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Short Note

Residual Effect of Composts on Soil Fertility Under Amaranthus-Turmeric Cropping System

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In amaranthus-turmeric cropping system, turmeric (var. BSR 2) was raised after amaranthus to assess the residual effect of composts on soil fertility. The experiment was conducted without disturbing the original treatment structure. Significantly higher residual effect was observed in those plots which had received compost of banana pseudostem or sugarcane trash prepared with different starter materials *viz*., Cow dung and sewage sludge, accelerator ie., Microbial inoculum *viz*., Pseudomonas and Bacillus sp and *Trichoderma viride*, accelerator cum enricher materials like Urea and Poultry manure than the raw materials. In general, the performance of Poultry manure enriched microbial inoculum or *Trichoderma viride* compost of banana pseudostem or sugarcane trash @ 750 kg ha^{-1} with 75 per cent of the recommended dose of fertilizer (RDF) was quite impressive than that of no manure i.e., 100 per cent RDF alone and the absolute control in enhancing available nutrient (N, P and K) status, organic carbon and cation exchange capacity at post harvest stage of residual crop of turmeric. The residual effect of composts prepared with banana pseudostem was considerable than that with sugarcane trash. The highest available N, P, K, organic carbon and cation exchange capacity of 236 kg ha^{-1}, 16.72 kg ha^{-1}, 482 kg ha^{-1}, 0.64 per cent and 20.73 cmol (P^+) kg^{-1} respectively was recorded with the application of poultry manure enriched microbial inoculant compost of banana pseudostem @ 750 kg ha^{-1} with 75 per cent of the recommended dose of fertilizer.

Key words: Compost, Amaranthus, Turmeric, Residual effect, Soil fertility.

Organic manures besides supplying some amount of the essential nutrients to the current crop often leave substantial residual effect on the succeeding crops in the system and this residual effect lasts for several seasons (*Seshadri Reddy et al., 2005*). This paper reports the residual effect of composts on soil fertility under amaranthus–turmeric cropping system.

Materials and Methods

A field experiment was conducted during 2004 - 2005 in farmer's field at Alanthurai, Coimbatore district, Tamil Nadu, using amaranthus (var. CO2) as test crop to find out the effect of composts on nutrient uptake and green yield of amaranthus. The residual crop turmeric (var. BSR 2) was raised in the same field of amaranthus after harvesting, to know the residual effect of raw and composted base materials *viz*., banana pseudostem and sugarcane trash on soil fertility without disturbing the original treatment structure. The initial soil available N, P, K, Organic carbon and CEC was 165 kg ha^{-1}, 10.40 kg ha^{-1}, 413 kg ha^{-1}, 0.50 per cent and 15.0 cmol (P^+) kg^{-1}) respectively. The experimental field was ploughed well to obtain fine tilth and leveled.The field was then divided into 60 plots of 20 M^2 (5 x 4 M^2) size leaving 0.5 M spacing between each plot and 1 M between each block for irrigation purpose. The experiment was laid out in randomized block design and replicated thrice. The experiment comprised of eight treatments for composted banana pseudostem and sugarcane trash separately, 100 per cent recommended dose of fertilizer (RDF) alone and absolute control, i.e., F_0C_0 : Absolute control; F_1C_0 : Recommended dose of fertilizer (RDF 120:60:90 kg ha^{-1} N, P_2O_2 and K_2O respectively); F_1C_1: Raw base material @ 5 t ha^{-1} + 100% RDF; F_2C_2 : Cow dung slurry compost @ 750 kg ha^{-1} + 75% RDF (90:45:67.5 kg ha^{-1} N, P_2O_5 and K_2O respectively) ; F_2C_3: Sewage sludge compost @ 750 kg ha^{-1} +75% RDF; F_2C_4: Microbial inoculum compost @ 750 kg ha^{-1} + 75% RDF; F_2C_5: Microbial inoculum + poultry manure enriched compost @ 75 kg ha^{-1} + 75% RDF; F_2C_7: *Trichoderma viride* + urea enriched compost @ 750 kg ha^{-1} +75% RDF and F_2C_9: *Trichoderma viride* + poultry manure enriched compost @ 750 kg ha^{-1} + 75% RDF. All the improved agronomic practices were adopted appropriately. The composts were applied only to amaranthus and only inorganic fertilizers were applied to turmeric. The fertilizer was applied @ 120:60:90 kg N, P_2O_5 and K_2O ha^{-1} respectively. The P_2O_5 was applied basally and N and K_2O were applied as split doses

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at 30, 60, 90 and 120 DAP. The crop was harvested 10 months after planting. The rhizome yield was recorded separately for each plot. The soil samples were collected at post harvest stage of turmeric from each treatment plot. The collected soil samples were shade dried, processed and sieved through 2 mm sieve and stored in polythene bags, for carrying out the analysis. The collected samples were analyzed for their organic carbon content, cation exchange capacity and macronutrients status by adopting standard procedures. The results of the study are presented below.

Results and Discussion

The status of soil available N, P and K after the harvest of turmeric changed significantly due to different treatments imposed to the previous crop of amaranthus. Application of poultry manure enriched banana pseudostem or sugarcane trash composts prepared with microbial inoculum or *Trichoderma viride* @ 750 kg ha^{-1} (F_2C_6) in conjunction with 75 per cent of the RDF significantly increased the available N, P and K status, when compared to the other composts / raw base materials / 100 per cent NPK alone / absolute control. The alkaline $KMnO_4$ – N, Olsen – P and neutral normal NH_4OAC – K status of soil ranged from 142 – 236 kg ha^{-1} (Table 1), 8.40 – 16.72 kg ha^{-1} (Table 2) and 324 – 482 kg ha^{-1} (Table 3) respectively. The composts prepared with banana pseudostem were superior to sugarcane trash. The comparison made among all the composts applied treatments,the F_2C_6 compost of banana pseudostem recorded significantly higher alkaline $KMnO_4$ – N, Olsen – P and neutral normal NH_4OAC-K.

