CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Meloidogyne artiellia

Figure 1. Chickpea roots with galls induced by *Meloidogyne artiellia*. Arrows indicate females on roots. Photo credit: Sergei Subbotin, Plant Pest Diagnostic Center, California Department of Food and Agriculture, CA, USA (Subbotin et al., 2024).

Scientific Name

Meloidogyne artiellia Franklin, 1961

Synonym(s):

None

Common Names

British root-knot nematode, cereal and legume root-knot nematode

Type of Pest

Nematode

Taxonomic Position

Class: Chromadorea, **Order:** Rhabditida, **Family:** Meloidogynidae

Pest Recognition

Pest Description

Meloidogyne artiellia is a root-knot nematode infecting cereals, legumes, and cruciferous crops (Fig. 1) (Subbotin et al., 2024; Subbotin et al., 2021). The species is distributed in several Asian, African and European countries (CABI, 2025; Palomares-Rius, 2022). The nematode is usually active on host plants during cool growing seasons (Di Vito et al., 1994; Palomares-Rius, 2022).

The eggs of *Meloidogyne artiellia* are similar to that of other species of *Meloidogyne* (Palomares-Rius, 2022). The infective stage is the second-stage juvenile (J2) (Fig. 2A). J2 and adult males are only found in sampled soil, while females occur only in or on host roots (Palomares-Rius, 2022).

J2 nematodes are worm-shaped (vermiform). J2s have short, rounded, narrow, and conical-shaped tails (Fig. 2B) (Franklin, 1961; Imren et al., 2014). Male and female stylet (piercing mouthparts) knobs are small, egg-shaped, and backwardly sloping (Damme et al., 2013). Females feed on the roots and their body swells as they feed (Fig. 2C), eventually resulting in a pear-shaped form (Fig. 2E) with an egg mass (Palomares-Rius, 2022). The distinguishing features of females include the shape of the vulva (Fig. 2D) and the excretory pore (Fig. 2C) that require a microscope and training to properly identify.

Signs & Symptoms

Nematode infestation of host roots limits water uptake, and damage in the field usually occurs in patches (Kyrou, 1969; Palomares-Rius, 2022). Infected plants may appear wilted under hot and sunny conditions, even with ample soil moisture (Palomares-Rius, 2022). Symptoms of nematode damage may be similar to those caused by nutrient or water deficiency (Davis and Venette, 2004).

Damage caused by *Meloidogyne* spp. involves impaired root growth and impaired root function. Impaired root growth results in gall formation, proliferation of lateral roots, or stimulation of giant cell growth at nematode feeding sites (Palomares-Rius, 2022). Damage to root function results in yellowing or browning of roots, stunted growth, nutrient deficiencies, necrosis (premature death) of above-ground plant parts, and/or reduction in yield (Lombardo et al., 2011; Palomares-Rius, 2022). Symptoms may not be apparent until later stages of growth (Davis and Venette, 2004; Greco et al., 1992).

