

# Steinernema-System

**Steinernema-System provides the perfect biological solution to the problem of glasshouse sciarids. It is based on a unique strain of the insect parasitic nematode *Steinernema feltiae*, which seeks out and destroys sciarid larvae in compost. Also, this nematode is a natural enemy of thrips and leafminer.**

## GLASSHOUSE SCIARID

### Biology

Glasshouse sciarids belong to the family of the Sciaridae. They are small (3-5 mm) dark flies with long, slender antennae and long legs. They are usually seen in warm and humid environment in the proximity of plants. That's why they can occur the whole year round in the greenhouse.

After mating, the female fly lays 50-200 eggs, which hatch in 2-3 days. The emerging larvae develop through four instars over 2-3 weeks. By that time, they are about 5 mm long, translucent white in color with a distinctive black head. They then pupate in the compost and emerge as adult flies 3 days later. At temperatures in excess of 24 °C, breeding is continuous and the life cycle takes 3-4 weeks.

### Damage

The larvae of the glasshouse sciarids can cause a lot of damage. They not only feed on decaying organic matter in the compost, such as algae and mould, but also on living material such as root and stalk tissue. They pierce into the root and/or stalk of cuttings, seedlings or young plants. As a result of this, secondary plant diseases such as *Pythium*, *Phytophthora*, *Botrytis*, *Fusarium* and *Verticillium* can be spread.

The most common symptoms of such an attack are the wilting and the slowing down of the plant growth. In the worst case, this might even lead to the death of these plants.

The following crops frequently suffer severe sciarid attack:

- seedlings, cuttings and young plants, especially if heated and under mist;
- certain pot plants, e.g. ferns, *Poinsettia*, *Azalea*, *Cyclamen*, *Kalanchoë*, *Exacum*, *Gerbera*, *Begonia*, ...;
- some long term rockwool grown crops;
- mushrooms

## HOW IT WORKS

Steinernema-System owes its consistent, effective control of sciarids to the way in which it works.

Applied to the compost, the nematodes actively seek out sciarid larvae. They enter each larva through natural body openings. Once inside of the larva, they move to the intestinal canal and drill through the intestinal wall of the larva. A specific bacterium which lives in

symbiosis with the nematode is released and will eventually cause the death of the larva.

The nematodes reproduce inside the sciarid larva. As it decomposes, a new generation of nematodes moves off into the compost in search of further prey.

## CONTROLLING GLASSHOUSE SCIARIDS WITH STEINERNEMA-SYSTEM

The key to success is applying routine, preventative treatments. That way, sciarid populations are not allowed to build up, and crop damage is prevented.

Compost should be treated as soon as possible after sowing seed or inserting cuttings. Many crops are susceptible to sciarid damage during the first six weeks, and a single Steinernema-System treatment is already sufficient. The dose that needs to be applied is always 1 million of nematodes/m<sup>2</sup>. For very slow growing crops, it may be desirable to reapply Steinernema-System at six week intervals in order to maintain protection. If Steinernema-System treatment is delayed until sciarids are established in the crop, it will take 2-3 weeks before the numbers of adult flies are noticeably reduced.

Steinernema-System works best in moist, warm compost (15 °C-20 °C). If compost temperatures fall to less than 10 °C or rise to 30 °C or higher, the nematodes become inactive. Wet spots as well as the growth of algae are best to be prevented, as they could promote the number of glasshouse sciarids present.

## THRIPS

(*Frankliniella occidentalis* – Western flower thrips)

### Biology

Adult thrips are small, elongated insects with typical fringed wings. They measure about 1 mm, and have a greyish or yellow to brown colour. The female thrips deposits eggs in the leaf tissue. The eggs hatch within a few days into very mobile larvae which immediately start to feed. After the second instar they let themselves fall on the ground to pupate. The total development time from egg to adult takes from 20 days at 20 °C (68°F) to 12 days at 30 °C (86°F). At sufficiently high temperatures one female thrips can produce up to 100 descendants.

### Damage

Thrips damage the crop by withdrawing the plant cell fluids. Empty cells are filled with air, causing a silvery appearance, on which dark spots (the excrements) are visible. Moreover, there exist many more damage symptoms depending on the crop. For instance, thrips can cause deformed fruits. In several ornamentals, flower damage through discoloration or deformation occurs. Only a few individual thrips are enough. Moreover, thrips are important vectors of several viruses (e.g. tomato spotted wilt virus or TSWV and impatiens necrotic spot virus).

## EFFECTS OF STEINERNEMA FELTIAE

Through spraying of the leaves, the nematodes come in contact with thrips. They enter the host through natural body openings. Once inside, the nematodes move to the intestinal canal and drill through the intestinal wall of the larva. The *Xenorhabdus* bacterium, that lives in symbiosis with the nematode, is released and will eventually cause the death of the larva.

Steinernema-System can be used for all cultures to control the thrips population, without having any negative influence on biological adversaries. If used in alternation to thrips pesticides, it reduces the resistance of thrips to chemical agents. No perceptible residue remains after the treatment. The use of Steinernema-System as part of a thrips control program seems obvious.

## CONTROL

There's both a precautionary and curative control strategy. For the precautionary strategy 125.000 nematodes/m<sup>2</sup> are sprayed weekly. For the curative treatment a dose of 250.000 nematodes/m<sup>2</sup> is applied 2 up to 3 times. Each time, the nematodes are dissolved in approximately 1000 liter of water per ha. It is important to obtain a consistent coverage, with no spray solution leaving the crop. Otherwise the nematodes would not end up on the crop but on the soil. To guarantee a good consistent coverage and to increase the penetration in the head of the crop, it is recommended to add a wetting agent to the solution. After some applications the situation needs to be reassessed. The thrips damage can be easily monitored by means of blue Bug-Scan traps. The nematodes control all life stages of thrips except eggs. The nematodes are very efficient against the females in the population. This way exponential growth of the thrips population is impossible. Since the nematodes are susceptible to dehydration, it is important that the leaves remain wet for at least 2 hours. We recommend to perform the treatment in the evening with the ventilation closed. These nematodes experience little or no hindrance of most of the chemical pesticides (excepting nematicides) and can therefore be used in a tankmix. To make sure, you can always consult our side-effects manual on [www.biobest.be](http://www.biobest.be).

## LEAFMINER

Leafminer damage occurs on lots of vegetables and ornamentals. In ornamental crops, the feeding spots already reduce the aesthetic value of the plant. Leafminer do not only reduce photosynthesis of the leaves, but can also cause withering or early shedding of the leaves. Finally, feeding spots can also be an entrance for all kinds of diseases.

To control leafminer with these nematodes the timing of application is very important.

In case of synchronous population, one application is sufficient. When the population of leafminer grows asynchronously, it is necessary to repeat the treatment weekly. Doses and application techniques are the same as for thrips control.

## PACKING

Steinernema-System is delivered as a gelformulation. Depending on the pack size, they contain a minimum of 5, 50 or 250 or 1250 (5x250) million juvenile nematodes. During mixing with water, the nematodes form a suspension, which can be applied to the compost surface.

### ADVANTAGES

- **No re-entry time;**
- **No residue on the crop;**
- **Can be integrated in resistance management;**
- **No pest resistance problems;**
- **Can be applied during bloom (e.g. strawberry);**
- **Indifferent to most chemical crop protection means (tankmix);**
- **Controls the problem before it appears**
- **Practical and simple usage**
- **Compatible with other biological or integrated systems**
- **Absolutely safe to users, consumers and the environment**
- **No disposal problems.**