

Is there an effect of 'effective microorganisms' on EM-Bokashi in banana (*Musa ssp.*) production?

Beate Formowitz¹✉, Fritz Elango², Shuichi Okumoto², Andreas Buerkert¹, Torsten Müller³

¹Ecological Plant Production and Agroecosystems Research and ³Soil Biology and Plant Nutrition, University of Kassel;
²Earth University, Costa Rica; ✉ formowitz@uni-kassel.de



Introduction

'Effective microorganisms' (EM) are commercialised as a mineralisation and plant growth promoting product which is used for 'Bokashi' compost production in many regions. Given that there is little quantitative data about the effects of EM in composting processes, this study aimed at comparing the effects of EM addition on the decomposition of banana residues to other compost additives. Also studied were the effects of different Bokashi variants on the vegetative growth of young and adult banana (*Musa ssp.*).



Materials and Methods

Aerobic Bokashi was produced from chopped banana residues with daily applications of either 31 ml of EM or non-EM additives consisting of water only (W), sterilized EM (EMst) and molasse (M). During the composting period temperatures were measured and samples taken at 8 dates to be analysed for dry matter, nutrient concentration and microbial activity.

In a second 3-months experiment banana growth data and fresh weight of foliar biomass as affected by EM-Bokashi application were taken and compared to a control without compost. Also measured was banana root dry matter at final harvest.

A third 7-week experiment aimed at investigating the effects of EM-Bokashi applied as mulch material compared to two non Bokashi variants on the secondary root growth of adult banana.

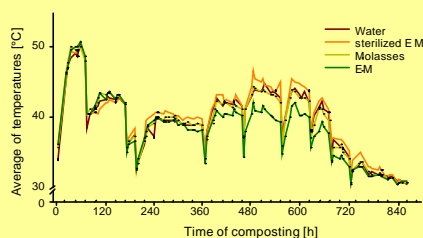


Figure 1. Average daily temperature of Bokashi compost produced with four different treatments during 5 weeks of composting. Temperature measurements were conducted at 7 am; 11.30 am and 5 pm each day. 120 h = 5 days.

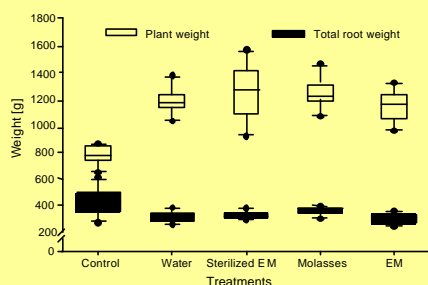


Figure 3. Total root weight and plant dry weight (leaves and pseudo stem) of young banana plants grown under greenhouse conditions with application of four different Bokashi variants compared to a control with unamended soil.

Results

In the second half of the composting period temperatures in the EM-Bokashi were lower than in all other variants (Fig.1). Ergosterol as an indicator for fungal biomass was at the end of the composting significantly higher in EM-Bokashi than in all other variants (Fig.2). Nutrient analysis showed no effect of living EM on mineralisation processes and changes in microbial biomass C (C_{mic}) and N (N_{mic}).

Plant growth was promoted by all Bokashi variants similarly and no marked effect of EM-Bokashi was observed (Fig.3). Nematodes numbers were significantly decreased by EM-Bokashi and Bokashi produced with molasses compared to the control without compost (Fig.4).

Secondary root growth of adult banana plants under field conditions was greatest with EM-Bokashi as mulch material (186.7 g) even if differences were not significant compared to non EM variants (104.6-150.6 g).

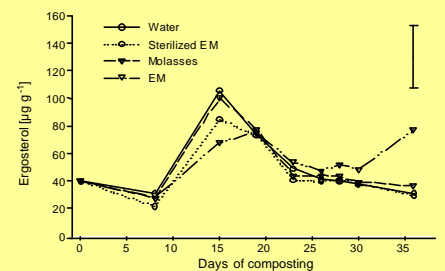


Figure 2. Ergosterol concentrations during the composting process of the four Bokashi variants. Vertical bars show the Honest Significant Difference (HSD) at $P < 0.05$ between observed means, wherever significant treatment effects were detected.

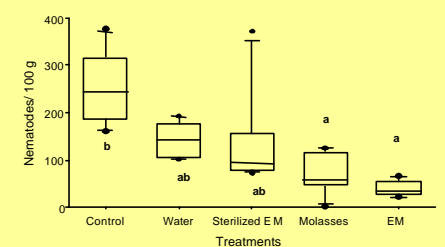


Figure 4. Root-borne nematodes of banana grown with the four different Bokashi treatments compared to the non-Bokashi control. Means with different letters are significantly different at $P < 0.05$ (Tukey HSD).

Conclusions

Under the conditions of this study (EM application rates, frequency of compost pile turning), effects of EM-Bokashi on the decomposition process and growth of young and adult banana plants were only minor. However, our results are in contrast to data mainly published in non-reviewed literature reporting stronger effects of EM-Bokashi especially on N-mineralization.

Further research under varying composting conditions, with higher treatment rates and optimised banana growing conditions may be needed to verify our results.

Acknowledgements

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