Table 1. Effect of compost on soil available N (kg ha^{-1}) at post harvest stage of turmeric Comparison made between absolute control and RDF

F_0C_0	F_1C_0	CD (0.05%)
142	184	6

Comparison made between raw organics @ 5 t ha^{-1} with 100% RDF and composted organics @ 750 kg ha^{-1} with 75% RDF

Treatments / Organic Sources	F_1C_1	F_2C_2	F_2C_3	F_2C_4	F_2C_5	F_2C_6	F_2C_7	F_2C_8	F_2C_9	CD (0.05%)
Banana pseudostem	198	216	224	210	220	236	207	218	232	6
Sugarcane trash	192	210	218	205	216	225	202	214	220	

Table 2. Effect of compost on soil available P (kg ha^{-1}) at post harvest stage of turmeric Comparison made between absolute control and RDF

F_0C_0	F_1C_0	CD (0.05%)
8.4	10.6	0.47

Comparison made between raw organics @ 5 t ha^{-1} with 100% RDF and composted organics @ 750 kg ha^{-1} with 75% RDF

Treatments / Organic Sources	F_1C_1	F_2C_2	F_2C_3	F_2C_4	F_2C_5	F_2C_6	F_2C_7	F_2C_8	F_2C_9	CD (0.05%)
Banana pseudostem	11.9	15.6	15.8	14.4	15.3	16.7	14.1	15.2	16.6	0.47
Sugarcane trash	11.1	14.9	15.2	13.9	14.7	15.9	13.5	14.7	15.9	

Table 3. Effect of compost on soil available K (kg ha^{-1}) at post harvest stage of turmeric Comparison made between absolute control and RDF

F_0C_0	F_1C_0	CD (0.05%)
324	396	9

Comparison made between raw organics @ 5 t ha^{-1} with 100% RDF and composted organics @ 750 kg ha^{-1} with 75% RDF

Treatments / Organic Sources	F_1C_1	F_2C_2	F_2C_3	F_2C_4	F_2C_5	F_2C_6	F_2C_7	F_2C_8	F_2C_9	CD (0.05%)
Bananapseudostem	422	462	468	445	455	482	437	450	479	9
Sugarcane trash	418	454	460	441	446	470	430	442	466	

The buildup in available nutrients status of soil through organic sources, in this case, the composts of banana pseudostem / sugarcane trash could be attributed to the residual effect of applied fertilizers and to the mineralization of organic sources (or) solubilization of the nutrients from the native source during the decomposition process (Patel and Patel, 2003).

Organic carbon and cation exchange capacity

The data on organic carbon (Table 4) and CEC (Table 5) of soil after the harvest of turmeric indicated that the different treatments imposed to the previous crop of amaranthus significantly affected these parameters. The highest organic carbon content (0.64%) and CEC (20.73 cmol (P^+) kg^{-1}) were associated with the application of 750 kg ha^{-1} of poultry manure enriched microbial inoculum or *Trichoderma viride* compost of banana pseudostem or sugarcane trash with 75 per cent of the RDF and the lowest were found under absolute control.

Table 4. Effect of compost on soil organic carbon content (%) at post harvest stage of turmeric Comparison made between absolute control and RDF

F_0C_0	F_1C_0	CD (0.05%)
0.44	0.50	0.010

Comparison made between raw organics @ 5 t ha^{-1} with 100% RDF and composted organics @ 750 kg ha^{-1} with 75% RDF

Treatments / Organic Sources	F_1C_1	F_2C_2	F_2C_3	F_2C_4	F_2C_5	F_2C_6	F_2C_7	F_2C_8	F_2C_9	CD (0.05%)
Banana pseudostem	0.53	0.60	0.62	0.57	0.58	0.64	0.55	0.58	0.63	0.010
Sugarcane trash	0.52	0.58	0.59	0.55	0.56	0.61	0.54	0.57	0.61	

The increase in the organic carbon and CEC of soil owing to the application of banana pseudostem or sugarcane trash composts prepared with different starter or accelerator with or without enrichment in conjunction with 75 per cent of the RDF to the previous crop of amaranthus could be attributed to their residual effect. The higher organic carbon content could also be ascribed to the fact that these composts can be easily decomposed because of their narrower C/N ratio as reported earliest by Bellaki and Badanur (1994).

Table 5. Effect of compost on soil CEC (cmol (P^+) kg^{-1}) at post harvest stage of turmeric Comparison made between absolute control and RDF

F_0C_0	F_1C_0	CD (0.05%)
0.44	16.50	0.334

Comparison made between raw organics @ 5 t ha^{-1} with 100% RDF and composted organics @ 750 kg ha^{-1} with 75% RDF

Treatments / Organic Sources	F_1C_1	F_2C_2	F_2C_3	F_2C_4	F_2C_5	F_2C_6	F_2C_7	F_2C_8	F_2C_9	CD (0.05%)
Banana pseudostem	17.30	19.60	20.12	18.62	18.90	20.73	18.20	18.82	20.70	0.334
Sugarcane trash	17.16	18.80	19.15	18.12	18.58	19.56	17.90	18.25	19.42	

Conclusion

In general, the performance of poultry manure enriched, microbial inoculum or *Trichoderma viride* composts of bananapseudostem or sugarcane trash @ 750 kg ha^{-1} with 75 per cent of the RDF was quite impressive than that of no manure in enhancing the available nutrient (N, P and K) status, organic carbon content and cation exchange capacity at post harvest stage of residual crop of turmeric.

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