Plant Disease Control Notes

EXTENSION DIVISION VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY

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NEMATODE CONTROL IN NURSERIES

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Nematodes are small roundworms that live in soil water, and plant tissue. They are too small to be seen with the naked eye and are identified with the aid of a microscope. Over 1,239 nematode species are parasitic on plants. In addition to those that feed on plant roots there are species that feed on or in plant stems, leaves, buds and flowers. Many nematode species cause decline in ornamentals.

SYMPTOMS OF NEMATODE ATTACK

Nematode damage to crops is often overlooked because of the small size of nematodes and the fact that they seldom kill plants. Usually, there is a retardation of plant growth which spreads through the field over several growing seasons from an initial small area of plant decline. Other above ground symptoms of nematode attack are plant stunting, yellowing, die-back, deficiency symptoms and loss of plant vigor. Affected plant roots may possess numerous galls, root decay, or a general reduction of root growth.

WAYS THAT NEMATODES CAUSE CROP LOSS

1. Nematodes alone are capable of causing a decline in plant growth, yield and quality.
2. Nematode affected plants are not capable of efficient utilization of water and plant food. Often plants show deficiency symptoms where soil is amply fertilized; therefore, there is a waste of fertilizer.
3. Damage in nursery plants is caused indirectly by nematodes which transmit virus diseases.
4. Plant varieties resistant to diseases caused by fungi and bacteria may become susceptible and die from these diseases because nematodes create "ports of entry" for other soil-borne diseases.

NEMATODE ASSAY AND CONTROL SERVICE

The identification of nematode diseases requires the services of a nematologist and specialized equipment. Nematode control by chemicals, crop rotation, or resistant varieties depends upon a positive identification of the kinds of nematodes involved in each nematode disease situation. For this reason, the Plant Disease Clinic in the Plant Pathology and Physiology Department at V.P.I. provides a nematode assay and control service to aid you in nematode disease identification and control recommendations. Contact the V.P.I. Cooperative Extension Office in your county for information on methods of collecting and handling plant and soil samples for nematode assay.

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CHEMICAL CONTROL PROCEDURES

The most effective way to control nematode diseases of plants is by chemical soil treatment, especially where several kinds of nematodes are present. Currently soil fumigants are in widespread usage for nematode control.

METHODS OF CHEMICAL APPLICATION

1. Broadcast (overall) treatment - should be used as a preplant application of soil fumigants. This method generally produces the best results. Follow these simple steps when applying soil fumigants: (A) Work crop remains into soil so they are well decomposed before applying soil fumigants. (B) Deep tillage to a depth of 12" is essential, break up all clods and loosen soil thoroughly. (C) At time of treatment, the soil should be in good seedbed condition, with a temperature between 50°F and 80°F at the 5" level and with adequate moisture for good seed germination. (D) Use a fertilizer containing at least 30% of the nitrogen in the nitrate form to avoid nitrogen deficiency. (E) Soil surface should be sealed immediately after chemical application with a plastic tarp or with a roller or cultipacker depending upon chemical used. (F) CONSULT CONTAINER LABEL FOR ADDITIONAL INFORMATION.

2. Row Treatment - Postplant treatment to established plants may be accomplished by applying Nemagon or Fumazone through two chisels spaced 12" apart per row. This is used primarily as a salvage operation and generally is not as effective as the preplant broadcast (overall) application method.

PLANT TOLERANCE TO VARIOUS CHEMICALS

The bottom of the next two pages contain listing of nursery plants reported as TOLERANT and MODERATELY TOLERANT to NEMAGON or FUMAZONE. Any plants not listed should be treated at a low dosage level and on a small scale until tolerance is determined. Do not apply either materials to carnations, chrysanthemums or dwarf palm.

