

Role and the effectiveness of phospho-microorganisms with rock phosphate on growth of soybean in acid sulfate soils

Bunjirtluk JIntaridh and Chaveewan Leaungwuttiviroth

Abstract

Plants on acid sulfate soils are inhibited by Al toxicity and have disturbed nutrient uptake especially for phosphorus. Mitigating soil acidity was investigated by liming, fertilizing the soil to overcome nutrient deficiency problems, and using microorganisms. The role and the effectiveness of phospho-microorganisms with rock phosphate on growth the soybean in acid sulfate soils were studied. The experiments were conducted on Rangsit soil series, Thailand. In the experiment I, effects of VAM (Vesicular Arbuscular Mycorrhizae) with rock phosphate applied to soybeans were studied. The experiment design was a randomized complete block with 16 treatments and 2 replications. The treatments consisted of four rates of rock phosphate (0.03, 0.06, 0.12, 0.24 g P₂O₅/pot) and four microorganism combinations (no microorganism, VAM, *Bradyrhizobium Japonicum*, and VAM + *B.Japonicum*). In experiment II, the effect of phosphate solubilizing microorganisms with rock phosphate applied to soybeans was studied. The experiment design used phosphate solubilizing microorganisms instead of VAM. In experiment I, the height of soybean plants at 65 days was greatest when using VAM + *B.Japonicum* with a rock phosphate rate of 0.24 g P₂O₅/pot and was significantly different from combinations using only rates of rock phosphate at 0.3 g P₂O₅/pot (61.24 cm. and 49.67 cm., respectively). Applying rock phosphate in combination with VAM + *B.Japonicum* increase plant nutrient uptake for N, P, K, Ca, and Mg. Soil pH, % OM, P, Ca, and Mg in soil increased after using rock phosphate at 0.24 g P₂O₅/pot in combination with VAM + *B.Japonicum*, but Fe and Al decreased. In experiment II, the height of soybean at 65 days was highest when using rock phosphate at 0.24 g P₂O₅/pot in combination with phosphate solubilizing microorganisms and *B.Japonicum*, which was significantly different from using rate of rock phosphate at 0.03 g P₂O₅/pot (64 cm. and 48.33 cm., respectively). N, P, and K increased in plant tissue after using rock phosphate in combination with phosphate solubilizing microorganisms compared with rock phosphate alone, however, Ca and Mg did not show any difference. For soil analysis, the %OM, K, and Mg did not show differences. Soil pH, P, and Ca increased while Fe and Al decreased. It was concluded that both experiment concluded that applying VAM (Vesicular -Arbuscular Mycorrhizae) or phospho-microorganisms combination with rock phosphate on growth the soybean in acid sulfate soils resulted increasing height, nutrient uptake, and soil fertility.

Keywords : acid sulfate soils, microorganisms, Vesicular Arbuscular Mycorrhiza, phosphate solubilizing microorganisms, *Bradyrhizobium Japonicum*