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Future of Phosphatic Fertilizers

DMR Sekhar*

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*e-mail: dmrsekhar@yahoo.com



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DMR Sekhar

C/o JPMC Plc, P.O. Box : 30, Jordan

It was reported^{1,2} that high grade (34% P_2O_5) rock phosphate mineral in fine size (80% particles passing through 74 micron IS sieve) along with organic manure shows agronomic efficiency as high as Di Ammonium Phosphate (DAP) even in alkaline soils. This technique (Phosphate Rich Organic Manure or PROM) was validated by agricultural scientists through several research projects sponsored by M/s Rajasthan State Mines and Minerals Ltd. in different agro climatic conditions testing a variety of crops in India. During the same period ICAR scientists reported improved agronomic results using low grade (+ 18% P_2O_5 , 90% particles passing through 150 micron sieve) rock phosphate along with organic manure (phospho-compost). It is further noted³ that even low grade rock phosphate mineral can out perform the agronomic efficiency of DAP in saline soils provided the size of the rock phosphate particles is very fine, that is 80% passing through 74 micron mesh and is accompanied by organic manure.

Further research showed^{2,4,7} that fine sized rock phosphate mineral accompanied by N containing fertilizers (instead of organic manure) such as urea, ammonium sulphate, ammonium nitrate also show agronomic efficiency as high as DAP in alkaline soils. These studies indeed question the idea of phosphatic fertilizers containing water soluble P_2O_5 from which the use efficiency of P is reported⁸ to be just 15% in the first year and 1-2% per year in the subsequent years.

Excessive application of chemical fertilizers (that include N containing and other fertilizers) over long periods has also destroyed natural properties of soils by killing soil micro flora and fauna leading to

reduced agricultural production. Thus chemical phosphatic fertilizers pose two fold problems in that on the one hand almost 85% of the applied P is lost for ever which is from a non renewable resource and on the other hand destroys soil micro flora and fauna leading to soil ill health and poor quality of agricultural products.

The current research shows that almost all types of phosphate rocks may be used directly as P fertilizers even in alkaline soils^{9,10} provided the size of the rock phosphate particles are sufficiently fine and the phosphate rock is accompanied by N containing materials of organic or inorganic origin. The finer the grind of phosphate rock particles the higher is the citric soluble P (available P) content⁹ of the phosphate rock. P dissolution from the rock phosphate particles applied to the soils is caused by organic acids released by micro organism (naturally present in the soil or added) and the roots of the plants. The equilibrium of citric soluble P to total P of the rock phosphate applied to the soil (along with N containing materials) is presumably maintained as the plants take up the P from the rock phosphate particles. The beauty of applying finely ground rock phosphate along with N containing materials is that they show^{2,4,6} equal residual effect meaning that the consumption of rock phosphate may be reduced just to half there by leading to the conservation of phosphate mineral.

Fortunately, the Government of India approved PROM containing 10.42 % total P_2O_5 as a fertilizer and included the same in the Fertilizer Control Order (FCO) and unfortunately decision to provide subsidy is yet to be taken to put PROM on equal playing ground with the chemical phosphatic fertilizers. The costs of production of chemical phosphatic fertilizers despite subsidy have reached levels inaccessible to

Corresponding Author

***DMR Sekhar**

e-mail : dmrsekhar@yahoo.com

the farmers. The immediate effect is that the costs of agricultural products/ food items have gone up in the recent times. Clearly DAP is costly and outdated. One possibility in view of the current research is that DAP be mixed with finely ground rock phosphate and other N containing fertilizers to produce complexes of PN or PNS or NPK to reduce the costs without reducing the agronomic efficiency. Government of India should also authorize agencies to sell rock phosphate at subsidized rates to the producers of organic manure so that the manure is converted to PROM.

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