vacant space in between two paired rows of cane and planting two rows of potato in 120 cm vacant space.	98.8	63607.9	20377.0	32045.9	+12403.9
T ₂ Paired row cane at 45 cm distance keeping 135 cm vacant space in between two paired rows of cane and planting 3 rows of Potato in 135 cm vacant space.	106.0	68276.9	20377.0 (13652.0) 34029.0	34247.0	+14605.9
T ₃ Single row cane at 90 cm apart and planting one row of potato in 90 cm vacant space.	101.8	65527.0	20377.0 (11185.0) 31562.0	34247.9	+14605.9
T ₄ Single row cane at 100 cm apart and planting of two rows of potato in 100 cm vacant space.	117.1	75286.6	20377.0 (18585.0) 38962.0	33965.0	+14323.0
T ₅ Purestand cane at 90 cm row spacing (control)	—	40076.0	20377.0	19642.0	—

*Figures in the parenthesis indicate the cost of cultivation of potato intercrop.

chemical and biological condition of soil. Both cane and potato yield were significantly higher where two rows of potato were grown in between two rows of cane at a row distance of 100 cm. It confirmed the findings of Verma and Bhoj (1980) who found the highest yield of both cane and potato, where potato was planted in between two rows of cane at 90 cm distance in autumn planted cane. According to Rathi *et al.*, (1974), two rows of early potato followed by three rows of wheat in 75 cm space between two rows of autumn cane gave the optimum yield.

Adjusted total production in terms of cane yield and economics : The combined yield of cane and potato in terms of cane yield (106.0 t/ha) were obtained where two rows of potato were grown in 100 cm vacant space of two paired cane rows and was found superior to rest of the treatments (Table 2). The highest net returns were also obtained from the same treatments. These results could be supported by the finding of Rathi and Singh (1980). Among the treatments, combine higher net return were recorded from potato intercropped cane compared to purestand cane. This finding was in accord with the finding of Kirtikar *et al.*, (1976), Mathur (1976) and Imam *et al.*, (1987). In the light of results obtained in the present

investigation, it may be concluded that two rows of potato between two rows of cane at 100 cm vacant space or three rows of potato between paired rows of sugarcane at 135 cm vacant space was found superior over purestand and other combinations of potato intercropping.

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