

Studies on Intercrop Cultivation with Sugarcane in South Gujarat Region

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ABSTRACT

Field experiments were conducted on heavy black soils during the years 1979-80 and 1980-81 at the Regional Sugarcane Research Station, Navsari, on intercropping with sugarcane. The intercrops tried were onion, garlic, chillies, cabbage, fennugreek, gram and groundnut which did not affect the yield of sugarcane significantly. Among all the treatments, sugarcane with onion gave the highest additional net profit of Rs. 2764/- per hectare followed by sugarcane + chillies Rs. 2606/ha, sugarcane + garlic Rs. 1261/ha and sugarcane + groundnut Rs. 297/ha. Sugarcane with cabbage, gram and fennugreek gave 1943/-, 921/- and 894/- net loss respectively, compared to sugarcane alone. This indicated the suitability of onion, chillies and garlic as suitable intercrops with sugarcane in the heavy black soils of the South Gujarat Region.

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INTRODUCTION

Sugarcane is an important cash crop gaining more popularity in the irrigated area of South Gujarat Region. The rapid increase in the area under this crop is noticed after perennial irrigation facilities are being made available under Ukai-Kakrapar irrigation project as well as successful development of co-operative sugar factories in the region. This major shift in the area is from food and nonfood crops like jowar, rice and cotton. Irrigated areas are expected to grow both food and nonfood crops, preferably by the way of intercropping with a view to utilize the available space and moisture in the soil for getting additional income or improving the fertility of the land.

Sugarcane is a long duration crop, planted at a wide distance and very slow growth in first 2 to 3 months after plant-

ing. It becomes therefore necessary for economic reasons to grow short duration crops during the early phase of the sugarcane crop (Rage and Patwardhan, 1952). Zende and Patil (1973) and Hapse (1978) reviewed the work on intercropping or multiple cropping in sugarcane in Maharashtra. They observed that both vegetables and legumes produced a beneficial effect on cane weight resulting in higher cane yield and CCS. In other studies on intercropping of various crops with sugarcane in Bihar, Sharma and Prasad (1972) noted that potato and coriander were very effective as intercrops in sugarcane. In Hyaryana, potato, onion and garlic proved to be the best suited as intercrops in sugarcane for giving higher economic return (Zende, 1981).

Bawaskar *et al.* (1978) studied the influence of intercropping of oil seeds in

sugarcane on soil properties and cane yield. It was noticed that, only growing of soyabean increased the total nitrogen content of the soil, while groundnut increased the availability of phosphate and potash. However, no oil seed crop had any direct effect in increasing the cane yield. Bhoj *et al.* (1970), Kirtikar *et al.* (1975), Mathur *et al.* (1968) and Sachan *et al.* (1978) studied the effect of intercropping in sugarcane only from the point of view of economics.

Based on these above as well as with a view to ascertain the suitability of some intercrops, which can give additional income without adverse effect on the yield and quality of sugarcane, the present investigation was carried out at Regional Sugarcane Research Station, Navsari on heavy black soils during the years 1979-80 and 1980-81.

MATERIALS AND METHODS

Field experiments were conducted by adopting complete randomised design, with four replications and eight treatments during the years 1979-80 and 1980-81. Treatments undertaken were (1) sugarcane + onion, (2) sugarcane + garlic, (3) sugarcane + chillies (4) sugarcane + cabbage (5) sugarcane + fennugreek (6) sugarcane + gram (7) sugarcane + groundnut and (8) sugarcane alone. Sugarcane variety CO-419 was planted at a distance of 90 cm in second week of January in both the years. The ridges were flattened by dragging a light wooden plank over the top. Sowing of intercrops was carried out in two rows on either side of flattened ridges within one week after planting of sugarcane. Onion, chillies and cabbage seedlings were transplanted at 15, 20 and 30 cm apart, respectively. Garlic was planted at a distance of 15 cm. Fennugreek was sown in rows while gram and groundnut were dibbled in a row at a distance of 15 cm.

