

EFFECT OF SPACING ON YIELD AND QUALITY OF AUTUMN SOWN SUGARCANE INTERCROPPED WITH SUGARBEET

By

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ABSTRACT

An intercropping trial of sugarcane with sugar-beet was carried out at Sugarcane Research Institute, Faisalabad to evaluate the effect of spacing on yield & quality and economic benefits of both the crops during the years 2003-2004 & 2004-2005. The experiment was laid out in Randomized Complete Block Design having net plot size of 3.6 x 8 m². Single and double rows of sugar beet were planted in sugarcane spaced at 120, 90 and 60 cm. However, the maximum cane and sugar beet yields were obtained from treatments where both the crops were planted alone. Average of two years data revealed that maximum cane yield of intercropped sugarcane (101.50 t ha⁻¹) with sugar beet yield of 59.74 t ha⁻¹ was obtained when sugarcane was planted at 120 cm apart trenches with one row of sugar-beet. Hence, maximum income was also recorded in the same treatment (1,61,245 Rs. ha⁻¹) as against alone sugarcane 1,04,588 Rs. ha⁻¹ and alone sugarbeet 99,141 Rs. ha⁻¹.

Keywords: Intercropping, trial, sugarbeet, maximum, sugarcane, economic.

INTRODUCTION

Sugarcane crop serves as a major raw material for production of white sugar and gur. Sugarcane is a highly water intensive cash crop plays a vital role in economic uplift of farmers. The small growers having limited resources are not in a position to afford such a long duration crop with heavy initial investment and water requirement. So, there should be a source of interim income compensating the initial investment with ultimate improved economics of the farmers. Moreover, to face the WTO challenges, the sugar production cost is required to be reduced either by improving sugar recovery of cane or by expanding the crushing season of the sugar industry with some other alternate sugar crop like sugar beet (*Beta vulgaris* L.). Sugarcane and sugar beet are both the sugar crops which can be grown side by side (Khan and Minhas, 2000). Sugar-beet is known for its high tolerance to saline and alkaline conditions (Das Gupta, 1983) and irrigation requirement is fairly low, not more than 4 – 5 irrigations amounting to 37.5 – 60 cm would be required for the purpose (Das Gupta, 1985). Winter sugar-beet is a 6-7 months crop, sown in October and harvested in April and May. Sugar beet is favoured by a long and moderately cool growing season, warm days and fairly cool night, favour rapid growth. It is obvious from the said facts that sugar beet is not only the supplement crop of sugarcane but also can be grown with the sugarcane. Sugarcane and sugar-beet inter-cropping system may expand the crushing season of sugar industry upto 45 days and may also improve the sugar recovery with ultimate reduced cost of sugar production. However, the inter-cropping of sugar beet is only possible in autumn sown cane crop. Keeping in view, the present study was conducted to achieve the following objectives:

To workout the feasibility of sugar-beet intercropping in sugarcane.

1. To achieve a long awaited sustainable self-sufficiency in sugar to cater the sugar requirements of rapidly growing population.
2. To observe the sugar beet crop as a good supplement of sugarcane.
3. To open up avenues for extending the working season of sugar mills till the end of May.

MATERIALS AND METHODS

An intercropping trial of sugarcane with sugar beet was conducted at Sugarcane Research Institute, Faisalabad to workout the feasibility and effect of spacing on the yield, quality and economic benefits of both the crops during the years 2003-2004 and 2004-2005. The experiment was laid out in R.C.B.D. having net plot size of $3.6 \times 8 \text{ m}^2$. The sugarcane variety HSF-240 was sown on a well prepared seed-bed during 1st week of October in 60, 90 and 120 cm apart rows using 60,000 DBS/ha seed rate.

