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IMPACT OF VARIOUS ORGANIC SOURCES ON K UPTAKE AND YIELD OF RICE IN THAMBIRABARANI RIVER TRACT OF TAMIL NADU

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ABSTRACT

Two field experiments were conducted at Wetland Farm, Agricultural College and Research Institute, Killikulam, Tamil Nadu, during *Kharif* and *rabi* seasons of 1993-94 with different organic sources (farmyard manure, composted coirpith, raw coirpith, composted sugarcane trash, raw sugarcane trash, pressmud and green leaf manure *Sesbania aculeata* with graded levels of nitrogen viz., 0, 50, 75 and 100 kg N ha^{-1}. The other major nutrients P and K were applied at the rate of 50 kg ha^{-1} in the form of single super phosphate and muriate of potash, respectively, to study the direct and residual effect of various organic wastes on the soil available K, uptake of K and yield of low land rice. Application of composted coirpith improved the soil available k status and increased the uptake of potassium by grain and straw. The results indicated that 50 kg N with green leaf manure recorded the highest grain and straw yield in both seasons.

KEY WORDS : Organic wastes, K uptake, Soil available K, Yield

Organic residue recycling is an important aspect of environmentally sound sustainable agriculture. The objective of maximizing yield, maintaining soil productivity and ecological balance can be met by balanced use of inorganic fertiliser and organic soures of nutrients. Organic materials hold a great importance due to their local availabilty, as a source of multiple nutrients and ability to improve soil nutrient status and therby increase the crop productivity. The crop yields are higher when both chemical and organic sources are used when compared to either of them used separately (Kundu and Pillali,.1992). The present study describes the effect of organic residue recycling on soil available K, uptake of K and yield of rice.

MATERIALS AND METHODS

Two field experiments were conducted at Agricultural College and Research Institute, Killikulam, Tamil Nadu, during *kharif* and *rabi* seasons of 1993-94 with different sources of organic wastes viz., farmyard manure, composted coirpith, raw coirpith, composted sugarcane trash, raw sugarcane trash, pressmud and daincha (*Sesbania aculeata*) green leaf manure with different levels of N (0, 50, 75 and 100 kg N ha^{-1}). The soil was sandy clay loam in texture with pH 7.4, available N 380 kg, available P 23 kg and available K 230 kg ha^{-1}. The organic wastes were added based on equivalent organic carbon content comparable with that of FYM. The treatments were replicated three times in a split - plot design with gross plot of size 3.2 x 6.0 m. The rice cultivar used in the study was ADT-36.

Two seedlings were transplanted per hill at a spacing of 15 x 10 cm. Nitrogen was applied through urea in three splits i.e. 50 % at transplanting, 25% at tillering stage and 25% at panicle initiation stage. All the treatments received a uniform basal dose of 50 kg P_2O_5 as single super phosphate and 50 kg ha^{-1} as muriate of potash.

During rabi season the same rice variety was transplanted without disturbing the layout. The individual plots were prepared, levelled and applied with only the required levels of fertilizers (N, P, and K) under main plots, as per the treatment schedule. None of the organic wastes were applied for the second season crop in order that the residual effect of the organic wastes added to the first season crop could be studied on second season crop.

RESULTS AND DISCUSSION

Crop yield

Application of green leaf manure with 50 kg N ha^{-1} recorded the highest grain yields during *kharif* season followed by composted coirpith, pressmud, farmyard manure, composted sugarcane trash, raw coirpith and raw sugarcane trash. This is in line

Table 1. Soil available K, total K uptake and yield of *kharif* rice

Treatments	Soil available K (Kg ha^{-1})			Yield (kg ha^{-1})		Total K uptake (Grain + straw) (Kg ha^{-1})
	Tillering stage	Flowering stage	Harvesting stages	Grain	Straw	
N levels						
No-N	318	300	283	3241	4859	42.12
50 Kg N	369	349	331	4095	5537	54.09
75 Kg N	352	332	315	3911	5353	45.44
100 Kg N	332	313	296	3701	5143	46.27
CD (0.05)	16.5	15.9	14.5	126	156	3.12
Organic wastes						
No organics	232	213	197	3048	4490	34.55
Farmyard maure	324	308	292	3829	5272	48.77
Composted coirpitn	446	444	422	4362	5804	62.69
Raw coirpith	314	296	280	3488	4928	44.21
Composted sugarcane trash	314	296	280	3675	5117	43.06
Raw sugarcane trash	302	284	268	3365	4809	38.90
Pressmud	431	411	390	4069	5511	55.56
Greenleaf manure	358	338	343	4422	5864	56.11
CD (0.05)	9.8	11.6	10.9	117	195	4.7

