

Short Communication

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A RESEARCH NOTE ON THE PHOSPHORUS SOLUBILITY BY ELECTRO ULTRAFILTRATION (EUF) OF SOME ROCK PHOSPHATE MATERIALS

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The value of a rock phosphate as a fertilizer can be determined in the laboratory. The methods employed at present measures either apatite solubility in neutral ammonium acetate, 2% citric acid, 2% formic acid or use X-ray diffraction technique [2]. However, no general procedure has gained international acceptance [1].

In the present investigations, electro-ultrafiltration technique [3,5] has been employed to determine phosphorus solubility in six rock phosphate fertilizer materials; Lagarban phosphate rock, Calcined-quenched Lagarban phosphate rock Jordan phosphate Di-calcium phosphate, Lagarban phosphate rock + Single super phosphate and single super phosphate. The materials were not incubated in the soil [4,7]. A fully automatic EUF equipment, model 723, was used for extraction of the samples. The total extraction took 35 min. divided into 5 min. intervals. The voltage between the electrodes was 50V for 0-5 min; 200V for 5-30 min. and 400V for 30-35 min. in agreement with the recommendations of [3].

Anode and Cathode filters were of the type EUF 510 and EUF 511 respectively. The anode and cathode extracts were collected separately. The vacuum in the two outside chambers was adjusted so as to allow 50 ml. volumes (material extract + rinse water) per 5 min. extraction time to be obtained. The solubilized phosphorus was determined by method of [6].

Data presented in Table 1, indicate that EUF -P solubility at 20° (200V, 0-30 min.) ranged from 192 to 520 mg/100g of material. This fraction of EUF-P characterized the quantities of phosphorus which was easily available to plants. The EUF-P solubility at 80° (400V, 31-35 min) ranged from 66 to 112 mg/100g of materials. This fraction of EUF-P characterized the quantities of phosphorus which was not easily available to plants. The overall solubility of Di-calcium phosphate was similar to single super phosphate. Considering the quantity of P extracted, it becomes evident that Di-calcium phosphate (612 mg P/100g), Lagarban phosphate + single super phosphate (600 mg P/100g) and single super phosphate (610 mg P/100g) had considerably higher quantity compared to Lagarban phosphate (310 mg P/100g), Calcined-quenched Lagarban phosphate (347 mg P/100g) and Jordan phosphate (258 mg P/100g). The solubility of rock phosphate

TABLE 1. PHOSPHORUS SOLUBILITY (MG/100G MATERIAL) BY ELECTRO-ULTRAFILTRATION TECHNIQUE OF VARIOUS PHOSPHATE MATERIALS (AVERAGE OF 5 REPEATS)

Phosphate materials	EUF-P solubility 20°C, 200V, 0-30 min.	EUF-P solubility 80°C, 400V, 30-35 min	EUF-P total solubility
Lagarban phosphate	226	84	310
Calcinedquenched Lagarban phosphate	253	94	347
Jordan phosphate	193	66	258
Di-calcium phosphate	500	112	612
Lagarban phosphate + single super phosphate	510	90	600
Single super phosphate	520	90	610

is no doubt lower than the superphosphate but these materials could be safely used for maintenance application and for crops which have low phosphorus requirements [8]. According to Lehr [2] and Khasawneh and Doll [8], the low analysis fertilizer use seems unavoidable due to cost of energy and changing phosphorus fertilizer requirements in several areas of agriculture development. The solubility of super phosphate and rock phosphate obtained with this newly developed technique (extraction with EUF-method) must be further tested by incubation in soils differing widely in soil types and plant experiments. Obigbesan and Mengel [4], who reported that in neutral soils, 2 to 10 times as much was extracted from the super phosphate treatments as from the rock phosphate treatments, tested by the EUF technique, in an incubation studies. It thus appears that the EUF method is well suited and desirable to test the solubility of different types of fertilizers.

Key words: Electro-ultrafiltration, Phosphorus solubility, Rock phosphate materials.

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