

Phospho-compost from different organic sources for soil phosphorus management in acidic soils

Shaon Kumar Das¹, R. K. Avasthe¹, Matber Singh¹ and Aniruddha Roy²

¹ICAR-National Organic Farming Research Institute, Tadong, Gangtok, Sikkim-737102

²ICAR Research Complex for NEH Region, Umroi Road, Umiam, Meghalaya

e-mail: shaon.iari@gmail.com

P is immobile in the soil system and fixation is a serious problem in acidic soils. Only labile pool of P has significance to soil fertility. In organic farming systems P is supplied to soils through recycling of on-farm organic materials, viz., compost, animal manure, and green manure crops. Sustainable management of limiting soil P can be enhanced with phospho-compost preparation. Rock phosphate having chemical formula $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaF}_2$ is the primary raw material for producing soluble P fertilizers. It can be applied directly and can solubilize in the soil, making the P available to crops depending on the soil properties, climatic conditions, cropping systems and nutrient management practices. Rock phosphate is recommended for application to acid soils where P is an important limiting nutrient on plant growth. Rock phosphate (18% P_2O_5) is ground and marketed for direct application in acid soils and the particles are such that a minimum of 90% passes through 0.15 mm IS sieve and the balance 10% through 0.25 mm IS sieve. But when it is mixed with compost and finally decomposes for a minimum period of 70-90 days it produces phospho-compost or rock phosphate-enriched compost. Phospho-compost or P-enriched compost can be made by mixing rock phosphate @ 5% to 10% w/w with the composting mass (FYM, goat manure, poultry manure or pig manure). Phosphate solubilizing microorganisms, namely *Pseudomonas striata* and *Bacillus polymixa*; N-fixer (*Azotobacter chroococcum*) etc. may also be used in this composting process to accelerate the decomposition process.

The addition of insoluble source of P to enrich compost is a more rational and practically useful approach since solubilization of insoluble P occurs during composting process. Following compostable materials consisting of crop residues, grasses, weeds, tree leaves, animals feed wastes or their mixtures and cattle dung are used along with P sources. Phospho-compost application is important with respect to soil fertility and plant nutrition. Phospho compost contains 1.5-2.0% N, 2.0-3.0% P with C:N ratio 16-18.

Preparation of phospho-compost is very easy. As per our requirement we have to prepare one *kuccha* or RCC structure where the composting process will be carried out. But the base should be made of hard, woody materials such as sticks, bamboo sticks etc. Waste material like FYM, poultry manure, pig manure or goat manure should be dumped in the structure and mixed properly with rock phosphate. Simply, rock phosphate + raw animal waste + water are used to prepare enrich P compost. We can also add different weeds/fresh crop residue produced in the farm. However, weeds should be considered only before flowering stage. Some plant leaves high

in nitrogen content *Gliricidia sepium*, *Sesbania reticulata*, karanj (*Pongamia glabra*), *Ipomea*, and *Jatropha gossipifolia* etc. can be added into the composting process to increase the nitrogen content and thus the prepared compost is called as nitro-phospho-compost. Generally in this process rock phosphate is used @ 5% to 10% depending upon the situation. Hence, layer wise mixing should be done with rock phosphate along with manure and weeds/fresh crop residue. Add water to the heap so that moisture remains about 60 to 70%. Cover the heap with soil or polythene and add water 15-20 day interval to avoid dryness in the compost.

Compositing of rock phosphates with agricultural wastes is known to increase solubility of rock phosphates. Supplementing composted livestock manure with added phosphorus to make phospho-compost makes the compost into more complete nutrient source for strongly acidic soils. The use of composted livestock manure on strongly acidic soils not only improves soil productivity and soil P but is also a way of recycling waste materials and protecting the environment from pollution. Phospho-compost is eco-friendly, non-toxic organic manure. It increases microbial biota of soil as well as soil health. Farmers can save considerable amount of chemical fertilizers by the application plant nutrients through phospho-compost without any adverse effect on crop yield in acidic soil at low cost.

