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Impact of coirpith on rice - rice crop sequence

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Abstract: Field experiments were conducted at Regional Research Station, Paiyur to find out the impact of coirpith on rice-rice crop sequence during *kharif*, 1998 (June-Oct) and *rabi*, 1998 (Nov, 1998 to Feb, 1999) seasons. The experiments were laidout in randomised block design replicated thrice with treatment combinations of control, Raw Coirpith (RCP) @ 12.5 t/ha, Composted Coirpith (CCP) @ 12.5 t/ha, Recommended Inorganic Fertilizers (RIF), RCP + RIF and CCP + RIF. The coirpith treatments were applied only to first crop and the fertilizers were applied to both the crops as per the treatment schedule. Results revealed that the incorporation of composted coirpith @ 12.5 t/ha along with recommended inorganic fertilizers found to record increased values of Leaf Area Index, productive tillers/hill, grains/panicle, and test weight. The highest grain yield, straw yield and net income of 6408 kg/ha, 5440 kg/ha and Rs. 18093/ha respectively were recorded with RIF + CCP application in first season crop of rice. While the grain yield (5960 kg/ha) and straw yield (4098 kg/ha) was high in CCP alone applied plots during second season rice crop but these values were on par with CCP + RIF application with 5760 kg/ha and 4616 kg/ha of grain and straw yield respectively. The residual soil available nutrients status after the harvest of second season rice crop revealed that available N and K status of soil was improved markedly in CCP and CCP + RIF applied plots. Application of CCP along with recommended inorganic fertilizers found to increase the growth, yield and economics of rice-rice crop sequence besides improving fertility status of the soil.

Key words : Raw coirpith, Composted coirpith, Inorganic fertilizers, Crop sequence, Economics, Soil fertlity.

Introduction

Coirpith (coirwaste) is available to an extent of 10.0 lakhs tonnes annually in India, of which Tamil Nadu contributes about 26 per cent. Coirwaste contains 30 percent of lignin and 27 per cent of cellulose. It retains five times of its weight of moisture besides containing 0.21 per cent N, 0.09 per cent P_2O_5 and 0.84 per cent K_2O. It also continued 26.1 per cent organic carbon (Nagarajan *et al.* 1986). Significant increase in nutrient status of soil was observed by coir waste addition (Lavanya, 1986). The possibilities of utilizing the coirwaste as soil conditioner, substitute for scarce FYM and other organic sources for crop production are abundant. The information on the effect of coirwaste on rice-rice crop sequence is scanty. Hence, an attempt was made in this paper to study the effect of coirpith on the growth and yield of rice-rice crop sequence.

Materials and Methods

Field experiments were conducted at Regional Research Station, Paiyur to study the effect of coirwaste on growth and yield of two succeeding crops of rice after rice sequence under irrigated puddled transplanted low land ecosystem. The experimental soil was with EC of 0.46 dS m with pH of 7.8. The available N, P and K status was 286 kg/ha, 9.8 kg/ha and 314 kg/ha respectively. The organic carbon content was 0.3% with CEC of 13.2 C mole (p+) /kg of soil. The textural classification revealed sandy clay loam type of soil with 47.5% coarse sand, 30.0% of fine sand, 6.21% silt and 16.29% of clay. The first season crop of rice was raised during *Kharif* 1998 (June-Oct) season and the second crop during *Rabi*, 1998 (Nov-Feb, 1999) season immediately after the harvest of first crop. The test crop variety was Paiyur 1 for both the seasons. Transplanting of 25 days old seedlings were done with a spacing of 15 x 10 cm at a depth of 3 cm in a properly levelled low land puddled soil. Recommended inorganic fertilizer dose of 150: 50: 50 kg/ha of NPK were applied to the crop. 50% of N, 50% of K and 100% of P_2O_5 were applied as basal at a time of transplanting.

