



## Nematode Diseases of Alliums

(\*Jayalakshmi K<sup>1</sup>, Ram Dutta<sup>1</sup>, Ashwini P. Benke<sup>1</sup> and Saranya R<sup>2</sup>)

<sup>1</sup>ICAR-Directorate of Onion Garlic Research, Pune, Maharashtra, India

<sup>2</sup>ICAR-Central Arid Zone Research Station, Jaisalmer, Rajasthan, India

\*Corresponding Author's email: [jayalakshmiapat@gmail.com](mailto:jayalakshmiapat@gmail.com)

Nematodes are soil-borne pests that are frequently brought into a region by human activity-related soil movement. They can often stay in the soil until no longer having access to adequate host tissue for feeding. Nematode pest activity has increased due to the diverse agro-climatic conditions and soils, which are combined with agricultural cultivation year-round to inflict significant harm to many major crops. *Ditylenchus dipsaci* (stem and bulb nematode), *Pratylenchus penetrans* (lesion), and *Meloidogyne spp.* (root knot) are most commonly associated with *Allium* crops viz., onion and garlic.

### Stem and Bulb Nematode

*Ditylenchus dipsaci* Kühn (Filipjev), belongs to the major pests of several vegetable crops. Considerable losses are repeatedly reported from cultures of garlic, onion. It is major pest in in areas of high rainfall and heavy spring rains. It is usually associated with heavy soils. Infected stems enlarge and are often discolored, nodes swell, and the internodes are shortened. Stem nematode is the most economically devastating of the nematodes to infest alfalfa. Stands may become economically nonviable within 2 to 3 years after infestation.

**Symptoms:** Infested with stem and bulb nematode has distorted and swollen tissues with a spongy appearance. The plants become stunted with shortened and thickened leaves often with brown or yellowish spots. The bulb tissue begins softening at the neck and gradually proceeds downwards; scales appear grey and the bulbs desiccate and split at the base under dry conditions. Under wet conditions secondary invaders such as bacteria, fungi and onion maggots may induce soft rot and decay of the bulbs.

**Causal organism:** *Ditylenchus dipsaci* (Aftalion and Cohn 1990) are microscopic (0.9 - 1.8 mm long) roundworms that live in soil and plant tissues. They feed on stems, leaves and bulbs by puncturing and sucking cell contents with a needle-like mouthpart called a stylet. Nematode attacks more than 1,200 species of wild and cultivated plants.

**Disease cycle:** Except in cold weather, reproduction occurs throughout the year with a typical life cycle taking between 19 and 23 days at 15°C. When sexually mature, the nematode lives for between 45 and 75 days. Each female being capable of producing up to 500 eggs. It is the fourth stage juvenile that is the nematode survival stage and it can go into a state of diapause ('slowed life') on or below the surface of plant stems, petioles and bulbs for up to five years. The stem and bulb nematode is a migratory parasite. At the beginning of a new season the fourth stage juvenile will enter young tissues especially seedlings just below the soil surface. Secondary Spread: Migration on plant parts above ground level requires water and juveniles and adults will take advantage of rain and irrigation water to travel above the soil.

**Management:** It is important to know the cropping history of the land to be planted; if the field is known to be free from stem and bulb nematode then planting should be done with

clean, uninfected cloves/bulbs. Where infestation of planting stock is evident or suspected then treating bulbs with hot water (46°C for 2 hours) has been shown to be effective in eradicating nematodes. Soil application of Fluensulfone or Fluopyram 1.3-5.2µg/ml.

### Root-knot Nematode

*Meloidogyne* spp. is the most widely disseminated plant parasitic pest in the world. It is usually favored by sandy soils, although it is present in all soils.

**Causal organism:** *Meloidogyne incognita*, *M. graminicola*

**Symptoms:** The presence of galls on the root system is the primary and specific symptom associated with *Meloidogyne* infection. On monocotyledonous crops such as onion and leek are very discrete, the main symptom being the presence of the protruding egg masses on the root surface. In case of severe infestation, the normal root system is reduced to a limited number of severely galled roots with a completely disorganized vascular system. Rootlets are almost completely absent. The roots are seriously hampered in their main functions of uptake and transport of water and nutrients. Plants wilt rapidly, especially under dry growing conditions from which they recover during cooler part of the day. Plant growth is retarded and leaves may be chlorotic. In case of seedling infection, numerous plants die in the seedbed and seedlings do not survive transplanting. Even the plants that do survive transplanting show reduced flowering and fruit production in the field.

**Survival:** Being obligate parasites, the absence of suitable host plants for prolonged periods leads to the disappearance of Root-knot nematodes. In the absence of susceptible crops, they often survive on weed hosts. During stress, when nematode populations rapidly decline, a proportion of the eggs in the egg mass goes in diapause and ensures perpetuation of the species. Under adverse environmental conditions, emergence and juvenile activity are reduced, thus increasing the chances of survival. Survival is influenced mainly by moisture content of the soil and to a lesser extent by temperature.

### Management

- Soil solarisation and deep summer ploughing of nematode infested fields 2-3 times at an interval of 10-15 days during the hot summer months.
- Crop rotations with maize, sugarcane, mustard, finger millet, groundnut, sugarcane and other grasses.
- Application of soil amendments such as neem cake and cotton seed cakes.
- Short periods of flooding in the field. Application of *Paecilomyces lilacinus* / *Trichoderma harzianum* with neem cake / FYM.
- Seedlings may be raised in solarized nursery beds treated with carbofuran at 0.3 g a.i./h (10 g/m<sup>2</sup>) + neem cake at 500 Kg/ha in nematode infested soil ten days before transplanting. Application of Carbofuran 5G at 45kg/ha.

### References

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