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# Plant Disease Control Notes

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January 1971

## NEMATODE CONTROL IN TOBACCO

Control Series 73

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Four major nematode diseases of tobacco caused by root-knot, root-lesion, cyst, and stunt nematodes cost Virginia tobacco producers over \$6,000,000 annually. Research shows that in problem areas net profit can be increased in excess of \$225 per acre by adequate nematode control.

### NEMATODES THAT ATTACK TOBACCO AND GENERAL SYMPTOMS

Root-knot nematodes - Five kinds of root-knot nematodes found in Virginia cause plant injury by burrowing into roots and remaining there to feed. Infected roots form galls or swellings and as a result, the plant cannot feed as it normally would. Affected plants show retarded plant growth with excessive wilting on hot, dry days. Premature ripening and "firing" of leaves results in poor quality of cured tobacco. Various root-knot nematode species are found in tobacco producing counties throughout the state.

Osborne cyst nematode - This nematode causes severe crop loss in Amelia, Not-taway and Dinwiddie counties. Plant roots are attacked early in the growing season and plants are severely stunted. Root systems of affected plants are restricted and plant leaves show excessive wilting during midday, even where there is ample soil moisture. Usually, there is no premature leaf ripening or leaf discoloration. Plant growth may be so retarded that plants are often killed by frost before harvesting is completed.

Root-lesion (meadow) nematodes - do not cause knots or galls to develop on roots. They feed inside roots and cause root decay. This disease is commonly referred to as brown root rot. Root-lesion nematodes are found in all tobacco producing areas of the state.

Stunt nematodes - feed on plant roots and cause no visible injury other than a stunted root system and poor plant growth.

### NEMATODE CONTROL PROCEDURES

Crop rotation, fall culture practices such as plowing out stubble, and resistant varieties are in most instances considered supplements to a chemical control program. "Root-knot nematode resistant varieties" are not resistant to all root-knot nematode species found in Virginia. Also, fields may possess high populations of root-lesion, stunt, and cyst nematodes in addition to root-knot nematodes. Therefore, chemicals are the key to effective nematode control in most tobacco fields.

### NEMATODE CONTROL IN THE TOBACCO SEEDBED

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 early September so that crop debris will decompose prior to chemical application.

Chemicals Recommended for Nematode Control in the Tobacco Seedbed

<u>NEMATOCIDE</u>	<u>APPLICATION RATE PER 100 SQUARE YARDS</u>		<u>REMARKS</u>
Dowfume MC-2	9	lbs.	Prepare seedbed as you would for seeding. You must use an airtight cover. Treat at soil temperature above 50°F. (For soil temperature less than 50°F. consult V.P.I. & S.U. Extension MR-241 - "Rapid seedbed treatment with methyl bromide.") Expose soil to fumigant for 24 to 48 hours. Aerate for 6 days before seeding.
Bromogas	9	lbs.	
Star Brand	9	lbs.	
Starbrom TG-67	7.23	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 6 days before seeding.
Dowfume MC-33	7.23	lbs.	
Terr-O-Gas 67	7.23	lbs.	
Starbrom	10	lbs.	(Same procedure used for Dowfume MC-33.)
Brozone	10	lbs.	
Vorlex	4	qts.	Inject or incorporate chemical to a 5" depth and cover immediately with plastic. Treat at least 4 weeks prior to seeding. Remove cover at least one week prior to seeding and work soil lightly. Aerate by cultivation and delay planting 7 days for each 23 lbs. active material used per acre.
Vapam	1.5	gal.	Inject chemical to a depth of 5" at rate of 1.5 gal. in 40 gal. water per 100 sq. yds. Cover area immediately with plastic. After removing plastic, cultivate soil lightly and wait 7-14 days prior to planting in treated area.

NEMATODE CONTROL IN THE TOBACCO FIELD

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

SOIL FUMIGANTS

The broadcast (overall) method of soil fumigant application is the most effective and produces the highest net profit per acre. This is the only method recommended and offers the following advantages.

All The Land is Treated - Tobacco roots, in the absence of plant diseases have a potential growth of 40" with a 24" depth. Soil fumigants diffuse approximately 6" in all directions from the point of injection in the soil. Therefore, with row treatment only a 12" wide band of soil is treated down the row. It is apparent that much of the root system is left untreated when applying the fumigant with one chisel in the center of the row. Often on hilly or rolling land it is difficult to transplant in the center of a 12" wide treated strip because of equipment slippage. Placing plants on the edge of the treated strips or in untreated soil further reduces the relatively low degree of nematode control obtained with the row method of chemical application.

More Efficient Use of Plant Food - Nematode free plants are more efficient utilizers of plant food and soil moisture. Tobacco growers find that when using the broadcast method of fumigant application, the tobacco plants suffer less from drought and fertilizer rates can be reduced.

