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Assessment of Non-chemical Alternatives for Controlling the Burrowing Nematode in Banana in Costa Rica

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Abstract

The objective of this study was to technically and economically assess the effect of biopesticides on the very serious plant parasitic nematode *Radopholus similis* in banana in Costa Rica. The following treatments were evaluated: a mixture of nematode trapping-fungi - *Arthrobotrys oligospora*, *A. botryospora*, *Dactylella brochophaga*, and *Drechmeria coniospora*; DiThera DF which consist of a "dead" fungus *Myrothecium* spp and its fermentation substrate; Savitan produced from desert plants extracts; QL Agri which contain *Quillaja saponaria* extracts; Japanese-style compost called Bokashi; two application of a chemical nematicide; and an absolute control. Results of root sampling on a six month basis showed that the biopesticides had lower nematode population densities than the control with the nematode trapping-fungi having statistically significant differences over the other treatments. Chemical control was highly effective and produced the lowest nematode density. However, there were no statistical significant differences between the chemical treatment over the trapping-fungi treatment. The functional root variable showed no significant differences between treatments even though the Bokashi treatment gave the highest functional root weight. No significant treatment differences were observed with respect to plant growth and production parameters. Nevertheless, treatment with the biopesticide DiTera gave the highest bunch weight. Conversely, economic analyses indicated that using nematode trapping-fungi, chemical nematicide, or the QL Agri treatments gave a detectable profit. The land expectation value of the banana plantation was higher than the price of banana land which indicated that under normal conditions in the banana sector, production is economically sustainable/profitable. Other results confirm that profit in banana production is affected by the price of a banana box, production, and discount rate. The optimal production cycle was obtained in year ten after farm establishment, which refers to the year with the highest profit following plantation renewal. Finally, economical results highlighted the importance of nematodes control, since profitability indexes were sensitive to the efficiency and cost of nematode management technology adopted by the banana company.

Keywords: Banana, biological control, economic analysis, land expectation value, profit, *Radopholus similis*

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