

Nematode

CHARACTERISTICS

Development conditions

In the absence of suitable host plants, the beet cyst nematode can survive in the soil for up to five or six years in the form of cysts, each containing hundreds of eggs and larvae. For cysts to hatch they require contact with root secretions and favourable climatic conditions, which generally occur in spring between 16 and 28°C (25°C the optimum). The larvae penetrate the root tissue, before migrating to the main vascular cylinder, where they establish a feeding site which blocks sap circulation within the beet. From this point onward, the growth and development of the plant is impaired. The larvae gradually develop into males or females. The females remain attached by the head to the complex of nutritive cells, and their body swells, until it is visible to the naked eye on the surface of the root. The males move through the soil fertilising females, after fertilisation the females die, and their white lemon-shaped bodies gradually transform into brownish cysts containing up to 600 eggs (between 100 and 300 on average).

The nematode's ability to move through the soil is relatively limited. However, the cysts may be dispersed by water (rainfall, run-off, irrigation, etc.), as well as by soil transport mechanisms such as erosion, soil cultivations and uprooting. Depending on the climatic conditions (rainfall, temperature, etc.) and the presence of hosts, several cycles of development can take place while the crop grows (2 or 3 generations per year in Northern European conditions). The optimum reproduction conditions for the beet cyst nematode are: a wet spring (although a period of drought will also accentuate the visible symptoms on infested plants), high soil temperatures, and a light soil type. However, the parasite can be present in any type of soil.



IN BRIEF

The beet cyst nematode (*Heterodera schachtii*) is a microscopic worm approximately 1 millimetre long, which lives in the soil.

Host plants

The beet cyst nematode has a very wide host range:

- ◀ cultivated species (beet, spinach, cabbage, canola/rapeseed)
- ◀ intermediate crop species (white mustard, fodder radish and some legumes).
- ◀ many adventitious plants (weeds such as Goosefoot (chenopodium), Lady's thumb, etc.)

Symptoms

The symptoms of an outbreak of *Heterodera schachtii* appear in limited patches in fields, which slowly increase in size over the season. They can be observed from June until harvest:



IN THE ROOTS

- ◀ The tap root is under-developed.
- ◀ Root hair may form, on which small white lemon-shaped cysts between 0.5 and 1 mm in diameter can be observed. Once they are fully developed, the cysts turn brown and detach from the plant.

IN FOLIAGE

- ◀ Wilting during the hottest part of the day; beyond a certain level of infestation, the leaves no longer have the capacity to recover during cooler periods, and this wilting becomes permanent
- ◀ Yellowing of the outer leaves
- ◀ Symptoms of magnesium deficiency





INTERVIEW WITH A SESVANDERHAVE EXPERT



Jan sels

PLANT BREEDER / NEMATODE EXPERT

BIOTIC STRESS DEPARTMENT

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CAN A NEMATODE INFESTATION BE CONFUSED WITH ANY OTHER DISEASE?

JS: The symptoms can indeed be confused with other diseases such as rhizomania, or with the symptoms of poor soil structure:

- ◀ Wilting of leaves and proliferation of root hair are also characteristic of rhizomania
- ◀ Poor soil structure can also contribute to the proliferation of root hair, adversely affecting the tap root, and wilting may be accelerated during dry weather
- ◀ Magnesium deficiency can also cause similar symptoms in leaves

WHAT TECHNIQUES ARE AVAILABLE FOR COMBATING THE BEET CYST NEMATODE?

JS: No approved, effective chemical control option is currently available against the nematode. Protection of sugar beet against the beet cyst nematode is based on agronomic measures, and sowing of tolerant varieties.

Agronomic measures include extended rotation and avoidance of host species, such as canola/

rapeseed, cabbage, spinach, etc., during rotation. Canola/rapeseed and any other non-nematicide crucifer must absolutely be avoided in fields contaminated by *Heterodera schachtii*. If canola/rapeseed was the preceding crop, it must be ensured that volunteers are routinely destroyed. A resistant crucifer can also be sown as an intermediate crop (known as a “nematicide green manure”), and soil structure as well as drainage can be improved. Sowing a tolerant variety is advisable in the event of:

- ◀ A drop in yield, or yields lower than the local average
- ◀ Symptoms of magnesium deficiency in the foliage
- ◀ Wilting during the hottest part of the day
- ◀ The presence of cysts in the soil, if possible confirmed by analysis

HOW IS SESVANDERHAVE POSITIONED IN THIS MARKET SEGMENT?

JS: SESVanderHave has had a presence, thanks to its nematode-tolerant varieties, in all the countries affected by the parasite since 2008. SESVanderHave was

the first to develop FlexField® varieties which, in addition to their excellent behaviour in nematode-infested land, exhibit agronomic characteristics and performance close to those of rhizomania varieties in healthy soil. This was a genuine revolution for users.

TO WHAT DOES SESVANDERHAVE OWE ITS SUCCESS?

JS: In 2003, SESVanderHave refocused its breeding programme on tolerant varieties, with the aim of breeding strains with a good level of partial resistance in biotests and with high yields in healthy and infested fields. Various sources were used. In recent years, we have invested a great deal in incorporating these tolerances into our elite lines.

ARE YOU EXPECTING TO REMAIN AT THE CUTTING EDGE IN THIS MARKET SEGMENT?

JS: It's important to stress that further genetic improvements are expected in the coming years, in particular thanks to the range of tools we have available, and to the fact that the tolerance genes used do not penalise yields. The objective is clear: to reduce the



difference in yield between single rhizomania varieties and dual rhizomania/nematode tolerant varieties, and thus to continue the development of FlexField® varieties.

We are also working on combining several tolerances in a single hybrid. I'm thinking of products that are tolerant to rhizomania, nematode and rhizoctonia root rot, which are already available. The next step is to combine tolerances to cercospora and powdery mildew with products that are already rhizomania- and nematode-tolerant, and real progress is being made on this topic. Major breeding efforts are also under way to introduce nematode tolerances to Tandem Technology® varieties. Looking beyond yield performance, which remains the number one priority, our team of plant breeders is also developing strains with better processing quality that are bolting-resistant, drought-tolerant, and also exhibit better storability. Research programmes are also under way with new sources of tolerance, although no breakdown of resistance has been observed so far.

All of these lines of research have to be explored in order to remain at the cutting edge in this highly technical market.

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More info?

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