Lasting effect of solid waste composts on soil microbial communities

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Introduction:

Due to human activity, large quantities of organic wastes are produced and need to be recycled in order to limit environmental impacts. The agricultural use of Organic Waste Products (OWP) as amendments improve soil fertility. Few studies assess the effect of OWP on soil biological component. In addition most of these studies focused on the short-term effect of OWP on microbial communities. What about the lasting effect?

Objective:

➡ To assess the lasting effect of a long-term organic fertilization on soil microbial communities

Materials and methods:

1 *Organic waste products* ➡ Application every 2 years

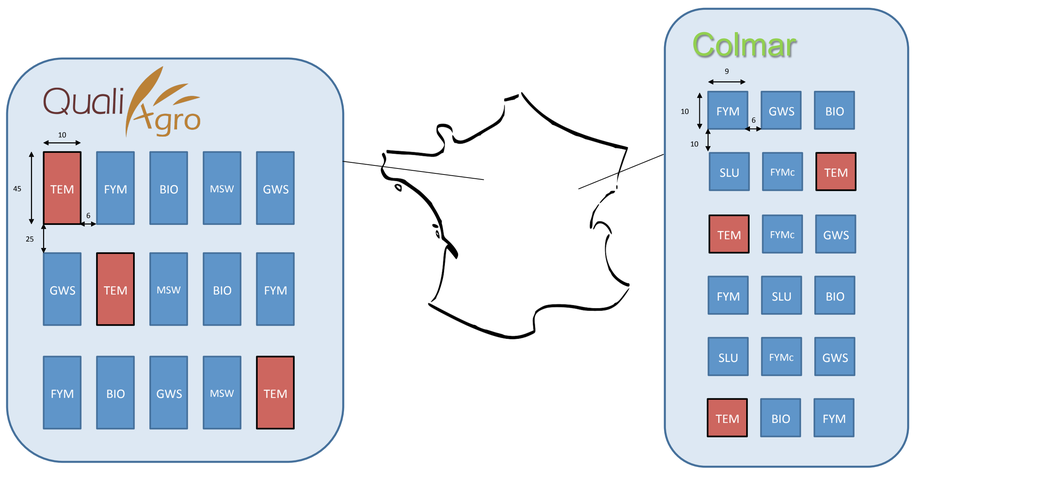
Site	Treatment	Organic Matter (%)	Application rate
Colmar	BIO	39.1	0.84 to 2.2 T C/ha
	FYM	13.9	
	FYMc	13.4	
	GWS	31.4	
	SLU	11.7	
QualiAgro	BIO	50.8	4 T C/ha
	FYM	37.9	
	GWS	46.2	
	MSW	39.6	

**Biowaste compost (BIO), Farmyard manure (FYM), Co-composting of green wastes with sewage sludge (GWS), Municipal solid waste compost (MSW), Non-composted sewage sludge (SLU), Composted farmyard manure (FYMc)*

2 *Field experiments and soil sampling*

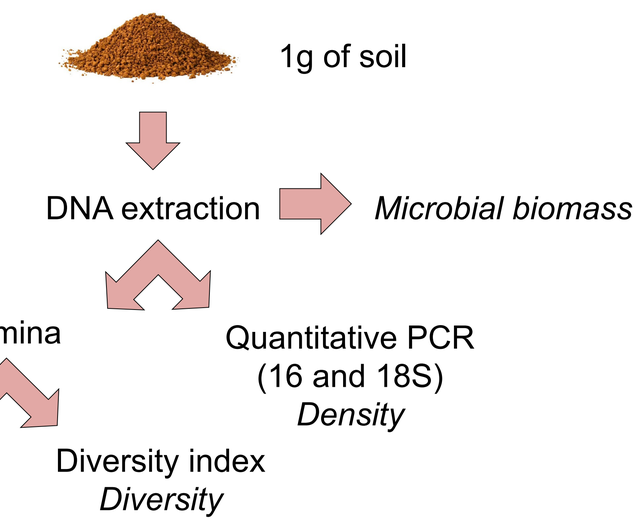
Soil sampling : 1 year after …

7th application (14 years) | 6th application of OWP (12 years)



