

Technology 2: Enriched Compost Production

Most of the Indian soils are deficient in Phosphorus. Also, yearly removal of P is more than its addition through P fertilizers during continuous and intensive cropping. Bio-solids produced in cities, agro-industries and at farms normally have low nutrient value, particularly of P content. Compost production from these bio-degradable wastes is presently not an economically viable proposition. The traditional technology of composting, if improved in terms of nutrients content, may help in arresting trends of nutrient depletion to a greater extent. Further, the use of mineral additives such as rock phosphate and pyrites during composting have been found beneficial. A phosphocompost/N-enriched phosphocompost technology has, thus, been developed using phosphate solubilizing microorganisms, namely, *Aspergillus awamori*, *Pseudomonas straita* and *Bacillus megaterium*; phosphate rock, pyrite and bio-solids to increase the manurial value compared to ordinary FYM and compost.

Raw material used

- For the production of one tonne of phosphocompost, materials such as 1900 kg organic/ vegetable wastes/straw, 200 kg cow-dung (dry weight basis) and 250 kg phosphate rock (18% P₂O₅) are used.

Methods

- Prepare a base of the heap out of hard, woody materials such as sticks, bamboo sticks etc. This base should be 15 cm thick and 3 m width and 3 m length depending upon the quantity of materials to be composted.
- Place bio-solids over the base made above. The layer should be around 30 cm ± 10 cm thick.
- Sprinkle slurry prepared by mixing cow dung and rock phosphate over the crop residues to moisten the material.
- Make another layer of crop residue and moisten it with slurry.
- Continue with alternate layer of crop residue (30 cm) and slurry until the heap is 1.5 m high. Reduce the area of each layer so that the heap tapers by about 0.5 m high. Reduce the area of each layer so that the heap tapers by about 0.5 m at the top. Add water to the heap so that moisture remains about 60 to 70%.
- Cover the heap with soil or polythene and mix the material after 15 days. Give two turnings after 30 & 45 days. Add water at each turning to maintain the moisture content about 60-70%.
- The compost becomes ready for field application within 90-100 days period.

Nutritional quality

- The phosphocompost contains 2-3.5% P and 17-18 C:N ratio (Table 2.1).

Table 2.1 : Nutrient composition of manure and phosphocompost

Manure	Total N (%)	Total P (%)	C:N ratio
FYM	0.5-0.8	0.32-0.55	22.0-25.0
Ordinary Compost	0.6-0.8	0.55-0.60	22.0-25.0
Phospho-compost	1.2-1.4	2.00-3.50	17.0-18.0

Yield advantage

Field experiments conducted across different states under AICRP on microbiological decomposition under irrigated and rainfed situations revealed that use of phosphocompost can fulfill the P requirement of various crops and farmers can do away with the use of phosphatic fertilizers.

In view of the multi-nutrient deficiency of Indian soils, an effort has been made to enrich manurial value particularly sulphur and N content of the compost.

- To prepare N-enriched phospho-compost, nitrogen as urea @ 0.5-1% (w/w), rock phosphate (12.5% w/w) and pyrite @ 10% (w/w) are added into the composting mixture.
- The N-enriched phospho-compost contains 1.4-1.6% N and 15-20 C:N ratio.

Yield advantage

- Field testing of the N-enriched phospho-compost revealed that when 25% of fertilizer NPK was substituted by Nitro-Phospho-Sulpho-Compost yield advantage over NPK fertilizer was 11.5% in soybean and 2.5% in sorghum. This had also significant residual effect on yield of succeeding wheat crop (Table 2.2).
- This enriched compost also improved root biomass of soybean and sorghum.

Table 2.2: The performance of phosphocompost in the field on soybean-wheat and sorghum-wheat system (pooled over three years)

Treatment	Soybean-wheat		Sorghum-wheat	
	Soybean	Wheat	Sorghum	Wheat
Control	846	1381	1499	957
75% NPK	1011	2148	3706	1285
100% NPK	1094	2476	4138	1820
75%NPK+5t	1220	2713	4242	2450

phospho-compost				
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Economics

- The cost incurred to obtain one kg P_2O_5 through phosphocompost is around Rs.9.00 as compared to Rs.16.0-17.0 supplied through single super phosphate or Diammonium phosphate. Thus, supplying phosphorus @ 60 kg P_2O_5 ha⁻¹ in a crop would save around Rs.400-500.