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Effect of integrated application of pressmud and paddy husk with fertilizers on yield and quality of sugarcane (*Saccharum officinarum*)

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ABSTRACT

A field experiment was conducted on a medium black soil at Gangavati on integrated nutrient management in sugarcane (*Saccharum officinarum* L.). Application of organic sources (pressmud and paddy husk) were foud to substitute 25% of the recommended fertilizers in getting higher cane and sugar yields. Economics worked out indicated that application of pressmud in conjuction with 100% recommended fertilizers gave higher returns.

Use of organic manures is inevitable for sustained agricultural production, especially for sugarcane (*Saccharum officinarum* L.) which is a soil-exhausting crop and requires higher quantities of plant nutrients. Increasing cost of inorganic fertilizers and deteriorating soil physical environment have necessitated the use of organics to supplement not only the nutritional requirement of the crops but also to maintain favourable physical soil environment. In view of this, organic wastes like pressmud and paddy husk which are easily available were included in the present investigation to examine them as partial substitutes of inorganic fertilizers.

MATERIALS AND METHODS

A field experiment was conducted during 1992 and 1993 at the Agricultural Research station, Gangavati, in randomized block design with 3 replications, in which 11 treatment combinations involving both organic and inorganic fertilizers were used. Two locally and easily available organics such as pressmud and paddy husk were applied on the basis of N composition. Press mud which is generated from sugar industries had 2.9, 0.6 and 1.1% N, P and K respectively and was applied @ 3.25 tonnes/ha equivalent to 25% of the recommended N. Paddy husk containing 0.5, 0.16 and 0.32% N, P and K respectively was applied @ 12 tonnes/ha to substitute 25% of the recommended N. However, P and K contents of the organics were not considered while applying P and K fertilizers. The experiment which was initiated on a Vertisol had low N, medium P and high K contents. Sugarcane (var. 'CoC 671') crop was grown as an *eksali* with a row spacing of 90 cm planted during the second

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fortnight of January and received normal package except treatments. The total rainfall received during crop period was 647.1 and 806.7 mm in 1992 and 1993 respectively. Additional benefit : cost ratio was computed based on the ratio of income realized by additional yield increase due to treatment compared with recommended fertilizers to that of extra cost involved by that treatment compared with recommended fertilizers.

RESULTS AND DISCUSSION

Both cane and sugar yields increased with an increase in level of only inorganic fertilizers owing to increase in yield parameters, such as cane length, diameter and weight (Tables 1, 2). But the increased levels of inorganic fertilizers had marginal negative effect on brix and pol % juice (Table 3), while reverse was true for sugar recovery and indices of commercial cane sugar (Prasad *et al.*, 1983). Application of 125 and 150% of recommended inorganic fertilizers resulted in an additional benefit : cost ratio of 3.17 and 3.38 respectively (Table 1). However, the increasing cost of inorganics has become disincentive and substituting them with organics has been vital.

Application of pressmud [equivalent to 25% (RDN)] along with 75% of the recommended inorganic fertilizers (T_4) remained at par with 100% RDF (T_1) in terms of cane and sugar yields (Table 1). Similarly, when pressmud (equivalent to 25% RDN) was applied along with 100% RDF (T_5) remained on a par with 125% of inorganic RDF (T_2). Likewise, the application of pressmud of similar quantity as above along with 125% of RDF (T_6) remianed at par with 150% inorganic RDF (T_3) Application of paddy husk (equivalent to 25% of RDN), like pressmud when applied along with inorganic fertilizers

