The case of the plant- parasitic nematodes

Nematodes belong to a monophyletic group, one of the most abundant and diverse on the earth (26,000 species). They are found in all environments and have various survival strategies (e.g. free-living, commensal, parasitic, or mixed modes according to their stage). Especially in soils, they live in communities subject to interactions that govern such ecosystems; they also can be environmental indicators in the habitats they occupy. These properties make them excellent models for comparative studies of host-parasite interactions, evolution of pesticide resistance, and the impact of various cropping practices or landscape management strategies on agroecology. The plant-parasitic nematode model is relevant in order to acquire knowledge on communities and on biological and environmental interactions that affect them, to evaluate the impact of history (phylogeny, phylogeography) on the evolution of their life traits and their ecological adaptation, as well as to understand habitat functions.

Due to the complexity of soil-nematode interactions and the resistance/resilience capacities of soils on plant pathogens, the nematode community approach is an ecological and agronomic challenge for nematode control. From an economic point of view, world yield losses of the twenty most important crops due to plant-parasitic nematodes are very high. Crop rotations, resistance and biological practices, developed as alternatives to chemical control, are targeted against few species. This could lead to species erosion in communities without modifying their global pathogenic effect.

In order to engage research on management of complex habitats and environments such as soils, the objectives of CBGP (UMR 1062 Inra, Montpellier SupAgro, Cirad, IRD) within the program «*Écologie et gestion de la diversité des communautés de nématodes phytoparasites*» is to understand assemblage processes in communities by studying interspecific relationships (e.g. evolutionary history, species coexistence, dispersion) and the biotic and abiotic constraints of their environment (e.g. host-plant interactions, predators, physiochemical factors). The goal of these studies relates to nematode management (i.e. sustainable control methods) by producing more knowledge about the effect of anthropogenic stresses on species adaptation in communities and the utility of biological indicators of soil health.

Such studies are carried out in the NS2 quarantine laboratory (government agreement) of CBGP, managed as a technical platform (nematode extraction from soils and roots; chloride treatment of waste-water; autoclave; optics; CIV) in which the MNHN/IRD reference collection of preserved nematodes (15 000 slides, 2 300 types) is stored. Experiments are also carried out in the molecular biology facility of CBGP. ■

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Horticultural agroecological management from tropical areas to the Mediterranean Sea

The topic of the UPR "Horticulture", from the «Fruit and Horticultural crops» Department is to ensure sustainable agricultural production in tropical and mediterranean areas, including local self-suffiency of food security and sustainable horticultural production, as well as environmental protection. Regarding horticultural products, the UPR limits its scope to vegetables, plantain bananas, roots, and tubers, for most of which the principal concern is perishability and seasonality. This fixed topic has three goals: the diminution of pesticide residuals in vegetable production, reduction of the negative impact of vegetable production on the environment, and improvement of market access for the growers.
The research follows two main lines:

- To propose an agroecological production system and to define the quality of the products. How to reduce nitrate and residual pesticides in horticultural products and the environment? How to maintain soil fertility?
- To improve the competitiveness of the field of studies.

How to find tools for the field of social studies (market access, technolgy transfer, and exchange)? How to identify and recognize other periurban agricultural systems (land developments, parks management, sharing of resources with the city and managing water pollution, grower/consumer networks)? The Laboratory *Biodiversité entomologique et d'Écologie Évolutive en agrosystème maraîcher* studies the inter-relations between crop plants, pests, and natural enemies in several systems : vegetables / leafminer / parasotoids ; cabbages / DBM / parasitoids ; and most recently vegetables / *B. tabaci* / parasitoids.

Current research assesses female parasitoid behaviour, depending on host patch size, to select new natural enemy populations having females with great reproductive potential. Other topics under study in the laboratory include the biological and genetic differentiation of populations of pests and natural enemies native to different geographic regions.

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