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Short Communication

Nitro PROM using Wool Waste: A Preliminary Study

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Abstract

PROM is produced by co-composting high grade phosphate rock in fine size with natural organic matter. Organic matter can come from a variety of sources say cattle dung, farm wastes such as straw of paddy and wheat or waste from sugar or fruit industries, wool waste etc. Addition of chemical N (Urea, Ammonium or nitrate salts) greatly enhances the agronomic efficiency of PROM. Unfortunately the use of chemical fertilizer is prohibited in organic farming. Therefore an attempt to use wool waste as a source of nitrogen for PROM production has been made by the authors.

Keywords : PROM, wool waste, phosphate rock.

Introduction

Phosphorus is an essential element for all forms life. It is one of the 17 chemical elements required for plant growth and reproduction. It is often referred to as the "energizer" since it helps store and transfer energy during photosynthesis[1]. It is a vital component of the genetic material found in all cells. It is the eleventh most abundant element in the earth's crust. Some of its important functions are:

- Stimulates early growth and root formation and growth.
- Necessary for cell division and DNA & RNA formation.
- Improves the ability of plants to absorb water and other nutrients.
- Stimulates flower blooms and seed development.
- Improves plant strength and the ability to tolerate unfavourable environmental conditions.
- Aids in photosynthesis and food formation.

The common source for commercial phosphorus fertilizers is rock phosphate, a calcium phosphate mineral found as deposits within the earth. Rock phosphate is usually strip mined and then pulverized. The resulting material is treated with sulfuric, phosphoric or nitric acid to produce various soluble phosphates that can be used as fertilizers like monoamonium phosphate, diammonium phosphates and super phosphates.

Plants absorb phosphorus in the form of phosphate ions $H_2PO^-_4$, HPO_4^{-2} and PO_4^{-3}. These phosphate ions react readily with the soil and become part of the soil particles in a process called "fixation". Fixation prevents the leaching of phosphorus, but also changes it to a form that plants cannot use.

A number of research workers studied the direct application of phosphate rock as fertilizer, some times ending up with controversial results[2,3]. Certain amendments to phosphate rock to increase their P availability and also to possibly enhance their rate of dissolution after application to soil may be useful to direct application fertilisers[4,5]. Composting of phosphate rock with agricultural wastes is known to increase the solubility of phosphate rocks and the extent of solubilization of a given phosphate rock varies with kind of waste and the rate of decomposition[6].

It is reported that the process of decomposition may be speeded up by adding nitrogen through oil

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cakes, waste from wool industry or salt petre (a mineral form of KNO_3) or by adding urea (which is not allowed in organic farming)[7]

Materials and Methods

Field experiments were conducted at the Engineering College, Bikaner (Rajasthan) for the session 2005-06 to evaluate the agronomic effectiveness of high grade rock phosphate with a tatal P_2O_5 content of 34% and in 74 micron size (PR 34/74) supplied by M/s Rajasthan State Mines and Minerals Ltd., Bikaner, Rajasthan on the yield response of carrot.

The land was prepared by giving necessary cultural operations like irrigation, ploughing and levelling. The experimental plots of 2m x 2m were replicated thrice and were arranged in randomized block design. The study consists of four treatments, wherein the recommended rate of phosphorus @ 60 Kg. $P_2O_5 ha^{-1}$ was applied through conventional source *i.e.* DAP and through a non-conventional source PR (34/74) together with Biogas slurry at 0.5 t h^{-1} with varying amounts of wool waste. PROM with different quantities of wool waste was prepared well in advance by the usual method[7] and was applied 15 days prior to sowing. The phosphorus dose through conventional sources, DAP, however, was applied at the time of sowing.

Plots were maintained weed free throughout the plant growth. The crop was harvested premature and the biomass (aerial part + underground part) was dried in the sun to a constant weight and its yield in each plot was recorded.

Table 1. Effect of different treatments on biomass of carrot plant in field experiments

S. No.	Treatment	Average Biomass in grams
1.	Soil	143.33
2.	Only DAP, @ 60 Kg h^{-1} P_2O_5	170.00
3.	PR (34/74), @ 60 Kg h^{-1} P_2O_5 + BGS @ 0.5th^{-1} + wool waste @ 25Kg h^{-1}	183.33
4.	PR (34/74), @ 60 Kg h^{-1} P_2O_5 + BGS @ 0.5th^{-1} + wool waste @ 50Kg h^{-1}	273.33

Closing Remarks

The results shown in Table-1 indicate that the highest yield of biomass is obtained in case of PROM treatment containing 50 Kg h^{-1} wool waste. The increase is biomass is surprisingly very high as compared to DAP alone. This results may be helpful in solving pollution problem caused due to woolen industries. Further, wool waste is a good source of nitrogen containing 10 to 13% N.

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