# Namatode Confronts Tea Plantation in Japan

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Tea is a host in Japan for several species of parasitic nematodes, the most important being the root-lesion nematode, known as *Praty lenchus loosi* Loof. The sheath nematode, *Hemicriconemoides kanayaensis* Nakasono and Ichinohe has been found in soil samples at the Tea Research Station of Japan.

Since its discovery as a pest, this nematode has been discovered in soil samples received from or collected at main tea cultivated areas in Japan. The spiral nematodes, *Helicotylenchus dihystera* and *Helicotylenchus erythrinae,* are found to be the next group in order of frequency followed by the lesion nematode and sheath nematode.

Although the pin nematode *Paratylenchus curvitatus* occurs often, crop failure caused by this nematodes has not been known. Other species of plant-parasitic nematodes that have been found near tea soils are root-knot nematodes *Meloidogyne incognita acrita,* stunt nematode *Tylenchorhynchus nudus.*

The following deals with the morphological note, distribution, host plants, damages and ecology of major nematode species attacking tea:

## Root-Lesion nematode

Morphological note: *P. loosi* closely resembles *P. coffeae* but the former is differentiated from the latter by its slenderer body, more posterior vulval position and shape of female tail, variations of tail being between those of *P. loosi* and *P. coffeae.*

**Distribution and host plants:** This nematode was described originally by Loof (1960) from the tea tree of Ceylon. In Japan, damages to tea by this species are common in all tea plantations. The nematode was also isolated from *Poncirus trifoliata* Rafin. On which *Citurus unshiu* Marcov. had been grafted.

**Damages:** The typical symptoms of injury caused by *P. loosi* are the presence of unhealthy tea, and the bushes with leaves turning yellow from pale green in winter. The bushes have the tendency to produce flowers and fail in crops. However, such symptoms have appeared in cases of deficient minerals, wanting of fertilizer, high water table of ground and many other soil-inhabiting organisms.

More positive proof of injury are the larger storage roots bear lesions of varying sizes that are recognized by stripping off the bark.

**Ecology:** Few detailed lifehistories of *P. loosi* appear in literatures in Japan. But the life-cycle occupies a period of 40 to 50 days; eggs are laid in the root system and the larvae feed in the host tissue, passing through about four moults. Males and females are found, but a smaller number of males was discovered as females in the soil and root.

## Sheath nematode

Morphological Note: This is a species originally described with the specimen detected from tea roots at Kanaya, Shizuoka Prefecture, by Nakasono and Ichinohe (1961).

*H. kanayaensis* resembles two species of *H. strictathecatus* Esser, 1960 and *H. mangiferae* Siddiqi, 1961; each species being comparatively in the approximate length of the body. *H. kanayaensis* differs from *H. strictathecatus* in (1) the shape of the first annule of the lip region, the outer margin of which is founded in the former and disc-shaped in the later species, and (2) the stylet knobs being directed anteriorly in the former and spherioid in the later.

*H. kanayaensis* is clearly distinguished from *H. mangiferae* by (1) the shape of the first annule of the lip region is angular in the latter, (2) the "c" of female is smaller in the former than those of the latter and (3) the lip region of the male bears three annules with the first annule setoff by constriction in the former while five annules without protruded first annule in the latter and (4) the bursa absent in the former but present in the latter.

**Distribution and host plants:** The nematode is prevalent in Shizuoka, Mie, Kochi, Saga, Miyazaki and Kagoshima Prefectures. As to the spreading of this nematode, it was believed that tea seedling plays an important role. No other plant was found infested with this nematode.

**Damages:** *H. kanayaensis* feeds on feeder roots. The symptoms of the feeder roots attacked by the nematode are the slipping off of roots cortex from stele and the brownish discoloration of stele. The above-mentioned decayed rootpiled layer is composed of thsoe nematode-attacked feeder roots.

According to a survey conducted by Kaneko (1963), the sheath nematode occurs in greater numbers at 30 cm depth and causes crop failure.

**Ecology:** Throughout a year, adult females occupy most portion of *H. kanayaensis* population and very few males are found as far as the Baermann funnel technique is applied. The ratio of larvae to adults reaches the maximum in July. But, in using the centrifugal flotation technique, the seasonal fluctuation of *H. kanayaensis* population was kept constantly around the year.

A single female contains usually 14 to 15 eggs and egg cells. Oviposition by a single female lasts for 15 to 20 days in June and July according to observations in the laboratory.

### Other nematode parasites in tea

Other nematodes such as the spiral nematodes, stunt nematodes, pin nematodes and root-knot nematode have also been found in the tea plantation soil. Even if a high population of nematodes is detected around the tea roots, it is difficult to prove the relationship existing between the nematode and its effect on the tea.

### Control of nematodes

In Japan, direct control of a nematode by using chemicals has not been often economic or practicable so indirect or cultural methods have to be employed customarily. But in recent years the campaign of replanting tea is promoted in the principal cultivated areas so chemical control of nematodes has become an essential work.

In mature tea plantation, it was clearly shown that the ground mealy bug lives and this insect was controlled by using nematocides. Therefore the utilization of nematocides has been on the increase for several years.

Generally speaking, there are three methods for controlling the nematode of ornamental, (1) cultural control (2) the selection of resistant and tolerant varieties and (3) chemical control. From the first point of view, the influence of manuring on the general problem of nematode control is discussed repeatedly, and it was ascertained that the organic compost decreased the parastic nematodes density. Nevertheless, the nematodes problem was not settle merely by the application of organic compost.

Concerning the second method, the selection of resistant and tolerant varieties, is one of the best means to combat the nematode issue, but tea being a crop that has to remain in the

field for many years, it was not a practical solution of the problem.

The nematocides application is divided in three cases, namely, (1) fumigation of tea nursery soil, (2) fumigation of replanting plantation and (3) fumigation of young and mature tea plantation.

**Fumigation of tea nursery soil:** Chloropicrin is now being recommended for fumigating tea nurseries. This application eradicates not only nematode population but also other harmful diseases, such as root rot.

**Fumigation of replanting plantation:** For controlling nematodes in plantations, the soil before replanting is treated with ethylene dibromide or D-D mixture at 20–30 l/10a, 20–30 cm deep. Autumn is preferable for the treatment with replanting occurring the following spring.

**Fumigation of young and mature tea plantation:** DBCP (1, 2-Dibromo-3-Chloropropan) and DCIP (Dichloro-Diisopropyl ether) are widely used in mature tea plantation in Japan. Two formulation of both DBCP and DCIP are available; the emulsifiable concentrate which contains 80% by weight and granular formulation which contains 20% by weight (DBCP) and 30% by weight (DCIP).

Diluted chemicals are powered into trenches 10–15 cm deep, positioned as closely to the plants as possible without disturbing or damaging the roots. Granular applications are usually applied manually into trenches or concentric circles set up in the same way as for the emulsifiable concentrate application up to a depth of 10–15 cm.

Another application method is an even broadcasting of the chemical onto the surface by top-dressing. In many old mature tea plantation, feeder roots are maldistributed on just beneath the surface of soil due to lack of cultivation. Therefore, it is difficult to trench the surface without damaging the roots. Except for the warm season (July-September), the top-dressing application of nematocides is effective agains nematodes and ground mealy bug inhabiting near the soil surface.

## References


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