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Growth response and nitrogen fixation of *Phaseolus lunatus* (Lima bean) with the inoculation of AM fungi and *Rhizobium*

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ABSTRACT

The indigenous arbuscular myeorrhizal (VAM) fungi was recovered from soils at the crop research centre. University of Agriculture Sciences, Dharwad. Plants were able to promote growth of *Phaseolus lunatus*. Introduced *Glomus mosseae* were not showed significant effect on growth. The dual inoculation with indigenous *Glomus fasciculatum* depicted a growth response was much grater gain with single inoculation. The tripartite system, indigenous AMF and *Rhizobium phaseoil* improved plant growth and also resulted in increased plant height, plant dry matter, modulation number. N and P content of lima bean that in non-inoculated plants with either AM-*mycorrhiza* or *Rhizobium* alone.

Key words : *Indigenous AM fungi, Glomus fasciculalum, G. mosseae. Rhizobium, Phaseolus lunatus*

INTRODUCTION

Research in the last three decades has established that *Arbuscular mycorrhizal* (AM) fungi can improve plant growth through increased uptake of phosphorus, especially in soil of low fertility (Harley and Smith, 1983), Asai (1944) demonstrated that several legumes grow poorly and failed to nodulate in autoclaved soil unless they were mycorrhizal. This was probably due to phosphorus deficiency since an adequate phosphorus supply are important for satisfactory nodulation and nitrogen fixation (Subbarao *et al.*, 1986), Ross and Harper (1984), showed that the growth and yield of nodulating soybean increased after inoculation with *Glomus mosseae* in fumigated sil. Inoculation of crop plants with *Arbuscular mycorrhizal* fungi and *Rhizobium* was found to has synergistic beneficial effect on nodulation, nitrogen fixation and plant growth (Cruz *et al.*, 1988; Lakshman, 1998). Most agricultural soils possess an indigenous VAM spore strains, the role of which in crop productivity has been examined in sufficient details (Mathew and Johri, 1989). Therefore, a suitable host endophyte combinations, however required to obtain the better results. This object can be achieved through a better understanding of the effectiveness of AM fungi. *Phaseolus lunatus* Linn (Lima bean) is a herbaceous annual legume, rich in protein mineral and carbohydrates, it is primary grown for green pods which is cooked as vegetables, as dry beans it is a pulse. The present study was aimed at examination the role of indigenous AM fungi on growth of *Phaseolus lunatus* and evaluating their interaction with introduced *Glomus mosseae Glomus fasciculatum* and *Rhizobium phaseoli*.

MATERIALS AND METHODS

Field survey work were carried in different locations of lima bean grown centers of University of Agricultural Sciences, Dharwad. The geographical location of Dharwad is between 15"20 to $15^0$28 north latitude and 75" to 75"70 east longitude. Minimum eight rhizoshperic soil samples and twenty five roots were collected from each individual plants growing in the fields. A summary of the analytical details of the field soil consist of pH : 6.8. organic matter: 1.72 (%), total nitrogen : 810 (ppm), total phosphorus : 491 (ppm) and total potassium : 563 (ppm). Randomly selected root samples were cut into lcm segments and cleared with 10 % KOH and strained with 0.05 % tryphan blue in lactophenol. Following the procedure of Phillips and Hayman (1970). The percentage of root length by Giovanetti and Mosse (1980). The number of AM spores per 50g soil was calculated by adapting the procedure of wet-sieving and decanting technique Gerdemann and Nicolson (1963). Identification of AM fungal species was done following the keys suggested by (Morton, 1988; Schenck and Perez, 1990).

The soil used in pot experiments was a phosphorus deficient 2.4 ppm available extract with NH_4F + HCl sandy loam. pH 6.8. Two day old seedlings were transplanted in pots containing 5km soil sterilized in 5 % methyl bromide. Four triplicate pots were maintained in glass house at 25-27^0C temperature, watered alternatively. *Rhizobium* inoculation was done by treating the field bean seeds with a peat based culture before sowing. Mycorrhizal inoculum (introduced/indigenous) was applied to the planting hole in the corresponding pot and it consisted of spores, hyphae and infected fragments thoroughly homogenized and was divided into similar