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Microbial Inoculants for Sustainable Agriculture - Growth Promotion of Pigeon Pea (*Cajanus cajan*) and Finger Millet (*Eleusine coracana*) by Arbuscular Mycorrhizal Fungi and its Hyphal Spread

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Abstract

Rainfed farms on marginal lands will be most affected by scarcity of non-renewable resources such as fertilisers. Mutualistic root organisms like arbuscular mycorrhizal fungi (AMF) can substantially contribute to a more resilient, ecointensified dryland farming system. We are interested to study the possibility to use AMF as “biofertilisers” in mixed-cropping schemes in Indian agriculture, planting pigeon pea (*Cajanus cajan*) seedlings pre-inoculated with AMF into a field sown with finger millet (*Eleusine coracana*). To study the potential of the AMF to spread from AMF-inoculated pigeon pea to uninoculated finger millet seedlings, we established experimental microcosms in the greenhouse, in which the pigeon pea and two finger millet plantlets were kept in separate pots, connected by a soil bridge of 5 or 12 cm length inaccessible to roots but accessible to fungal hyphae. In the longer system with *R. fasciculatus* dry biomass (63.4% more than control) and dry panicle weight (81.4% more than control) of the second finger millet was significantly increased. With *R. irregulare* the dry biomass of the first finger millet plant was significantly decreased (45.8% less than control). However hyphal growth of the two species was similar. Surprisingly in the short system the third species, *C. etunicatum*, promoted growth of the second finger millet more than the other inoculants (34% more than control).

We found that AMF hyphae could spread readily through the soil bridges from the roots of pigeon pea to the roots of finger millet, covering distances of up to 35 cm in 20 weeks, and have growth promoting effects there. Competition effects with pigeon pea only allowed the second finger millet to benefit from the symbiosis with AMF. We conclude that the row distance between the crops and the choice of AMF species play a crucial role for the application of AMF as biofertiliser.

Keywords: AMF, biofertiliser, finger millet, mixed cropping, pigeon pea