

Application of Biocontrol Nematodes for Control of Alfalfa Snout Beetle



Cornell University
Cooperative Extension

Introduction

Biocontrol nematodes used for the control of alfalfa snout beetles are easily applied through slightly modified commercial pesticide sprayers by following the instructions listed below.



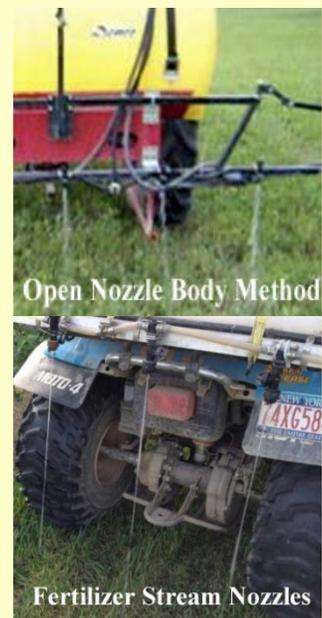
Sprayer Requirements

Any commercial pesticide sprayer can be used to apply biocontrol nematodes with a few minor modifications.

- 1) All screens and filters have to be removed. Nematodes cannot pass through them.
- 2) Sprayers need to be cleaned in a similar manner as required when changing pesticides for applications.
- 3) Non-chlorinated water must be used to fill the sprayer.
- 4) Standard pressures (40-60 psi) are best for nematode survival.
- 5) Sprayers need to apply a minimum of 50 gallons per acre (total from all nozzles) but we only use a portion of the nozzles so the actual application rate of water is less. A calibration example is below to help.

Nozzles: The best results require that a nematode-water stream is applied to the soil surface with as little as possible of the solution remaining on the plants. Any nozzle adjustment which sends a single stream down to the soil surface is best. The typical flat fan or flooding nozzle leaves too many nematodes on plant foliage where they are killed with UV light. Total coverage typical of a pesticide application is neither required nor desired. The goal is a stream of water (with nematodes) wetting the soil surface in a narrow band with separation between the bands.

These solid streams of water can be achieved in several ways. On sprayers with short booms, open nozzle bodies without screens and nozzles works great. On longer booms where maintaining pressure for the boom length is a problem, nitrogen drop nozzles or fertilizer stream nozzles (0010, 0015) in the nozzle bodies work great (no screens).



Nozzle spacing: The application of biocontrol nematodes does not require that nematodes be applied out of every nozzle because these biocontrol nematodes move 3 ft per season on their own. We recommend blocking 2 of every 3 nozzles so that nematodes are applied out of every 3rd nozzle. Then by driving the whole field, only 1/3 of the field is treated with 1/3 of the nematode rate. Within a year, the nematodes increase in numbers by attacking/reproducing in soil insects and move into the open zones between application strips.

Calibration example:

Required water rate calculation:

If all nozzles were being used on the spray boom, the application rate for the water would be a minimum of 50 gpa. However, some nozzles are blocked and therefore the following calculation is required.

Calculating the required flow rate from each nozzle (50 gpa)

- 1) Application speed = 6 mph or 528 ft. /min.
- 2) Sprayer has a 30 ft. boom with nozzles every 22 inches = 16 nozzles
- 3) 30 ft. boom covers an acre in 1,452 ft. of travel (43,560 sq. ft. per acre / 30 ft. boom)
- 4) 30 ft. boom at 6 mph (258 ft. /min) cover the acre in 2.75 min (1,452 ft. / 258 ft. per min)
- 5) 50 gpa / 2.75 min = spray output per min from all nozzles = 18 g/min
- 6) 18 g/min (all nozzles) / 16 nozzles = amount applied from each nozzle = 1.13 g/min/nozzle

Output from each nozzle at 6 mph needs to be 1.13 gallons per min (145 oz./min).

Calculating the amount of water actually applied using the 33% nematode application strategy (*Modified Application Rate or MAR*):

- 1) If application is at the 33% rate using our 30 ft boom example, than every third nozzle is left unplugged to apply nematodes ($16/3 = 5.33$), leaving 5 nozzles unplugged applying nematodes.
- 2) Actual application rate of water per min is the number of unplugged nozzles (5 in our example) X the rate of water per nozzle (1.13 gal/min in our example) which equals the amount of water in the tank actually applied when driving over the entire field per min (5.65 gal/min)
- 3) Actual application rate of water per acre is the time it takes to drive an acre (2.75 min in our example) times the amount of water per min from all unplugged nozzles (in our example, 5.65 gallons per min from all nozzles X 2.75 min = 15.5 gallons of water per acre). This is your ***Modified Application Rate or MAR***.