Table 1. Effect of organic and inorganic manures on cane and sugar yields

	Cane yield (tonnes/ha)			Additional benefit : cost	Sugar yield (tonnes/ha)	
	1992	1993	Mean		1992	1993
T_1, Recommended dose of fertilizers (RDF)	90.2	72.5	81.4		13.2	10.4
T_2, 125% RDF	92.1	80.8	86.5	3.17	13.8	11.4
T_3, 150% RDF	102.9	81.8	92.4	3.38	15.6	12.6
T_4, 75% RDF + pressmud*	88.6	70.5	79.6	1	13.4	10.7
T_5, 100% RDF + pressmud	95.6	79.0	87.3	8.65	14.2	11.1
T_6, 125% RDF + pressmud	102.1	84.4	93.3	5.20	15.3	14.2
T_7, 150% RDF + pressmud	101.9	84.4	93.2	3.00	15.1	13.1
T_8, 75% RDF + paddy husk**	88.3	73.0	80.7	1	13.2	11.2
T_9, 100% RDF + paddy husk	98.6	79.7	89.2	3.21	14.5	12.4
T_{10}, 125% RDF + husk	101.9	80.2	91.1	2.47	15.1	12.4
T_{11}, 150% RDF + paddy husk	105.4	85.5	96.5	2.55	15.3	12.2
CD (P = 0.05)	5.37	6.52			1.4	NS

* Pressmud; 3.25 tonnes/ha; ** paddy husk, 12 tonnes/ha; sugarcane, Rs 550/tonnes

Fertilizer (Rs/tonnes); Urea, 2,830; single superphosphate, 2,950; muriate of potash, 4,606; pressmud, 100; paddy husk, 100

gave similar comparable results to pressmud (Table 1). Thus the response of the crop clearly demonstrated that there was a distinct possibility of saving 25% of the inorganic fertilizers without any sacrifice in the cane as well as sugar yields. Yaduvanshi *et al.* (1990) and Singh *et al.* (1991) reported similar effects of organics on sugarcane. Apart from saving N, laboratory tests gave clear evidence of improvement in the soil physical environment through improvement in the decreased dispersability of clays wherever the organics had been previously incorporated.

Application of either pressmud or paddy husk in conjuction with 100% of recommended fertilizers recorded significantly higher cane yield than that of same along with 75% of recommended dose due to improved yield parameters (Tables 1, 2). However, when the same was applied along with higher levels of recommended fertilizers (125 or 150%) it did not indicate any further significant increase in the yield. Paddy husk although is slower to decompose (30–35 days of application) compared with partially decomposed pressmud, remained on a par in realizing similar cane and sugar yields, as the applied inorganic fertilizers met the crop need during the decomposition period. Unlike inorganics, application of organics along with inorganics had no influence on quality indices (Table 3) (Sarkar *et al.*, 1983; Jonathan *et al.*, 1991).

The correlation between cane yield (Y) and yield attributes such as cane length (x_1), diameter (x_2) and weight (x_3) were significant in both the years and regression between them are as follows.

1992

$Y = 5.202 + 0.3084\ x_1 + 17.3057\ x_2 - 6.0896\ x_3$

$R^2 = 60.52$

1993

$Y = 27.9296 + 0.0176\ x_1 + 39.5659\ x_2 - 4.5204\ x_3$

$R^2 = 45.14$

Pooled

$Y = 13.5454 + 0.1171\ x_1 + 25.1343\ x_2 - 7.9427\ x_3$

$R^2 = 42.92$

Similarly, relationship between sugar

Table 2. Effect of organic and inorganic manures on yield parameters of sugarcane

	Cane length (cm)		Cane diameter (cm)		Cane weight (kg)	
	1992	1993	1992	1993	1992	1993
T_1, Recommended dose of fertilizers (RDF)	166	173	2.23	2.34	0.88	0.95
T_2, 125% RDF	179	195	2.55	2.58	1.10	1.20
T_3, 150% RDF	197	202	2.55	2.47	1.23	1.25
T_4, 75% RDF + pressmud	168	170	2.24	2.32	0.93	0.94
T_5, 100% RDF + pressmud	175	183	2.74	2.51	1.30	1.26
T_6, 125% RDF + pressmud	198	193	2.59	2.63	1.14	1.32
T_7, 150% RDF + pressmud	187	202	2.63	2.63	1.23	1.38
T_8, 75% RDF + paddy husk	170	171	2.27	2.33	0.92	0.95
T_9, 100% RDF + paddy husk	175	176	2.50	2.53	1.13	1.25
T_{10}, 125% RDF + husk	182	182	2.55	2.53	1.10	1.22
T_{11}, 150% RDF + paddy husk	197	200	2.51	2.58	1.17	1.20
CD (P = 0.05)	8.90	17.50	0.27	0.09	0.22	0.13

