Plant Disease Control Notes

EXTENSION DIVISION VIRGINIA POLYTECHNIC INSTITUTE & STATE UNIVERSITY

THE OSBORNE'S CYST NEMATODE - A SERIOUS PEST IN TOBACCO

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In July 1961, a cyst nematode was discovered on roots of Hicks variety of tobacco in Amelia County. Dr. L. I. Miller, Professor of Plant Pathology, V.P.I., conducted extensive morphological and physiological studies with this nematode and determined that it is a new species which is known to occur only in Virginia. He named it the Osborne's Cyst Nematode.

This nematode has been found on 16 farms in Amelia, Nottoway, and Dinwiddie counties. The Osborne's Cyst nematode is a major threat to tobacco production because: (1) research shows that it is capable of attacking all types of tobacco produced in Virginia; (2) yields are below profitable levels in heavily infested fields. Research in 1967 showed that tobacco yield in untreated rows was 54% less than the best chemical treatment (Figure 1). In some fields plants were so severely stunted that growers did not harvest the crop; (3) the pest may persist for several years in the soil even in the absence of a host plant; (4) presently, there are no commercially available varieties which are resistant to this nematode; (5) the nature of this nematode makes control by soil fumigants both difficult and costly; (6) the long persistence of this nematode in soil curtails the effectiveness of crop rotation and other control measures employing cultural practices.

Figure 1. Osborne's cyst nematode infested field: (Left) healthy tobacco on treated soil; (right) stunted row of tobacco on untreated soil has not reached flowering stage.

Figure 2. Wilted leaves on cyst nematode infected plants.

Figure 3. Plant roots of the same age: (left) cyst nematode infected roots, (right) healthy root system.

Figure 4. Magnified rootlet showing numerous brown oval cysts.

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SYMPTOMS AND SIGNS OF THE DISEASE IN TOBACCO

There are no definite symptoms on the above ground portion of plants that permit identification of this disease. Typical plant response is severely stunted plant growth, and plant leaves show excessive wilting during mid-day even where there is ample soil moisture. (Figure 1). Usually, there is no premature leaf ripening or discoloration. Infected plants are stunted early in the growing season and are unable to catch up with non-infected plants even where there are additional applications of fertilizer and irrigation water. In heavily infested soil the plant growth may be so retarded that plants are killed by frost before the harvest is completed.

Root systems of affected plants are restricted in size and there are fewer rootlets than on healthy plants (Figure 2). Close examination with a magnifying glass reveals the presence of numerous small spherical white and brown bodies attached to the roots (Figure 3). These bodies are the female cyst nematode.

LIFE CYCLE OF THE NEMATODE

Live female cyst nematodes are pearly white in color. Eggs are retained within the female's body. When the female dies her body becomes a brown leather-like sack containing hundreds of eggs. The dead egg-filled bodies are called "cysts". The cysts are resistant to breakdown by soil organisms, to drying, and action by chemicals employed to control other types of nematodes. Eggs and larvae contained in the cyst may remain in the soil for several years in the absence of a host plant. Under suitable conditions the eggs will hatch and the young worm-shaped nematode larvae emerge from the cyst and migrate to plant roots and feed with their heads in the central portion of the rootlet. When developing, the females become spherical, break through the root surface and, as adults, only the head and neck portions remain in the root. Mature males emerge from the root and fertilize the female. Approximately 20 days are required for the female to complete its life cycle and produce numerous eggs. Many of these eggs hatch within a few days and invade rootlets. It is estimated that four to five nematode generations are produced on a single tobacco crop. Over 2,000 cysts containing eggs have been extracted from a pint of soil.

DISSEMINATION

Cyst nematodes move several inches through soil by their effort. There are many ways of transporting cysts to other areas--particularly by soil adhering to farm implements, irrigation equipment, the feet of livestock and other animals, and by runoff water. It is important that tobacco growers take every precaution to prevent the spread of this disease.

HOST PLANTS

The Osborne's cyst nematode will feed and reproduce on tobacco, tomato, and eggplant. Weed hosts include horsenettle, (Solanum carolinense, L.); apple of peru, (Nicandra physalodes, L.); black nightshade, (Solanum nigrum, L.); bittersweet nightshade, (Solanum dulcamara, L.); and buffalo burr, (Solanum rostratum, Dunal.). As studies continue, additional host plants probably will be discovered.

CONTROL RECOMMENDATIONS

Growers who have ample suitable land for tobacco production are advised to plant cyst nematode infested land to fescue for three or more years to help prevent a nematode population increase and the spread of this pest. Where suitable tobacco soil is limited on a farm and the grower must plant tobacco in cyst nematode infested soil chemical control is recommended.

CHEMICAL CONTROL OF THE OSBORNE'S CYST NEMATODE

The first step in a nematode control program is seedbed treatment. The introduction of diseased plants from the seedbed to the field nullifies the effect of field treatment. Effective seedbed treatment cannot be made if there is crop debris in the soil. Plow and disk the seedbed area in August so that crop debris will decompose prior to chemical application.