Calculating the number of biocontrol nematode cups to be washed for the spray tank:

- 1) After calculating your ***MAR***, (our example is 15.5 gallons of water per acre), wash 1.3 cups of nematodes per ***MAR*** and add them to the tank. For example, if your ***MAR*** is 15 gallons per acre and your spray tank is 300 gallons then you need to wash 26 cups of nematodes (13 cups of each species) and add them to the spray tank. **Remember that you are mixing two species of nematodes in the tank for application and they need to be added to the spray tank in approximate equal quantities.**

Biocontrol Nematode Species:



S. carpocapsae 'NY001'

S. feltiae 'NY04'

Application Timing:

Alfalfa Stand Age: We recommend that efforts to apply biocontrol nematodes be focused on new seedlings and 1st production year alfalfa fields. If biocontrol nematodes are focused on this age of fields each year, the entire farm will be treated within 3-5 years and the cost of treatment can be spread out over the same time period.

Application Timing: Since the biocontrol nematodes need to be applied to the soil surface and have some shading from sunlight until they enter the soil, we recommend that the **applications be made to alfalfa fields 2-3 weeks after harvest**. This allows about 6" of regrowth which shades the soils surface while allowing the stream of water from the sprayer to easily contact the soil surface. In addition, applications should be made **late in the day (after 6 pm)** or during cloudy and/or rainy days to minimize nematode death from intense UV sunlight.

Care of Nematodes after receiving them from the Shields Lab:

You will be receiving the biocontrol nematodes in 16 oz. plastic cups filled with saw dust/wood chips. If you open the containers, you will see numerous decomposing insect larvae on the surface of the wood chips, a dirty looking film on the sides/lid of the container and be greeted with an offensive odor. Most of the 25 million nematodes are distributed throughout the sawdust/wood chips. Until application, these cups of biocontrol nematodes need to be kept cool (60-70 F) because the biocontrol nematodes are living organisms. Upon receipt, these biocontrol nematodes can be held under cool conditions for 2-4 days without a major impact on nematode viability.

Nematode preparation for application:

In order to prepare the biocontrol nematodes for application, they have to be removed from the sawdust/wood chips and the sides of the 16 oz. container.

- 1) To remove the biocontrol nematodes from the wood shavings or saw dust and other biological material, the contents of the cup is dumped onto a wire screen (20 mesh, 841 μm openings) and the nematodes are washed through, into a lower container with a large volume of non-chlorinated water. Window screen is very close to 20 mesh and can be used to screen out the biological debris during the initial washing by fastening a single layer of window screen to a rigid frame.

- 2) The solution passing through the initial screen from the initial washing needs to be poured through a second finer screen to remove finer debris which will still clog nozzles. We recommend a 40 mesh (400 μm opening) screen. If window screen is doubled with the holes of each layer misaligned when fastened to a frame, the result is a screen similar to a 40 mesh screen.
- 3) After the second screening, the solution containing nematodes is ready to be dumped into the spray tank for application. Please remember to remove all internal filters and screens from the sprayer because those filters/screens will become plugged with nematodes and prevent them from being applied to the soil.



Initial washing (coarse screen)

Secondary filtering (fine screen)

- 4) Sets of screens similar to the ones shown in the picture are available on a loan basis for use during applications. Please contact your local CCE educator to borrow a set of screens.
 - a. Kitty O'Neal (St Lawrence, Franklin, Clinton, Essex Counties):
Office phone: (315) 379-9192; Cell: (315) 854-1218, Email: kao32@cornell.edu
 - b. Amy Ivy (Clinton, Essex Counties):
Office phone: (518) 561 7450; Cell: (518) 570-5991; Email: adi2@cornell.edu
 - c. Mike Hunter (Jefferson, Lewis Counties):
Office phone: (315) 788-8450; Cell: (315) 788-8602; Email: meh27@cornell.edu
- 5) Once the biocontrol nematodes are washed out of the sawdust/wood chips and poured into the spray tank, they need to be applied within an hour to reduce nematode death. Nematode death accelerates once they are placed in water due to the shortage of oxygen in the water. Agitating the spray tank help to incorporate more oxygen into the spray solution, but there are so many nematodes in solution, oxygen is quickly depleted and the nematodes begin suffocating.

Applications of biocontrol nematodes should be made late in the day (after 6 pm) or on days with thick clouds to protect the nematodes from UV light while they are entering the soil.

For More Information

Visit our website: www.alfalfasnoutbeetle.org or
Contact local CCE educator

We thank the following for their
long-term and continuing support

