NemaNote 13

Apple Nematodes in Western North Carolina

www.ncagr.gov/agronomi/uyrnem.htm

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Your Species & Prevalence

Several species of microscopic nematodes damage apples in North Carolina. These parasites feed on small feeder roots, inhibiting nutrient and water uptake. They also increase susceptibility to root diseases.

Among nematode pests of apple, lesion (*Pratylenchus* spp.) and dagger (*Xiphinema americanum*) are the most common, although root-knot, stubby root, ring, sheath, needle, pin, spiral and stunt are also encountered often in our assay. In the mid-1990s, NCDA&CS conducted a survey of established and recently replanted apple orchards in five western North Carolina counties. Of 51 samples collected, 85% tested positive for lesion and 78% for dagger nematodes; 20% of the samples contained moderate to high numbers of one or both species.

Nematode Damage

Established orchards. Nematode damage produces no definitive symptoms in established trees. Apple yield and quality tend to be reduced, and trees grow less vigorously. Some leaf chlorosis (yellowing) may occur. The root system is usually restricted, and feeder roots are often absent. Even when most of the trees in an orchard are infected, damage tends to vary from tree to tree.

Replanted orchards. Nematodes are a component of *apple replant disease*, which is typified by poor growth and, in some instances, death of young trees. In heavy, poorly drained soils, nematodes are seldom the principal causal factor; however, in light, well-drained soils, they play a greater role. Damaged trees often have unsound root systems and can be easily pushed over.

Taking Nematode Samples

Microscopic analysis (assay) of soil and root samples is the only way to detect nematodes in apple orchards. Dagger nematodes are usually found in root-zone soil, while lesion nematodes are usually found inside the roots. For detailed sampling instructions, see the *Nematode Problem-Diagnosis Information* form.

Taking a representative nematode sample involves collecting more than a quart of soil and roots from the drip-line of at least 20 trees scattered throughout the orchard (Figure 1). Sample material should be collected to a depth of 8–10 inches. Feeder roots must be included. A soil probe is the best tool for collecting soil; a trowel or spade is best for collecting roots. It is important to mix the collected material well before filling the plastic sample bag. The best time to sample is in March or April after the start of new feeder growth.

Nematode Management

Nematode assays are an essential management tool. They are the only way to find out if apple-damaging species are present and, if so, whether these species are present at critical population levels. Without the information assays provide, rational control strategies are impossible.

Established orchards. In North Carolina, Vydate, Basamid and Lorsban-4E are labeled for use against insects on established apples. These pesticides also have nematicidal effects and can increase orchard yield.

Replanted orchards or new plantings. Trees planted in fumigated areas grow faster and yield more than those in nonfumigated plantings. In replanted orchards, preplant fumigation also increases tree survival rates. Orchards treated with a broad-spectrum fumigant yield better than those treated with a nematicide alone, thus indicating that nematodes are not the sole cause of replant problems.

Nematode Testing Sites

Collaborative test-plot research conducted by NCDA&CS, N.C. Cooperative Extension and the NCSU Plant Pathology Department compared efficacy of two postplant and two preplant nematicides. Preplant fumigation produced significant growth response in some apple varieties (TABLE 1). These findings should encourage use of a fumigant when replanting an orchard—especially if soil-borne diseases are present.

The recommended rates, moisture ranges and soil temperatures are determined by soil type, as described in TABLE 2 for methyl bromide. This equation can be used to calibrate fumigation equipment:

$A = (W \times D \times R) \div 43560$, *where*

A = amount of fumigant (lb or gallons),

W = width of treated area (feet),

D = length of treated area (feet), and

R = application rate (gallons or lb/acre).

Thus for a loam with a 12% moisture level and a soil temperature of 60°F, TABLE 2 points to a methyl-bromide application rate of 350 lb per acre. If the field to be treated is 8 ft × 100 ft, the application rate would be: $A = (8 \times 100 \times 350) \div 43560 = 6.43$ lb.

Always follow label instructions when applying pesticides. For additional assistance, contact the Agronomic Division, visit our Web site or call your county Cooperative Extension office.

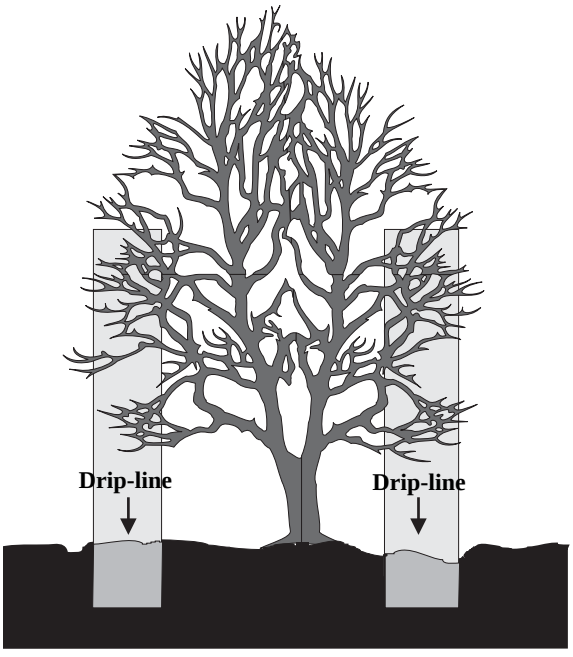

FIGURE 1. Collect soil and roots for nematode assay from the drip-lines of at least 20 trees scattered throughout the orchard.

TABLE 1. Preplant fumigation test, 1994

Treatment	Caliper	Height to node	Height to terminal
Plot 1. (6th leaf) / Red Fuji/M9/111			
		——inches——	
Control	0.80	41.80	63.29
Telone II	1.25*	58.20*	96.20*
Telone C-17	1.06*	60.80*	83.90*
Methyl-bromide	1.19*	55.00*	89.30*
Plot 2. (4th leaf) / Empire/EMLA9			
		——inches——	
Control	0.60	40.80	64.60
Telone II	0.51	45.29	65.43
Telone C-17	0.66	43.50	72.00
Methyl-bromide	0.63	43.00	56.00
Plot 3. (5th leaf) / Gala/M26			
		——inches——	
Control	0.70	43.00	65.20
Telone II	0.75	44.80	78.50*
Telone C-17	0.75	40.80	75.20*
Methyl-bromide	0.79	53.50	82.83*
Plot 4. (5th leaf) / Jonagold/EMLA26			
		——inches——	
Control	0.70	43.00	65.20
Telone II	0.75	44.75	78.50
Telone C-17	0.75	40.80	75.20
Methyl-bromide	0.79	53.50	82.83

* Difference from control significant at $p = 0.05$

TABLE 2. Preplant fumigation rates based on soil type, moisture range and soil temperature.*

Soil type	*% Moisture*	*Temp (°F)*	*Methyl bromide (lb/acre)*
Sand	2–6	40–77	200
Loamy sand	3–8	40–77	200–250
Sandy loam	4–12	40–77	250–300
Loam	6–18	40–77	250–350
Clay loam	8–21	50–77	350–400
Clay	15–35	50–77	500

* Adapted from University of California Publ. 3340

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