

Phosphorus in Organic Agriculture

Acidulating Rock Phosphate with Buttermilk and Enriching Farmyard Manure

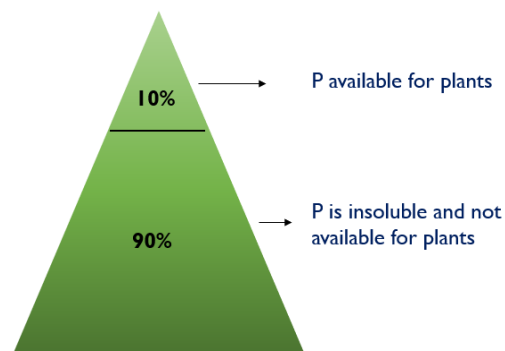


Importance of Phosphorous

Phosphorus is one of the most important essential nutrient for plants together with nitrogen and potassium. Without enough supply of phosphorus, plants are not able to complete their normal production cycle. Phosphorus is one of the vital components of DNA, which contains the genetic data of all living things. Phosphorus also plays a major role in photosynthesis, building proteins, respiration and nutrient transport through plant cells. After Nitrogen, it is the most limiting essential nutrient for plant growth.

Phosphorus Availability to Plants

Though phosphorus is abundant in the soil, more than 90% of it is not available for plants. This is due to the fact that it easily binds to other elements, which makes it unavailable for plants. Overall, the yield of any crop is directly influenced by the amount of nutrient supply, especially phosphorus.



P availability to plants from overall P present in the soil

Phosphorous Deficiency Symptoms in Cotton, Wheat and Soy



Cotton: Leaf discoloration, stunted root and shoot growth, poor boll development



Wheat: Reduced growth irregular maturity, leaf necrosis



Soy: Overall retardance of growth, leaf chlorosis and necrosis

Phosphorus in Organic Agriculture

In most cases crops depend on external phosphorus for efficient production. After every harvest, considerable amounts of the element is lost with the removal of the plants. Thus, it is essential to add additional external fertilizers. In case of organic farming, synthetic fertilizers are prohibited. Natural sources of phosphorus such as bone meal, guano and rock phosphate are some recommended materials rich in phosphorus for organic agriculture. Among the available phosphorus sources for organic farming, rock phosphate is probably the most reliable and accessible one in developing countries. However, its efficiency is limited without acidulation, especially for soils with high pH and low organic matter.

Figures reference :

<https://www.flickr.com/photos/cimmyt/5084216978/in/photostream/>

<https://www.yara.us/crop-nutrition/cotton/nutrient-deficiencies/phosphorus-deficiency-cotton/>

<https://www.yara.us/crop-nutrition/soybean/nutrient-deficiencies/phosphorus-deficiency-soybean/>

Importance of Rock Phosphate Acidulation with Buttermilk and Farmyard Manure (FYM) Enrichment

Rock Phosphate Acidulation with Buttermilk

The basic method for increasing phosphorus availability to plants from rock phosphate is acidulation. Acidulation helps release phosphorus that is bound to other elements in the soil. For organic agricultural systems, the best suited method is partial acidulation of rock phosphate. This is cost-effective and it improves the phosphorus supplying ability of indigenous rock phosphate that has inherently low solubility.

Despite partial acidulation of rock phosphate being one of the most commonly promoted methods, its application is limited and not widespread because of lack of information on this technique and because these acids may not be locally accessible to the smallholder farmers in developing countries. Moreover, in organic farming, the use of synthetic acids is not allowed. There are few proven locally available products which have the potential to acidulate rock phosphate. Of these, buttermilk and mahua vinegar showed the most promising results. After the participatory research with farmers, it was understood that the acidulation with buttermilk is the more accepted and available option of the two.

Farmyard Manure Enrichment

The optimal way to supply acidulated rock phosphate to crops is to mix it with farmyard manure/compost. Enriching manure with acidulated rock phosphate makes it easier to distribute to the plants. Acidulating the rock phosphate with buttermilk and then adding it to manure increases the phosphorus content in the manure and facilitates fast release of the element.

