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The effect of mycorrhizal fungi on Italian ryegrass in Guangzhou paddy field

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Key words : mycorrhizal fungi, Italian ryegrass, root colonization, phosphorus fertilizer, soil sterilization

Introduction As a feed, Italian ryegrass (*Lolium multiflorum*) has many advantages such as containing more crude protein. Moreover, Italian ryegrass winter cropping can promote the output of succeeding rice. This study evaluated the effect of mycorrhizal fungi on the growth of Italian ryegrass, as well as its performance at different rates of phosphorus fertilizer with or without soil sterilization.

Materials and methods The pot experiment was conducted during the dry season (November 2005–February 2006) with Italian ryegrass (*Lolium multiflorum*), in laterite soil from Guangzhou paddy field, China. A three-factor experiment was designed: the plants were grown in different soil treatments as sterile (S) or non-sterile (NS), different inoculants as single inoculants (*Glomus mosseae*, SI), multiple inoculants (*Glomus caledonium* + *Glomus caledonium* + *Glomus versiforme*, MI) or non-inoculants (NI), and different concentration of phosphorus fertilizer as 0 mg/kg (CK), 30 mg/kg (LP), 60 mg/kg (MP), 100 mg/kg (HP). Plants were harvested after 67 days of growth. Roots were assessed regarding root colonization according to Phillips and Hayman (1970) with some modifications. The performance of Italian ryegrass was studied also.

Results The plants inoculated with single fungus had higher root colonization compared with multiple fungus ($p < 0.05$), and the plants grown in sterile soil had higher root colonization than in non-sterile soil ($p < 0.05$) (Figure 1). When inoculated plants were compared to non-inoculated plants, the mycorrhizal fungi had a positive effect on growth of ryegrass ($p < 0.05$) (Table 1). High P fertilizer improved growth ($p < 0.05$), but high levels of P negatively correlated with root colonization (Figure 1).

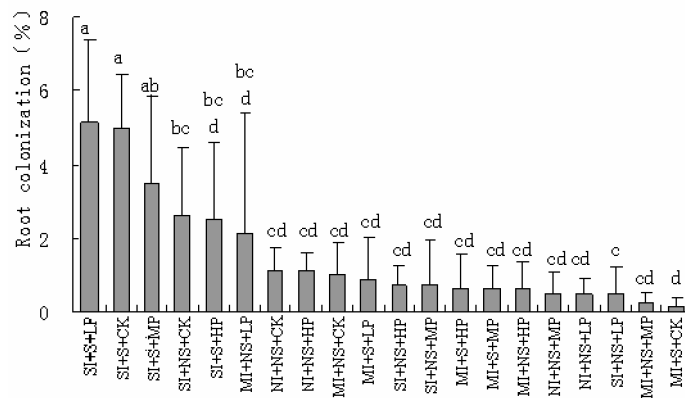


Figure 1 A M total colonization of IRG in the pot culture experiment.

Table 1 Correlations between AM colonization and growth of IRG (Pearson Correlation, Sig. 2-tailed, N=80).

	Root conolization
Above-ground biomass	0.267 [*]
Underground biomass	0.281 [*]
Plant height	0.287 ^{**}
tillers	0.223 [*]

* : $p < 0.05$, ** : $p < 0.01$.

Conclusions Ryegrass was more sensitive to single inoculants (*Glomus mosseae*), but root colonization and mycorrhizal dependency was universally low, which probably is because ryegrass has well-developed root systems which can uptake nutrients well without mycorrhiza. Plant biomass, height and the number of tillers strongly increased in the presence of mycorrhiza. There seems to be potential to improve the plant growth by inoculating with mycorrhiza. Nevertheless, it is still essential to find the balance between P fertilizer and mycorrhizal fungus. Soil sterilization had a significant positive effect on the root colonization and growth parameters of plants, which possibly resulting from the absent competition of indigenous soil microbes.