All crops residues were restitued to soil

3 *Molecular and statistical analyses*



Results:

Colmar ➡ Whatever the parameters considered, no lasting effect of OWP was observed

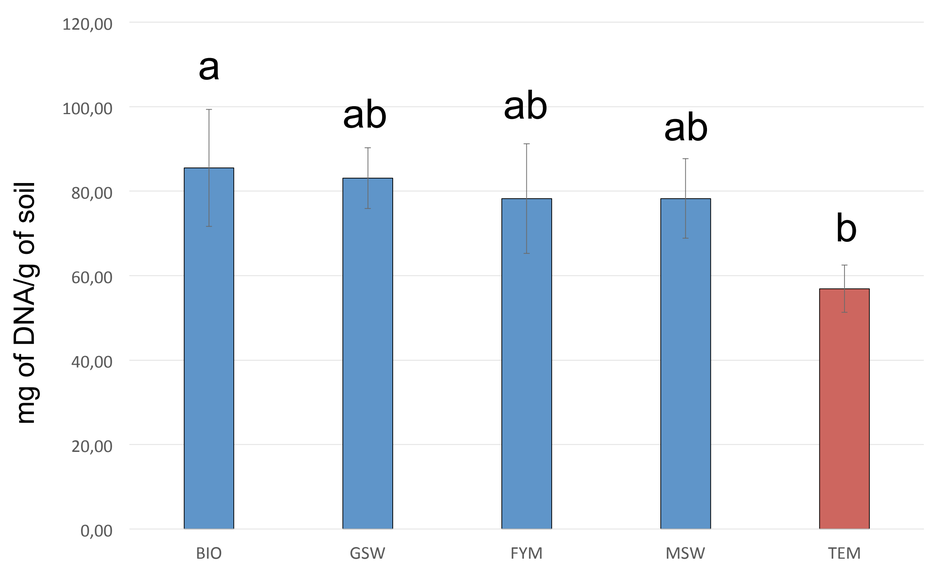
QualiAgro

1 *Microbial biomass, density and diversity*

Microbial biomass

- *Application of BIO :*

  ↗ *Microbial biomass*

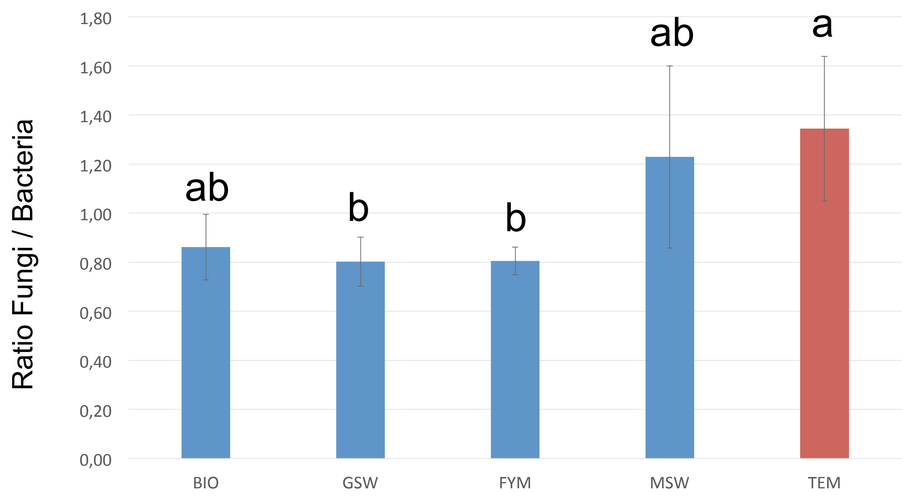


Microbial density

- *Application of GSW and FYM:*

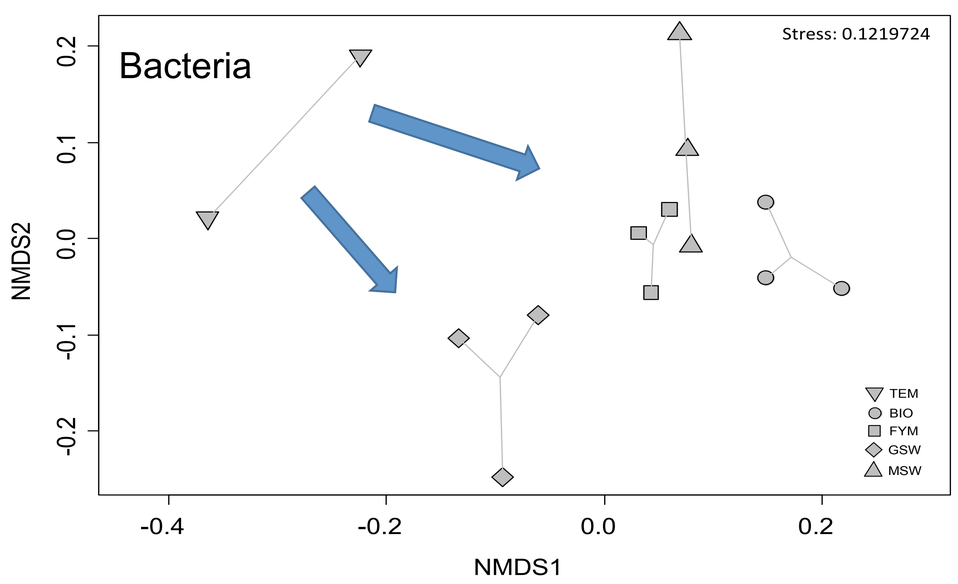
  ↘ *Fungal density,*

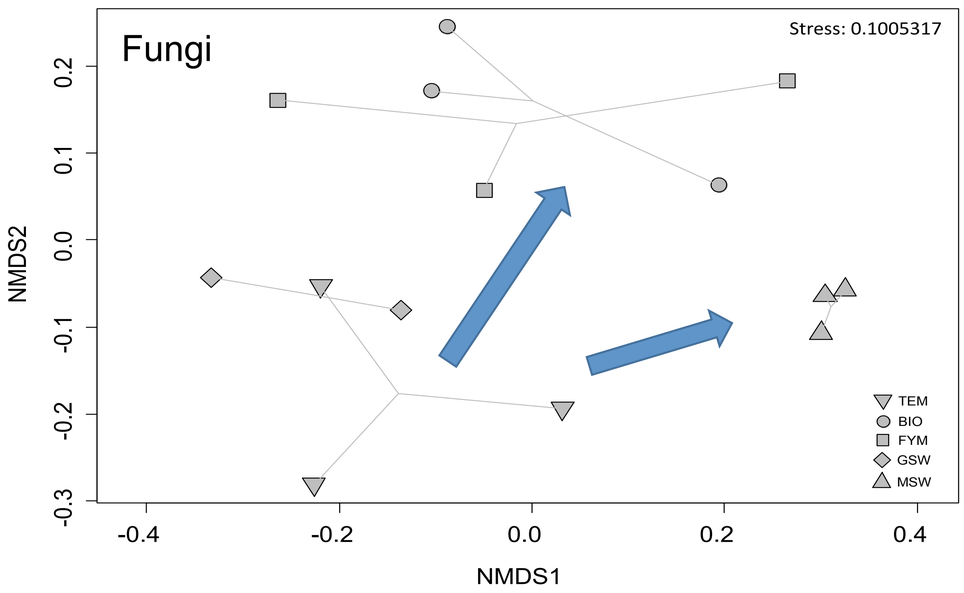
  ↗ *Bacterial density*



Microbial diversity ➡ *No effect on diversity index*

2 *Microbial communities structure*





- *Changes of bacterial and fungal communities' structures depending of type of OWP*

Conclusions:

Lasting effect of a long-term organic fertilization on soil microbial communities :

- Structures more affected than microbial biomass, density and diversity
- Depends on the quantity of OWP applied
- More marked with amendments containing a high organic matter amount (BIO)
- OWP effect could be attenuate by some anthropic factors such as restitution of crops residues to soil

[1]INRA Dijon, UMR 1347 Agroecology ; [2]INRA Thiverval-Grignon, UMR 1402 Ecosys Ecologie fonctionnelle et Ecotoxicologie des agroécosystèmes ; [3]INRA Dijon, Genosol Plateform ; [4]INRA Colmar, UE 0871 Service d'expérimentation Agronomique et Viticole