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Agronomic Performance and Microbial Diversity of Wheat Following Organic and Synthetic Seed Treatments: A Swiss Field Study

Introduction

Seed treatment remains a widely used crop protection method.

Nevertheless, the negative impacts of these treatments on the ecosystem are well-documented.

We conduct an on-farm wheat field study comparing different organic and synthetic seed treatments to untreated seeds and assess results in terms of:

- Agronomic parameters
- Microbial diversity

Only certified seeds were used in this study.

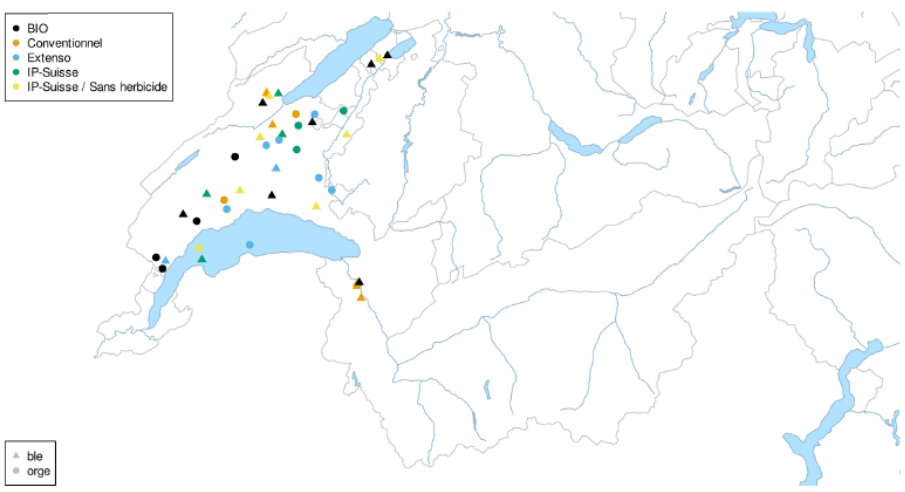

Fig.1: Map showing the distribution of the different wheat fields of the study

Methods

- Agronomic data were assessed for the three years 2021-2023
- Rhizosphere microbial communities of 5-10 cm plants were profiled through amplicon sequencing
- A sample of treatments was analysed for microbial diversity due to financial limitations

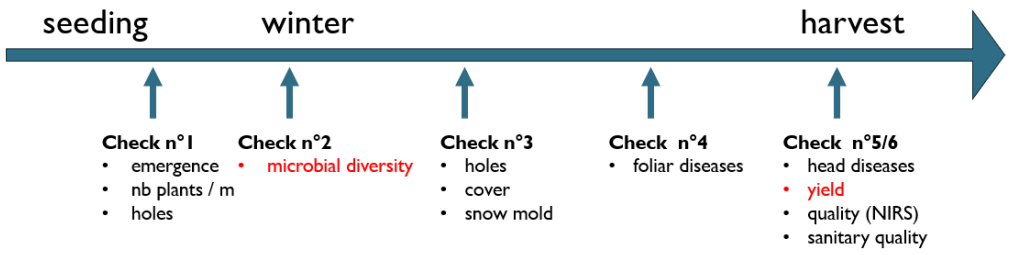

Fig. 2: Sampling methodology

Results

Results of the year 2022 are shown below.

- Synthetic treatments showed no yield enhancement compared to the untreated control (Fig.3).
- Only Alternative and Tillecur showed a significant increase in yield compared to the untreated control (Fig.3).
- All tested treatments led to a significant decrease in bacterial diversity, and no effect on fungal diversity (Fig.4).

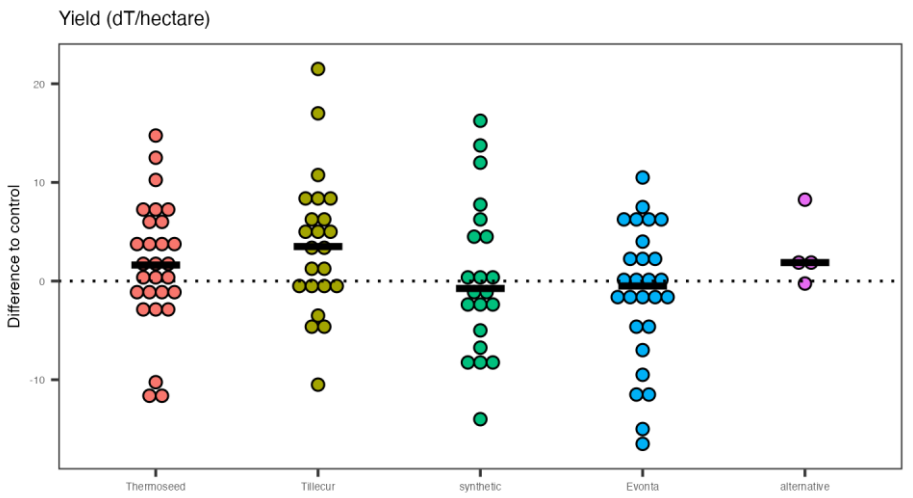

Fig.3: Yield as a difference from the untreated control for the different seed treatments

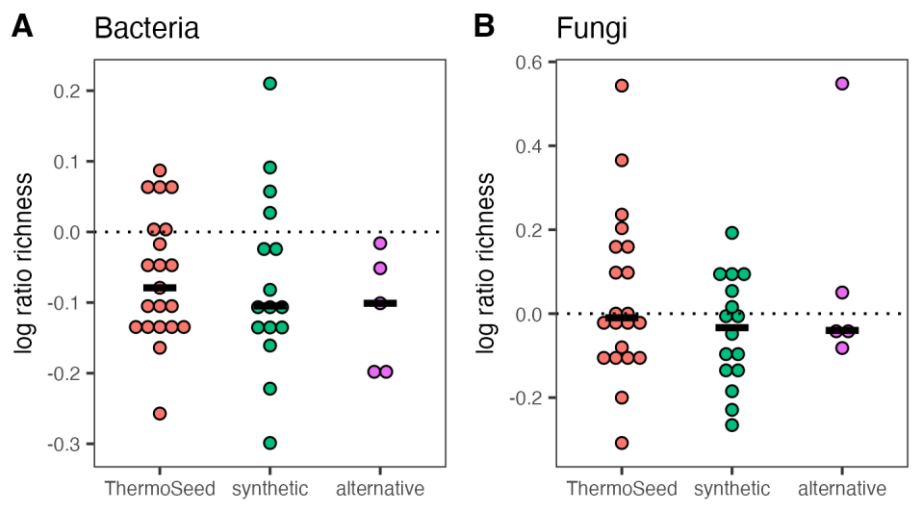

Fig. 4: Within-sample diversity (alpha diversity) of bacterial and fungal wheat plants

Conclusion

- Some alternative treatments show a promising increase in yield effect, yet the negative impact on bacterial diversity needs to be considered.
- Given the limited positive impact on yield and adverse environmental and economic effects, omitting seed treatment of certified seeds remains a viable option.
- The analysis of the agronomic data of the three years would follow, leading to a more comprehensive picture of the effects of different treatments.

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