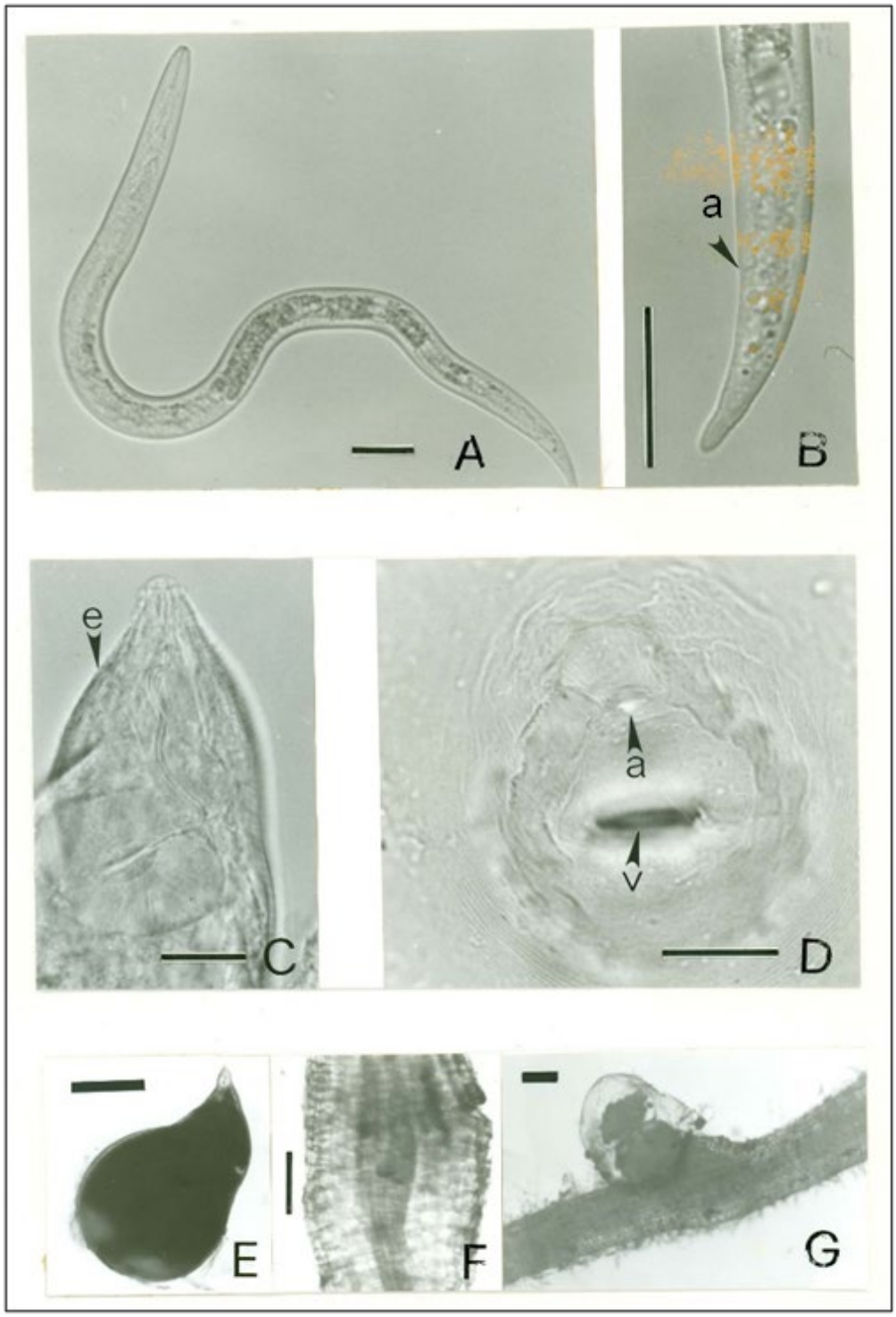

Figure 2. Photomicrograph of *Meloidogyne artiellia* life stages. Scale bars = 20 *µm* in A-D and 200 *µm* in E-G. **(A)** entire body of second-stage juvenile (J2); **(B)** posterior body portion of J2, a=anus; **(C)** anterior body portion of swollen female, e=excretory pore; **(D)** perineal pattern showing the eight-shaped inner area marked by coarse lines and containing vulva (v) and anus (a), note the fine striae and continuous striae surrounding the inner area; **(E)** entire body of swollen female; **(F)** slight swelling induced by J2 on chickpea root; **(G)** large egg mass covering a swollen female, which protrudes with its posterior portion of the body from the surface of a chickpea root. All photos courtesy of R.N. Inserra, Nematology Section of the Bureau E.N.P., Gainesville, FL, USA (Greco et al., 1992).

Injured root tissue is susceptible to other disease-causing pathogens. Thus, symptoms of another disease may appear on the nematode-injured plants, and a plant could be infested with nematodes and another pathogen.

Root galls are the only clearly visible sign of nematode infestation. Measurements of root galls are not available; however, are very small and visible with the naked eye (Fig. 1). Sometimes they may go undetected because of their size (Palomares-Rius, 2022). *Meloidogyne artiellia* adult females are swollen (Fig. 2E), 650-760 µm × 340-460 µm in size (Davis and Venette, 2004), generally not visible with the naked eye, remain inside the root galls, are often covered by large egg masses (Fig. 2G), and in some cases are associated with a proliferation of lateral roots (Palomares-Rius, 2022).

