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SEVERE DAMAGES CAUSED BY *MELOIDOGYNE ARTIELLIA* TO CEREALS AND LEGUMINOUS IN SICILY

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Lombardo S., Colombo A., Rapisarda C. – Severe damage caused by *Meloidogyne artiellia* on cereals and leguminous in Sicily.

The root-knot nematode *Meloidogyne artiellia* Franklin has been reported in various Italian regions on host plants belonging to the families *Graminaceae*, *Leguminosae* and *Cruciferae*, on which it is responsible for severe yield losses. It had never been detected in Sicily. In spring 2008, the nematode was found in different legume and cereal fields in the area of Caltagirone (province of Catania, Sicily). Fields infested with the nematode showed patches of stunted, chlorotic, withered and dwarfed plants. Moreover, ears of wheat were small and kernels appeared dried; finally, roots were scrubby.

Infected plants were durum wheat (*Triticum durum* Desf.), barley (*Hordeum vulgare* L.), chickpea (*Cicer arietinum* L.), broad bean (*Vicia faba* L.), lentil (*Lens culinaris* Medik.) and vetch (*Vicia sativa* L.)

Root observations showed brownings, small galls and mature females bearing egg masses and larvae at root bifurcations.

KEY WORDS: Root-knot nematode, cereals, leguminous, Sicily.

INTRODUCTION

During spring 2008, various cereals and leguminous fields in the countryside of Caltagirone (Catania, Sicily) showed extensive patches with plants stunted and chlorotic (fig. I).

Though not specific, these symptoms were suspected to be due to nematode attacks. Later, soil and roots analysis from the stunting patches showed that the observed symptoms could have been caused by the root-knot nematode *Meloidogyne artiellia* Franklin, already reported from various Italian regions on host plants belonging to the families *Graminaceae*, *Leguminosae* and *Cruciferae*, but never from Sicily.

Therefore, brief notes are given on this nematode.

MATERIAL AND METHODS

The data reported here are from a survey conducted in May-June 2008 in the area of Caltagirone (province of Catania, south-eastern Sicily), in fields of durum wheat (*Triticum durum* Desf.), barley (*Hordeum vulgare* L.), chickpea (*Cicer arietinum* L.), lentil (*Lens culinaris* Medik.), broad bean (*Vicia faba* L.), and vetch (*Vicia sativa* L),, in which plants were stunted, chlorotic and poor yielding and, thus, suspected to be attacked by nematodes (Fig. I).

Each sampled area of an investigated field was of one hectare and each soil sample was composed of 20 subsamples collected with a small spade in the plant rhizosphere to a depth of 5-20 cm, after removing the top 5 cm soil. The entire 2 kg sample was thoroughly mixed, kept in plastic bag and taken to the laboratory. Samples were stored at 6 °C until they were processed.

The same sampling scheme was followed to collect root samples. Roots were carefully washed free of adhering soil and then observed under a stereo microscope (magnification 25×). Infected roots were dissected and nematode females were collected and used to prepare perineal patterns. Therefore, females were cleaned, fixed in FP 4:1 and perineal patterns were cut and mounted in lactophenol.

Second stage juveniles, taken from egg masses, were killed by gentle heat, fixed in FP 4:1 and mounted in anhydrous glycerol on permanent slides.

Identification to species level was made by observing the average morphometric data of 30 second stage juveniles (body length and shape and length of tail) and 30 perineal patterns of females. The observed data were

Fig. I – Yellowing and stunting of cereals caused by *Meloidogyne artiellia* in Sicily.

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compared with those reported in the literature (KARSSEN, 2002), including morphometric data of an Italian population of the nematode (GRECO, 1984).

RESULTS

Root observations showed brownings, small galls and mature females bearing egg masses and larvae at root bifurcations

The nematode was identified as *M. artiellia* and was abundant in both soil and root samples from different plant crop.

Females of the Sicilian population of *M. artiellia* were pear-shaped (fig. II), with the longitudinal diameter of 0.6-0.8 mm, although some individuals were smaller or larger compared to the typical shape. They showed a well distinct neck, vulva not prominent, small knobs, ovoid and backwardly sloping. The cuticle of the female body was quite thin. Adult females were pearl white. Most of them protruded from the roots and were nearly entirely covered by a large gelatinous egg sac (fig. II) (they are indeed defined as "saccate"), also before the eggs were laid down. The perineal pattern of the females were large and eight-shaped, composed by a small area enclosing the anus and a wide area enclosing the vagina (fig. III), as described in the literature (GRECO *et al.*, 1992).

