



## Compost tea as leaf application on winter cereals

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The extension of the Soilcom project with compost tea is interesting because of the direct relation with compost. Developing new, innovative products, with compost as a starting point give more opportunities to use the positive effects of compost. The idea of using composts as well as compost tea is that it leads to biodiversity and balance in the soil, to increased nutrient efficiency and a good soil structure because of the development of aggregates by the increasing fungal and bacterial population. Furthermore, it can protect plants against harmful bacteria and fungi when applied on the plants.

Starting point of making compost tea is a high-quality

compost. Application of water and aeration will help to develop the compost tea under aerobic conditions. Optionally additives such as oligo-elements, molasses, humic and fulvic acids, seaweed extracts, fermented comfrey or nettle extract can be added to enhance the brewing process.

ILVO used a tailor-made compost tea from an external company with leaf application on winter cereals in spring 2021 and spring 2022. Compost tea was made of a high-quality compost composed of two thirds compost extract and one third water mixed with some additives. Plant health was obtained by a drone flight with a multispectral sensor. Yield and wheat quality were determined at harvest. Microbiome of compost, compost tea and barley plant (stem and leaves) will be investigated using DNA metabarcoding.

### **Compost tea trials**

At an organic managed field in Hansbeke (Belgium) compost tea was applied in winter wheat in two doses of 200 L/ha on April 22<sup>nd</sup> and May 31<sup>st</sup>. The effect of compost tea was investigated using a strip trial with pseudo-replications. No significant differences were found between the treatment with and without compost tea based on the vegetation index NDVI which is a measure for green biomass. Yield of winter wheat varied around 3 ton/ha and did not differ between the two treatments.

At a conventional managed parcel in Gavere (Belgium) compost tea was applied in winter barley in two doses of 200 L/ha on April 21<sup>st</sup> and May 11<sup>th</sup>. The effect of compost tea was investigated using a randomized block design. No significant differences in NDVI index were found between the treatment with and without compost tea. There were no significant differences for both yield and crude protein between the two treatments. Yield of winter barley was close to 9 ton/ha (15% moisture) and crude protein content varied around 8,5%.

### **Microbial community compost, compost tea and plant**

Compost tea (applied on the winter wheat in 2021)

compared to compost (of which compost tea is prepared) resulted in lower bacterial diversity. Lower bacterial diversity of compost tea is related to an increase in relative abundance of phyla Proteobacteria, Firmicutes and Bacteroidota, and a decrease in relative abundance of phylum Chloroflexi. Reads were too low to say anything about changes in fungal diversity between compost and compost tea. Winter wheat treated with compost tea showed lower bacterial diversity. An increase in relative abundance of phyla Proteobacteria, Firmicutes, Bacteroidota (family Flavobacteriaceae) and a decrease in phylum Chloroflexi was observed. This corresponds to the changes in bacterial diversity of compost tea versus compost. No difference in fungal diversity on winter wheat plants was observed between compost tea and no compost tea application.

Compost tea (applied on winter barley in 2022) resulted also in a lower bacterial diversity compared to compost. This is related to an increase in relative abundance of phyla Actinobacteriota, Proteobacteria and Firmicutes and a decrease in relative abundance of phylum Chloroflexi. Bacterial and fungal diversity on winter barley did not differ between compost tea versus no compost tea application. A (trend in) decrease in relative abundance of bacterial phyla Actinobacteriota and Proteobacteria was observed on winter barley treated with compost tea. This is opposite to changes in relative abundance from compost to compost tea. A significant increase in relative abundance of phylum Firmicutes was observed, in accordance with the increase from compost to compost tea.

## **DNA metabarcoding**

To conclude, no significant effect of compost tea as leaf application was observed on winter cereal health, grain yield, and grain yield quality (crude protein) under both organic and conventional conditions. Compost tea resulted in a lower bacterial diversity compared to compost. The fungal diversity of the compost tea remained unchanged. In accordance, application of compost tea resulted in a lower bacterial diversity on winter cereal plants. No difference in fungal diversity on winter cereal plants was observed between compost tea and no compost tea application. Shifts in bacterial families on winter cereals were not always in line with the bacterial shifts observed in the compost tea.

Nevertheless, the applied DNA metabarcoding technique allowed to study the highly complex and diverse microbial community in compost, compost tea and plant stem and leaves. This approach is suitable for observing shifts in the microbial community on plants shortly after compost tea application. DNA-based indicators which can be used to study the effect of compost tea as leaf application are diversity, number of shifting families, which specific families shifted, and the magnitude of the response (i.e., how large was the shift in relative abundance of a family).



*First application of 200 l/ha compost tea in winter barley on 21<sup>st</sup> April 2022 in a randomized block design field experiment using a precision spraying program.*