CHEMICALS RECOMMENDED FOR NEMATODE CONTROL IN NURSERY CROPS

Crop	Nematicides*	Application Rates	Remarks
Ornamentals: (Small area treatment to soil around established plants) (Postplant Application)	FUMAZONE 70E NEMAGON EC-2	1/2 to 1 teaspoon per square yard to soil depending upon plant species tolerance.**	Tolerant Plant Species: (1) Punch holes 1' apart and 10" deep in soil around plants in the root zone area. (2) Prepare a diluted emulsion by mixing 1 teaspoon of Nemagon EC-2 or Fumazone 70E per gallon of water. (3) With a sprinkling can drench the area with one gallon of this dilute emulsion per square yard (3' x 3'). Sprinkle plants and treated area with water from garden hose to further wash chemical to root zone.

Crop	Nematicides*	Application Rates	Remarks
			(4) Press hole opening closed to prevent escape of fumigant (wear rubber boots). Soil temperature should be between 55 and 80°F. Apply in spring and fall. Moderately Tolerant Plant Species: Use 1/2 teaspoon (Nemagon EC-2 or Fumazone 70E) per gallon of water. Safety precautions - wear rubber boots and follow manufacturer's instructions.
(Small area treatment to seedbed without plants) (Preplant Application)	DOWFUME MC-2 STARBRAND BROM-O-GAS	2 lbs. per 100 sq. ft. 2 lbs. per 100 sq. ft. 2 lbs. per 100 sq. ft.	To obtain best results - plow or spade area to 12" depth, prepare soil until it is free of clods and in good seedbed condition. Introduce chemical under a gas-tight cover over area being treated. FOLLOW MANUFACTURER'S INSTRUCTIONS.
(Large area field or seedbed treatment) (Preplant Application)	AGEL MB-68	Use at a rate of 3-2/3 pints (60 fluid ounces) per 1000 sq. ft.	Apply through a tractor-mounted chisel-type broadcast liquid fumigant unit. The chisels should be spaced 12" apart with fumigant injected 6 to 8" deep. No plastic film is needed with this treatment: FOLLOW MANUFACTURER'S INSTRUCTIONS.
	DOWFUME MC-33 STARBROM TG-67	350 lbs. per acre for overall treatment 350 lbs. per acre for overall treatment	Apply as a preplant application: This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURER'S INSTRUCTIONS.
	VORLEX	40 to 60 gal. per acre for overall treatment	Apply as a preplant application: This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURER'S INSTRUCTIONS.
	VAPAM	1.5 gal. in 40 gal. water per 100 sq. yds. overall treatment	Apply as a preplant application: This treatment is effective against nematodes and other soil-borne pests. Treated area must be immediately covered with a plastic film. A mechanical applicator and plastic tarp layer is available for seedbed and field treatment: FOLLOW MANUFACTURER'S INSTRUCTIONS.

Crop	Nematicides*	Application Rates	Remarks
	D-D	30 gal. per acre overall treatment	Apply as a preplant application: Overall application: Apply 14 days prior to seeding or planting in treated area. Inject chemical to a depth of 10" through chisels spaced 12" apart. Seal surface immediately with a roller or cultipacker to prevent rapid escape of soil fumigant. FOLLOW MANUFACTURER'S INSTRUCTIONS.

TOLERANT SPECIES

Ajuga	Buxus harlandi Boxwood	Cryptanthus	Hellebrous	Oak, live	Polygonium distorum
African Violet		Daisy	Hemlock	Oak, Northern Red	Potentilla
Aglaonema	Buxus japonica Boxwood	Dianthus grenadin	Hibiscus	Oak, White	Protocarpus
Amaryllis		Decentra	Hypericium	Pachysandra	Pyrethrum, seed
Anchusa	Calanthea	Diffenbachia	Ilex rotundifolia-	Pansy	Rudbeckia
Andromeda	Callistemon rigidus Bottle Brush	Dogwood, white	Holly	Peach	Sansevieria
Apple		Dracaena	Incarvillea	Pear	Schefflera
Ardisia japonica	Caryopteris	Elm	Lavandula	Peony	Sedum
Arrowwood	Centranthus	Euonymus Vegetus	Ligustrum-Privet	Peperomia	Spirea
Asclepias	Cherry, Mahaleb root stock	Exochorda	Lilly of the Valley	Periwinkle	Syrings-lilac
Ash		Fatshedera	Locust, seedlings	Philodendron	Sweet pea (Perennial)
Asparagus fern	Columbine	Firethorn	Macrophylum	Pilea	Taxus
Astilbe	Coreopsis	Forget-me-nots	Maple, red	Pine, white	Tritoma
Azalea	Crab apple	Funkia	Maranta	Pittsporum, Vari.	Violet
Barbery Red Leaf & Dwarf	Crepe myrtle (purple) Croft lilly	Gypsophilum	Mountain Ash	Plum	Weigela
		Heliposis	Nephthytis	Pothos	Yew, Japanese
					Zinna

