Trejo, D., Guadarrama, C., Lara, L; Jiménez, T; and Barois, I.Fungi in lily (Lilium longiflorum Effect of agricultural practices on growth and diversity of arbuscular mycorrhizal Thunb) cropping. International Conference on Mycorrhiza , Belo Horizonte, Brazil, from the 09th to the 14th of August 2009

# Effect of agricultural practices on growth and diversity of arbuscular mycorrhizal fungi in lily (*Lilium longiflorum* Thunb) cropping.

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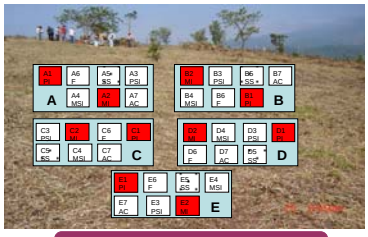
"Conservation and Sustainable Management of Below ground Biodiversity"
BGBD. Financed by GEF-UNEP (GF/2715-02-4517- GF/1030-02-05 )

## INTRODUCTION

**Agricultural practices affect arbuscular mycorrhizal fungi (AMF), as has been indicated in studies of the functionality of AMF in agroecosystems. In general, these studies have shown that the abundance of AMF and the efficiency of colonization of roots and the promotion of plant growth decrease over agricultural practices intensification (Oehl *et al*; 2003). However, little is known about the effect of agricultural practices, diversity of species, and the structure of communities of AMF. A recent study about the effects of conventional practices versus low input agriculture revealed that different agricultural practices do not affect AMF communities significantly (Franke-Snyder *et al*., 2001). The Tuxtla region in the last few years has suffered severe deforestation, which has caused loss of the microbiota diversity and fertility of these soils. The reincorporation of beneficial organisms such as nitrogen fixing bacteria and AMF to deteriorated soils improves the quality of them, and consequently plant development. A direct application of these kinds of organisms in commercial crops would require great amounts of inoculum. Therefore, the aim of the present work was to find out the diversity of AMF communities under different agricultural practices and the effectiveness of them on the reincorporation of arbuscular mycorrhizal fungi to crop fields.**

## MATERIALS AND METHODS




Arrangement of treatments

Soil solarization

Cultivation of *M. pruriens* and *P. erosus*


Inoculation of AMF

### Description of treatments

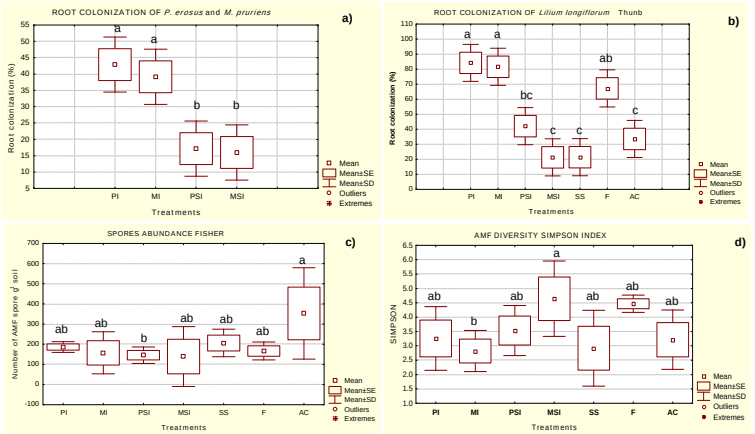
| Tratamientos | Descripción |
|---|---|
| 1 | One year rotation of lily with *Pachyrrhyzus erosus* inoculated with AMF (PI) |
| 2 | one year rotation of lily with *M. pruriens* inoculated with AMF (MI) |
| 3 | one year rotation of lily with *P. erosus* without inoculation (PSI) |
| 4 | one year rotation of lily with *M. pruriens* without inoculation (MSI) |
| 5 | monoculture of lily with solarization plus incorporated cow manure (SS) |
| 6 | Culture according to local agricultural practices (F) |
| 7 | Culture without rotation and without local agricultural practices (absolute control) (AC) |

