

# Disturbance and land use effect

# on functional diversity of the mycorrhizal fungi

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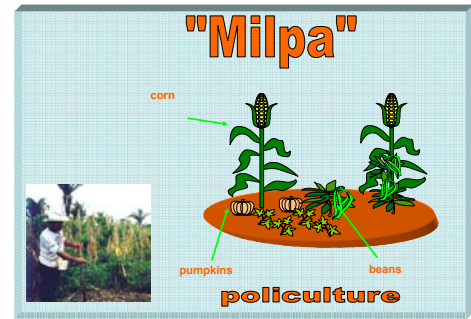
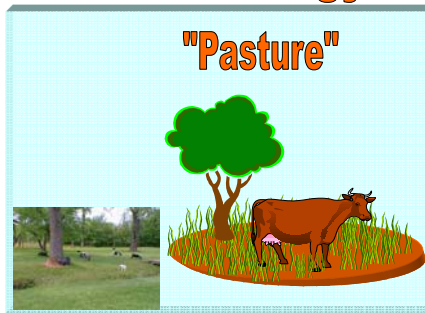
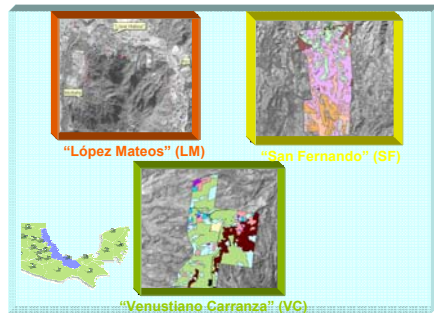
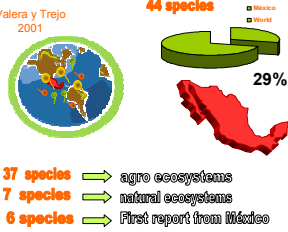
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## Introduction

Disturbance and land use effect on functional diversity of the mycorrhizal fungi. 5th International Conference on Mycorrhiza (ICOM5). Julio 2006

Mexico is a megadiversity country, and occupies the fourth place in plant biodiversity. Around 22 000 plant species have been reported and there is an estimation that 80% -95% of these plants, are symbiotic to AMF. It is possible that the taxonomic and physiological diversity of AMF be one of the highest in the world. One of the most interesting areas in México is Los Tuxtlas Biosphere Reserve; this region is characterized by its notable plant and animal life diversity and is the northern geographic limit of the moist Neotropical forest in North. America. Many tropical plant species, are obligate dependent on and highly responsive to mycorrhizal fungi in their natural habitats, especially on phosphorus-poor, lowland humid tropical soils (Janos, 1980). In order to increase understanding of mycorrhizal dynamics and their roles in ecosystem productivity and forest regeneration, knowledge on how soil disturbance due to various land uses affects mycorrhizal propagules and activities is imperative

## Methodology



### SITES

### USE LAND SOIL

This study was conducted in the biosphere reserve "Los Tuxtlas" Three field sites (windows) were studied according to disturbance gradient: López Mateos (LM) (75% of forest cover), San Fernando (SF) (50% forest cover) and Venustiano Carranza (VC) (25 % forest cover). Two different land use was consider : Pasture and "milpa". Soil samples (four replicates per land use, per site; plot size ~ 114m<sup>2</sup>) were taken at the end of the rainy season. In each plot, sixteen core samples were taken at 20 cm depth by using a soil core. The soil of the sixteen samples was carefully grounded by hand and mixed. Spores were separated from 100 g of soil by wet sieving and decanting (Gerdeman and Nicholson 1963) and were separately characterized by morphospecies and then counted. The spore number was counted from soil. In addition, the taxonomic diversity of AMF through the Shannon-Weaver diversity index, the root AMF-colonization in trap plants was assayed after 4 months, the mycorrhizal potential infectivity (MIP), and the mycorrhizal growth reponse (MGR) and propagule viability were also determined

## Results

- **AMF species found at field sites.** On the basis of morphological criteria, 46 morphospecies could be distinguished, right now only 22 species could be identified unequivocally according to descriptions in the literature
- **AMF species found at land use soil.** 26 morphospecies were present in all the sampled sites, where 12 of them were exclusively found at the "milpa" site, and 8 were only found at the Pasture.
- **Species diversity.** AMF diversities expressed by the Shanno-Weaver diversity index, at each use land soil and site, did not significantly differ.
- **Spore viability.** Main effects of site and use land soil were significant at  $P < 0.001$ . ( Fig. 1a and 2a)
- **Colonization.** Significant effects ( $P < 0.001$ ) were observed for both Site and Use land soil (Fig.1b and Fig.2c).
- **AMF spore abundance.** The spore abundance was higher at the pasture as compared to the "milpa" use land soil (Fig. 2a). Nonsignificant differences were observed among sites.
- **Mycorrhizal Growth Response (MGR).** AMF species from LM enhanced plant growth response which ranged from 74.1% to 194.5%. In contrast, AMF from VC did not significantly enhanced plant growth.
- **Mycorrhizal infection potential (MIP).** AMF from VC had lower MIP than those AMF from LM.

