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Spices intercropping with autumn-planted sugarcane (*Saccharum officinarum*)

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ABSTRACT

A field experiment was conducted during 1993–95, 1994–96 and 1995–97 to work out the production potential and economic feasibility of spices intercropping with autumn-planted 'CoS 767' sugarcane (*Saccharum officinarum* L.). Intercropping of garlic (*Allium cepa* L.) with autumn cane improved the cane yield by 8.10%, while other spices as intercrop affected the cane yield adversely. The decrease in yield was the lowest (2.10%) under cane + cumin (*Cuminum cyminum* L.) and the highest (11.15%) under cane + black mustard [*Brassica nigra* (L.) Koch] compared to sole crop of cane. Among different intercropping systems, cane + garlic (*Allium sativum* L.) was found much beneficial giving the highest net return of Rs 80,255/ha, followed by cane + fennel (*Foeniculum vulgare* Mill.) (Rs 72,849/ha) amounting to 86.53% and 69.55% more than that the autumn cane alone. These treatments reflected a higher benefit : cost ratio of 3.52 and 3.44 compared with 2.28 under cane alone. The intercrop cumin failed in all the experimental seasons, showing net loss of return up to 9.32% due to its intercropping in cane. Effect of spices intercropping on juice-quality parameters was not significant.

Key words: Spices + sugarcane intercropping, Cane yield, Economics

A little work has been done so far to grow spices as intercrops with autumn-planted sugarcane. As spices are highly remunerative and labour intensive, their intercropping in autumn cane may increase the income level as well as employment potential for small farmers. Apart from this, these crops also possess peculiar odour which may serve as a repellent to the insect pests of sugarcane. Tewari and Prakash (1980) and Verma *et al.* (1981) observed a significant reduction in top-borer incidence when spices were intercropped with cane. Since information on yield potential and economic advantage of intercropping spices with autumn-planted sugarane is very much lacking, present investigation was undertaken.

MATERIALS AND METHODS

The field experiment was conducted during 1993–97 at Shahjahanpur. The soil was sandy loam, moderately alkaline (pH 7.9), low in organic carbon and medium in available nitrogen, phosphorus and potash. The experiment was laid out in randomized block design with 3 replications, keeping test variety of sugarcane 'CoS 767'. Intercrops selected for the study were coriander, carum, fennel, black cumin, cumin, chillies, garlic, fenugreek and black mustard. Sole crop of sugarcane was

included to compare the yield potential and economics of intercropping systems. There were 10 treatments. Agronomic practices adopted for raising different intercrops are given in Table 1.

Sugarcane was planted in furrows 90 cm apart keeping one-three bud setts, 30-cm-row length, in October, whereas all the intercrops were sown in the first week of November during all the seasons. Sugarcane was fertilized with 180 kg N/ha (one-third at planting + two-thirds in 2 equal split doses as top- dressing after harvesting of intercrops at proper moisture), whereas intercrops were given half of the total N + full dose of P_2O_5 and K_2O at their respective sowing time and remaining half N was top-dressed 30 days after sowing as per Table 1.

Number of shoots and millable canes along with the yield of intercrops and cane were recorded at their respective growth and harvesting stages. Juice samples were drawn in the last week of December and analysed for brix and sucrose (%). Available sugar (%) in cane and commercial cane sugar were calculated as per Spencer and Meade (1955). Economics of different intercropping systems were worked out at the prevailing market prices during experimentation. Data were pooled and analysed statistically.

RESULTS AND DISCUSSION

Shoot and millable cane

Among intercropping treatments, significantly higher number of shoots were recorded under cane + garlic intercropping which was at par with cane + chilli and cane alone. More reduction in shoots was noticed under cane + fennel, cane + carum, cane + fenugreek and cane + black mustard intercropping than other treatments. It may be due to severe smothering of shoots in cane by dense canopy formed by above mentioned intercrops. Number of shoots which were recorded statistically at par in case of cane + cumin, cane + chilli, cane + garlic intercropping and cane alone may be attributed to the deep hoeing of the field due to digging of garlic plants and their root exudates. Verma *et al.* (1981) also reported similar findings. The failure of cumin and chilli intercrops during experimentation resulted in the growth of cane at par with sole cane cropping. Data of millable canes/ha followed almost the same trend as shoots.

