

Performance of intercropping systems in plant crop of sugarcane in Cauvery Command area

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SUMMARY

Experiment conducted at Zonal Agricultural Research Station, V.C. Farm, Mandya on the plant crop of sugarcane revealed that sugarcane + vegetable soybean was a better intercropping option with higher B:C Ratio (2.38), sugarcane yields (161.67 t/ha) with the check crop of beans (already released technology) (169.14 t/ha), when compared to pure crop of sugarcane (164.51 t/ha). Higher number of tillers was recorded with these intercropping systems with the advantage of shorter duration and by virtue of them being leguminous crops with the ability to fix atmospheric nitrogen which compliment and supplement sugarcane crop by enhancing its growth and productivity. The additional income realised by these crops in addition to sugarcane yield is an added advantage. Vegetable crops like onion, bhendi, tomato have negative effect on the cane tillering, yield and economic feasibility.

Key Words : Intercropping, Vegetable soybean, Legume intercrops

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Sugarcane is one of the important commercial crops in the command areas. In Karnataka state it is cultivated in an area of 4.2 lakh hectares with a productivity of 94 tonnes/ha (Anonymous, 2011). Sugarcane is a slow grower in the initial phase and as it is widely spaced crop there is scope for utilizing the space and time. Khushk and Mallah (2012) report that early stage sugarcane grows slowly and can accommodate a number of short duration crops and major intercrops combination in sugarcane identified are: sugarcane + sunflower; sugarcane + onion; sugarcane + wheat; sugarcane + coriander; sugarcane + mustard; sugarcane + tomato and sugarcane + cabbage and spinach. Productivity of cane can

be enhanced by different agronomic measures and careful selection and intercropping of suitable compatible crop with sugarcane which compliment and supplement it is of paramount importance. Different crops are being cultivated as intercrops at various locations though not all crops are ideal foils. The crop should put forth its biomass early and cover the land surface so that weed growth is minimised and essentially it should come to harvest within 75-80 days of sugarcane planting. Singh and Lal (2008) reported that Sugarcane + cowpea [*Vigna unguiculata* (L.) Walp], effectively suppressed the weed density (81/m²) and reduced the dry weight of weeds. The initial slow growth of the sugarcane crop facilitates exploitation of time and space in the early stage of crop for intercropping. The research station at V.C. Farm has hitherto made recommendations for taking up short duration crops like soybean and French beans as profitable intercrops both monetarily and soil health point of view. In this background, a field experiment was conducted in the plant crop of sugarcane to study the performance of different crops (legume as well as nonlegumes) as intercropping system and to identify the best feasible crops for taking up as intercrops.

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MATERIAL AND METHODS

A field experiment was conducted at Zonal Agriculture Research Station farm, V.C.Farm, Mandya with seven crops with sugarcane as intercrops and sugarcane pure crop to study the performance of these crops as intercrops with sugarcane. Following crops form sugarcane intercrops as treatments, the experiment was laid out in a Randomized Complete Block Design with three replications. The soil of the experiment was red sandy loam which is low in nitrogen, medium in p content and higher in potassium availability.

Treatments:

- T₁ Sugarcane + Tomato
- T₂ Sugarcane + Onion
- T₃ Sugarcane + Bhendi
- T₄ Sugarcane + Cowpea
- T₅ Sugarcane + French beans
- T₆ Sugarcane + Vegetable soybean
- T₇ Sugarcane + Groundnut
- T₈ Sugarcane pure crop

The observations on number of tillers was recorded at 120 days after planting and , yield attributing characters and yield were done at the time of harvest. Economics were worked

out to arrive at the B:C ratio for each intercropping system. The data were analysed by adopting analysis of variance technique as per Panse and Sukatme (1967).

RESULTS AND DISCUSSION

Highest cane length was recorded when sugarcane was intercropped with French beans (Table 1) which was at par with sugarcane pure crop. This was followed by sugarcane + bendi, sugarcane + onion and sugarcane + ground nut. However, cane weight and girth were not influenced by the intercropping systems.

Significantly highest number of tillers was recorded when sugarcane was intercropped with vegetable soybean (109.77/ha) (Table 2) and this was lower in all the intercropping systems as lowest was with sugarcane + tomato. The reduction in number of tillers was possibly due to extended period of the intercrop which coincided with the tillering stage of the crop growth. However, the number of internodes was not influenced by the intercropping system.

Significantly higher cane yields were recorded with sugarcane + French beans intercropping system which was at par with sugarcane pure crop followed by sugarcane with vegetable soybean. Significantly lower cane yields were recorded when sugarcane was grown with either tomato or

Table 1 : Cane length, weight and girth as influenced by different intercropping systems

Treatments	Cane length (m)	Cane weight (kg)	Girth (cm)
T ₁ -Sugarcane + Tomato	1.97	1.29	1.25
T ₂ -Sugarcane + Onion	2.01	1.31	1.34
T ₃ -Sugarcane + Bhendi	2.00	1.31	1.29
T ₄ -Sugarcane + Cowpea	1.97	1.29	1.20
T ₅ -Sugarcane + French Beans	2.09	1.35	1.37
T ₆ -Sugarcane + Vegetable soybean	1.91	1.25	1.03
T ₇ -Sugarcane + Groundnut	2.00	1.31	1.24
T ₈ -Sugarcane pure crop	2.10	1.84	1.48
S.E. ±	0.03	0.02	0.15
C.D. (P=0.05)	0.092	NS	NS