with the findings of Ramasamy *et al.* (1988) who reported that the greenleaf manure + 40 kg N gave significantly higher grain and straw yield than 40 kg fertiliser alone. The enhanced yield obtained in the present study might be due to increased number of productive tillers which might be due to enhanced nutrient availability owing to reduced volatilisation losses of N. This is in confirmity with the earlier findings as reported by Christianson (1989). Greenleaf manure, composted coirpith, pressmud, farmyard manure, composted sugarcane trash, raw coirpith and raw sugarcane trash recorded 45, 43, 33, 25, 20, 14 and 10 per cent increase in grain yield over no organic wastes. Among the N levels 50 kg N ha^{-1} recorded the highest straw yield of 5537 kg ha^{-1} followed by 75 N ha^{-1} which recorded the straw yield of 5353 kg ha^{-1}. Among the organics greenleaf manure registered the maximum straw yield of 5864 kg ha^{-1} and it was on par with composted coirpith.

Uptake of K

The increase of K uptake consequent to the addition of various levels of N over control was significant. Among the organic wastes added, composted coirpith recorded the highest K uptake (62.69 kg ha^{-1}). Addition of raw coirpith and composted sugarcane trash were on par at all levels of N.

Soil available K

Application of N at different levels increased the available K status of soil over control. Application of organic wastes irrespective of the sources recorded increased available K status of soil over no organics. Among the organic sources, application of composted coirpith recorded the highest value followed by pressmud, greenleaf manure, farmyard manure, raw coirpith, composted sugarcane trash and raw sugarcane trash. Application of organic manures increased the available K status of soil. The acidic decomposition products of these organics would have dissolved the natural potassic minerals and brought the K into soluble and exchangeable forms. Among the organics, composted coirpith recorded the maximum soil available K.

Table 2. Soil available K, total K uptake and yield of *rabi* rice

Treatments	Soil available K (Kg ha^{-1})		Yield (kg ha^{-1})		Total K uptake (Grain + straw) (Kg ha^{-1})
	Tillering stage	Flowering stage	Grain	Straw	
N levels					
No-N	308	268	3319	4761	41.18
50 Kg N	356	313	3992	5435	53.07
75 Kg N	340	292	3807	5253	42.87
100 Kg N	321	279	3594	5040	44.99
CD (0.05)	11.6	10.1	178	176	2.12
Organic wastes					
No organics	222	189	2945	4387	34.60
Farmyard maure	319	266	3725	5169	48.92
Composted coirpith	447	402	4250	5692	62.73
Raw coirpith	319	280	3382	4825	43.69
Composted sugarcane trash	305	264	3571	5014	42.93
Raw sugarcane trash	293	252	3262	4705	37.96
Pressmud	415	371	3966	5409	48.09
Greenleaf manure	347	306	4327	5775	58.48
CD (0.05)	11.6	10,5	147	212	4.25

As coirpith is predominant in cellulose, composted coirpith and its decomposition products would naturally contain various organic acids. These organic acids might have solubilised the non-exchangeable K to soluble form of K to some extent. Nagarajan *et al* (1990) also reported the increased K availability in soils and consequent crop growth due to application of composted coirpith. The results of the present investigation revealed that there was a decreasing trend in the soil available K with progress of crop growth. This could be attributed to the crop removal and fixation of K in the clay lattice. The results are in agreement with the findings of Antony Joseph (1969).

As in the first crop similar trend of results were observed in yield, soil available K status and K uptake in the second crop also. However, the values were lesser when compared to the first crop.

From the results of present study it was evident that application of 50 kg N ha^{-1} along with greenleaf manure seemed better for obtaining higher yields.

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