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Effect on earthworm's communities of different organic fraction of municipal solid waste treatments applied on field

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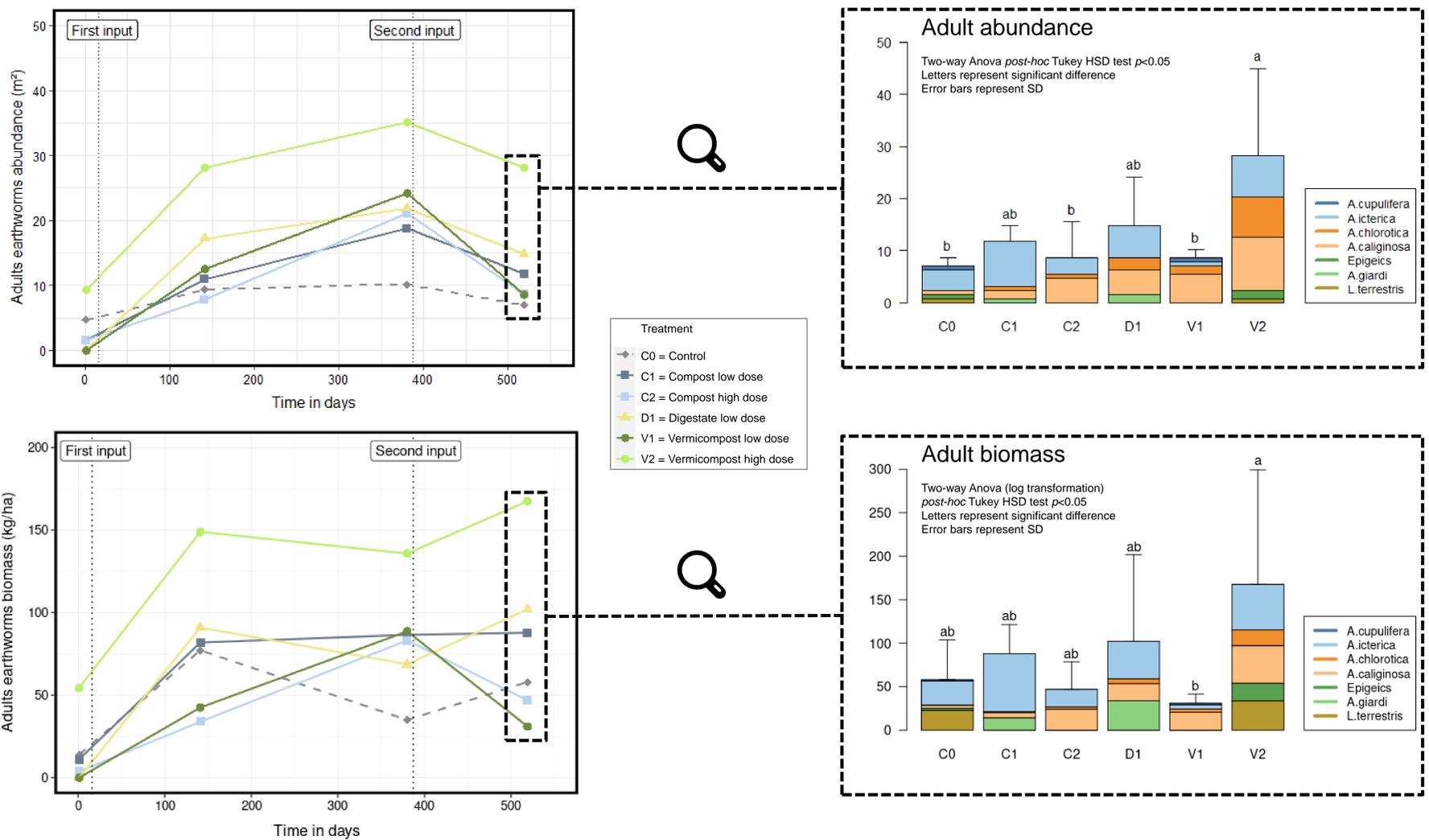
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With increasing population and urbanization, the amount of waste increases and so does the need for food. At the same time, environmental issues are pushing for the development of a more sustainable agriculture. The recycling of organic fraction of municipal waste (OFMSW) is potentially a solution to the reduction of waste and chemical inputs in agriculture. Organic matter (OM) from different OFMSW treatments was applied to a field crop under no-tillage organic farming in logic of fertilization (equivalent N per ha) for two consecutive years on a randomized block design with 4 replicates. Compost made from an electro-mechanical composter (OFMSW + shredded wood), vermicompost from a collective vermicomposter (OFMSW + cardboard) and digestate from anaerobic digestion without phase separation (OFMSW + agricultural waste). These products were applied at 60 and 120 kg/N/ha on barley and 80 and 160 kg/ha on wheat for compost and vermicompost, and only 60 and 80 kg/N/ha for digestate. We followed every 6 months the evolution of the biomass and abundance of earthworms by identifying the species.