The crop was fertilized with 250 kg N, 125 kg P_2O_5 and 125 kg K_2O per hectare in addition to 25 tonnes of F.Y.M. Entire dose of P_2O_5 as well as K_2O was applied at the time of planting cane, while nitrogenous fertilizer was given in four splits. Fifteen per cent at the time of planting and remaining in split doses of 30, 20 and 35 per cent after 6, 12 and 18 weeks of planting, respectively. No additional fertilizer was given to any of the intercrops. The necessary operations like weeding, irrigation and plant protection were carried out whenever necessary. Intercrops were harvested after 12 to 16 weeks on maturity and sugarcane was harvested at 12 month age. The cabbage crop was uprooted and removed in both the years because of the heavy attack of prodenia (*Spodoptera litura* F.)

RESULTS AND DISCUSSION

The data on yield of sugarcane and intercrops are given in Table-1. The data revealed that in the year 1979-80, except in the treatment of sugarcane + chillies, the yield of sugarcane was low compared to that under the treatment of sugarcane alone, but the reduction in the yield was not significant. In the year 1980-81, the yield of sugarcane was at par, except in the treatment, sugarcane + chillies, which gave significantly higher yield (93.09 t/ha) as compared that under control (75.99 t/ha) i.e. sugarcane alone.

In pooled analysis, the yield difference was found significant. The average yield of 1979-80 and 1980-81 in the treatment sugarcane alone was 91.38 t/ha, while the same in other treatments in which onion, garlic, chillies, cabbage, fennugreek, gram and groundnut were grown as an intercrops were 87.22, 97.85, 92.32, 85.83, 88.63, 79.99

TABLE 1

Mean data on sugarcane and intercrops yields (1979-80 and 1980-81).

Sr. No.	Treatment	Sugarcane yield t/ha			intercrops yield qt/ha		
		79-80	80-81	Average	79-80	80-81	Average
(1)	Sugarcane alone	106.77	75.99	91.38	—	—	—
(2)	Sugarcane + Onion	100.87	73.56	87.22	113.72	72.92	93.31
(3)	Sugarcane + Garlic	102.60	93.09	97.85	15.75	0.69	8.22
(4)	Sugarcane + Chillies	109.42	75.22	92.32	3.08	23.82	13.45
(5)	Sugarcane + Cabbage	90.80	80.86	85.83	*	*	—
(6)	Sugarcane + Fennugreek	104.69	72.57	88.63	13.45	3.12	11.15
(7)	Sugarcane + Gram	86.20	73.78	79.99	16.80	0.39	8.60
(8)	Sugarcane + Groundnut	96.57	82.08	89.33	—	—	4.98
	Bye-product	—	—	—	—	—	26.10
	S.Em. t/ha	4.948	3.144	2.932	—	—	—
	C.D. at 5% t/ha	14.552	9.247	8.360	—	—	—

*The cabbage crop was uprooted and removed because of the heavy infestation of prodenia.

TABLE 2

Average data on sugarcane yield, yield attributing characters and juice quality (1979-80 and 1980-81).

Sr. No.	Particulars	Treatments							
		Sugar- cane alone	Sugar- cane + Onion	Sugar- cane + Garlic	Sugar- cane + Chillies	Sugar- cane + Cabbage	Sugar- cane + Fennu- greek	Sugar- cane + Gram	Sugar- cane + Ground- nut
1	2	3	4	5	6	7	8	9	10
1.	Sugarcane yield t/ha	91.38	87.22	97.85	92.32	85.83	88.63	79.99	89.33
2.	Millable canes/ha in thousand	103.037	98.892	100.303	104.146	95.333	98.719	94.335	94.465
3.	Weight/cane in kg	0.930	0.880	0.980	0.890	0.900	0.890	0.850	0.940
4.	Juice quality								
	(a) Pol. per cent	17.27	17.96	17.97	18.15	17.16	17.40	17.80	18.10
	(b) Purity per cent	92.62	92.01	93.41	92.20	92.50	92.96	92.49	93.74
	(c) CCS per cent	12.30	12.81	13.34	12.91	12.50	12.55	12.77	13.38
	(d) CCS t/ha	11.30	11.21	12.96	11.95	10.53	11.19	10.21	11.97

TABLE 3

Economics of different intercrops treatments with sugarcane, based on pooled data (1979-80 and 1980-81).

