



Assessing the Effect of Management Practices on Soil Microbial Communities in a Vertisol Using Enzymes and ¹⁵N-DNA Stable Isotopic Probing Techniques

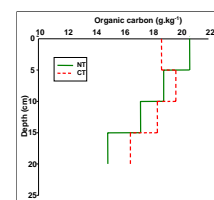
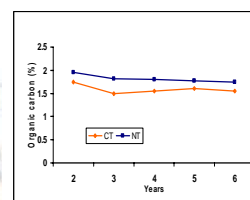
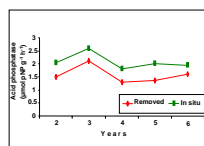
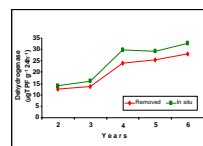
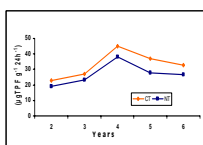
Mingrelia España^{1,2}, Belkys Rodriguez², Ellen Kandeler³, Gary Bending⁴ and Georg Cadisch¹

Introduction

- ❖ Agricultural management practices have been shown to cause significant effects on microbial activity, population structure, and on their functions.
- ❖ The quality of plant residue is considered as primary importance for the development of microbial populations
- ❖ Stable isotopic probing (SIP) offers a new technique for identifying of microorganisms that are actively involved in specific metabolic processes

Objective 1

To evaluate the effect of different management practices (tillage, residues and cropping systems), on soil enzymes activities and organic carbon content in a long-term field experiment

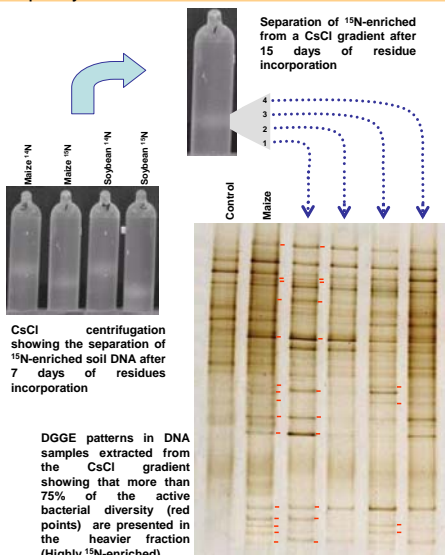
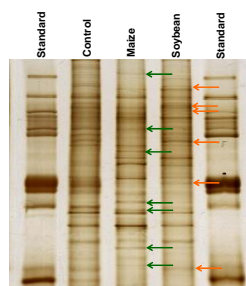


Materials & Methods

- ❖ Soil samples were collected during five years from a long-term experiment conducted at Aragua state in Venezuela
- ❖ The soil is a Vertisol (Typic Haplusterts), with a clay loam texture, pH (H₂O) 6.7 and an OC content of 1.52 %
- ❖ Dehydrogenase and acid phosphatase activities were measured according to Casida et al (1964) and Tabatabai & Bremner (1969) respectively

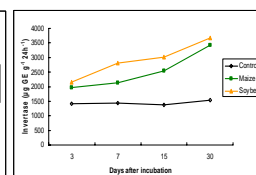
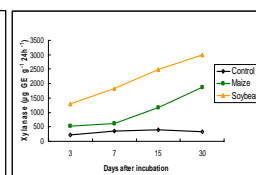
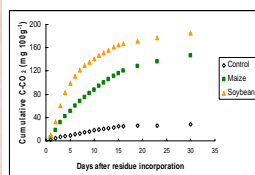
Objective 2

To identify the active bacterial community involved in decomposition of crop residues of different quality



Materials & Methods

- ❖ Highly ¹⁵N-enriched plant residues (95 at%) of different quality i.e. maize (C:N 32) and soybean (C:N 15), were mixed (1%) with soil samples from the same field experiment and incubated for 30 days (25°C)
- ❖ CO₂ evolution was measured using a IRGA
- ❖ Invertase and xylanase activities were measured according to Schinner and von Mersi (1990)
- ❖ DNA was extracted after 7, 15 and 30 days and centrifuged in a CsCl gradient (69h at 140K g)
- ❖ The DNA was analyzed by DGGE after PCR reaction using general bacterial primers (F984GC / R1378)



Conclusions

- ❖ Conventional tillage (CT), presented not only higher enzyme activities, but also reduced surface organic carbon accumulation (0-10 cm).
- ❖ No tillage increased organic carbon accumulation only in the topsoil (0-5 cm)
- ❖ Residues additions stimulated soil microbial activities, while the quality of plant residues determined enzyme activities and changed the composition of microbial communities
- ❖ Stable isotope probing technique allowed the separation of the active microbial community