The alone sugarcane was planted in 120 cm apart trenches and alone sugar-beet variety Kawe Terma was planted at 60 cm apart rows. Single and double rows of sugar beet were planted in sugarcane spaced at 120, 90 & 60 cm. The sugar beet crop was thinned twice to maintain 10 cm plant to plant distance. The sugarcane and sugar beet were fertilized @ 168-112-112 and 100-50-0 kg NPK ha⁻¹, respectively. The weeds were controlled by hand hoeing and 5 irrigations were applied upto the harvest of inter-crop. The cane crop was earthed up after inter-crop harvest. The data regarding yield and sugar recovery were recorded for both the crops. The economic analysis to adjudge the adaptability of the treatments. Data were recorded by using the standard procedure and analyzed statistically through MSTATC Statistical Programme (MSTAT-C, Manual, 1991).

RESULTS & DISCUSSION

The data presented in table-1 showed that all the treatments where both the crops alone or inter-cropped at different spacings were affected significantly during 2003-2004. The maximum cane yield of 111.27 t ha^{-1} (T₁) and beet yield of 105.47 t ha^{-1} (T₈) were obtained from treatments where both the crops were planted alone with sugar yields of 10.54 t ha^{-1} and 11.98 t ha^{-1} , respectively (Bashir *et al.*, 2005). The data also revealed that maximum cane yield of inter-cropped sugarcane (107.96 t ha^{-1}) with additional sugar beet yield of 63.87 t ha^{-1} was obtained where sugarcane was planted at 120 cm apart trenches with one row of sugar beet. However, when the same spaced cane crop was inter-cropped by 2 sugar beet rows on either side of the ridge, the reduction in cane yield was much more than the increase in sugar beet yield. It is obvious that within the same spacing, the cane yield was remarkably reduced by increasing the intercrop density. The general adaptability of system depends upon the monetary gain from the system. Almost similar trend was also found among the data regarding cane and beet yield and sugar yields of both the crops during the year 2004-2005 (Table-2) and the same treatments were prominent in their performance. The data regarding gross income per hectare reveal that irrespective of the duration of the system, sugarcane – sugar-beet inter-cropping system proved economically much more beneficial than the mono-cropping system of either crop. The treatment T₂ (sugarcane at 120 cm spacing + 1 row of sugar beet) gave the maximum gross income (171840 and 150650 Rs. ha⁻¹) as against sugarcane alone (111267 and 97910 Rs. ha⁻¹) and alone sugar beet (105473 and 92810 Rs. ha⁻¹) during both years (2003-2004 and 2004-2005), respectively. Similar results were also reported by Behl and Narwal, (1977) and Chattha *et al.*, (2003).

CONCLUSION

It is concluded from the discussion that sugarcane – sugar-beet inter-cropping system is feasible and acceptable to the growers.

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Table-1 Yield and quality of autumn sown sugarcane inter-cropped with sugar beet as affected by spacing (2003-2004)

Treatments	Beet yield t/ha	Sugar yield of S.beet (t/ha)	Sugarcane yield (t/ha)	Sugar Yield (t/ha)	Gross income Rs./ha	% increase over cane mono-crop
T ₁ = Sugarcane alone at 120 cm apart rows	-	-	111.27 a	10.54 N.S.	111267 d	-
T ₂ = Sugarcane at 120 cm spacing + one row of sugar beet	63.87 f	6.60 f	107.96 b	10.57	171840 a	54.44
T ₃ = Sugarcane at 120 cm spacing + two rows of sugar beet	75.58 e	7.64 c	87.66 c	10.62	163253 b	46.72
T ₄ = Sugarcane at 90 cm spacing + one row of sugar beet	85.74 d	8.73 a	80.17 d	10.25	165907 b	49.12
T ₅ = Sugarcane @ 90 cm spacing + two rows of sugar beet	91.41 c	9.21 cd	70.47 e	9.81	161947 b	45.55
T ₆ = Sugarcane 60 cm spacing + one row of sugar beet	100.9 b	11.08 b	61.17 f	9.87	162093 b	45.68
T ₇ = Sugarcane 60 cm spacing + two rows of sugar beet	91.5 c	9.68 c	58.30 g	10.00	149450 c	34.31
T ₈ = Sugar beet alone at 60 cm apart rows	105.47 a	11.98 a	-	-	105473 e	-
LSD	4.224	0.4937	2.376	-	429.7	-