Easily Mistaken Species

Meloidogyne artiellia can be confused with other root-knot nematodes, including *M. acrita*, *M. arenaria*, *M. christiei*, *M. cruciana*, *M. megatyla*, *M. hapla*, *M. incognita*, *M. graminis*, *M. javanica*, *M. querciana*, and *M. thamesi*. Of these easily mistaken species, *M. arenaria*, *M. hapla*, *M. incognita*, *M. graminis*, and *M. javanica* are already in the United States (WPPNUS, 2025). However, *M. artiellia* can be distinguished from other root-knot nematodes by examining their morphology using a microscope.

Meloidogyne artiellia J2s have a shorter tail, measuring 16-28.8 µm long (Palomares-Rius, 2022); whereas, J2s of the other species listed above have longer tails, measuring >30 µm (Greco et al., 1992). J2s and males can be found in sampled soil, while females occur only in the roots (Palomares-Rius, 2022). The perineal pattern of the female of this nematode has an eight-shaped inner area marked by coarse lines (Fig. 2D) (Greco et al., 1992), which is different from other root-knot nematodes (Franklin, 1961). However, training is required to recognize the differences.

Though plants in the Fabaceae, Brassicaceae, and Poaceae are considered good hosts of this nematode, the symptoms of an infection are more evident on chickpea (Di Vito et al., 1994). Many of the easily mistaken root-knot nematode species, such as *M. incognita* and *M. javanica*, are cosmopolitan in nature; whereas, *M. artiellia* is found in Africa, Asia, and Europe (EPPO, 2025). Compared to the root galls of other root-knot nematodes, the root galls of *M. artiellia* are relatively small and often difficult to detect (Palomares-Rius, 2022).

Commonly Encountered Non-targets

The approved method for survey is soil sampling. Soil samples are sent to a nematology diagnostic laboratory, where nematodes will be extracted and identified.

Multiple plant-parasitic and free-living nematodes are common in soils and are likely to be encountered during surveys for *M. artiellia*. However, the presence of root-galls is evidence of an attack by root-knot nematodes, *Meloidogyne* spp. specifically.

Root galls can be confused with naturally occurring root nodules (N-fixing nodules) found in Fabaceous hosts of this nematode such as chickpea. Root galls are more swollen and irregularly shaped structures on the roots, whereas nodules are typically spherical masses attached to the roots. If the galls and nodules are both present, galls are often difficult to distinguish on roots because nodules cover the roots (Fig. 3) (UF/IFAS, 2016).