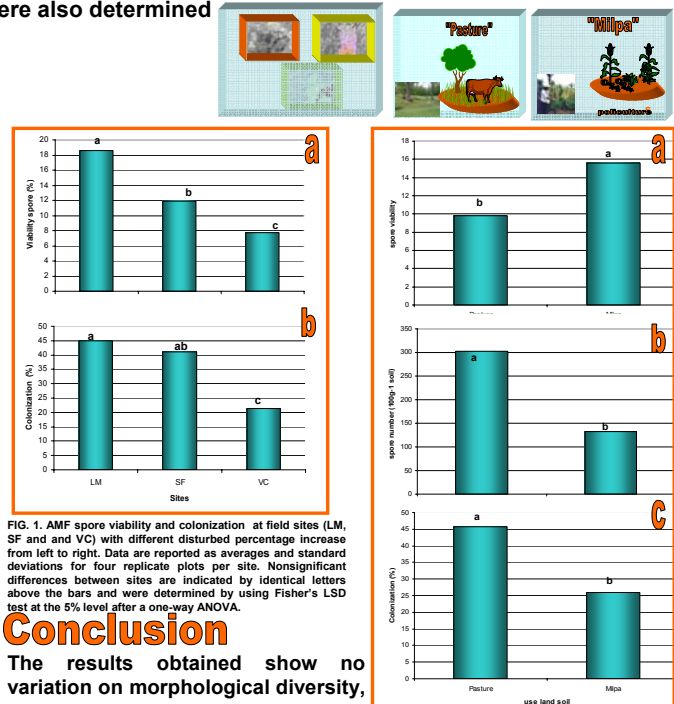


FIG. 1. AMF spore viability and colonization at field sites (LM, SF and VC) with different disturbed percentage increase from left to right. Data are reported as averages and standard deviations for four replicate plots per site. Nonsignificant differences between sites are indicated by identical letters above the bars and were determined by using Fisher's LSD test at the 5% level after a one-way ANOVA.

## Conclusion

The results obtained show no variation on morphological diversity, however there is a tendency in the AMF functional diversity leading us to think to a larger perturbation and smaller functionality. There is a need to continue research on this line to prove that a disturbance on soil affects functional diversity.

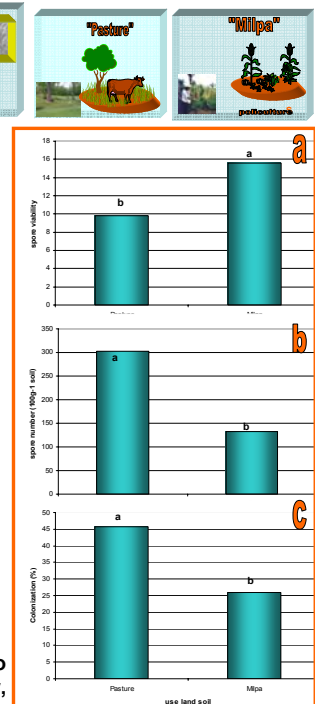


FIG. 2. AMF spore viability, spore abundance and colonization in different land use (Pasture and "milpa"). Data are reported as averages and standard deviations for four replicate plots per site. Nonsignificant differences between sites are indicated by identical letters above the bars and were determined by using Fisher's LSD test at the 5% level after a one-way ANOVA.



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## Disturbance and land use effect on functional diversity of the mycorrhizal fungi.

Dora Trejo, Isabel Barois, Wendy Sangabriel, Lucia Varela, Liliana Lara, Ramon Zulueta y Juan Ruiz

The biodiversity of AMF in Mexico has not been extensively studied. Even though taxonomic studies have been made that show the presence of 29 % of the reported species in the world, the knowledge about their functional diversity is poor. The aim of this study was compare the impact of disturbance and functional diversity of AMF at different sites. Three sites were selected for this study according to disturbance gradient and land use: López Mateos (LM), San Fernando (SF) and Venustiano Carranza (VC) (with low, medium and high disturbance respectively). They are located in the "Los Tuxtlas" Biosphere Reserve in the state of Veracruz. The land use in each site includes, "milpa" and pasture. High percentages of colonization and viability of spores were found in the LM soils, 100 % of the pasture soils have a high MIP, the fungi mixtures coming from that site promote the highest GRM with increases from 74.11 % to 194.59 % over the control treatment. SF soils have high percentages of colonization and viability of spores, only 20 % had a high MIP and their GRM promotes increases from 14.66 % to 120.36 %. Soils from VC have the lowest percentages of colonization and viability of spores. Only 10 % of the soils have a high MIP and their GRM was not better than the control. These results make to suppose that the soil disturbance affects in a negative way the functionality of the AMF.