

ECONOMIC POTENTIAL OF INTERCROPPING RAYA IN AUTUMN PLANTED SUGARCANE

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ABSTRACT

Agro-economic studies on intercropping raya by gupchat and drill method in autumn planted sugarcane were carried out at Sugarcane Research Station, Khanpur during the year, 2006. Sugarcane was sown alone in September and after harvesting Raya in March or in combination with raya varieties i.e., Khanpur raya and Anmol raya by gupchat and drill method. The results indicated non-significant effect of intercrops on germination and significant on yield and its attributing characters. Cane planted alone superseded in yield and its allied components. However, the additional harvests of intercrop raised the gross and net income of intercropping treatments. Sugarcane intercropped with "Khanpur raya" by gupchat method gave the highest net income of Rs. 106.25 thousands per hectare followed by sugarcane sown in March after harvesting "Khanpur raya". Key words: Sugarcane, intercropping, Khanpur raya and Anmol raya.

INTRODUCTION

Economically high Agricultural productivity is a prerequisite to foster an efficient and competitive agricultural industry. As sugarcane production involves a heavy long term financial investments so there should be a source of interim income especially for the small growers, which will reduce the sugar production cost also. Intercropping is a convincing approach to achieve a reasonable interim income. Autumn planted sugarcane passes a dormant growth phase of about four months in its early days due to low winter temperature and makes a little use of soil and water resources. In order to derive benefits from this early slow growth and to make better use of resources, an additional sweep of short duration intercrop can be harvested. However, adjustment in crop management practices is needed for successful maturity of either of the crops. Nazir *et al.*, (9) received the highest yield of alone cane (91.13t/ha) closely followed by cane + mash (87.08t/ha) and cane + soyabean (86.71t/ha). Higher B.C.R. (3.02) was recorded from sugarcane intercropped with mash bean. Malik and Kamoka (8) observed that raya over shadowed the cane crop and affected the tillering and cane density adversely. Though yield reduction of 9.63 percent was reported but the net income from cane + raya was significantly higher than cane alone. Aslam *et al.*, (2) found that intercropping mung and maize did not affect the germination and tillering of sugarcane. While cane formation and yield was measurably depressed. The cane + mung intercrop gave significantly higher net income with 23.23% gain over cane alone. Aslam *et al.*, (3) conducted a field trial and reported higher cash returns (Rs.23197/ha) by intercropping mung in sugarcane. In another field experiment Aslam *et al.*, (4) concluded that intercropped soyabean and mung bean did not affect the cane yield and its components significantly. Intercropping treatments gave slightly better net income than sole sugarcane. According to Aslam *et al.*, (5), although intercropping raya and sunflower depressed cane yield, yet the net income was relatively greater than that from September planted alone cane. Afzal *et al.* (1) undertook a study on intercropping sunflower in spring planted sugarcane and recorded statistically similar cane yields in alone and intercropped sugarcane. Chattha *et al.*, (7) planted sugar beet in sugarcane and recorded a magnificent increase in gross income due to intercropping.

The present field study was carried out to explore the economic feasibility of intercropping raya in autumn planted crop of sugarcane.

MATERIALS AND METHODS

The trial was conducted at Sugarcane Research Station, Khanpur during year, 2006 to find out the economic potential of intercropping raya in autumn planted sugarcane. A commercial sugarcane cultivar SPF.234 was planted in the second week of September at 1.2m row distance, while raya was intercropped in the first week of October. The planting of sugarcane was done by dry method using a seed rate of 75000 DBS/ha. The field was fertilized at the rate of 168:112:112 Kgs NPK/ha. Full dose of Phosphorous and Potash was applied at the time of sowing. Nitrogen was applied in three split doses, 1/3 at the completion of cane germination, 1/3 at tillering of sugarcane in the last week of January and the remaining 1/3 N was added after harvesting the intercrop in March. The experiment comprised of seven treatments as detailed below.