Collection of soil and roots with AMF

**The percentage of colonization was assessed (Giovannetti y Mosse, 1980), spores were extracted (Gerdemann and Nicolson, 1960). The taxonomic identification was done according to similar morphological characteristics and using The International Culture Collection Of Arbuscular And Vesicular Arbuscular Mycorrhizal Fungi (INVAM) as reference and specialized literature. The diversity index of Shannon-Wiener (H') and Simpson was evaluated through the "Diversity" software. An analysis of variance was carried out with STATISTICA software and Tukey's means test (*P<0.05*).**

## RESULTS AND DISCUSSION

**Two months after inoculation of *P. erosus* and *M. pruriens*, significant differences were found *(P≤0.05*) among inoculated and non-inoculated treatments (treatments 1 and 2) for the percentage of mycorrhizal colonization (Fig. 1a). 8 months later, in lily roots statistically significant differences were found among treatments, the better treatment being the ones in which the mentioned microorganisms were introduced through *P. erosus* and *M. pruriens* (Treatments 1 and 2) (Fig.1b). and the lowest percentages of colonization in solarized soils, these results agree with the results reported by Camprubí *et al* (2007) Solarization reduces AMF population in the soil indirectly reducing weed and pathogen populations, however, AMF maintain propagules of infectivity. Statistically significant differences were found in the spores abundance in lily according to Fisher's test (α 0.05) The greatest amount of spores were found in treatment control and the least amount in non-inoculated treatments with previous culture of yam bean and mucuna without inoculation ( Fig 1c). Samples of rhizospheric soil of lily showed statistically significant differences for spores abundance in accordance with Fisher's test (α 0.05) 11 morphospecies were identified, based on their morphological characteristics, found in 4 of the treatments (1,3,6,7) and only 10 in the remaining three (2, 4 y 5). Three generalist species were found since they appear with high abundance in all treatments sampled (*Glomus* sp1, *Glomus* sp2 *Acaulospora* sp1) (Fig. 1e); a similar tendency in the spores abundance was observed in all treatments, except for the solarized plus manure where the specie *Acaulospora* sp5 appears in 40% of total spores counted. These results showed no significant differences for the Shannon–Wiener index (1.6787±1.26), but for Simpson (4.6431±2.8211) (Fig. 1d). Results show that inoculation throughout legumes in rotation with lilies might be an alternative to the reintroduction of AMF to disturbed soils.**



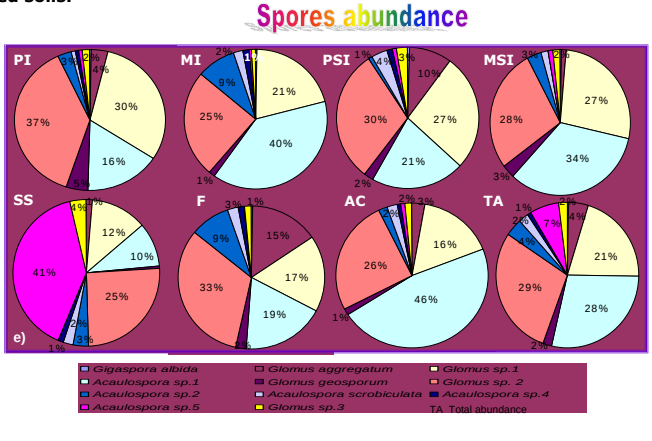




**Figure 1a. Percentage of mycorrhizal colonization in *P. erosus* in *M. pruriens;* b). Percentage of mycorrhizal colonization in *Lilium longiflorum*; c) Spores abundance in rhizosphere of lily, eight months after inoculation in field; d) Simpson's index of the number of species detected in the seven treatments. Bars show the standard error. Values of probability are given through Fisher's test (α 0.05) and e) abundance of species by treatment.**

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