

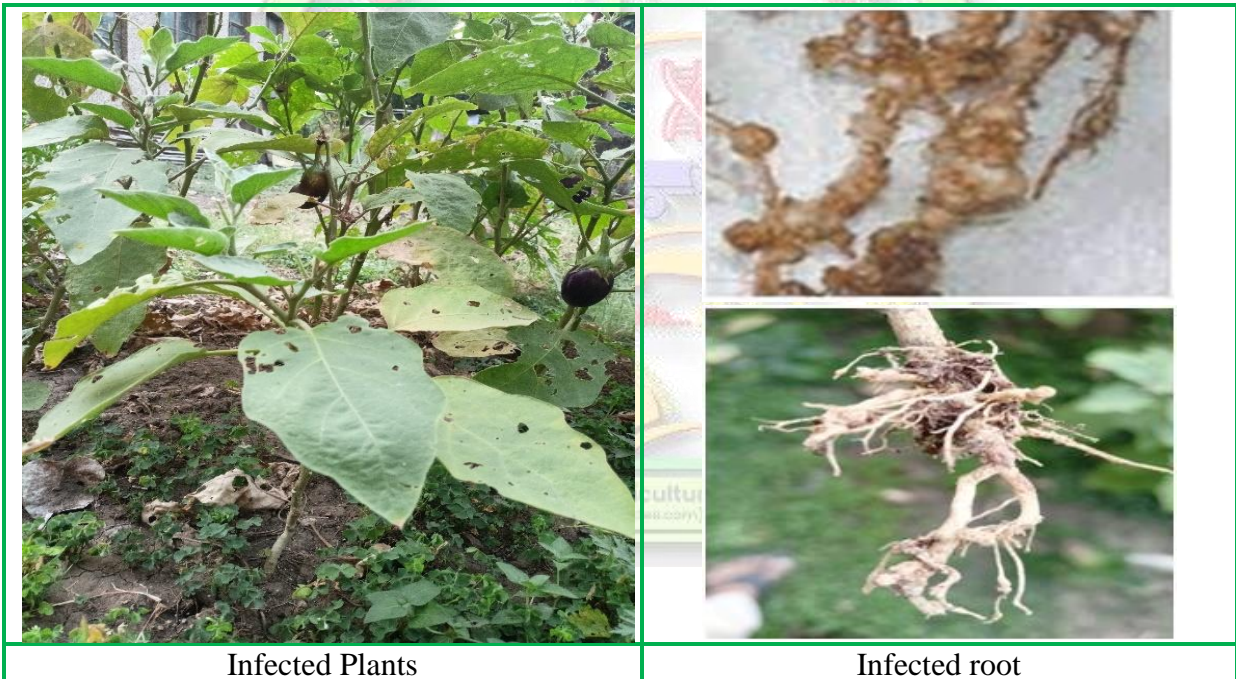
Root-Knot Nematode of Brinjal and their Management

(Naveen K. Dhakad, *Sanjay Kharte, Jayant Bhatt, A.K. Jain and Swarna Kurmi)

Department of Plant Pathology, JNKVV, Jabalpur-482004, Madhya Pradesh, India

*Corresponding Author's email: skpatho@jnkvv.org

Root Knot nematode (*Meloidogyne incognita*), also known as the southern root-nematode is a plant-parasitic nematodes in brinjal crops. The generic name *Meloidogyne* is derived from Greek words; melon: apple or goard, oides, oid: resembling and gyne, female; meaning apple or goard like female, the shape which they acquire on maturity. It typically incites large, usually irregular galls on roots as a result of parasitism. The response is complicated and thought to allow the nematodes to move toward an appropriate level in soil, while they search for chemical cues that can guide them to specific roots. This root knot nematode is world-wide and is distributed throughout India, especially in warmer climates. It is restricted to altitudes below 2000 m above sea level. *Meloidogyne incognita* is found on a variety of soil types, damage and yield losses are typically more severe on coarse-textured sandy soils. *Meloidogyne* spp. are typically intolerant of waterlogged soil conditions.



Infected Plants

Infected root

❖ Host Range

- This nematode is particularly polyphagous, consuming both monocotyledons and dicotyledons.
- The majority of plants can support at least one of the most prevalent species of root-knot nematodes, which have a wide host range.

These nematodes thrive in a variety of fruits, vegetables, and ornamental crops, including bananas, cucurbits, grapes, carnations, passionfruit, nectarine, capsicum, beans, kiwi fruit,

chrysanthemum, pineapple, tomato, carrot, egg fruit, strawberry, rose, peach, celery, ginger, lettuce, papaya, and pumpkin. Grass plants are often more resistant to root-knot nematodes than other plant families.