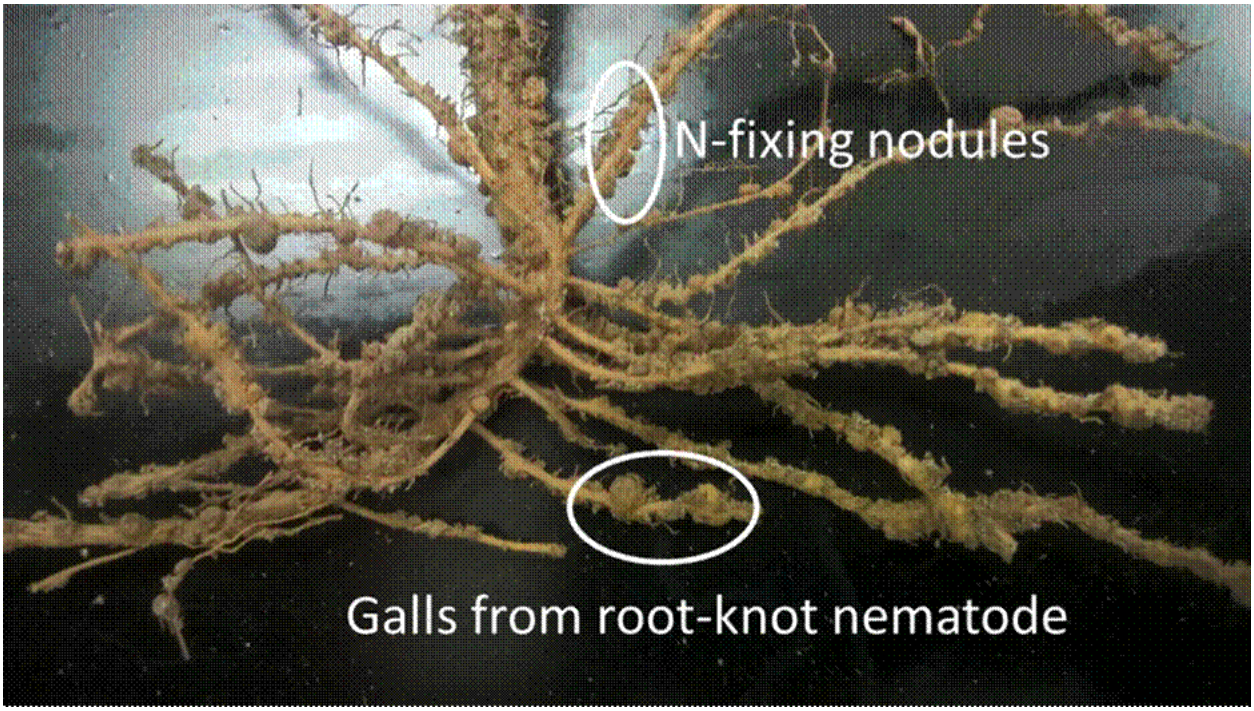

Figure 3. Peanut roots with galls caused by root-knot nematode, *Meloidogyne* sp. Galls are thickenings of the roots while nodules are round attachments to the side of the roots. Photo credit: Nematode Assay Laboratory, Institute of Food and Agricultural Sciences, University of Florida (IFAS) (UF/IFAS, 2016).

Biology and Ecology

Meloidogyne artiellia development and activity depend on temperature. *M. artiellia* is adapted to cool and dry conditions and enters an inactive, quiescent state to survive environmental stresses (Palomares-Rius, 2022). This nematode is active during autumn (Buisson et al., 2014), winter, and spring and inactive from late spring through summer (Di Vito and Greco, 1988b). Prolonged egg hatch occurs at temperatures as low as 41-50ºF (Greco et al., 1992). Based on the results of a field experiment conducted in France, researchers have hypothesized that some of the J2s that penetrate the host roots in autumn could complete their development at the beginning of spring (Buisson et al., 2014). However, the biological process is much faster when temperatures reach 59-77ºF. Root penetration by a J2 also occurs when temperatures are at least 50ºF. Temperatures below 50ºF and above 86ºF are unfavorable for root penetration, development, and egg production, while temperatures between 59ºF and 77ºF are considered optimal (Greco et al., 1992).

Embryogenesis and hatch of infective J2: Following embryogenesis, the first molt occurs within the egg, giving rise to a J2, which is the stage that can infect plants (Sasser and Carter, 1985). Eggs will not hatch under extended dry periods. The unhatched eggs may persist in soil or dry roots awaiting more favorable moist soil conditions (Greco et al., 1992). After emergence, if a host is not available, the J2s of this nematode can survive in “fallow” fields for 1-2 years (Greco et al., 1992; Palomares-Rius, 2022).

Infection: Once J2s leave the egg masses, they interact with the host plant and create the feeding site usually near or behind the root cap, at lateral root initials, or in galled root tissue near an embedded adult female (Palomares-Rius, 2022). The site where one J2 enters the root may attract other J2s. The J2s move through the root to the region of cell differentiation, settle, and become inactive while feeding (Hussey, 1985).

Feeding induces cells to swell and form “giant” cells on which J2s feed until development is complete (Hussey, 1985; Palomares-Rius, 2022). When giant cell formation occurs, tissues surrounding the feeding nematode begin transforming to a gall within 1-2 days following root penetration (Hussey, 1985).

Juvenile stages to adult stage: Following root penetration, third- and fourth-stage juveniles develop in 3-5 and 10-12 days, respectively, and the adult stage is developed in 20 days at 59-77ºF (15-25ºC) (Di Vito and Greco, 1988b; Greco et al., 1992; Palomares-Rius, 2022). However, the total development time varies from approximately 20 days at 77ºF (25ºC) to 55 days at 50ºF (10ºC) (Greco et al., 1992).

An adult female swells as it feeds until development is completed (Di Vito and Greco, 1988b). Males do not feed on roots, are worm-shaped, and move out of the root into the soil after completing their development. The males survive in the soil for several weeks (Palomares-Rius, 2022).

