

Mini data sheet on *Meloidogyne mali*

Meloidogyne mali was added to the EPPO A2 List in 2017. A full datasheet will be prepared, in the meantime you can view here the data which was previously available from the EPPO Alert List (added to the EPPO Alert List in 2014 - deleted in 2017).

Meloidogyne mali

Why: *Meloidogyne mali* is a polyphagous root-knot nematode originating from Japan whose presence in the EPPO region has been noticed recently, although its introduction probably took place several decades ago. *M. mali* is a damaging nematode which can produce large root galls on its host plants, interfering with their water and nutrient uptake from the soil and thus reducing their growth. Taking into account the information presented in a preliminary risk assessment carried out by the Dutch NPPO, it was considered that *M. mali* should be added to the EPPO Alert List.

Where: *M. mali* was originally described in Japan from roots of an apple rootstock (*Malus prunifolia*). It has probably been introduced into the EPPO region with elm trees from Japan, at least 50 years ago.

EPPO region: France (transient), Italy, Netherlands.

Asia: Japan (Honshu, Hokkaido).

North America: USA (New York).

In Europe, *M. mali* was first found in the Netherlands in 2012/2013 on roots of several *Ulmus* trees of at least 50 years old in an arboretum in Wageningen, as well as in 3 experimental fields where elm trees were tested for their resistance to *Ceratocystis ulmi* (Dutch elm disease) in Wageningen and Baarn. In 2014, *M. mali* was detected in several street trees in the Hague. In Italy, the nematode was first found on root samples collected during 1995-98 from slowly declining *Ulmus chenmoui* trees at San Rossore (Pisa, Toscana region). The nematode was initially described as a new species, *Meloidogyne ulmi*, which was later synonymized with *M. mali*. These elm trees had been imported from the Netherlands as 3 year old plants. Subsequently, populations of *M. mali* were found at Mantignano (Firenze, Toscana region) on *U. chenmoui* and *U. glabra* plants imported from the Netherlands and used as rootstocks of *Ulmus* hybrid selections. Although the presence of *M. mali* has only been confirmed in Italy and the Netherlands, it is thought that its distribution in the EPPO region might be wider because elm trees grown on the infected plots in the Netherlands (breeding programme for the resistance against Dutch elm disease) have been sent to other European countries. In the USA, *M. mali* was first found in 2016, in root samples which had been collected from a declining hedge of *Euonymus kiautschovicus* (Celastraceae) growing in a private garden. The origin of this infestation is not known, but as is the case in Europe, it is hypothesized that the nematode might have been introduced with elm planting material within the framework of breeding programmes against Dutch elm disease.

On which plants: In Japan, *M. mali* is considered to be a significant pest of apple (*Malus domestica*/*M. pumila*, including rootstocks such as *M. prunifolia*) and mulberry (*Morus alba*, *M. bombycis*) trees. In Italy and the Netherlands, it has been found primarily on elms (*U. chenmoui*, *U. glabra*). According to the Japanese literature and experiments carried out in the Netherlands, *M. mali* has a wide host range which includes trees, shrubs and herbaceous plants (e.g. *Acer palmatum*, *Acer pseudoplatanus*, *Arctium lappa*, *Brassica pekinensis*, *Broussonetia kazinoki*, *Broussonetia papyrifera*, *Castanea crenata*, *Citrullus lanatus*, *Cucumis sativus*, *Daucus carota*, *Dryopteris carthusiana*, *D. filix-mas*, *Euonymus kiautschovicus*, *Fagus sylvatica*, *Ficus carica*, *Geranium robertianum*, *Geum coccineum*, *Glycine max*, *Impatiens parviflora*, *Maclura tricuspidata*, *Malus prunifolia*, *Malus sieboldii*, *Prunus x yedoensis*, *Quercus robur*, *Rubus idaeus*, *Solanum melongena*, *Sorbus aucuparia*,

Taraxacum officinale, *Taxus baccata*, *Ulmus davidiana* var. *japonica*, *Ulmus x hollandica*, *Urtica dioica*).

Damage: *M. mali* induces large root galls ('bead-like' galls) on its host plants resulting in malformed root systems and retarded plant growth. In Japan, stunting and severe decline has been reported in apple orchards infested by this nematode. Inoculation studies done in Japan on potted mulberry seedlings (*Morus* spp.) showed that 30 to 60% of the plants were killed by the nematode within a year. On 2-3 year old mulberry trees, inoculation resulted in a 10-20 % reduction of leaf weight. *M. mali* has sedentary endoparasitic habits. On apple, *M. mali* requires 18-22 weeks to complete its life cycle and there is one generation per year. It is suspected that the nematode overwinters in the roots (but the development stage at which this occurs needs to be studied).

Dissemination: natural spread in the soil is slow but *M. mali* can easily be transported with soil and plants for planting over long distances.

Pathway: Infested soil and growing media, plants for planting from countries where *M. mali* occurs. Soil attached to machinery, tools, footwear, or plant products is also another possible pathway.

Possible risks: The host range of *M. mali* includes many species which are of economic importance in horticulture (e.g. apple) and forestry (e.g. elm). According to the Japanese literature, *M. mali* is an important pest in apple orchards. However, no data is available on its current economic impact on apple production. Its impact on vegetable crops (*Brassicaceae*, *Cucurbitaceae*, *Solanaceae*) and other major forest trees (*Fagus* spp., *Quercus* spp.) remains to be clarified but its potential capacity to develop on these economically important plants might add to the risk for the EPPO region. Once root-knot nematodes have been introduced into new areas, it is in general difficult to control or eradicate them. In its preliminary risk assessment, the Dutch NPPO underlined that *M. mali* presented a particular risk to tree species because of their retarded growth and their increased vulnerability to windthrow. The high cost of their replacement, either in orchards or in urban environments, was also underlined. It seems desirable that more attention is given to *M. mali*, as its distribution in the EPPO region might be wider than originally thought, and to envisage possible measures to prevent its further spread.

Sources

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EPPO RS 2014/102, 2017/043, 2017/075
Panel review date 2017-03

Entry date 2014-06