Effet of exogenous matter on soil biodiversity and ecosystem services in tomato plantations

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INTRODUCTION

After the Green revolution, the use of chemical fertilizers and pesticides allowed the increase of agriculture productivity in order to respond to global food demand. However, these practices have negative side effects on the environment and human health. Consequently, the use of alternative practices more respectful of the environment is preconized nowadays. Among these alternatives practices, compost and vermicompost are known to preserve soil biodiversity which had a tremendous influence on ecosystem services.
The objective of this study was to investigate the impact of chemical fertilizers, compost and vermicompost on key ecosystem services (primary production, nutrient recycling and decomposition of organic matter) provided by soil biodiversity in tomatoes (*Solanum lycopersicum*) plantations.

MATERIALS AND METHODS

Experimental design

Soil: Forest Ferralsol (Domaine Duclos, Petit-Bourg).

Tomato plants : *Solanum lycopersicum* cv. Heatmaster.

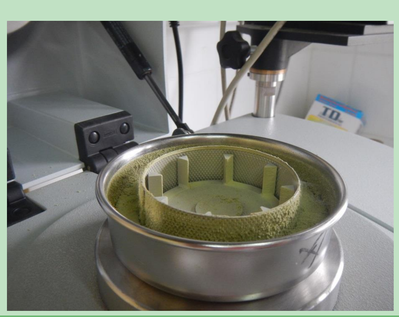
Four different substrates were used :

T : soil forest + Ca ;
SPE : soil forest + chemical fertilizers+ Ca ;
SPC : soil forest + compost+ Ca;
SPV : soil forest + vermicompost+ Ca.

This study was carried out in a greenhouse during 4 months.

Primary production

Plant aboveground biomass was determined 30 days after the experiment setting up.



Organic matter decomposition

Organic matter decomposition was measured using the litterbags method. Five bags were installed at the soil surface of each pot and were randomly collected 7 days, 15 days, 30 days, 2 months and 4 months after the experiment setting up.

Soil chemical properties

Total P, K were determined after soil mineralisation.

Plant chemical properties

The P and K content were determined from dry plant material (leaves and fruits).

RESULTS

Primary production and Nutrient recycling

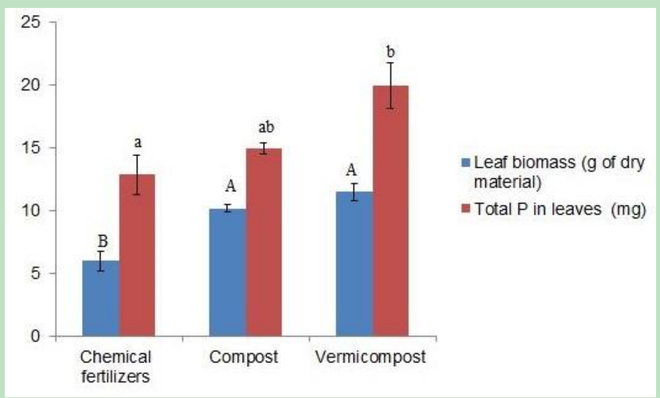


Figure 1: Leaf biomass and Total P in leaves in chemical fertilizers, compost and vermicompost at 30 days.

Organic matter decomposition

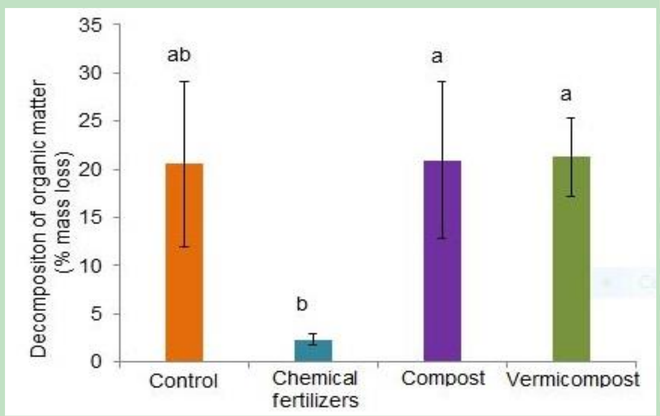
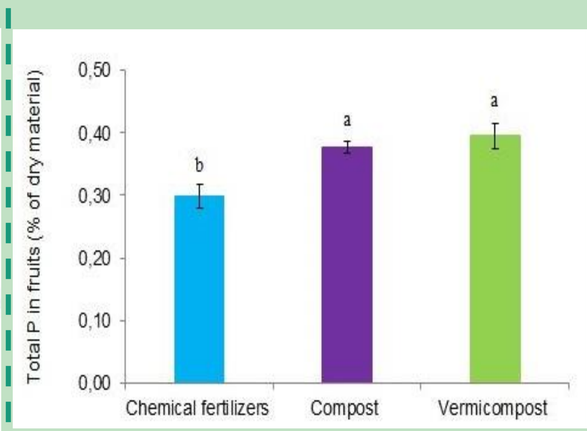


Figure 2: Organic matter decomposition in tomato plantations under different treatments, at 4 months.

Nutrient recycling



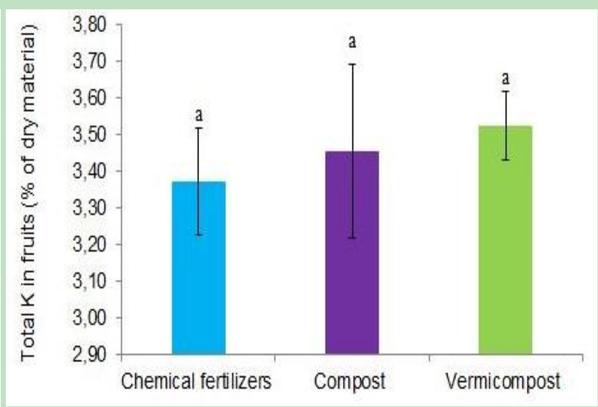


Figure 3: Total P (% of dry material) in fruits (on the left) and Total K in fruits(on the right) at 4 months for chemical fertilizers and organic fertilizers.

CONCLUSION

In general, the availability of nutrients was not identical for all treatments based on the decomposition of organic matter. We observed that plants, which were treated with vermicompost and compost, had an easily access to nutrients especially for the P. These plants had a tendency to accumulate more nutrients in fruits compared to plants which were treated with chemical fertilizers.

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