



The GEDUNEM project: Varietal and technical innovations for the sustainable and integrated management of root-knot nematodes in protected vegetable cropping systems

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PLANT RESISTANCE SUSTAINABILITY

International Conference — 2012



La Colle-Sur-Loup (France)
October 16th-19th, 2012



Scientific Programme and Abstracts

Sessions

Session 1: Impact of plant disease resistance on the structure and evolution of pathogen populations

Session 3: From plant-pathogen molecular interactions to the durability of resistance

Session 2: Sustainable and integrated breeding and deployment of genetic resistance

Session 4: Socio-economic issues related to the use of resistant varieties and their deployment in agro-systems

Invited Speakers

Philippe Baret, Université Catholique de Louvain, Belgium - **James Brown**, John Innes Centre, England - **Marion Desquilbet**, INRA, France - **Sylvain Gandon**, CNRS, France - **Benoit Moury**, INRA, France - **Chris Mundt**, Oregon State University, USA - **Laura Rose**, Heinrich-Heine University, Germany - **Walter Rossing**, Wageningen University, The Netherlands - **Peter Thrall**, CSIRO Plant Industry, Australia

Organised by the Institut National de la Recherche Agronomique (INRA)
Metaprogramme on Sustainable Management of Crop Health (SMaCH)



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Abstract

The recent banning of the most active chemical nematicides raised root-knot nematodes (RKN) as the major problem of vegetable growing in the south-east of France, with over 40% of horticultural farms affected. Resistant (*R*) cultivars successfully limit nematode attacks of the crop itself and reduce nematode abundance in soil in the short term. But their use in commercial fields faces two major constraints: (1) the limited number of cultivated species with RKN *R*-genes available (tomato, pepper), which would lead to major changes in crop rotations with socio-economic constraints; (2) the emergence of virulent root-knot nematode populations, able to overcome the resistance conferred by some of the *R*-genes. Recent research showed that the durability of the resistance per se was possibly increased with an optimal choice of the *R*-gene or allele combination, and of the genetic background in which the major *R*-genes were introgressed. However, the requirement for agronomic performance, does not always allow the breeder to fully use the genetic diversity available in *R*-genes and genetic backgrounds. In such cases, spatio-temporal deployment strategies of resistant cultivars in the rotation were proposed and provided some success. But combination of genetic resistance with cultivation practices including multicrop rotations, intercultural management and/or prophylactic treatments was poorly tested for its ability to provide complementary selection pressures on the pathogen populations and to increase the durability of the protection.

The project aims at identifying innovative strategies across the agrosystem, combining varietal resistance in crop rotations with agronomic practices, for a sustainable control of RKN that infect vegetable crops in protected crop systems. This pilot and demonstrative project involves analytical and systemic aspects: i/ the validation of previous results on the durability of RKN genetic resistance in tomato and pepper by long-term experiments in research stations and in farms, ii/ the impact of agronomic practices on the parasitic pressure in the soil and its contribution in the increase of resistance durability, and iii/ the impact of such innovations on the yield and the economic viability for protected



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crop systems in a Mediterranean climate. The added value here is to combine together currently dispersed approaches based on synergistic and long-term effects, towards a satisfying level of nematode control over pluri-annual crop sequences. The diversity of partners (research, experimental stations, technical institutes) and associated forces (growers' development structures, 'chambres d'agriculture') brings all the complementary expertise needed for answering specific short-term questions as well as generic mid-long term expectations.

'GEDUNEM' has been launched in the framework of the INRA metaprogramme SMaCH (Sustainable Management of Crop Health).

Keywords: integrated pest management, root-knot nematodes, crop rotation in vegetable farming, genetic resistance to nematodes, agronomic practices
