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Importance and Strategies of Screening for Enhanced Biodegradation of Pesticides in Banana Plantations

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Abstract

Worldwide control of banana nematodes, especially the burrowing nematode *Radopholus similis*, requires yearly and repeated nematicide applications. Non-fumigant versus fumigant nematicides are the most preferred for cost and environmental reasons. Enhanced biodegradation is the rapid microbial degradation of nematicides by a specialised fraction of the soil microflora that has evolved through pesticide selection to rapidly metabolise specific nematicides. It is the process by which microorganisms (bacteria, fungi or algae) convert materials into biomass, carbon dioxide and water. Enhanced biodegradation of fenamiphos, ebufos, terbufos, ethoprophos (organophosphates) and carbofuran (carbamate) have been observed in banana soils. If total nematodes per gram of soil are directly correlated with percentage of functional roots and with banana bunch weight and the crop does not respond to nematicide application then yield loss might be the consequence of enhanced biodegradation. When chemical control of nematodes is erratic after repeated applications, especially in this perennial cropping system, enhanced biodegradation needs to be studied as a possible cause. The development of efficient tests to detect enhanced biodegradation are needed in order to react to this situation and to recommend alternative control measures. Strategies like alternating between carbamates and organophosphates, to alternate every second treatment with a different nematicide and interrupting chemical application for 12 to 16 months have shown to reduce enhanced biodegradation. Biological control agents might be helpful in breaking the nematicide use cycle. In addition, biofumigation using cover crops and organic matter may induce shifts in microbial communities away from enhanced biodegradation. The results of field surveys on the occurrence of biodegradation as well as alternative control methodologies will be presented.

Keywords: Bananas, enhanced biodegradation, non-fumigant nematicides, *Radopholus similis*