The second stage juveniles were vermiform but rather short (body length 301-370 m) and thin (mid body width 15-16.5 m), with a rounded, short and conical tail (tail length 22-25 m) (fig. IV) and a dome-shaped lip region which is slightly separate from the body. The stylet was strong, well developed (stylet length 15-16 m) and with rounded knobs.

DISCUSSION AND CONCLUSIONS

The British root-knot nematode, *Meloidogyne artiellia*, was observed for the first time in England and described by FRANKLIN (1961). Since then, this nematode has been found in several countries in the Mediterranean area (SIKORA & GRECO, 1990).

In Italy, the nematode was found for the first time in Puglia on chickpea (GRECO, 1984) and is presently widespread in various Italian regions, where it causes severe damages. It is extremely polyphagous, attacks severely cereals but is very damaging also to *Brassicaceae* and *Leguminosae* (DI VITO *et al.,* 1985).

In Sicily, especially in sandy soils, *M. artiellia* damages various crops such as durum wheat, barley, chickpea, broad bean, lentil and vetch. During our survey, the damages caused by *M. artiellia* were more severe under specific environmental conditions. Low clay content of the soil and drought year can increase the severity of the nematode.

Natural factors suppressing soil densities of *M. artiellia* are temperatures higher than 30 °C and the presence of nematophagous fungi in the soil. The average nematode density can decline to 40, 87 and 97% after 1.5, 5 and 15 months, respectively, after the harvest of a susceptible crop (DI VITO & GRECO, 1988).

The control of *M. artiellia* on cereals and leguminous with nematicides is not economically sustainable. However, the nematode can be effectively controlled by crop rotation with non-host crops. In the Mediterranean area, cotton, sugar-beet, potato, oat, maize, tomato and

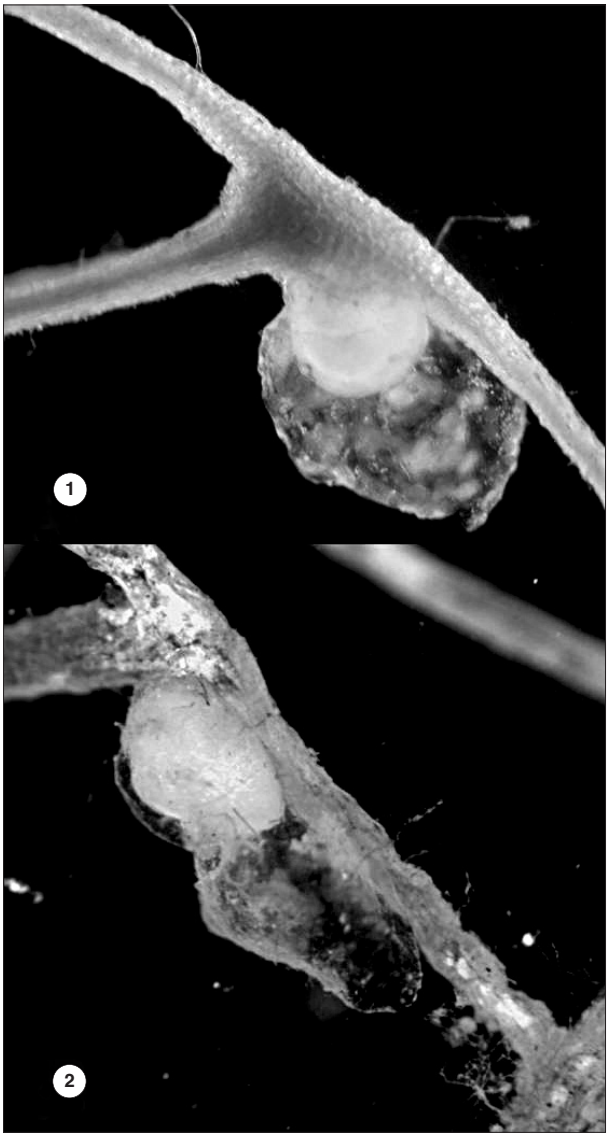

Fig. II – Root galls with mature females of *Meloidogyne artiellia* on wheat (1) and chickpea (2) plants nearly entirely covered by the gelatinous egg mass.

