

Plant Parasitic Nematode Management Strategies

Disease Diagnosis

Plant parasitic nematode management hinges on detection and population density estimation. Before selecting a field for vegetable production, submit a soil sample to a lab with a trained nematologist to analyze the soil for the presence and quantity of plant parasitic nematodes. Root-knot nematodes (*Meloidogyne* spp.) and soybean cyst nematodes (*Heterodera glycines*) are the most important nematode pests commonly found in the Midwest.

Disease-resistant Varieties

Resistance to *Meloidogyne incongnita* is available with the Mi gene in tomato, but few other vegetable crops presently have resistant genes for root-knot nematodes. Nematode resistance in tomatoes is indicated by the “N” designation. Resistant varieties should be used whenever possible to reduce yield loss. It is important to have multiple disease resistance genes when more than one important pathogen is present in a field, such as with tomatoes where root-knot nematodes, *Verticillium*, and *Fusarium* can interact.

Crop Rotation

Plant parasitic nematodes overwinter in the soil or in association with plant material. Crop rotation and weed control are very important in managing plant parasitic nematodes. Root-knot nematodes have a very wide vegetable, field crop, and weed host range. Soybean cyst nematodes have a much narrower host range, but when both nematode species are present, a rotation ideal for soybean cyst nematode reduction may favor buildup of root-knot nematodes.

Other Cultural Practices

Adequate water and fertilizer can minimize plant parasitic nematode damage. Plant parasitic nematodes reduce the plant root system’s ability to take up water and nutrients. Adequate water and fertilizer do not

reduce nematode density but help plants to cope better with nematode damage, and might increase yield and reduce the symptoms of nematode damage.

Anything that moves soil can spread plant parasitic nematodes to other fields and within the same field. Thus, preventing infested soil and plant material from infesting fields will help with nematode management.

Chemical Control

Seedling diseases, root diseases, and vascular wilts caused by soilborne fungi and nematodes can be destructive problems in the field and greenhouse. Soil-applied fumigants or nematicides may help prevent serious losses to soilborne disease when combined with long-term management practices.

Soil fumigants are chemicals that are injected into the soil and emit toxic fumes that penetrate air spaces in the soil and kill microorganisms. Fumigants must be sealed into the soil with water or a plastic tarp to ensure that a lethal concentration and exposure time. Because fumigants are harmful to all living plants, a certain amount of time (from two weeks to two months) must pass between treatment and planting to avoid crop damage. Several nonfumigant nematicides are available for several vegetable crops. These generally are systemic compounds that also may provide good insect control.

A number of factors affect the performance of these products, including soil temperature, soil moisture, soil tillage, organic matter, soil type, and time of application. Consult the product label for specific details on safe handling and application methods.

A brief description of several common soil treatments is given in Table 28.

Table 28. Nematode Soil Treatments

Chemical	Fumigant/ Nematicide	Application	Plant Back Time	Crops	Comments
methyl bromide (RUP)	F	Preplant, tarped, or mulched for 24-48 hours.	10-14 days	most vegetables	Formulations with 98% methyl bromide and 2% chloropicrin are appropriate for nematode control.
Mocap [®] , ethroprop (RUP)	N	Soil only. Applied with water by soil injection, sprinkler system, flood irrigation, over soil surface with sprinkling can.		cabbage, sweet corn, cucumbers, potatoes, sweet potatoes, snap beans, lima beans	Mobile in sand soils. Crop injury can occur if used in furrow.
SMDC: sodium methyldithio carbamate (Vapam [®] , etc.)	F	Preplant tarped. Don't enter within 48 hours.	14-21 days after treatment	general use fumigant	Vapam is more effective when applied with considerable water.
Vydate [®] (RUP)	N	Soil and foliage treatment.	NA	carrots, celery, cucurbits, eggplants, peppers, potatoes, sweet potatoes, tomatoes	Foliar applications are not effective for moderate and high populations of nematodes.
Telone [®] (RUP)	F	Soil treatment only.	2-3 weeks	most vegetables	Formulations with high percentages chloropicrin are needed to control soilborne fungal diseases.
Nemacur [®] , fenamiphos (RUP)	N	Soil treatment only.	NA	cabbage, Brussels sprouts, bok choy, okra, garlic	

F=fumigant

N=nematicide

RUP=restricted use pesticide

Slug and Snail Control

Occasionally, slugs and snails seriously damage seedlings; tender, low-growing leafy vegetables; or ripening fruit that are on the ground. Slug and snail feeding damage (hollowed-out areas) can be found anywhere on fruit, but is usually concentrated near the stem. Slugs leave behind telltale slime trails (silvery trails) on the surfaces of fruit or leaves. Slugs and snails are active at night or cloudy days.

Slugs and snails favor continuously moist soil and organic mulch. They lay eggs in groups in moist soil, and overwinter in organic mulch. Slugs can complete their entire life cycle in a field.

If slugs are a problem, their hiding places (i.e., boards, stones, weedy areas), should be eliminated. Heavy

mulching creates favorable slug habitats, so should be thinned so the soil can become warm and dry. Raised beds that can dry out more readily than flat beds reduce slug problems. Using black plastic mulch discourages slug build-up because it causes the soil to heat up and dry out.

As a last resort, metaldehyde bait (e.g., Clean Crop, 3.5G[®] at 30-40 lbs./A or Clean Crop 7.5G[®] at 15-20 lbs./A) can be used and is usually very effective. Follow label instructions carefully for application methods for each particular vegetable crop. Apply bait in evening after a rain or irrigation. An organic alternative to metaldehyde is iron phosphate. Baits containing iron phosphate are sold under the trade name Sluggo[®] (and others) and are only slightly less effective than metaldehyde baits.