Crop	Nematicides	Application rate-gal/A for designated row spacings 3'	4'	5'	6'	7'	cc* per 400' of row per chisel.	Remarks
Ornamentals:								FOR TOLERANT PLANT SPECIES: AT TIME OF PLANTING OR POSTPLANT TREATMENT.
(Field treatment to soil around established plants)	NEMAGON 12.1	2	1.5	1.2	1	.86	312	Use 2 chisels per row and in such a manner as to treat both sides of the row, with chisel injection lines 6" from stem of plant on each side of plant. Use a narrow chisel and seal opening made by chisel with a press wheel or similar sealing device. Inject chemical to a 10" depth.
	NEMAGON 12.1 EC	2	1.5	1.2	1	.86	312	
	FUMAZONE 86	2	1.5	1.2	1	.86	312	
	FUMAZONE 86E	2	1.5	1.2	1	.86	312	
	NEMAGON 12.1	1.32	1.0	.8	.66	.55	208	FOR MODERATELY TOLERANT PLANT SPECIES: At time of planting or postplant treatment. Use 2 chisels per row in such a manner as to treat both sides of the row. Chisel injection lines should be 6" from stem of plant on each side of the row. Use a narrow chisel and seal soil opened by chisel with a press wheel or similar sealing device. Inject chemical to a 10" depth.
	NEMAGON 12.1 EC	1.32	1.0	.8	.66	.55	208	
	FUMAZONE 86	1.32	1.0	.8	.66	.55	208	
	FUMAZONE 86E	1.32	1.0	.8	.66	.55	208	

* A cubic centimeter (cc) is a unit of liquid measure. Some conversion units are: 1 teaspoon=5cc; 1 cup=237cc; 1 pint=463cc; 1 quart=946cc; and 1 gallon=3,785cc. Baby milk bottles and prescription bottles are usually marked with cc units and are useful in measuring fumigants.

MODERATELY TOLERANT SPECIES

Artemesia	Chrysanthemum	Geum	Pyrethrum, plants	Rosa
Blueberry	Delphinium	Gladiolus	Rosa fortuneana	(Var. Countesa Vandal)
Camelia, Japanica	Echinops	Lythrum	(Var. Happiness Rose)	Rosa
(Var. Pink Perfection)	Forsythia	Magnolia grandiflora	Rosa sp.	(Var. Isobel Harkness)
(Var. Shell Pink)	Gardenia fortuniana	Magnolia soulangeana	(Var. Jiminy Cricket)	Stantolina
Camellia Sasanqua	(Var. Mystery)	Phlox	Rosa	Vinca
(Var. Elizabeth)	Gardenia jasminoides	Pine, slash	(Var. Dr. Huey)	
Campanula	(Florida, August Beauty)	Polygonum distorum		

Trade and brand names are used only for the purpose of information and the Virginia Cooperative Extension Service does not guarantee nor warrant the standard of the product, nor does it imply approval of the product to the exclusion of others which may also be suitable.

KEYS TO PROPER USE OF PESTICIDES

1. Read the label on each pesticide container before each use. Follow instructions to the letter; heed all cautions and warnings, and note precautions about residues.
2. Keep pesticides in the containers in which you bought them. Put them where children or animals cannot get to them, preferably under lock and away from food, feed, seed, or other material that may become harmful if contaminated.
3. Dispose of empty containers in the manner specified on the label. If disposal instructions are not printed on the label, burn the containers where smoke will not be a hazard, or bury them at least 18" deep in a place where water supplies will not be contaminated.

SEE YOUR DOCTOR IF SYMPTOMS OF ILLNESS OCCUR DURING OR AFTER USE OF PESTICIDES.

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