N.S.= Non significant

Values followed by the same letter in the same column do not differ significantly at 0.05 Probability

Sugarcane @ Rs. 1000/- t

Sugar beet @ Rs. 1000/- t

Table-2 Yield and quality of autumn sown sugarcane inter-cropped with sugar beet as affected by spacing (2004-2005)

Treatments	Beet yield t/ha	Sugar yield. of S.beet (t/ha)	Sugarcane yield (t/ha)	Sugar Yield (t/ha)	Gross income Rs./ha	% increase over cane mono-crop
T ₁ = Sugarcane alone at 120 cm apart rows	-	-	97.91 a	9.27 a	97910 e	-
T ₂ = Sugarcane at 120 cm spacing + one row of sugar beet	55.61 f	5.75 g	97.04 b	9.30 a	150650 a	53.86
T ₃ = Sugarcane at 120 cm spacing + two rows of sugar beet	66.51 e	6.72 f	76.56 c	9.28 a	140370 c	46.12
T ₄ = Sugarcane at 90 cm spacing + one row of sugar beet	74.45 d	7.68 e	71.72 d	9.16 a	147170 b	50.13
T ₅ = Sugarcane @ 90 cm spacing + two rows of sugar beet	80.44 c	8.10 d	61.51 e	8.56 c	141950 c	44.98
T ₆ = Sugarcane 60 cm spacing + one row of sugar beet	88.80 b	9.75 b	54.12 f	8.73 bc	142920 c	45.97
T ₇ = Sugarcane 60 cm spacing + two rows of sugar beet	80.21 c	8.48 c	51.92 g	8.90 b	132130 d	34.95
T ₈ = Sugar beet alone at 60 cm apart rows	92.81 a	10.54 a	-	-	92810 f	-
LSD	1.214	0.2387	1.829	0.1779	1981	-

Values followed by the same letter in the same column do not differ significantly at 0.05 Probability

Sugarcane @ Rs. 1000/- t

Sugar beet @ Rs. 1000/- t

Table-3 Yield and quality of autumn sown sugarcane inter-cropped with sugar beet as affected by spacing (Average of two years)

Treatments	Beet yield t/ha	Sugar yield of S.beet (t/ha)	Sugarcane yield (t/ha)	Sugar Yield (t/ha)	Gross income Rs./ha	% increase over cane mono- crop
T ₁ = Sugarcane alone at 120 cm apart rows	-	-	104.59	9.91	104588.5	-
T ₂ = Sugarcane at 120 cm spacing + one row of sugar beet	59.74	6.18	102.50	9.94	161.245	54.15
T ₃ = Sugarcane at 120 cm spacing + two rows of sugar beet	71.05	7.18	82.11	9.95	151811.5	46.42
T ₄ = Sugarcane at 90 cm spacing + one row of sugar beet	80.10	8.21	75.95	9.71	156538.5	49.63
T ₅ = Sugarcane @ 90 cm spacing + two rows of sugar beet	85.93	8.66	65.99	9.19	151948.5	45.27
T ₆ = Sugarcane 60 cm spacing + one row of sugar beet	94.85	10.42	57.65	9.30	152506.5	45.83
T ₇ = Sugarcane 60 cm spacing + two rows of sugar beet	85.86	9.08	55.11	9.45	140790	34.63
T ₈ = Sugar beet alone at 60 cm apart rows	99.14	11.26	-	-	99141.5	-

Values followed by the same letter in the same column do not differ significantly at 0.05 Probability

Sugarcane @ Rs. 1000/- t

Sugar beet @ Rs. 1000/- t