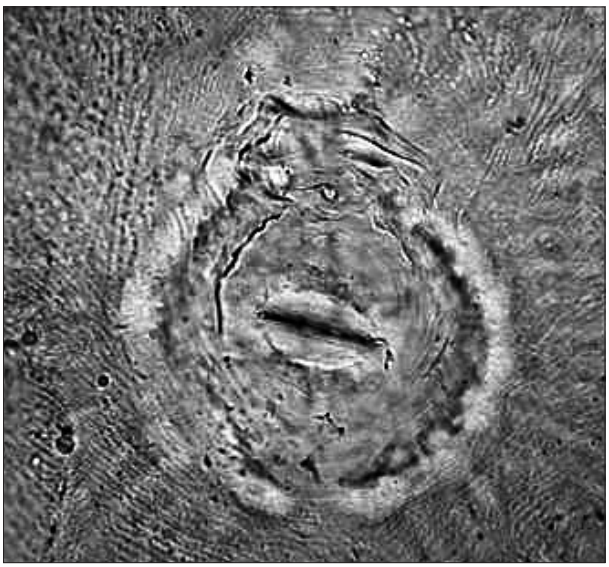

Fig. III – Perineal pattern of adult female of *Meloidogyne artiellia.* Note the eight shape.

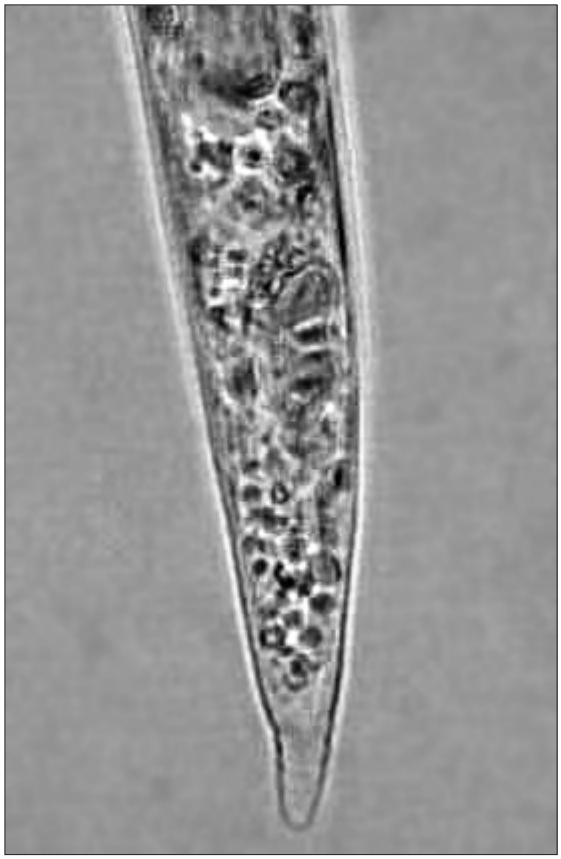

Fig. IV – Short and conical tail of the second juvenile of *Meloidogyne artiellia*.

melon are poor or non-host for *M. artiellia* and, therefore, can be included in a crop rotation for controlling the nematode. The rotation should be designed long enough to reduce the soil densities of the nematode below threshold levels and generally one of 2-4 years is satisfactory.

A 6-8 week solarization period can effectively control the nematode in the Mediterranean countries but it may not be economically convenient for legume and cereal crops.

RIASSUNTO

PRESENZA DI MELOIDOGYNE ARTIELLIA *SU CEREALI E LEGUMINOSE IN SICILIA*

Durante la primavera del 2008, il nematode galligeno *Meloidogyne artiellia* Franklin è stato rinvenuto in Sicilia in diversi appezzamenti situati in agro di Caltagirone (CT). I campi, in buona parte destinati alle coltivazioni di cereali autunno-vernini e di leguminose foraggere, mostravano chiazze di vegetazione stentata,; le piante si presentavano nanizzate, con foglie clorotiche, spighe con cariossidi inconsistenti e apparato radicale ridotto.

Il nematode galligeno *M. artiellia*, responsabile di gravi perdite di produzione, segnalato in diverse regioni italiane su ospiti comprendenti numerose specie appartenenti alle famiglie *Graminaceae*, *Leguminosae* e *Cruciferae,* non era mai stato rinvenuto in Sicilia.

Piante di frumento duro (*Triticum durum* Desf.), di orzo (*Hordeum vulgare* L.), di cece (*Cicer arietinum* L.), di favino (*Vicia faba* L.), di lenticchia (*Lens culinaris* Medik.) e di veccia (*Vicia sativa* L.) infestate dal nematode, all'esame visivo, si presentavano poco sviluppate rispetto a quelle sane circostanti. Indagini di laboratorio, effettuate su campioni di tessuto radicale provenienti da tali specie, attraverso l'osservazione allo stereoscopio da dissezione, hanno evidenziato imbrunimenti nei punti di inserzione delle radichette, in corrispondenza della presenza di piccole galle, recanti femmine mature con ovisacco ripieno di uova e di larve preparassitiche.

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