- T₁= Sugarcane alone in September
- T₂= Sugarcane after harvesting "Khanpur Raya".
- T₃= Sugarcane after harvesting "Anmol Raya"
- T₄= Sugarcane + "Khanpur Raya" sown by gupchat
- T₅= Sugarcane + "Anmol Raya" sown by gupchat
- T₆= Sugarcane + "Khanpur Raya" sown by drill
- T₇= Sugarcane + "Anmol Raya" sown by drill

The experiment was planted in Randomized Complete Block Design with four replications and a net plot size of 3.6 x 12m. Raya was intercropped as per treatments. Thinning of intercrop was done twice, at 6 inches and 9 inches plant height. All other cultural operations were performed as and when required by the crops. The yield of intercrop was recorded after harvesting and drying the grains in the first week of March. In treatments 2 and 3 sugarcane was sown in the third week of March. Meanwhile observations were recorded on germination and tillering of sugarcane. Data on cane density, weight and yield were recorded at harvest during the last week of December. The recorded data were then analysed by using Analysis of Variance techniques and Least Significant Difference test was applied at five percent probability level to compare the treatment means (10).

RESULTS AND DISCUSSION

Germination and Tillering

The data presented in table-1 indicate that different intercropping treatments did not affect the germination of sugarcane probably because it has emerged out during the germination phase of intercrop before the start of active plant competition. The tabulated data depict the depressing effect of intercrop on the tiller formation. The depressing effect was more pronounced where raya was sown by gupchat. However, the intercrop varietal difference was non significant in this regard. Sugarcane planted alone in September produced maximum tillers/plant (3.11), followed by sugarcane sown alone in March at the harvest of raya (2.63). The lowest tillers per plant (1.30) have been recorded in the plots where raya was sown by gupchat method. Relatively more reduction in the expression of tillering potential in these treatments was probably due to the closer competition as compared to the drill sown treatments. The depressing effect of intercrops on cane tillering has also been reported by Aslam *et al.*, (5) and Malik and Kamoka (8).

Millable Cane Density and Weight

Millable cane density is an important yield attributing character and is the interaction of germination, tillering and tiller mortality. The mean cane stand differences were statistically significant as shown by the data embodied in table 2.

September planted sole cane gave significantly high cane density of 102.78 thousand canes per hectare. It was matchingly followed by the sugarcane sown in March after harvesting raya. The sugarcane intercropped with raya sown either by gupchat or drill, reduced cane formation significantly. The depressing effect of raya on cane formation may be attributed to the corresponding lower tillering and relatively more tiller mortality due to shading effect of the intercrop. Similar conclusions have also been drawn by Aslam *et al.*, (5) and Malik and Kamoka (8).

The data recorded in table-1 for hundred cane weight reveal significant differences among the means of different treatments. The cane stalks planted in September either alone or with intercrops were heavier than the spring planted cane probably because of the prolonged growth period available to the former. The minimum hundred cane weight of 93.50kg was recorded for the cane planted after harvesting raya in March.

Crop Yields

The final crop yield is the ultimate goal of each and every grower. A perusal of the data given in table 2 exhibit that the differences among the means of cane yield in the treatments were statistically significant. Autumn planted alone sugarcane produced the highest cane yield (115.33t/ha). None of the other treatments could match it. The sugarcane intercropped with raya sown by drill method gave slightly more yield than the gupchat treatments but these were statistically at par with one another. Sugarcane planted after the harvest of raya in March gave the least tonnage of 95.60 per hectare. These yield losses were compensated by the additional harvests of intercrop. The "Khanpur Raya" when planted alone gave a produce of 2.37t/ha. The same variety of raya produced 2.1 It/ha when intercropped by gupchat method and 1.72t/ha when sown by drill method. The raya variety Anmol produced lower than Khanpur Raya in all the treatments. The yield results are quite in line to those of Aslam *et al.*, (4), Chattha *et al.*, (7) and Malik and Kamoka (8).