Treatments	LAI at flowering	Total number of tillers/hill	Productive tillers/hill	Grains/ panicle	Test weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index	Net income Rs./ha	B:C ratio
T_1 - Control	5.3	13.5	8.6	183	16.6	4062	3259	0.55	8943	1.64
T_2 - RCP	5.2	13.0	8.2	176	15.3	4533	3641	0.55	10852	1.74
T_3 - CCP	5.9	14.1	8.8	189	17.0	5312	4174	0.56	14671	1.96
T_4 - RIF	6.2	14.3	9.1	206	17.6	5470	4430	0.55	13998	1.83
T_5 - RIF + RCP	6.1	14.5	9.1	219	17.6	5782	4495	0.56	14707	1.83
T_6 - RIF + CCP	6.5	14.9	9.5	232	17.9	6408	5440	0.54	18093	12.0
CD (P=0.05)	0.5	NS	0.6	21.4	0.06	534	440	NS	-	-

Table 2. Growth, yield and economics of second season residual crop of rice as influenced by coirpith (*Kharif*, 1998)

Treatments	LAI at flowering	Total number of tillers/hill	Productive tillers/hill	Grains/ panicle	Test weight (g)	Grain yield (kg/ha)	Straw yield (kg/ha)	Harvest index	Net income Rs./ha	B:C ratio
T_1 - Control	4.9	9.6	5.8	212.5	15.4	3560	3206	0.53	6390	1.5
T_2 - RCP	4.8	9.8	5.8	207.0	14.2	3600	3141	0.53	6536	1.5
T_3 - CCP	5.3	10.3	6.2	242.3	15.9	5960	4898	0.55	17943	2.4
T_4 - RIF	5.7	12.2	8.0	255.6	16.6	4080	3341	0.55	9098	1.7
T_5 - RIF + RCP	5.8	11.5	7.3	268.9	16.8	5360	4105	0.57	16109	2.2
T_6 - RIF + CCP	6.1	12.8	8.5	278.7	17.8	5760	4614	0.56	18516	2.3
CD (P=0.05)	0.4	0.7	0.6	24.5	0.05	512	405	NS	-	-

Remaining 50% N was applied in three equal splits at the time of tillering, panicle initiation and milky stage of the crop growth. 50% of K was applied in two equal splits at the time of tillering and milky stage. Recommended dose of fertilizers were applied both crops as per treatment schedule. Irrigations were given from the canal water received from Krishnagiri Reservoir Project (constructed on Thenpennai river). For the initial period of seven days after transplanting, 2.5 cm depth of water was maintained and after that 5 cm of irrigation was given at each time after the disappearance of ponded water. Irrigation was stopped 10 days before harvest.

The treatments included are T_1 - control, T_2 - Raw coirpith (RCP) 12.5 t/ha, T_3 - Composted coirpith (CCP) 12.5 t/ha, T_4 - Recommended inorganic fertilizer (RIF), T_5 - RIF + RCP and T_6 - RIF + CCP. The coirpith treatments were imposed only to first crop. Coirpith @ 12.5 t/ha both raw and composted were applied to the plots and were incorporated into the puddled soil before transplanting of rice seedlings. The second crop was raised as residual crop without imposing any coirpith application, but inorganic fertilizers were applied as per the treatment schedule T_4, T_5 and T_6,

Table 3. Post harvest soil available nutrient status after harvest of second crop of rice

Treatments	Soil available nitrogen (kg/ha)	Soil available phosphorus (kg/ha)	Soil available potassium (kg/ha)
T_1 - Control	168	8.2	210
T_2 - RCP	166	9.3	222
T_3 - CCP	220	9.7	260
T_4 - RIF	182	10.6	248
T_5 - RIF + RCP	192	10.6	280
T_6 - RIF + CCP	215	10.9	290
CD (P=0.05)	19.2	NS	32

without altering previous crop layout. The experiment was laidout in randomised block design replicated thrice.

