



Nematodes

General information about nematodes

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INTRODUCTION

Nematodes are microscopically small, unsegmented organisms that vary in length between 0,1 to 1mm. The shape of the nematode varies from thread-like in most cases to round or saccate (in the case where the females swell up, e.g. root-knot nematode).

The name of the nematode is often derived from their shape, e.g. ring nematode, spiral nematode, etc. In other cases the name is derived from the damage they cause on the roots, e.g. stubby root nematode or lesion nematode (Fig. 1).

Each hand full of soil contains hundreds of nematodes, most of which are free-living (microbe feeders). Included amongst these are a few plant-parasitic nematodes which colonize plant roots. Although they are microscopic in size, these pathogens can have a negative influence on the health of a large variety of agricultural crops. The nematodes feed on the plant roots and lower parts of the plant stem and these damaged roots are less able to absorb much needed water and nutrients.

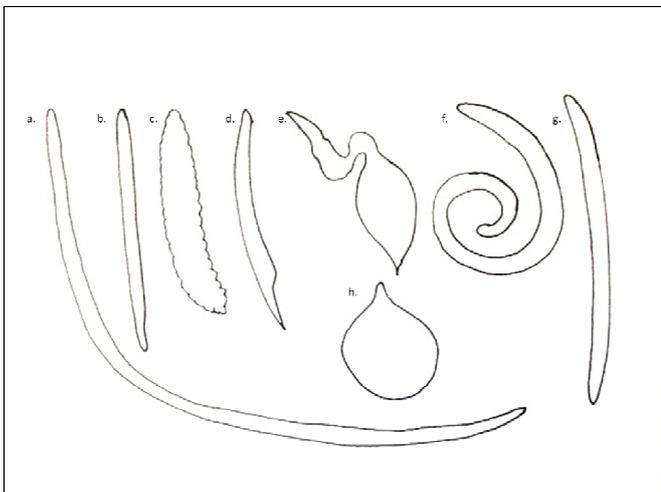


Figure 1: Different shapes of nematodes (a. dagger nematode, b. lesion nematode, c. ring nematode, d. pin nematode, e. citrus nematode female, f. spiral nematode, g. stunt nematode, h. root knot nematode female).

NEMATODES AND AGRICULTURE

The loss resulting from the damage caused by the plant-parasitic nematodes is conservatively estimated at approximately R1.9 billion in South Africa. It is clear that nematode infestation can be a serious threat to the producer. The most successful method to manage nematode problems is to collect and analyse the relevant data, then find the most suitable solution in order to generate optimal agricultural yield and ensure maximum profits for the producer.

Nematodes occur in untilled soil and the intensive cultivation of host plants created a mechanism through which nematodes could multiply and quickly reach pest status.

Life cycle

The life cycle (Fig. 2) of the nematode is made up of 4 larval stages from the egg stage to the adult. The second larval stage emerges from the egg. The length of the life cycle lasts anything from 21 days to 9 months depending on the environmental circumstances and the type of nematode.

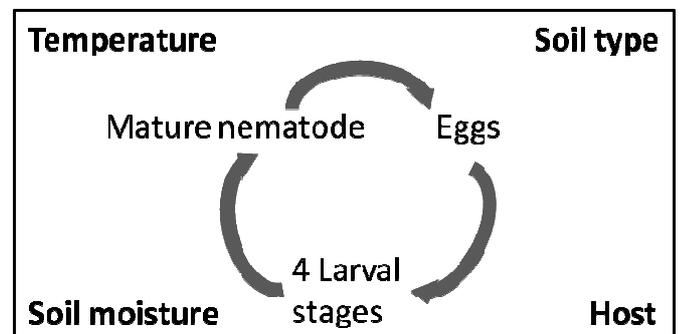


Figure 2: Nematode life cycle

Environmental factors

A range of environmental factors play a role in the biology of the nematode. Most nematodes will die if the temperature reaches 50°C.

Below 12°C the nematodes become physiologically inactive and their life cycles take longer to complete.

Soil moisture is essential to the nematode for movement. However there are cases where nematodes can survive under dry conditions for many years in a cryptobiotic state. The most frequent nematode damage is in lighter soils, e.g. sands and sandy loam soils. However damage is not limited to these soils.

Biology

Plant-parasitic nematodes are equipped with a hollow, spear-like stylet in the mouth which they use to penetrate root cells. Nematodes feed either on the outside of the roots (ectoparasites) or inside the roots (endoparasites).

The normal passage of water and nutrients is hindered and further growth of the roots is suspended.

Some nematodes have a very wide host range, e.g. root-knot nematode, whilst others have a very limited host range, e.g. the cyst nematodes.

Dispersal

Nematodes are relatively immobile and are primarily transported from infested to non-infested soils by man. Due to this enforced movement nematode distribution is seldom uniform. For this reason nematode damage in a land or orchard is **patchy** or uneven.

In most cases nematode damage is only seen once patches of dwarfed plants appear or poor and stunted trees are observed in an orchard. These areas of poor growth vary in size from a few square metres to hectares and give the land/orchard an uneven appearance. This uneven area will also expand with time.

Symptoms

Until fairly recently nematodes received very little attention as a serious threat to any crop. The attention was limited to vegetables where the presence of nematodes is fairly easily observed. The reason for their obscurity can be attributed to the fact that they are microscopically small and the above-ground symptoms are not specific. The symptoms are easily confused with those of toxic soil conditions, soil compaction, poor drainage and 'exhausted soils'. The presence of nematodes is largely ignored and for this reason nematodes are often referred to as the "unseen crop thief".

The below-ground symptoms (root symptoms) are more specific and often particular to the nematode present. These symptoms include galls (warts) on the roots; thick stubby roots; necrotic lesions; the absence of fine hair roots; a shallow root system and a general decline in root size and mass.

It is therefore very important to observe these small differences both above and below ground between healthy and infested plants before considering nematodes as the cause of the problem.

Nematodes are stress pathogens. Healthy root systems are critical in achieving optimal production. Soil health plays an equally important role here.

Control

Various control measures can be considered to curb nematode damage. These include sanitation; the use of certified plant material; the application of heat and cold to destroy nematodes in plant material, e.g. cold storage for long periods, hot water treatment, fire on seedbeds and steam; crop rotation with either non-hosts or weak hosts to the nematodes present in the soil; the use of resistant cultivars or rootstocks and the use of chemical or biological nematicides.