Table 2. Residual effect of amendments on soil hardness and grain yield of black gram

Treatment		Soil hardness kg/sq in.		Emergence (%)		Grain yield (kg/ha)	
		T	R	T	R	T	R
Gypsum 2 t/ha		2.42	3.08	67.0	62.0	303	355
Gypsum 4 t/ha		2.58	2.92	63.8	56.5	233	352
Lime 2 t/ha		2.67	3.12	62.3	58.0	326	385
Lime 4 t/ha		2.75	2.83	66.0	60.7	418	465
Rice husk 5 t/ha		2.67	2.67	68.9	62.5	392	458
Pressmud 5 t/ha		2.58	2,92	70.2	58.8	390	415
FYM 5 t/ha		3.33	3.17	60.1	53.2	355	342
Control		3.33	3.33	50.3	53.0	230	268
Main plot	CD	0.4		3.5		83	
Sub-plot	CD	0.2		1.4		24	

T = Treated; R = Residual; Mean of three replications

studied for any effect due to the application of amendments. It was found that the amendments did not influence the available nitrogen and phosphorus status of the soil. However application of FYM (5 t/ha) significantly increased the available potassium status of the soil. Significant differences were observed in the the main plots as well as the sub-plots (Table 2). This showed that the grain yield was influenced by the residual effect of the amendments as well as further yield increments could be achieved by further application of amendments. Residual effect was pronounced in the plots which received lime (4 t/ha). rice husk (5 t/ha) and pressmud (5 t/ha) in the previous season. The same significant trend was observed with per cent emergence and soil hardness but these were only marginal. So it can be concluded that application of pressmud (5 t/ha) or lime (4 t/ha) would be beneficial for obtaining higher yields of crops and the continuous application over a period of time would result in the improvement in soil properties.

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DEGRADATION OF COIR WASTE AND TAPIOCA PEEL BY EARTHWORMS

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ABSTRACT

Degradation of coirwaste and tapioca peel by earthworms with and without feed was tried under laboratory condition. The rate of degradation was maximum in treatments with earthworms that received cowdung as feed. Degradation was marked by the decrease in organic carbon content, C/N ratio and the subsequent increase in major and minor nutrient contents and microbial activity in both coirwaste and tapioca peel. The hydrogen cyanide (HCN) content in tapioca peel also got reduced to an appreciable level.

KEY WORDS : Coirwaste, Tapioca Peel, Earthworm, Degradation, Nutrients

Knowledge on the association between earthworms and organic wastes has resulted in the use of earthworms for processing the organic wastes to alleviate their dis osal roblem.

Table 1. Nutrient content of raw and vermicomposted coir waste

Treatments	Nutrients									
	N (%)	P (%)	K (%)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)	Organic carbon (%)	C/N ratio	Microbial activity (mg of CO_2 evolved 100g sample)
Air dried coir waste	0.238	0.011	0.648	1.83	11.50	7.768	2.820	27.72	119.892	116.08
Control	0.416	0.0180	0.764	2.21	14.69	10.124	3.60	25.72	61.90	132.920
Coir waste + earthworms	1.018	0.040	0.976	2.588	22.182	13.402	5.20	23.14	23.18	173.6
Coir waste + earthworms + cowdung	1.118	0.044	0.990	2.702	22.14	13.77	5.202	17.04	19.078	175.84
CD (0.05)	0.0221	0.0324	0.022	0.097	0.1294	0.1504	0.638	6.421	5.6997	1.0667

Coirwaste and tapioca peel are two important agro-industrial wastes in India. Due to the fibrous nature and high lignin content, coirwaste takes very long period to decompose under natural conditions. Tapioca peel, on the other hand, has a toxic chemical, hydrogen cyanide (HCN) which is toxic to cattle. Though some attempts have been made to degrade coirwaste (Manickam *et al.*, 1989; Mani and Marimuthu, 1992; Ramasamy, 1993), earthworms have not been employed to decompose both coirwaste and tapioca peel in India. Hence, the present investigation was taken up to find out the possibility of managing these wastes with earthworms.