Egg laying by adult females: Newly developed females start to lay eggs within two weeks (Di Vito and Greco, 1988b). Eggs are deposited outside the nematode body in a gelatinous matrix, which is produced by female nematodes before and during egg production. The gelatinous matrix encases nematode eggs, forms the egg mass, protects the eggs from predators and pathogens (Sasser and Carter, 1985), and protects the female nematode body (Greco et al., 1992). Large gelatinous egg masses contain up to 371–596 eggs in wheat and up to 110–397 eggs in chickpea but are highly dependent on the nematode population (Fernández et al., 2005).

Known Hosts

Investigations on the host range of *M. artiellia* indicated that this root-knot nematode reproduces well on Poaceae, Brassicaceae, and Fabaceae plants (Di Vito et al., 1985; Palomares-Rius, 2022). The preferred hosts are *Brassica oleracea* var. c*apitata* (cabbage) (Franklin, 1961), *Cicer arietinum* (chickpea) (Greco, 1984), and *Triticum durum* (durum wheat) (Imren et al., 2014) (Table 1).

The host list below includes cultivated and wild plants that 1) are infected or infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for feeding and damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.

Table 1. Preferred hosts of *Meloidogyne artiellia.*

Scientific Name	Common Name	Type/Use	References/Notes
Avena sativa	oat*	Cultivated	(Franklin, 1961)
Brassica napus	rape*	Cultivated	(Buisson et al., 2014)
Brassica napus subsp. *rapifera*	swede*	Cultivated	(Franklin, 1961)
Brassica oleracea var. *acephala*	Kale*	Cultivated	(Franklin, 1961)
Brassica oleracea var. *capitata*	cabbage*	Cultivated	(Franklin, 1961)
Brassica oleracea var. *gemmifera*	Brussels sprouts*	Cultivated	(Franklin, 1961)
Cicer arietinum	chickpea*	Cultivated	(Di Vito et al., 1994; Lombardo et al., 2011; Navas-Cortés et al., 2008)
Hordeum vulgare	barley*	Cultivated	(Lombardo et al., 2011)
Lens culinaris subsp. *culinaris*	lentil*	Cultivated	(Lombardo et al., 2011)
Medicago lupulina	black medick*	Cultivated	(Franklin, 1961)
Medicago sativa subsp. *sativa*	alfalfa*	Cultivated	(Franklin, 1961)
Pisum sativum	garden pea*	Cultivated	(Abid El Moneim and Bellar, 1993; Franklin, 1961)
Trifolium pratense	red clover*	Cultivated	(Franklin, 1961)
Triticum aestivum	common wheat*	Cultivated	(Kyrou, 1969)
Triticum turgidum subsp. *durum*	durum wheat*		(Di Vito and Greco, 1987; Lombardo et al., 2011)
Vicia faba	faba bean*	Cultivated	(Franklin, 1961; Lombardo et al., 2011)
Vicia narbonensis	purple broad vetch*	Cultivated	(Abid El Moneim and Bellar, 1993)
Vicia sativa	garden vetch*	Cultivated	(Abid El Moneim and Bellar, 1993; Lombardo et al., 2011)

* Hosts with known U.S. distribution.

Pest Importance

Meloidogyne artiellia has been reported as a damaging pest of cereals and leguminous crops in European and Asian (Middle Eastern) countries (Palomares-Rius, 2022). It causes damage to wheat when the crop is continuously grown as a monoculture (Di

Vito and Greco, 1988a), and the nematode also causes consistent damage to chickpea after rotation with wheat (Di Vito and Greco, 1988b; Di Vito and Greco, 1988c). Microplot studies indicate that this nematode may reduce yields by ~80% in chickpea when the population density reaches ~236 eggs and J2s per US fluid oz of soil in winter or ~30 eggs and J2s per US fluid oz of soil in spring (Di Vito and Greco, 1988c). Studies on *Triticum durum* (durum wheat) in Italy show a 90% yield loss when population densities reach ~944 eggs and J2s per US fluid oz of soil (Di Vito and Greco, 1988a). Heavy damage to forage vetches (*Vicia* spp.) and peas (*Pisum sativum*) attributed to *M. artiellia* has also been reported in some fields in Syria (Abid El Moneim and Bellar, 1993).