❖ **Symptoms on host plants**

- Formation of galls on the roots.
- Plants wilt rapidly especially under dry growing conditions and are often stunted.
- Growth may be retarded and leaves may be chlorotic.
- In cases where seedlings infestation has taken place, numerous plants die in the seed bed and seedlings do not survive transplanting.
- In those plants that do survive, flowering and fruit production is strongly reduced.

❖ **Morphology and diagnostic characters *M. incognita*:**

Juvenile:

- The second stage body size of juveniles is between 350 and 450 μm in length.
- Their tail is rounded at the tip and varies in length from 43 to 65 μm , featuring a hyaline area that is 6 to 14 μm long.
- The stylet is slender and about 10 μm long, with rounded basal knobs; the oesophageal glands overlap the intestine ventrally; and the tail is an elongate conoid with a pointed tip.

Female:

- *M. incognita* females have a pear-shaped body and no posterior protuberance.
- Their stylet has rounded and offset knobs and varies in length from 15 to 16 μm .
- Cuticles are narrow, about 2-3 μm thick at the midbody.
- Excretory pore is often located slightly posterior to the stylet base.
- Striae, the perineal pattern is frequently ambiguous.
- Large, tightly spaced phasmids. The striae mark the tail end.

Male:

- Vermiform; 1.5-2.0 mm long; stylet and oesophagus well- developed; spicules slender, gubernaculum simple, bursa absent.
- The head is significantly set off, with a conspicuous head cap in dorsoventral view and two or three faintly defined annules.
- Round stylet knobs & no cephalids were seen.
- The excretory pore is located 40-50 μm posterior to the centre of the median bulb and 83-92 μm from the anterior end of the body.
- Testicles extended. Spicules are arcuate in shape, with bluntly rounded tips.
- Gubernaculum is brief and straight.
- Tail is short and distinctly subdigital.

❖ **Biology and Life Cycle of *M. incognita*:**

- Sedentary endoparasites, root-knot nematodes deposit their eggs in root galls. Throughout their lives, females that are lodged in galls lay between 200 and 400 eggs.
- Males reproduce through parthenogenetic reproduction and are not parasitic. Within roots, egg masses form, and the ideal temperature range for egg hatching is 20 to 30⁰ C.
- First-stage juveniles (J1) undergo a moult to become second-stage juveniles(J2) throughout the 10 to 15 days embryogenesis process.
- Larvae are released into the soil in spring and eventually make their way to the roots of host plants.
- Through stylet thrusts and enzymes, second-stage juveniles break through roots to become sessile and create feeding sites. The feeding process begins with parasitic second-stage juveniles assuming swollen shapes.
- Sex differentiation occurs, with females acquiring V-shaped genital primordium and males I-shaped.

- Second moult occurs in a week, followed by third(J3) and fourth-stage (J4) juveniles.
- The final moult sees adult female becoming sac-like, stylet appearing, and reproductive system fully developed.
- The larval stage is completed in three weeks, and the pH of 7.1 to 7.25 is suitable for nematode development and multiplication.
- Adult males are vermiform, coiled inside juveniles, with a short life cycle. Adverse environmental conditions can induce maleness in juveniles.
- The life-cycle is completed in 25 days at 25-30°C, with winter conditions extending it to 60-80 days. 7-8 overlapping generations are completed annually.

❖ **Management practices**

- Two to three deep summer ploughings at 10-15 days intervals in May/June effectively eliminate J2 in soil due to desiccation and hot temperatures.
- Crop rotation: Rotating brinjal with marigold helps to reduce the nematode incidence for the next crop.
- Resistant varieties/lines of eggplant are Black beauty, Pant Rituraj, Banaras Giant, Rajendra Baigan, Rajendra Baigan II long, IC-90903, IC-127029, IC- 122076, KS-224, IC-127040.
- Flooding and solarization of fields are good techniques to control nematodes.
- Inoculum densities could be decreased if diseased plants are burned to eradicate the disease.
- Treatment of nursery beds alone with carbofuran @ 3 kg a.i./ha (0.3g a.i.m) in case of transplanted crops at sowing.
- Seedling root-dipping in Rogor 30EC emulsion (1ml/litre water) for 3 hrs.
- Application of DD-100 @225 litres/ha at least one month before sowing/transplanting or use of Nemagone-60 @ 34 lit/ha in irrigation water in standing crop also controls the nematode.
- Soil application of granular pesticide carbofuran 3G @ one kg a.i/ha is recommended to nematode infested vegetable crops under field condition.