CHEMICALS RECOMMENDED FOR SEEDBED TREATMENT

Nematicide	Application rate per 100 square yards	
STAR BRAND BROM-O-GAS DOWFUME MC-2	9 9 9	lbs. lbs. lbs.	Prepare seedbed as you would for seeding. You must use an airtight cover. Treat at soil temperatures above 50°F. (For soil temperature less than 50°F. consult V.P.I. Extension Mimeograph MR-241--"Rapid seedbed treatment with methyl bromide .) Expose soil to fumigant for 24 to 48 hours. Aerate for 2 days before seeding.
STARBROM TG-67 DOWFUME MC-33 TERR-O-GAS 67	7.23 7.23 7.23	lbs. lbs. lbs.	Inject chemical to a depth of 5 to 8". Use an airtight cover. Treat when soil temperature is above 45°F. at the 5" level. Expose to fumigant for 24 to 48 hours. Aerate for 7 days before seeding.
STARBROM BROZONE	10 10	lbs. lbs.	(Same procedure used for Dowfume MC-33.) (Same procedure used for Dowfume MC-33.)

NEMATODE CONTROL IN THE TOBACCO FIELD

Chemicals recommended for the Osborne's cyst nematode control in the field are placed in 2 categories based on their physical properties, they are: (A) GRANULAR NON-FUMIGANTS and (B) SOIL FUMIGANTS.

GRANULAR NON-FUMIGANTS: Mocap is an effective nematicide against the cyst nematode and other kinds of nematodes which attack tobacco. This is a contact material that has no fumigant activity and will not give satisfactory results if applied by fumigant methods.

For effective cyst nematode control it is essential that granules be thoroughly mixed 6 to 8" deep by a power driven rototiller. (Figure 5.) Studies show that application should be made on a 24" wide band for row treatment. No waiting period is required with this material. Bed shapers are available with this equipment which will make a list when the nematicide is applied.

Figure 5. Power driven rototiller for the application of granular nematicides.

SOIL FUMIGANTS: The overall (broadcast) method of soil fumigant application is the only method recommended for nematode control in tobacco. A 30-gallon barrel equipped with a simple gravity flow applicator can easily be mounted on a general purpose cultivator with chisels spaced 12" apart. A 2" by 6" board placed behind the chisels seals the soil surface, preventing a rapid escape of fumigant (Figure 6) A broadcast applicator with 6 outlets will treat a 7' wide swath. If heavy rains occur within a week after soil fumigation, the fumigant may be trapped in the soil. If this

occurs, wait at least 9 days after fumigating before cultivating to aerate soil and then wait 5 days before transplanting. Where the fumigant is applied overall, the same equipment may be used to cultivate and aerate soil.

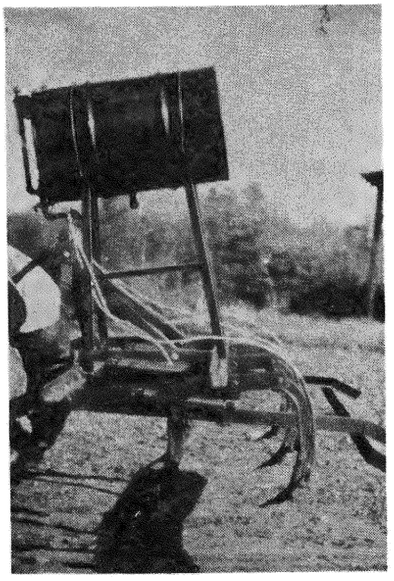

Figure 6. Gravity flow broadcast fumigation equipment with board to seal soil surface.

CHEMICALS RECOMMENDED FOR THE OSBORNE'S CYST NEMATODE CONTROL IN THE TOBACCO FIELD

Nematicide	Application rate/A	Remarks
MOCAP (10% Granule)	50 lbs.	Row application - Apply in a 24 inch wide band over the center of the row and incorporate in soil to a depth of 8 inches with a power driven rotary tiller.
	80 lbs.	Overall application - Apply the chemical evenly on top of the soil anytime from one week before planting to at planting time. Use a double gang disc harrow or other equipment which will mix MOCAP to a soil depth of 6 inches.
D-D Vidden D	40 gal. 40 gal.	Apply 14 days prior to transplanting using the overall (broadcast) method of chemical application. Inject chemical to a 10" depth with chisels spaced 12" apart. Seal soil surface immediately with a sealing board, heavy drag or roller.
Telone	32 gal.	(Use same method described above for D-D.)

NEMATODE IDENTIFICATION

When nematode damage is suspected an examination of plant roots and soil adhering to the root system is needed for a nematode assay. Dig several plants from the problem area and place in a plastic bag the plant roots and a quart of soil from the root zone area. Label each sample according to the location and take them to your County Virginia Tech Extension office. Samples will be sent to the Virginia Tech Plant Disease Clinic for nematode identification and control recommendations.

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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