Meloidogyne artiellia is listed as a harmful organism for Honduras, Indonesia, and Timor-Leste (PExD, 2025) for cultivated fields and grasslands (Palomares-Rius, 2022). There may be international trade implications for exports of rooted plants or plants with soil if this nematode becomes established in the United States.

Known Vectors (or associated insects)

This species is not a known vector, is not known to be vectored, and does not have any associated organisms.

Known Distribution

Table 2. Countries where *Meloidogyne artiellia* is known to occur.

Continent	Country	References/Notes
Africa	Algeria	(Imren et al., 2014; Palomares-Rius, 2022)
Africa	Tunisia	(Palomares-Rius, 2022)
Africa	Morocco	(Imren et al., 2014; Palomares-Rius, 2022)
Asia	China	(Imren et al., 2014; Palomares-Rius, 2022)
Asia	Israel	(Imren et al., 2014; Palomares-Rius, 2022)
Asia	Syria	(Imren et al., 2014; Palomares-Rius, 2022)
Asia	Turkey	(Imren et al., 2014; Palomares-Rius, 2022)
Europe	Belgium	(Damme et al., 2013; Palomares-Rius, 2022)
Europe	France	(Di Vito and Greco, 1987; Palomares-Rius, 2022)
Europe	Greece	(Kyrou, 1969; Palomares-Rius, 2022)
Europe	Italy	(Di Vito and Greco, 1987; Greco, 1984)
Europe	Russia	(Palomares-Rius, 2022; Shiabova, 1981)
Europe	Spain	(Palomares-Rius, 2022)
Europe	United Kingdom	(Franklin, 1961; Subbotin et al., 2024; Subbotin et al., 2021)

Status of infestation in the United States (December 2025)

Meloidogyne artiellia has not been reported in the United States (Palomares-Rius, 2022; Subbotin et al., 2024).

Pathway

The most likely pathway of entry for *M. artiellia* is through transport of infected planting material or soil. Since 1984, there have been at least twenty interceptions of *Meloidogyne* spp. at U.S. ports of entry in baggage, mail, and permit cargo coming from multiple countries (ARM, 2025). While none of these interceptions were confirmed to be *M. artiellia*, the interceptions demonstrate the ability of root-knot nematodes to be transported long distances.

*The **Agricultural Commodity Import Requirements (ACIR) manual** provides a single source to search for and retrieve entry requirements for imported commodities. Use ACIR to determine 1) if host plants or material are allowed to enter the United States from countries where the organism is present and 2) what phytosanitary measures (e.g., inspections, phytosanitary certificates, post entry quarantines, mandatory treatments) are in use.*

Potential Distribution within the United States

Based on where *M. artiellia* is known to occur in the world and comparing those climates with Global Plant Hardiness Zones, we expect that *M. artiellia* could establish in plant hardiness zones 2-11 (Davis and Venette, 2004; Shiabova, 1981; Takeuchi et al., 2018).

Little information is currently available on the potential distribution of this nematode in the United States, but areas that plant mustard crops, legumes, and small grains are especially at risk for establishment (Davis and Venette, 2004; Palomares-Rius, 2022). With such a broad range of suitable climates and suitable host crops grown in nearly every state, this nematode could likely establish anywhere in the United States.

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://approvedmethods.ceris.purdue.edu/.

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PPQ. 2025. Cooperative Agricultural Pest Survey (CAPS) Pest Datasheet for *Meloidogyne artiellia* (Meloidogynidae): British root-knot nematode. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC.

Versions

2016: Datasheet completed (Version 1).

2025: Datasheet revised (Version 2): Converted to new template with comprehensive revision of all sections.

- Revised the taxonomy.
- Added the Pest Recognition section.
- Specified the names of the Easily Mistaken Species.
- Added nematode trophic groups in the Commonly Encountered Non-targets section.
- Condensed the Biology and Ecology section.
- Added figures (Figures 1, 3, and 4) and new citations.
- Presented the known hosts and distribution of *M. artiellia* in Table 1 and Table 2, respectively.
- Revised the Approved Methods

Reviewer(s)

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