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NUTRIENT UPTAKE IMPROVEMENT OF FORAGE LEGUMES BY ROCK PHOSPHATE FERTILIZATION AND ARBUSCULAR MYCORRHIZAL FUNGI INOCULATION

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ABSTRACT

A series of experiments were carried out during 25 months consisting of greenhouse and field experiments and laboratory analysis. Centro (*Centrosema pubescens*) and puero (*Pueraria phaseoloides*) were inoculated with arbuscular mycorrhizal fungi (AMF) and without AMF and were fertilized with rock phosphate (RP) at dosage of 0, 100, 200, 300 and 400 kg P_2O_5/ha. Split in time in completely randomized design (CRD) in three replicates was used for greenhouse experiment and in completely randomized block design (CRBD) was used for field experiment. The significant difference among treatments was tested using Duncan Multiple Range Tests (DMRT). The results of greenhouse experiment showed that N and P uptake of puero were higher than centro. Nitrogen and P uptake of mycorrhizal legumes were higher than non-mycorrhizal legumes. Rock phosphate fertilization increased N and P uptake of mycorrhizal legumes approximately 9, and 22 times than non-mycorrhizal legumes respectively. The result of field experiment showed that N and P uptake of centro and puero increased after defoliation. However, N and P uptake of puero were higher than centro. Rock phosphate fertilization increased N and P uptake of legumes. Nitrogen and P uptake of legumes were not significantly different for both with or without AMF inoculation.

Keywords : *Centrosema pubescens*, phosphor, mycorrhiza, *Pueraria phaseseoloides*

Centro (*Centrosema pubescens*) and puero (*Pueraria phaseoloides*) are important forage legumes as protein and mineral sources for ruminant livestock in the tropics (Jones, 1990). However, most of the lands that are used for forage production belong to the non productive lands characterized by lack of P content and low soil pH.

The combination of persistent legumes and superphosphate fertilization have been used widely to improve the pasture productivity. However, the high cost of superphosphate fertilizer to be a limiting factor for the pasture productivity. Rock phosphate (RP) fertilization and arbuscular mycorrhizal fungi (AMF) inoculation become a promissing technique.

Centro and puero are suitable host plant for AMF culture (Lukiwati & Supriyanto, 1995) and persistent in non productive land (Latosolic soil) (Lukiwati *et al.*, 1994). Rock phosphate fertilization increased the productivity of mycorrhizal legumes (Lukiwati *et al.*, 1995). The constraint of mycorrhizal technology application in forage crops is caused by limited information on the role of AMF especially in the production and nutritive value improvement of forage crops in Indonesia.

The objective of the research is to study the effect of RP fertilization and AMF inoculation on N and P uptake of centro and puero.

MATERIALS AND METHODS

The experiments were carried out in the greenhouse and in the field conditions. Sterilized soil by gamma irradiation was used for greenhouse experiment. Each pot contained 4 kg air-dry weight soil inoculated with 50 *Glomus* sp spore according to the assigned treatment. Unsterilized soil was used for field experiment. Each plot (4 m x 5 m) was inoculated with 100 g of soil inoculum/hole plant according to the assigned treatment. Rock phosphate and KCl fertilizer (100 kg K_2O/ha) were applied at the time of planting. Urea was added (50 kg N/ha) at 3 weeks after planting for greenhouse and 4 weeks after planting for field experiment.

Split in time in Completely Randomized Design (CRD) for greenhouse and in Completely Randomized Block Design (CRBD) for field experiment in three replicates were used and tested using Duncan's Multiple Range Test (DMRT) by SAS program. The main plots consisted of three combination treatments as follows (1) legume species (centro and puero), (2) AMF inoculation (without and with AMF inoculation), (3) RP fertilizer (0, 100, 200, 300 and 400 kg P_2O_5/ha).

The defoliation period was used twice for greenhouse and three times for field experiment. The first defoliation was conducted three months after planting and the next defoliation was conducted every two months after defoliation. Variable observed were N and P uptake of centro and puero.

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