Cane yield

Significantly higher cane yield was obtained under the treatment of cane + garlic than other treatments, but it was statistially at par with cane alone, cane + black cumin,

Table 1. Agronomic details followed for various intercrops

Spice taken as intercrop	Test variety	No. of rows between cane rows	Intra-row spacing (cm)	Seed rate (kg/ha)	Fertilizer (kg/ha)		
					N	P	K
Coriander	'Sheetal'	2	10	15	50	30	30
Carum	'NP (J) 8'	2	25	3.5	30	20	20
Fennel	'PF 35'	2	25	3.5	50	30	20
Black cumin	'Local'	2	15	4.5	50	30	20
Cumin	'Local'	2	15	5.0	50	30	20
Chilli	'Pusa Jwala'	1	35	0.40	60	30	20
Garlic	'Jaunpuri'	4	15	350	80	40	40
Fenugreek	'Pusa Early Bunching'	3	15	13	40	20	20
Black mustard	'Local'	1	35	3.5	40	20	20

Table 2. Effect of spices intercropping on sugarcane shoots, millable canes, cane yield, juice quality, economics and incidence of early shoot-borer (statistically analysed pooled data of 1993–95, 1994–96 and 1995–97)

Treatment	No. of shoots ('000/ha)	No. of millable canes ('000/ha)	Yield of intercrops (q/ha)	Cane yield (tonnes/ ha)	Decrease in cane yield from cane alone	Available sugar (%) in cane	Cane equivalent yield (tonnes/ ha)	CCS (tonnes/ ha)	Cost of cultivation (Rs/ha)	Net return (Rs/ha)	B:C ratio	Incidence of early shoot borer (%)
Cane alone	258	121		90.97		10.65	90.97	9.69	18,834	43,026	2.28	9.27
Cane + coriander	186	104	12.08	82.67	9.12	10.64	106.21	8.80	21,985	50,238	2.29	2.89
Cane + carum	162	104	5.34	81.85	10.03	10.45	103.84	8.55	21,091	49,520	2.35	1.87
Cane + fennel	160	103	20.23	83.99	7.67	10.28	138.28	8.63	21,181	72,849	3.44	2.71
Cane + black cumin	186	105	4.04	86.86	4.52	10.44	98.00	9.07	20,738	45,902	2.21	2.67
Cane + cumin	236	119		88.98	2.19	10.63	88.98	9.46	21,489	39,017	1.82	9.07
Cane + chilli	244	119	9.44	88.56	2.65	10.75	96.89	9.52	21,695	44,190	2.04	8.11
Cane + garlic	262	130	32.88	98.34	(+) 8.10	10.60	151.53	10.42	22,785	80,255	3.52	1.70
Cane + fenugreek	173	101	16.38	81.86	10.01	10.34	111.37	8.46	20,885	54,847	2.63	2.28
Cane + black mustard	178	105	6.15	80.83	11.15	10.61	94.17	8.58	20,855	43,181	2.07	8.08
CD (P = 0.05)	27.68	24.86		13.69		NS						0.19

Prevailing market prices (Rs/kg): Coriander, 13.25; carum, 28.00; fennel, 18.25; black cumin 18.75; chilli (green) 6.00; fenugreek 12.25; garlic 11.00; black mustard 14.75; sugarcane (Rs 60/q)

cane + cumin and cane + chilli. Except cane + garlic, all the intercropping treatments gave significantly lower cane yield than cane alone; however, cane + cumin, cane + black cumin and cane + chilli where intercrops actually failed in different cropping seasons as reflected by their lower yields presented in (Table 1). The cane yield reductions were 2.19%, 2.65%, 4.52%, 7.67%, 9.12%, 10.01%, 10.03% and 11.15% due to cumin, chilli, black cumin, fennel, coriander, fenugreek, carum and black mustard respectively. It may be attributed to the competition between the 2 crops for space and light. Comparatively higher reduction in cane yield with cane + black mustard, cane + fenugreek, cane + carum, cane + coriander, cane + fennel and cane + black cumin treatments might have resulted due to taller height accompanied by dense canopy formed by these intercrops, resulting in severe smothering of cane plants. However, the growing of garlic as intercrop with autumn cane increased the yield of cane up to 8.10% compared with cane alone. It may be attributed to the lesser competition for space and light between the plants of cane and intercrop accompanied by lower sugarcane top-borer incidence (Verma *et al.*, 1981).

Juice quality and sugar yield

Available sugar (%) in cane was not affected significantly due to different intercropping treatments. Amount of commercial cane sugar calculated followed almost the same trend as the yield of cane under different treatments and accordingly, it was the highest under cane + garlic, followed by cane alone and other intercropping systems (Table 2).

Economics

All the intercropping systems except cane + chilli, cane + black cumin, cane + black mustard and cane + cumin showed higher net returns than cane alone. The treatment of cane + garlic gave highest net returns (86.53%), followed by cane + fennel (69.55%), cane + fenugreek (27.47%), cane + carum (15.09%) and cane + coriander (16.76%) compared with cane alone. The net losses of return in chilli (2.71%), black mustard (0.36%) and cumin (9.32%) were observed as compared with cane alone due to crop losses in different seasons. Benefit : cost ratio also followed almost the similar trend as that of net returns (Table 2).

Thus intercroping of cane + garlic, cane + fennel, cane + fenugreek, cane + carum and cane + coriander gave 86.53%, 69.55%, 27.47%, 15.09% and 16.76% more net return respectively than sole crop of cane and is, therefore, worth adopting by sugarcane growers.

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