Repeated high dose of vermicompost (V2) increased the total abundance and biomass of the adult earthworm population in the time (GLMs models)



Generalized linear models (GLMs) shows that vermicompost at high dose (120 and 160 kg/N/ha) allows the development of a perennial adults population (abundance and biomass). This treatment is significantly superior to the compost (both dose), digestate and control

The Two-way anova on last sample are more contrasted because high dose vermicompost is significantly superior to control, high dose compost and low dose vermicompost in terms of abundance and significantly superior to low dose vermicompost in terms of biomass

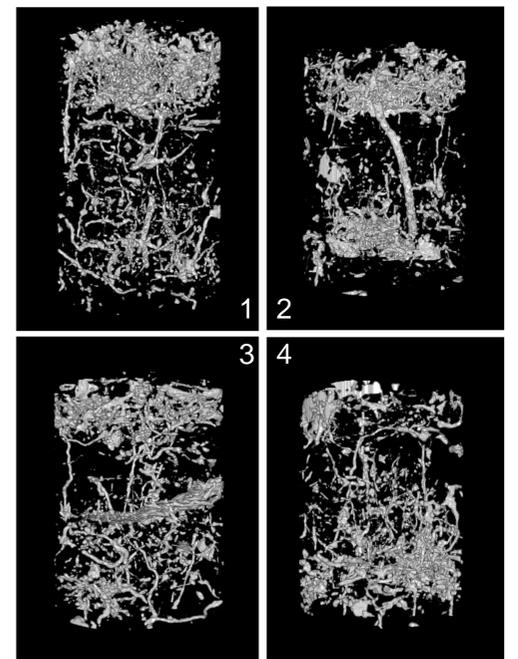
Low-dose digestate and two-dose compost had more limited effects on adult earthworm abundance and biomass (GLMs models and Two-way Anova)

Conclusion

- ✓ High-dose vermicompost was the only organic product that significantly increased the biomass and abundance of adult earthworms compared to the control with GLMs analysis.
- ✓ Digestate and compost had a positive impact on earthworm populations but the duration of the experiment did not show a significant difference from the control with GLMs analysis.
- ✓ Nitrogen equivalent inputs lead to a less input than a logic of amendment (high doses every 3 years) which can explain the absence of significant effect for the compost.

Perspectives

- ✓ Increase the duration of the experiments to have long-term results and potentially a significant difference at on sample date
- ✓ Develop methods to quantify the impact of earthworms following the application of soil amendments (e.g. estimation of galleries using tomography)
- ✓ To carry out comparative studies in controlled environment to limit the variability of the ground and to understand why the earthworms prefer the vermicompost to other products



Preliminary results of columns collected on the field and analyzed by the technique of X-ray tomography. 1 : vermicompost high dose ; 2 : compost high dose ; 3 : digestate low dose ; 4 : control