The data on leaf area index, total and productive tiller/hill at harvest, grains/panicle, test weight at harvest, grain yield and straw yield, harvest index, net income and B:C ratio of rice crops were recorded and presented in Tables 1 and 2. The post harvest soil samples after the harvest of second (residual) crop of rice were drawn from a depth of 30 cm and analysed for available nitrogen by alkaline permanganate method (Subbiah and Asija, 1956), available phosphorus by colorimetrically (Olsen *et al.* 1954) and available potassium by flame photometer (Stanford and English, 1949) and is presented in Table 3.

Results and Discussion

The results revealed that application of composted coirpith (CCP) @ 12.5 t/ha along with Recommended Inorganic Fertilizers (RIF) to rice crop found to influence Leaf Area Index (LAI) at flowering by recording maximum value of 6.5. It was followed by Raw coirpith @ 12.5 t/ha + RIF applied plots (6.1). The total number of tillers did not vary significantly for first crop of rice. While the productive tillers had significant effect and the maximum was observed with CCP + RIF (9.5) application and was comparable to RCP + RIF (9.1) application. Similarly number of grain per panile and test weight were also maximum in RIF + CCP applied plots registering the values of 232 and 17.9 respectively. Significantly the highest grain yield of 6408 kg/ha was recorded with CCP + RIF application. The percentage of yiel increase being 57.8 and 17.1 over control an RIF applied plots indicating the importanc of composted coirpith in improving the yiel of rice crop. The next best in the order w RIF + RCP (5732 kg/ha). The lowest gra yield of 4062 kg/ha was recorded in contr plot. The favourable influence of composte coirpith on growth and yield of various cro were also reported by Parasuraman *et al.* (1998 Appavu *et al.* (2000) and Rajkannan *et a* (2001). Similar trend as that of grain yiel was observed with straw yield. Harvest indc did not show any significant variations amon the treatments studied. The highest net income of Rs.18093/ha was recorded in RIF + CCP applied plots with B:C ratio of 2.

The growth, yield and economics of *Rabi* season residual crop of rice (Table 2) revealed that the LAI was significantly influenced and was maximum (6.1) in RIF + CCP application. The lowest being recorded in control (4.9). Total tillers and productive tillers were maximum in RIF + CCP application and was significantly superior to the rest of the treatments. Grains/ panicle, test weight were maximum in RIF + CCP application and was on par with the RIF + RCP application. The grain yields of 5960 kg/ha and 5760 kg/ha were recorded with CCP and RIF + CCP application respectively and were comparable to each other indicating favourable influence of composted coirpith application and its residual effect on the nutrient availability. The straw yield registered similar trend as that of grain yield. The net income of Rs.18516/ha and Rs.17943/ha was realised

the treatments of RIF + CCP and CCP e applied plots in the residual crop. The dual available nutrient status (Table 3) revealed the soil available N was as high as 220 ha and 215 kg/ha with CCP and CCP + applied plots compared to the lowest value .66 kg/ha in RCP and 168 kg/ha in control s. Indicating the importance of application RIF supplemented with composted coirpith. asamy and Kothandaraman (1985) observed the ability of coir waste in building up otal N was high. Lavanya (1986) reported significant increase in nutrient status of soil was resulted by coirwaste addition. available P status though did not vary ificantly, but numerically increased value 10.9 and 10.6 kg/ha were recorded with + RIF and CCP applied plots. There marked improvement in K status of soil 210 kg/ha in control to as high as 290 ha in RIF + CCP applied plots. This was to more of K content (1.2%) in composted pith as reported by Nagarajan *et al.* (1985).

Thus present study revealed that incorporation composted coirwaste @ 12.5 t/ha along with ommended inorganic fertilizers (150: 50: 50 NK kg/ha) resulted in highest grain yield, nomical and soil fertility status in rice- crop sequence in Thenpennai river basin KRP command area where the availability coirwaste is abundant.

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