GUIDE TO
NEMATODES
AND THEIR CONTROL
EXTENSION GUIDE No 68.
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WHAT ARE PLANT PARASITIC NEMATODES?

A great majority of plant parasitic nematodes are small wormlike animals ranging from 0.5 mm. to about 2 mm. long. In certain highly specialised forms, the female body may be greatly modified to assume a nearly spherical shape.

DISTRIBUTION OF NEMATODES

Most plant parasitic nematodes are cosmopolitan in distribution, occurring in the temperate regions as well as in the tropics. Some species are, however, restricted to tropical climates whereas some are more abundant in the temperate regions. In fact nematodes are known to exist everywhere there is organic matter.

HOW NEMATODES CAUSE DAMAGE

1. Plant Parasitic nematodes feed on roots, other underground parts and in some cases above-ground parts of plants causing much damage.

2. These nematodes have mouths in which there is a spearshaped structure which they use to pierce the cells of plant tissues. Some kinds of nematodes are able to enter a plant part and feed on the cell contents.

3. Other kinds of nematodes feed from the surface of the plant part or lie only slightly embedded in plant tissues with half of their body remaining on the plant part during feeding.

4. Nematodes feeding on or within plant tissues can cause both mechanical damage and chemical damage by secretion of toxic substances.
5. Finally, nematodes may predispose plants to attack by other pathogens.

6. In fact it is known that disease-resistant varieties of crops may become susceptible in presence of some nematode species.

7. Vectors of other plant pathogens e.g. Virus, fungi. (e.g. *Trichodorus* spp.) the stubby root nematode

SOME IMPORTANT PLANT PARASITIC NEMATODES.

In this country, nematodes cause important diseases of both rain-fed and dry season irrigated crops. The most important nematodes that cause diseases of crops in the Northern States of Nigeria are described below.

1. THE ROOT-KNOT NEMATODE (*Meloidogyne* spp)

Root-knot nematodes have been found mainly on vegetables, such as tomato, carrot, garden egg, cucumber, okra, cowpea, potato, lettuce etc. In the attack by root-knot nematodes, the female parasite after entering a root and becoming established within the tissues, remain in this position throughout the rest of its life, gradually losing its wormlike form and becoming more or less mango-shaped.

The most conspicuous symptom associated with root-knot nematode attack is gall formation. The nematodes invade the roots and other below ground parts and stimulate the development of swellings called galls. On some crops such as tomato, cucumber, melon, okra and lettuce, these galls often become large and conspicuous, but on other crops the galls may remain small and inconspicuous. Galls caused by root-knot nematodes can easily be differentiated from root nodules of leguminous plants by the fact that galls actually form part of the roots while nodules are only off loosely attached to the roots and can easily be brushed.
Gall formation may also lead to a decrease in size and malfunction of the root system. Other common symptoms are stunted growth, wilting, yellowing, dying and falling of leaves. Splitting of fruits in garden eggs is sometimes attributed to root-knot nematode attack.

2. The Reniform Nematode: *Rotylenchulus reniformis*

This nematode is generally found associated with roots of tomato, wheat, carrot, potato and lettuce. Tobacco, okra, garden eggs, cowpeas and sweet potato are also known to be highly susceptible hosts. The reniform nematode is semi-endoparasitic, feeding with its head embedded in the roots. It is only the female that so feeds and thus causes damage.

Symptoms of reniform nematode attack have been fully documented on cotton. Heavily infected cotton root system become pale with dead tissues on the outside. The whole of the root development is very poor. There is much reduction in boll-size and lint production and a delay in date of maturity.

3. The Root-Lesion Nematode: *Protocelenchus spp*

The root-lesion nematodes have been found around the roots of tomato, wheat, potato, onion, garden eggs etc. Little is however known about the natural host range for this nematode.

No definite symptoms of root-lesion nematode attack can be described. The nematodes penetrate extensively into root causing injury. These feeding sites gradually enlarge as a result of more nematode damage and may offer suitable sites for invasion by other pathogens. Root-lesion nematodes are migratory and are therefore capable of entering and leaving plant roots.

4. Other important or potentially important nematodes are: rice root nematode (*Hirschmanniella oryzae*), the spiral nematodes (*Helicotylenchus pseudorobustus* and *Scutelonema clathricandatum*)
on yam the stubby-root nematodes (*Trichodorus* spp.) and the rice white tip nematode (*Aphelenchoides hessey*).

**CONTROL MEASURES FOR NEMATODES**

**Crop Rotation**

Where the host range of a particular nematode permits the use of this method of control a 2—3 years rotation with non-host plants can help to reduce the nematode population in the soil. The crops that are likely to reduce root-knot nematodes population in the soil are rice, onion, guineacorn, maize, groundnuts and hot pepper. Though tomato as a crop is susceptible to root-knot nematodes, some varieties such as Ronita and Nematex are known to be resistant.

**Use of Trap-Crops**

Certain *Crotalaria* spp can be used as trap-crops. The plants induce the eggs of some nematodes to hatch and the larvae to invade the roots, but once inside the roots, the larvae do not develop to full maturity. *Crotalaria* has been known to reduce population of the sting nematode.

**Use Of Antagonistic Plants**

Certain plants are known to be antagonistic to nematodes. Examples are *Asparagus officinalis* and marigolds (*Tagetes* spp). These plants produce toxic substances which kill nematodes in the soil. By incorporating these antagonistic plants in the rotation or by interplanting these plants with the susceptible crops nematode populations can be kept down.

**Use of High Level of Organic Matter**

Incorporation of large quantities of organic matter into the soil has been found to reduce the severity of
infestation by nematodes and improve growing conditions of the crop.

Use of Base Fallow and Flooding

Bare fallow and flooding have been employed in certain circumstances for controlling nematodes. However, the implications of bare fallow in soil conservation and flooding in economics may limit their general use.

Use of Nematicides

Nematicides are chemicals used to kill nematodes. Chemical control of nematodes is the most effective means of reducing nematode populations in the soil, particularly in seed-beds and on the field where relatively small acreages are involved. Advice can be obtained from the Agricultural Officer on which nematicides to use. Examples of nematicides of importance are DD, and Nemagon and they are obtainable from any chemical company.

Good Husbandry

The practice of good farm husbandry can do much to keep infection of nematodes down to a minimum. The use of infested seed-beds and soil boxes to raise seedlings should be avoided.

FIGURE 1 A typical plant-parasitic nematode, Rotylenchus breviglans Sher, 1965.

(see Fig. A, B, C, D).

Somatic muscles
Testis
Spicule
Gubernacvium
Cloaca
Caudal alae (bursa)

Fig. A. Posterior portion of Nematode showing genital parts.
Fig. B. Anterior portion of Nematode showing mouth parts

Fig. C. Whole Nematode
Fig. D. Posterior portion of Nematode showing anal parts

N.B.

It is important to note that the collection and identification of nematode requires definite specialist attention and samples of diseased material suspected to be nematode attack should be sent to the I.A.R. Diagnostic and Advisory Service.

2. Chemicals for nematode control can be purchased from:

1. Shell Co. Ltd Kaduna

2. ICI Kano

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