MATERIALS AND METHODS

About 300g each of coirwaste and tapioca peel was introduced separately into each of 10 pots (20 cm x 20 cm). Another set of pots received 300g of coirwaste and tapioca peel, each separately with the addition of 60g dried powdered cowdung. The pots were perforated at the bottom and watered to field capacity. The perforations in the pots were closed with cotton to facilitate draining of excess water and to prevent the escape of worms. After two days, 15 earthworms *(Perionyx excavatus* E.perr., Megascolicidae : Moniligastrina) were introduced into each pot and covered with muslin cloth to prevent the worms from crawling out and also the entry of others insects. The pots were watered daily. Suitable controls were maintained for the experiment.

After four months, the samples were analysed for N (Humphries, 1956), P (Jackson, 1973), K (Toth and Prince, 1978), Fe, Mn, Zn and Cu (Lindsa' and Norvell, 1978), organic carbon (Walkley and Black, 1934), microbial biomass (Anderson and Domsch, 1978) and HCN (AOAC, 1965) content employing standard methods.

RESULTS AND DISCUSSION

Comparative analysis of airdried coirwaste and the vermicomposted coirwaste showed a marked reduction in organic carbon content, ranging from a minimum of 39 per cent in composted coirwaste with earthworms and cowdung (Table 1). Significant reduction in C/N ratio (84% in vermicomposted coirwaste, 81% in vermicomposted coirwaste without cowdung and 48% in control) was also observed at the end of experimental period. Major and minor nutrient content also got increased over a period of time. Of the three major nutrients, nitrogen content was more in vermicomposted coirwaste with cowdung (1.118%), followed by potassium (0.044%) and phosphorus (0.990%) as compared to air dried coirwaste. Microbial activity also showed an increase over airdried coirwaste (116.08) in all the treatments with maximum activity in vermicomposted coirwaste with cowdung (175.84). As in vermicomposted coirwaste, increase in macro-and micro nutrient contents have been reported in vermicomposted cattle dung (Holter, 1979) and maize and soyabean plant residues (Mackay and Kadivko, 1985).

With regard to decomposition of tapioca peel, significant differences were observed in the nutrient content of raw tapioca peel and vermicomposted tapioca peel (Table 2). As in coirwaste composting, earthworm activity lowered the organic carbon content in tapioca peel appreciably (21%) in vermicomposted tapioca peel

Table 2. Nutrient content of raw and vermicomposted tapioca peel

Treatments	Nutrients										
	N (%)	P (%)	K (%)	Fe (ppm)	Mn (ppm)	Zn (ppm)	Cu (ppm)	Organic carbon (%)	C/N ratio	Microbial activity (mg of CO_2 evolved 100g sample)	HCN (μg/g)
Air dried tapioca peel	0.880	0.094	1.320	1.36	4.60	2.334	2.334	31.270	35.53	87.220	63.16
Control	1.158	0.098	1.352	1.81	5.158	3.272	3.272	29.36	25.35	96.32	43.70
Tapioca peel + earthworms	1.492	0.110	1.350	2.39	6.310	4.52	4.52	24.48	16.40	123.32	35.54
Tapioca peel + earth worms + cowdung	1.504	0.112	1.350	2.39	6.390	4.69	4.69	24.79	16.48	126.40	30.22
CD (0.05)	0.016	0.241	0.017	0.535	0.0902	0.0747	0.0628	0.752	0.626	1.647	1.177

without addition of cowdung and 6 per cent in moist tapioca peel. The reduction in C/N ratio ranged from 28 per cent (moist coir waste) to 56 per cent in vermicomposted tapioca peel. Gradual increase in the nutrient content as well as microbial activity was observed in different treatments with the vermicomposted tapioca peel. The composting of tapioca peel by earthworms and the subsequent increase in nutrient contents and microbial activity with a reduction in HCN content and C/N ratio has already been reported by Mba (1983).

Other methods of composting coirwaste require input cost in the form of urea, *Pleurotus sajor caju* and labour, but vermicomposting needs less attention and hence vermicomposting can be tried for degradation of coir waste. Large scale trials on the vermicomposting of coirwaste and tapioca peel are under way and the results will be published in these columns.

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