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# Modelling Nematode Populations in Horticultural Systems

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To date, nematode dynamic models have been very simple, driven only by few parameters without accounting for host quality or environment characteristics. However, these approaches provided only a basic description of nematode population dynamics, and a few mechanistic insights into the relation between the nematode, host and the environment. Recently, more specific models were developed for a wide range of plant-parasitic nematodes and horticultural systems (*Pratylenchus penetrans* in rotations; potato cyst nematode and *Meloidogyne incognita* on potato systems; *Radopholus similis*, *Pratylenchus coffeae* and *Helicotylenchus multicinctus* on banana based systems). These models are either based on biological processes (population growth, initial or maximal population) or statistical approaches; often with dynamic outputs. These models account for the specificities of the relation in the nematode-plant complex, e.g. through the root biomass fluctuation which represents the food resource for nematodes. After reviewing the existing models that simulates nematode dynamics in horticultural systems, we present the example of the SIMBA-NEM model dedicated to plant-parasitic nematodes in banana based systems. We highlight the way this modelling approach allows integration of existing knowledge and permits us to re-examine research about nematode-plant relationship. We emphasize how these models may help to optimize the effect of nematicide applications and participate to the design of sustainable and more environmental-friendly cropping systems. We also focus on the use of models to tackle issues surrounding new banana varieties. Finally, we discuss the relevance of the modelling scale from the root to the field, and its implication in the efficiency in forecasting population dynamics and plant damages. We examine the needs for spatially explicit models that take into consideration the spatial variability of soil moisture or the availability of host root biomass.

## Plant-parasitic Nematodes of Coffee: Worldwide Status and Studies Conducted on *Meloidogyne exigua* at UENF

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In many coffee-producing regions worldwide, parasitic nematodes reduce the productivity and increase the production costs of this important commodity. In infested areas throughout the Americas, Africa and Asia, several species of *Meloidogyne* and *Pratylenchus* cause yield losses estimated in at least 15%, while many plantations have been decimated since late nineteenth century. In this complex pathosystem, nematode species, type of coffee grown (arabica or robusta and their cultivars) and edaphic-climatic conditions interplay to determine the damage level. Many other nematode genera have been reported associated with coffee, although in most case their parasitism has not been confirmed. *Rotylenchus reniformis*, *Radopholus* spp., *Hemicriconemoides* spp., *Xiphinema americanum* and *Helicotylenchus* spp. have been associated to coffee damage in some locations. Despite decades of research, in many cases the management options available to coffee growers are not satisfactory. In Rio de Janeiro State, Brazil, the widespread incidence of *M. exigua* has prompt the launching of several interdisciplinary projects, which covers evaluation of sampling strategies for assessment of field populations and epidemiology, assessment of productivity and resistance