Materials required



2. Buttermilk



1. Rock Phosphate

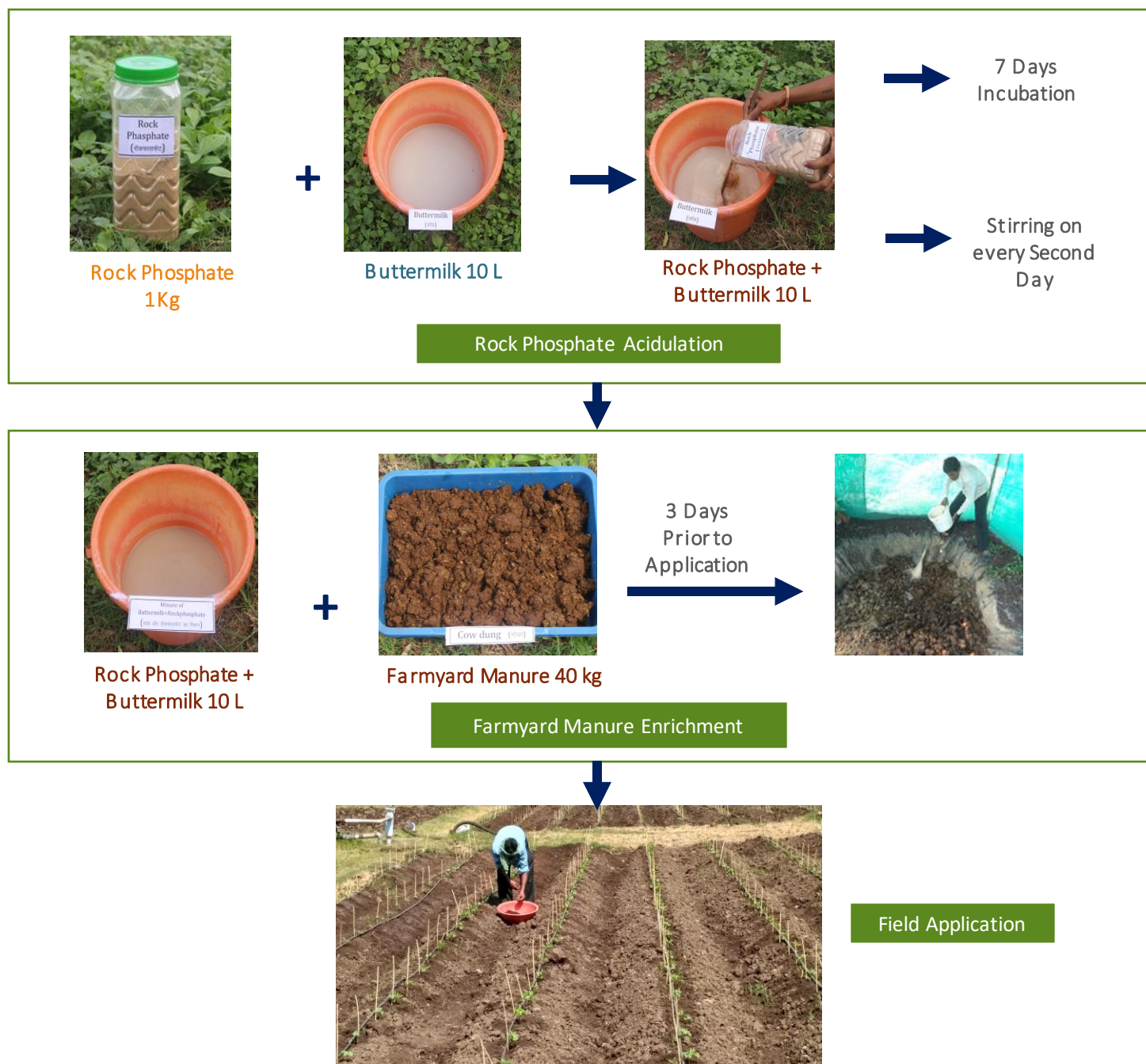


3. Farmyard Manure



Method of Preparation and Application

- ❖ Rock phosphate should be mixed with buttermilk with a ratio of 1:10 (rock phosphate : buttermilk).
- ❖ The mixture should be incubated for 7 days and continuously stirred every two days.
- ❖ The mixture is applied to the farmyard manure pit every week.
- ❖ The mixture of 1 kg of rock phosphate and 10 l buttermilk are added to 40 kg of farmyard manure
- ❖ The recommended amount of rock phosphate enriched manure is 5 tons/ha/year.



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This is based on the publication :

Cicek, H. et al. (2020) 'Partial Acidulation of Rock Phosphate for Increased Productivity in Organic and Smallholder Farming', *Sustainability*, 12(2), p. 607. doi:10.3390/su12020607



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