Sr. No.	Item	Treatment							
		Sugar-cane alone	Sugar-cane + Onion	Sugar-cane + Garlic	Sugar-cane + Chillies	Sugar-cane + Cabbage	Sugar-cane + Fennugreek	Sugar-cane + Gram	Sugar-cane + Groundnut
(1)	Sugarcane yield t/ha	91.38	87.22	97.85	92.32	85.83	88.63	79.99	89.33
(2)	Yield of intercrops qt/ha	—	93.31	8.22	13.45	*	3.12	8.60	4.98
	Bye-product qt/ha	—	—	—	—	—	—	—	26.10
(3)	Gross income								
	(a) Sugarcane Rs/ha	22845	21805	24462	23080	21457	22157	19997	22332
	(b) Intercrops Rs/ha	—	4665	1644	3362	—	780	3010	2004
	(c) Total Rs/ha	22845	26470	26106	26442	21457	22937	23007	24336
(4)	Cost of cultivation (Sugarcane + intercrops Rs/ha)	9000	9861	11000	9991	9555	9986	10083	10194
(5)	Net profit Rs/ha	13845	16609	15106	16451	11902	12951	12924	14142
(6)	Net additional profit Rs/ha	—	2764	1261	2606	(-1943)	(-894)	(-921)	297

*Cabbage crop was uprooted and removed because of heavy infestation of prodenia.

N.B.: The price of Sugarcane, Onion, Garlic, Chillies, Fennugreek, Gram, Groundnut and Groudnut bye-product were considered as Rs. 250/- ton, Rs. 50/qt., Rs. 200/qt, Rs. 250/qt (green), Rs. 250/qt, Rs. 250/- qt, Rs. 350/qt and Rs. 10/qt respectively.

and 89.33 tonnes per hectare, respectively. The yield in the treatments sugarcane + onion, sugarcane + garlic, sugarcane + chillies, sugarcane + fennugreek, sugarcane + groundnut and sugarcane + cabbage were at par with control i.e. sugarcane alone. While the same was significantly lower under the treatment sugarcane + gram. This indicated that intercrops i.e. onion, garlic, chillies, fennugreek and groundnut did not affect yield of sugarcane significantly.

But gave an additional yields of the said intercrops to the tune of 93.31, 8.22, 13.45, 3.12, 8.60 and 4.98 qts/ha, respectively.

The observations on weight per millable cane, number of millable cane/ha, pole percent, purity per cent C.C.S. per cent and CCS/ha were recorded and are given in Table-2. It is evident from the table that weight per millable cane was higher in the treatments intercropped with garlic and groundnut as compared

to that under sugarcane alone. The CCS per cent in all the treatments were higher than that under sugarcane alone, indicating that there was no adverse effects of intercrops on the quality of cane. The CCS per cent in the treatment sugarcane alone was 12.30, while the same in the treatment sugarcane intercropped with onion, garlic, chillies, cabbage, fennugreek, gram and groundnut were 12.81, 12.34, 12.91, 12.50, 12.55, 12.77 and 13.38 respectively.

The economics of each treatments were calculated. The mean data on this aspect are given in Table-3. The net additional profit i.e., profit realised after deduction of net profit of treatment sugarcane alone showed that the treatment sugarcane intercropped with onion gave the highest net additional profit of Rs. 2764/ha. The same were followed by sugarcane + chillies Rs. 2606/ha, sugarcane + garlic Rs. 1261/ha, and sugarcane + groundnut Rs. 297/ha. The other intercrops i.e. cabbage, gram and fennugreek gave net loss of Rs. 1943, 921 and 894 per hectare, respectively as compared to sugarcane alone. This indicated the suitability of onion, chillies and garlic as suitable intercrops with sugarcane in the heavy black soils of the South Gujarat Region.

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