

ABSTRACT

Arbuscular Mycorrhiza Fungi (AMF) are known to mobilize the unavailable forms of soil nutrients into mobile forms enhancing nutrient uptake and growth of plants under stressed conditions. This study was conducted to assess the abundance and the diversity of AMF associated with vegetables grown conventionally in vegetable –vegetable/ potato cropping systems in Nuwaraeliya district and organically managed vegetable farms in Welimada, and to screen the best suited AMF inoculants for leeks under field conditions. Plant samples of each leeks, carrot and lettuce grown under each conventional field added with either poultry manure (PM) (n=5) or cattle manure (CM) (n=5) and organic fields (OM) (n=3) were collected along with rhizosphere soils. Fresh roots were assessed for AMF infection. Fresh or air dried soils were assessed for pH, total C, available N and P, total P and selective metals, and AMF spore abundance. Twenty different AMF spore types were multiplied using leeks as the host plant on a sand -coir dust medium. The infected roots of leeks and spores along with the growth medium were then introduced to a fresh medium and leeks seedlings were grown adding with liquid fertilizers. The best AMF inoculants for leeks were further screened in a soil medium by transplanting seedlings grown in nursery trays containing sand -coir dust medium and AMF inoculants. In all three pot experiments, three months – old plants were uprooted and biomasses were recorded root infections with AMF were assessed in the pot experiment with soil. Seedlings for the field experiment were raised in sand coir dust medium. One field experiment each under conventional and organic practices was conducted for leeks in Rahangala and Welimada, respectively. The plant shoot and root biomass, P, N, K and Mg uptake and AMF infections were assessed at harvest.

The available P and N contents of the rhizosphere soils of the conventional farms varied between 70 and 149 mg kg⁻¹ and between 109 and 208 mg kg⁻¹, respectively. The mean total P varied from 239 to 555 mg kg⁻¹ soil in rhizosphere soils and significant differences were observed between PM, CM and GM added fields in rhizosphere soils of leeks and carrots. The AMF infection remained above 50% in all three crops and significantly higher infections were observed for leeks and carrots grown in organically managed fields than the respective plants grown in conventional fields. The AMF infection in the conventional fields negatively correlated with available P, total P and positively with NH₄⁺. About 22 spore types

were isolated from the conventional fields whereas only six predominant ecotypes were observed in the organic farm. In pot culture, spore types C, '12' and '17' have shown above 72% increase in shoot fresh weight in comparison to the non-inoculated plants and infection rates were also increased from 40% to 97%.

In the field experiment, leeks inoculated with AMF and grown with conventional practice showed about 100% root infection, significant increase in the uptake of P, N and Mg and 43-110% yield increase over the non-inoculated treatment with recommended fertilizer. AMF infection rates correlated positively with shoot and root biomass and N and Mg concentrations in shoots but not with P. The same positive impacts of AMF inoculants were observed in the organically managed fields on yield (36-171% increase) with significant increases in the P, N, K and Mg concentrations in the shoot. Spore types 8 and 12 of conventional farms and one from organic fields ('C') performed best in the conventional field whereas spore type 17 and 'C' performed best in the organic farm. Results revealed that application of best performed AMF ecotypes is a viable option to mobilize reserved forms of nutrients, particularly P and Mg in studied soils and increase yields of leeks.

Keywords : Animal Manure, Arbuscular Mycorrhiza Fungi, AMF inoculants, Leeks, Magnesium, Nitrogen, Phosphorus, Potassium

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