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Success story

March 2020

The impact of climate change on plant health: a nematology perspective

Root-knot nematodes, *Meloidogyne* spp., cause substantial economic losses in agriculture, and in particular in vegetable production. Within the genus, several root knot nematodes species (*M. incognita*, *M. arenaria*, *M. javanica*, *M. enterolobii*, *M. ethiopica*, *M. hispanica*, *M. paranaensis*, *etc*.) belong to the 'tropical' group, so called because they have been found predominantly in tropical and subtropical regions.

However, climate change is likely to influence their future distribution and it is expected that 'tropical' root-knot nematode species will become important pests in temperate regions, due to more favourable climatic and environmental conditions for pest colonization, development, reproduction and dispersal. This is why 'tropical' root-knot nematodes are considered an emerging phytosanitary problem within Europe.

Seven research partners of the MeloTrop consortium joined forces to: perform surveys for 'tropical' root-knot nematodes in open fields and greenhouses for vegetable production in France, Portugal, Serbia and Slovenia; to validate biochemical and molecular diagnostic tests for the identification of 'tropical' root-knot nematodes; to assess the survival ability of *M. incognita* and *M. arenaria* in the climatic conditions of continental Europe; and to generate models of the possible geographical spread for each tropical root-knot nematode species occurring in Europe.

Several tropical root-knot nematode species were detected in the partners' countries. The most frequent species were *M. arenaria* and *M. incognita* which were found in open fields in France, Portugal, Serbia and Slovenia. In Slovenia *M. incognita* was found in open fields for the first time. In addition, *M. enterolobii, M. hispanica, M. javanica* and *M. luci* were found in Portugal.

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Species identification within the group of tropical root-knot nematodes is based on a combination of morphological, morphometrical, biochemical and molecular methods. However, diagnosis is complicated by inter-specific morphometrical similarity and intra-specific morphological and molecular variability. A biochemical test based on esterase and malate dehydrogenase isozyme phenotyping and a molecular test based on multi locus sequencing of four mitochondrial DNA genes, were validated within the project through inter-laboratory test performance studies.

The ability of *M. incognita* and *M. arenaria* to overwinter in open fields under European continental climate conditions was tested in Slovenia in a micro-plot 3-year experiment. Both species survived the three winters and successfully infected tomato plants planted on the plot each spring. The survival ability of the isolates tested indicates that these species may spread in European continental climate areas in the future.

The data obtained from the occurrence and distribution study conducted in the framework of the MeloTrop project is currently being used to develop geographical models of possible open field spread for each tropical root-knot nematode species occurring in Europe. Simulations considering different climate change scenarios and predictive studies will be performed using the CLIMEX simulation software.

Project ID: Global warming and distribution of root-knot nematode species of the tropical group (MeloTrop)