NS=Non-significant

Table 2 : Number of internodes , number of tillers and yield of sugarcane as influenced by different intercropping systems

Treatments	No. of internodes	No. of tillers ('000/ha)	Yield (t/ha)
T ₁ -Sugarcane + Tomato	17.93	71.83	136.42
T ₂ -Sugarcane + Onion	16.00	73.60	137.65
T ₃ -Sugarcane + Bhendi	17.07	74.47	143.27
T ₄ -Sugarcane + Cowpea	16.73	98.07	159.57
T ₅ -Sugarcane + French Beans	17.93	94.07	169.14
T ₆ -Sugarcane + Vegetable soybean	14.33	109.77	161.67
T ₇ -Sugarcane + Groundnut	15.27	94.23	155.13
T ₈ -Sugarcane pure crop	21.67	115.67	164.51
S.E. ±	1.32	1.703	2.375
C.D. (P=0.05)	NS	5.248	7.32

NS=Non-significant

Table 3 : Jaggery quality as influenced by different intercropping systems

Treatments	Moisture %	RS%	Ash%	Sucrose %
T ₁ -Sugarcane + Tomato	6.00	3.03	1.73	78.40
T ₂ -Sugarcane + Onion	5.40	2.23	1.10	71.87
T ₃ -Sugarcane + Bhendi	5.50	3.03	1.43	75.79
T ₄ -Sugarcane + Cowpea	6.23	2.67	1.30	75.15
T ₅ -Sugarcane + French Beans	5.00	3.63	2.00	72.59
T ₆ -Sugarcane + Vegetable soybean	5.17	2.83	1.77	74.51
T ₇ -Sugarcane + Groundnut	5.67	2.17	1.97	73.92
S.E. ±	0.348	0.044	0.041	1.528
C.D. (P=0.05)	NS	0.135	0.127	NS

NS=Non-significant

Table 4 : Economics and B: C ratio as influenced by different intercropping systems

Treatments	Intercrop yield (q/ha)	Income (Rs 000/ha)	SC Eq. yield (t/ha)	Total income (Rs/ha)	Total cost	B : C ratio
T ₁ -Sugarcane + Tomato	20.0	30.0	13.63	330124	178000	1.85
T ₂ -Sugarcane + Onion	15.04	22.55	10.27	325380	170000	1.91
T ₃ -Sugarcane + Bhendi	48.15	57.77	26.27	372964	168000	2.22
T ₄ -Sugarcane + Cowpea	9.41	37.63	17.13	388684	166000	2.34
T ₅ -Sugarcane + French Beans	13.49	26.96	12.23	399068	169000	2.36
T ₆ -Sugarcane + Vegetable soybean	15.19	63.15	24.13	408824	172000	2.38
T ₇ -Sugarcane + Groundnut	10.0	40.0	18.20	381286	173000	2.20
T ₈ -Sugarcane pure crop	-	-	-	361922	163000	2.22
S.E. ±	10.07	1.855	0.853			
C.D. (P=0.05)	31.05	5.81	2.629			

onion or bhendi. This implies that these crops result in lowering the cane yield due to the interfering of these crops during the tillering and later stage of the sugarcane growth which happens to coincide with tillering and grand growth period of the sugarcane crop. A field experiment was conducted consecutively for three years at P.A.U. Sugarcane Research Station, Jalandhar (Saini *et al.*, 2003) to study the relative performance of different vegetable crops *viz.*, pea, radish, palak and turnip as double row intercropped in the autumn planted sugarcane. The results revealed that intercropping of peas did not affect the cane yield over the pure cane. The intercropping of radish, turnip and palak decreased the cane yield by 5.1, 7.4 and 11.5%, respectively over pure cane. The highest net profit of Rs. 26785/ha was obtained from cane + peas. This was closely followed by cane + radish (Rs. 26404) and cane + palak (Rs. 24494/ha) in comparison to Rs. 17848/ha with pure crop. The intercropping of sugarcane with turnip was found economically unviable. Whereas cowpea, vegetable soybean and ground nut did not lower the sugarcane yield drastically as these crops belong to the leguminous crop group which come to harvest early and have the facilitating effect of biological nitrogen fixation as well as addition of large volume of biomass. According to Khandagave (2010) cowpea grown and soybean

recorded higher NMC (92 080, 89 830 and 87 830/ha, respectively) than cane alone (85 910/ha), while maize intercropping gave 68 880 NMC and the sugarcane yields were 111.1, 109.1, 106.9 and 70.8 t/ha, respectively for the 4 inter-crops and 107.4 t/ha for cane alone.

The jaggery quality parameters assessed from the samples of these intercropping treatments revealed significant reduction in reducing sugars and ash percentage values in the jaggery samples from the intercropping system of sugarcane + ground nut and sugarcane + vegetable soybean. Sucrose per cent was found to be non significant (Table 3).

The economics worked out in experiment revealed that more profitable combination of intercropping system was Sugarcane + vegetable soybean with highest B:C ratio (2,38) followed by sugarcane + French beans (2,36) and sugarcane + cowpea (2.34). onion and tomato combinations recorded lower B:C ratio even when compared to pure crop of sugarcane (2.22) (Table 4). Khandagave (2010) also confirmed that as a result of the grain yield of soybean (1.5 t/ha) and lower cost of production in soybean inter-cropping, this strategy recorded the highest net return (Rs68, 336/ha) with B:C ratio of 3.21 compared to other inter-crops. Conversely, although maize and potato yields were higher, these treatments produced lower net income and B: C ratios due to the reduction in cane yield.

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