Table 3. Effect of organic and inorganic manures on quality estimates of sugarcane

	Brix (%)		Pol (%) juice		Purity (%)		Recovery (%)		Commercial cane sugar (%)	
	1992	1993	1992	1993	1992	1993	1992	1993	1992	1993
T_1, Recommended dose of fertilizers (RDF)	23.8	25.1	21.3	23.3	89.4	92.7	10.3	10.5	14.6	14.4
T_2, 125% RDF	23.7	24.2	21.7	21.3	91.0	89.1	11.2	10.9	15.0	14.1
T_3, 150% RDF	22.1	23.9	20.2	21.2	91.3	88.6	12.9	11.0	15.2	15.3
T_4, 75% RDF + pressmud	23.6	24.2	21.7	21.7	93.9	89.8	11.7	10.2	15.1	15.1
T_5, 100% RDF + pressmud	23.7	23.8	21.6	20.8	91.0	87.9	10.8	11.5	14.9	14.1
T_6, 125% RDF + pressmud	23.9	25.1	21.7	23.6	91.1	93.8	11.5	10.9	15.0	16.8
T_7, 150% RDF + pressmud	24.1	24.1	21.6	22.1	87.7	91.3	11.6	10.9	14.8	15.5
T_8, 75% RDF + paddy husk	23.9	24.9	21.7	22.2	90.8	89.6	11.4	10.9	14.9	15.4
T_9, 100% RDF + paddy husk	23.2	25.1	21.0	22.3	91.4	88.9	10.7	10.6	14.6	15.5
T_{10}, 125% RDF + husk	23.8	24.6	21.8	22.2	91.5	89.7	11.0	10.5	14.8	15.5
T_{11}, 150% RDF + paddy husk	23.9	24.7	21.3	20.6	92.1	88.3	10.9	10.3	14.5	14.2
CD (P = 0.05)	NS	0.75	NS	1.39	NS	3.07	0.90	NS	NS	NS

yield (Y) and yield (x_1) (0.8965 and 0.6802 respectively in 1992 and 1993), pol (%) juice (x_2) (0.4089 and 0.4904) and commercial cane sugar (%) (x_3) (0.3553 and 0.5301) were also significant and regression relation between them are as follows.

1992

$$Y = 15.125 + 0.1476\ x_1 - 0.0361\ x_2 + 1.0755\ x_3$$

$$R^2 = 99.29$$

1993

$$Y = 12.6465 + 0.1515\ x_1 - 0.0111\ x_2 + 0.853\ x_3$$

$$R^2 = 95.12$$

Pooled

$$Y = 2.3484 + 0.1334\ x_1 + 0.1620\ x_2 + 0.0341\ x_3$$

$$R^2 = 79.12$$

Application of pressmud in conjunction with 100% inorganics realized the highest additional benefit : cost ratio of 8.65 (Table 1), followed by the treatment which received 125% inorganic fertilizers applied along with pressmud (5.2). Use of paddy husk although improved yields when applied in conjuction with inorganics, the benefit : cost ratio did not favour its use. This was due to higher application rate, i.e. 12 tonnes/ha as against 3.25 tonnes in case of pressmud.

It was concluded that the use of pressmud and paddy husk (equivalent to 25% of recommended nitrogen) realized a net saving of 25% of recommended fertilizers. However,

application of 100% of inorganic RDF along with pressmud @ 3.25 tonnes/ha may be used for higher yield and benefit : cost ratio in sugarcane.

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