NEMATOCIDE*	RATE/A	REMARKS
MOCAP (10% Granule)	50 lbs.	<u>Row application:</u> Apply chemical 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.	<u>Broadcast application:</u> Apply chemical evenly on top of the soil anytime from 1 week before planting to at planting time. Use a double gang disc harrow or other equipment which will mix chemical to a soil depth of 6 inches.
Dasanit (10% Granule)	60 lbs.	<u>Row application:</u> Use in same manner prescribed for MOCAP. Not recommended for cyst nematode control.
	100 lbs.	<u>Broadcast treatment:</u> Use in same manner prescribed for MOCAP. Not recommended for cyst nematode control.
Telone	16 gal.	<u>Apply 14 days prior to transplanting, using the broadcast (overall) application method.</u> Space chisels 12" apart and inject chemical to a depth of 10". Seal soil surface immediately with a heavy drag or roller. For control of Osborne's Cyst Nematode use 32 gal. per acre rate.
Dowfume W-85	4.5 gal.	<u>Apply 14 days prior to transplanting using the broadcast (overall) application method.</u> Space chisels 12" apart and
Soilfume 85	4.5 gal.	inject chemical to a depth of 10". Seal soil surface immediately with a heavy drag or roller. This chemical is <u>not</u> recommended for root-lesion (meadow) or Osborne's Cyst Nematode control.
Vorlex	12 gal.	<u>Apply 14 days prior to transplanting using the broadcast (overall) application method.</u> Space chisels 8" apart and inject chemical to a 10" depth. Seal soil surface immediately with a heavy drage or roller. Use 24 gal. per acre for Osborne Cyst Nematode control.

\*Trade and brand names are used only for the purpose of information and the Virginia Agricultural Extension Service does not guarantee nor warrant the standards of the products, nor does it imply approval of the product to the exclusion of others which may also be suitable. (Always follow manufacturer's instructions.)

#### Nematode Identification

Nematode control by chemicals, crop rotation, or resistant varieties depends upon a positive identification of nematode species involved in each nematode disease situation. Contact your Cooperative Extension Office for information on methods of collecting and handling plant and soil samples for nematode assay at Virginia Polytechnic Institute and State University.

#### 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.

Ease of Chemical Application and Soil Aeration - A 30-gallon barrel equipped with a 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 1). 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. Wait 5 days after cultivating before transplanting. Where the fumigant is applied broadcast, the same equipment may be used to cultivate and aerate the soil.

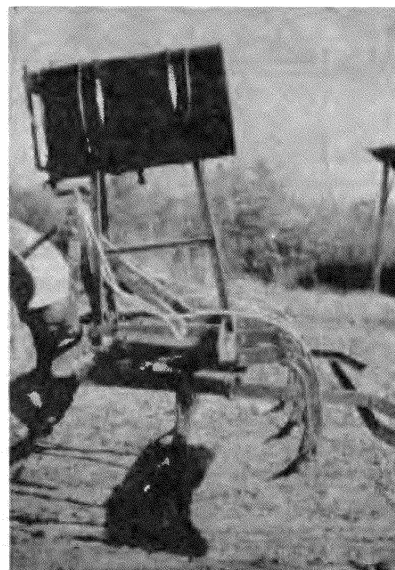


Figure 1. Simple gravity flow equipment for broadcast (overall) application of liquid soil fumigants.

Control of Other Soil Inhabiting Pests - Nematodes contribute to the severity of diseases such as black shank, granville wilt, and fusarium wilt which are caused by soil inhabiting organisms. More effective nematode control by broadcast fumigation serves to retard the severity of these diseases.

#### GRANULAR NON-FUMIGANTS

Mocap and Dasanit are 2 new non-fumigant nematocides now registered for use on tobacco. These are contact materials and have no fumigant activity. They will not give satisfactory results if applied by fumigant methods.

For best results it is essential that granules be thoroughly mixed to an 8" depth by a power driven rototiller or other similar equipment suitable for soil incorporation of pesticides (Figure 2). Studies show that application should be made on a 24" wide band for row treatment. Where power driven rototillers are not available - satisfactory nematode control may be obtained by broadcasting the chemical evenly on the soil surface and incorporating it to a 6 inch depth with a double gang disc harrow.



Figure 2. Power driven equipment for soil incorporation of granular pesticides.

#### Chemicals Recommended for Nematode Control in the Tobacco Field

<u>NEMATOCIDE*</u>	<u>APPLICATION RATE/A</u>	<u>REMARKS</u>
D-D	20 gal.	<u>Apply 14 days prior to transplanting using the broadcast (overall) method of chemical application.</u> Inject chemical to a depth of 10" with chisels spaced 12" apart. Seal soil surface immediately with a sealingboard, heavy drag, or roller. For control of Osborne's cyst nematode, use 40 gal. per acre rate.
Vidden-D	20 gal.	
Terr-O-Cide 15	20 gal.	
Terr-O-Cide 15 D	20 gal.	