

## Introduction

- Benefits on soil health of cover crops (CC) can be reduced or disappear depending on the CC termination method.
- Incorporating CC by tillage or glyphosate use are common to terminate CC.
- Roller crimping is emerging as a new promising technique, avoiding disadvantages of tillage or glyphosate on soil health.
- Glyphosate is sometimes used with roller-crimper to increase effectiveness, but this could influence soil microbial communities.
- The effect of CC termination methods may be affected by water availability, especially in the irregular Mediterranean climate.
- Few studies have focused on jointly analyzing impacts of CC termination method and water availability on soil microorganisms.
- Therefore, we evaluated under controlled conditions the effect of different CC termination methods on a selection of soil microbiological parameters and their interaction with two water availability scenarios.



## Materials and methods

- In a GREENHOUSE experiment, FOUR methods of CC TERMINATION + CONTROL (no-CC) were evaluated under TWO WATER LEVELS, H and L (75% of H)
- 50 pots of 30 x 12 x 10 cm containing a mixture (1:2) of sand and a silt loam texture soil with low organic matter content (1%) pH 8.5, .

- 3 months
- Water Level HIGH (1,6 mm/day) or LOW(1,25 mm/ day).
- No fertilization

**1st SAMPLING**  
(14 days after glyphosate)  
PRE-EMERGENCE

- 2 months
- Water Level HIGH (2,8 mm/day) or LOW (2,1 mm/ day).
- NPK-fertilization (low dose)

**2nd SAMPLING**  
(57 days after sowing)

### COVER CROP ( BARLEY+VETCH)



### CC TERMINATION

- INC:** Mowing and incorporation of cover crop residues
- ROL:** 2 roller-crimper passes (miniature prototype built ad-hoc)
- GLI:** Glyphosate (4 L/ha) 1 week earlier than other methods
- ROL+GLI:** Glyphosate (1 week earlier) + 2 roller-crimper passes.

### MAIN CROP (MAIZE)



## ANALYSES:

- Soil DNA extraction + gene copy number quantification by qPCR to estimate abundance of total bacteria (rRNA 16S, total archaea (rRNA 16), total fungi (ITS) and Glomeromycota (SSU rRNA)
- Length of extra radical hyphae and mycorrhizal colonization in maize roots.
- Analysis of variance with a general linear model (Statgraphics Centurion XVIII); Tukey's test for a p-value < 0.05.

## Result and discussion

Table 1. Effects of CC termination methods and water level on microbiological parameters at maize pre-emergence and 57 days after maize sowing.

Effects	Total bacteria		Total fungi		Total archaea		Glomero mycota		Hyphae length		Root colonization	
	Pre	57 d	Pre	57 d	Pre	57 d	Pre	57 d	Pre	57 d	Pre	57 d
Cover crop Termination (T)	***	***	***	***	***	***	***	***	**	**	-	***
Water level (W)	***	***	***	***	ns	***	ns	***	***	ns	-	*
T * W	***	***	***	***	ns	***	***	***	ns	ns	-	ns

Pre: maize pre-emergence; 57 d: 57 days after maize sowing. \* < 0.05; \*\* < 0.01; \*\*\* < 0.001; ns: not significant.

- CC termination methods greatly modify soil microbiota; this effect can last for some time afterwards, affecting the subsequent main crop.
- Water level modulates the soil biological response to termination methods.
- Time elapsed since CC termination modifies this response.
- Two months after maize sowing, CC incorporation is the method that stimulates soil microorganisms the most, regardless of water level.
- ROL stimulates fungi and archaea, while penalizing bacteria.
- Combination of ROL+GLI penalizes fungi, archaea and mycorrhizal parameters.
- A variety of effects can be expected at farm scale depending on the weather conditions of each season.
- A better understanding of the effects of CC termination methods will elucidate the underlying mechanisms and support decision making in the field.

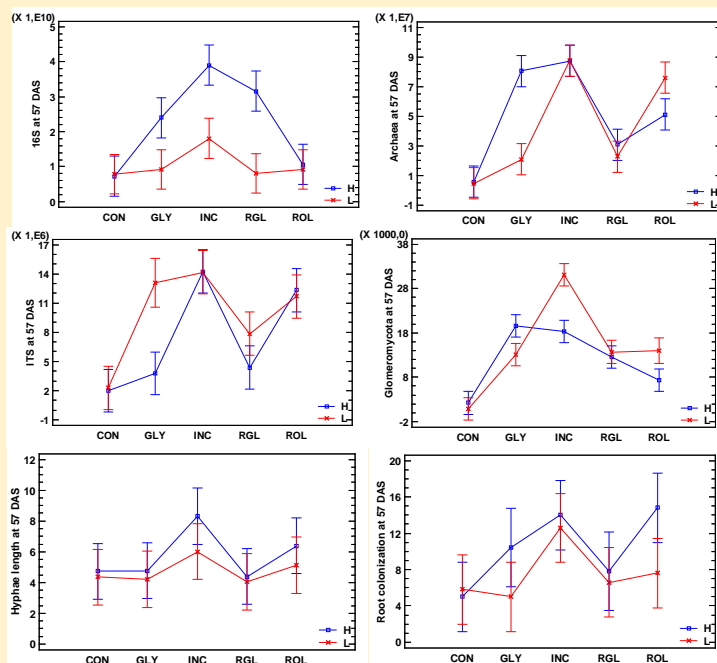


Figure 1. Abundance of total bacteria, total archaea, total fungi and Glomeromycota, length of extraradical hyphae and % root colonization at 57 days after maize sowing (DAS) as affected by CC termination method and water level