Nematodes

TERRANEM®

Heterorhabditis bacteriophora (insect-parasitic nematode) Pack-size: 50 million

Contains: 50 million infectious third stage larvae (L3) in inert carrying material.

Two factors determine the optimal application period:

- soil temperature
- the development stage of the target host

Soil temperature range for effective nematode activity is 57 to 91ºF (14 to 33ºC). At lower nighttime temperatures, development slows down or ceases, but resumes when daytime soil temperatures rise again.
Optimal control with H. bacteriophora is obtained on the second or third instar of the white grub. Success rate largely depends on the nematode reaching the target at the right stage.
Life cycle of the beetle grub varies depending on the beetle species and climate. Optimal application dates for Japanese beetle control are from mid-September through October, as long as soil temperature is high enough. As soon as soil temperature allows, another treatment in spring (up to mid-June) might be considered.
The different stages might lag behind some weeks in the more northern regions. In the warmer southern regions, stages might appear earlier. The Japanese beetle's life cycle might require two years in the northern extremes of North America.
The most reliable method to estimate optimal application period is to note when the first adult beetles are seen flying. Life cycles in different locations may shift with a few weeks, but duration of each stage in the season remains relatively constant.
May/June beetles (Phyllophaga spp.) have a three year cycle. Therefore, 2nd and 3rd instar larvae can be found any time of the year, with a higher proportion in spring and autumn.

Target
The insect-parasitic nematode Heterorhabditis bacteriophora biologically controls soil dwelling and boring larvae. It will provide control for many species of butterflies, beetles and flies. The most important target hosts in turf and open field crops in North America are:
- the Japanese Beetle (Popillia japonica)
- the European Chafer (Rhizotrogus majalis)
- the Asiatic Garden Beetle (Maladera castanea).
- May/June Beetles (Phyllophaga spp.)

Preparation of solution
· To prepare the solution, empty the contents of the package into a 5-gallon or larger container of water (at 59 to 68°F / 15 to 20°C), then stir.
· Let the entire solution soak for 5 minutes. Stir again thoroughly, then transfer the contents into the irrigation or spray tank and fill it up with water until the desired volume of spray liquid is reached. The desired volume of spray liquid mainly depends on practicability of application (e.g. two to six gallons per 1,000 square feet). The larger the spray volume, the better.
· Do not divide a package and/or use a part of it. The nematode distribution is not even throughout the package and using a part of it may result in a too low or too high dosage.

Rates
· 50 million nematodes per 2000 sq‘

Application and dose
· Apply the solution immediately, using the irrigation or spraying system, such as boom sprayers, hand held booms, 'shower droplet' style nozzle systems, slit-inserting systems, backpack sprayers or motorized sprayers. For spraying systems, pressure should not exceed 75 psi. To avoid blockages, remove all filters. The spray nozzle opening should be at least 50 mesh.
· Evenly spread the solution over the ground area to be treated. Continuous mixing should take place to prevent the nematodes sinking to the bottom (but also avoid excess tank agitation).
· Spray the whole mix in one application (don't let the mix stand overnight).
· Sprinkle the turf or soil with water again after the application to move the nematodes into the soil. A post-application irrigation of 0.10 to 0.25 inches is sufficient. Keep the soil moist during the first two weeks after application.

Environmental conditions
· Soil temperature should be between 57 and 91ºF (14 and 33ºC).
· Nematodes are very susceptible to ultraviolet light (UV). Avoid spraying in direct sunlight.
· Nematodes are susceptible to various chemical pesticides. Use caution when treating other diseases and pests.
· For optimal results, the ground surface should be moist. Sprinkle with water before application and keep the ground moist for two weeks after the application.

Storage and handling
· Store the product in a cool and dark place, like a refrigerator (36-43°F or 2-6°C).
· See the top of the package for the expiration date.
· Apply nematodes as soon as possible for best product performance.

Appearance
Larvae (third stage): size 0.6 mm
Other stages: develop inside host

Mode of action
The nematode actively searches for insect larvae and then enters a larva through a natural body opening, sometimes directly through the skin. Once inside the larva the nematode excretes specific bacteria from its digestive tract before it starts to feed. The bacteria multiply very rapidly and convert the host tissue into products that the nematodes take up and use for food. The larva dies within a few days and the color changes from white-beige to orange-red or red-brown. The nematodes multiply and develop within the dead insect. As soon as the nematodes are in the infectious third stage, they leave the old host and start searching for new larvae. When there are no new hosts present, the nematode population will slowly decrease.

Visual effect
Infected grubs turn color from white-beige to red-brown 2-4 days after application and become slimy. After a few weeks, dead larvae disintegrate completely and are difficult to find.