Economic Benefits

The economics of different crop combinations worked out in terms of gross income, cost of production and net income is given in table-3. The data show that the gross income received from either of the intercropping combinations was higher than the alone cane sown in September. The highest gross income of Rs. 214.10 thousands per hectare has been calculated for sugarcane intercropped with "Khanpur Raya" by gupchat method followed by the sugarcane planted after harvesting Khanpur Raya (Rs.208.57 thousands /ha). Net income was also greater for sugarcane intercropped with "Khanpur Raya" by gupchat method. The EMV of all the intercropping treatments was greater than 'T' which advocates the higher net returns from intercropping treatments. The highest EMVs of 1.51 and 1.42 show economic superiority of sugarcane + Khanpur Raya sown by gupchat and sugarcane sown after harvesting Khanpur raya, respectively. Similar economic gains due to intercropping have also been reported by Aslam *et al.* (2,3,4,5), Bahadar *et al.* (6) and Malik and Kamoka (8).

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Table-1 Germination, Tillering and Cane weight as affected by different intercropping systems

Sr. No.	Treatment	Germination %	Tillers /plant	100-cane weight (Kg)
1.	Sugarcane alone in Sept.	44.40	3.11 a	112.25 a
2.	Sugarcane after KPR Raya	41.59	2.63 b	95.00 b
3.	Sugarcane after Anmol Raya	42.30	2.55 b	93.50 b
4.	Sugarcane + KPR Raya Gupchat	44.63	1.33d	108.75 a
5.	Sugarcane + Anmol Raya Gupchat	44.65	1.30 d	107.25 a
6.	Sugarcane + KPR Raya drill	44.84	1.52 c	109.00 a
7.	Sugarcane + Anmol Raya drill	44.83	1.54 c	110.25 a
	LSD 0.05	N.S.	0.11	5.65

Treatments having no or same letter do not differ significantly (P=0.05)

Table-2 Cane density and yield as affected by different intercropping systems

S.No.	Treatments.	Cane density (000/ha)	Cane yield (t/ha)	Variation (%)	Raya yield (t/ha)
1.	Sugarcane alone in Sept.	102.78 a	115.33 a	...	—
2.	Sugarcane after KPR Raya	100.58 a	95.60c	17.10	2.37
3.	Sugarcane after Anmol Raya	102.36 a	96.58 c	16.26	1.76
4.	Sugarcane+KPR Raya Gupchat	95.66b	104.05 b	9.78	2.11
5.	Sugarcane+Anmol Raya Gupchat	94.79 b	101.33 be	11.79	1.68
6.	Sugarcane+KPR Raya drill	96.35 b	105.09 b	8.87	1.72
7.	Sugarcane+Anmol Raya drill	95.48 b	105.32 b	8.67	1.58
	LSD 0.05	2.03	6.22	—	—

Treatments having no or same letters do not differ significantly (P=0.05)

Table-3 Economic analysis of different intercropping systems

Sr. No	Treatments	Mean yield (t/ha)		G. Income Rs.000/ha	Cost of production Rs.000/ha	Net income Rs.000/ha	Estimated Monitory Value (EMV)
		Cane	Raya				
1.	Sugar cane alone in Sept	115.33	—	172.99	102.49	70.50	—
2.	Sugarcane after KPR Raya	95.60	2.37	208.57	107.81	100.75	1.42
3.	Sugarcane after Anmol Raya	96.58	1.76	193.27	107.11	86.16	1.22
4.	Sugarcane+KPR Raya Gupchat	104.05	2.11	214.10	107.85	106.25	1.51
5.	Sugarcane+Anmol Raya Gupchat	101.73	1.68	198.79	106.61	92.18	1.30
6.	Sugarcane+KPR Raya drill	105.09	1.72	204.93	107.52	97.41	1.38
7.	Sugarcane+Anmol Raya drill	105.32	1.58	201.43	107.36	94.07	1.33

Sugarcane @ Rs.1500/ton and Raya @ Rs.27500/ton