

Soil Treatments

Management of Nematodes and Soilborne Diseases

A number of plant-parasitic nematodes and plant pathogens inhabit the soil and can cause disease in or damage to crops. Soil fumigants (Table 1) can kill plant-parasitic nematodes, soilborne pathogens, insects and weeds in the soil – thereby improving seedling and crop performance. Soil fumigants also kill any beneficial microorganisms in the soil, however, and should be combined with cultural practices that promote good soil health. In addition, many fumigants can be administered only in the presence of a certified applicator. Certified applicators must successfully complete one of the soil fumigant training programs listed on the EPA website (<http://www.epa.gov/fumigantraining>). More information on fumigants registered for nematode management in various crops can be found in the nematode sections of this guide.

Unlike conventional farming systems, organic farming systems cannot rely on soil fumigants for disease management. Soil sterilants (Table 2) and microbial biopesticides (Table 3) are alternatives to fumigants. Soil sterilants are simple, safe and economical and are just as effective as fumigants when used in combination with good cultural practices. Although microbial biopesticides are less toxic than soil fumigants, they have a more limited target range, and the efficacy of microbial biopesticides is more variable than fumigants. Information on cultural practices and resistant varieties available to manage nematodes in home gardens can be found in the Nematode-Home Garden section of this guide.

Table 1. Soil fumigants and rates for control of nematodes, soilborne pathogens and weeds

Product Choices ^{1,2}	Rate ³	Pests Controlled
Metam CLR 42% Soil Fumigant	37.5-75 gal	Soilborne fungi and fungal like organisms ⁴ Nematodes Weeds
Nimitz	3.5-5 pt	Nematodes
Telone C-17 Soil Fungicide and Nematicide	10.8-45 gal	Garden centipedes Nematodes Soilborne fungi and fungal-like organisms ⁴
Vapam HL	37.5-75 gal	Nematodes Soilborne fungi and fungal-like organisms ⁴ Weeds

¹Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied.

²Not for use in greenhouses or other enclosed areas.

³Rates are the amount of formulation per treated acre for shank applications unless otherwise indicated. Rates vary depending on the crop and soil type. **Always refer to the label for correct rates.**

⁴Includes Clubroot of crucifers, Oak root fungus, *Phytophthora*, *Pythium*, *Rhizoctonia*, *Sclerotinia* and *Verticillium*.

Table 2. Soil sterilants for control of soilborne plant pathogens, insects, nematodes and weeds

Sterilant	Method
Dry heat	180°F, 30 minutes
Steam heat	145-165°F, 30 minutes
Soil solarization	99°F, 2-4 weeks

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Table 3. Microbial biopesticides for the management of soilborne plant pathogens in organic farming¹

Product Choices ²	Biocontrol Organism	Target Diseases	Rate ³	Crops
Actinovate AG	<i>Streptomyces lydicus</i>	Damping-off and root rots <i>Fusarium</i> spp. <i>Phytophthora</i> spp. <i>Pythium</i> spp. <i>Rhizoctonia</i> spp. <i>Verticillium</i> spp. Root decay <i>Phymatotrichum omnivorum</i>	3-12 oz ⁴	All food crops grown from seed
Actinovate SP	<i>Streptomyces lydicus</i>	Damping-off and root rots <i>Fusarium</i> spp. <i>Phytophthora</i> spp. <i>Pythium</i> spp. <i>Rhizoctonia</i> spp. <i>Verticillium</i> spp. Root decay <i>Phymatotrichum omnivorum</i>	4-6 oz/100 gal (ornamentals) 18-54 oz/100 gal (turf)	Ornamentals and turfgrasses
Cease	<i>Bacillus subtilis</i>	Sclerotinia diseases <i>S. sclerotiorum</i> <i>S. minor</i>	3-6 qt/100 gal	Leafy vegetables
Contans WG	<i>Coniothyrium minitans</i>	Sclerotinia diseases <i>S. minor</i> <i>S. sclerotiorum</i>	1-4 lb	Most crops
Mycostop	<i>Streptomyces griseoviridis</i> Strain K61	Damping-off and root rots <i>Alternaria</i> spp. <i>Fusarium</i> spp. <i>Phomopsis</i> spp. <i>Pythium</i> spp.	1-2 g/cubic yard	Container ornamentals Vegetable transplants
Plant Shield® HC Biological Foliar and Root	<i>Trichoderma harzianum</i>	Damping-off and root rots <i>Fusarium</i> spp. <i>Pythium</i> spp. <i>Rhizoctonia</i> spp.	4 oz/100 gal ⁴	Container ornamentals Vegetable transplants
Regalia	Extract of <i>Reynoutria sachalinensis</i>	Damping-off and root rots <i>Fusarium</i> spp. <i>Phytophthora</i> spp. <i>Pythium</i> spp. <i>Rhizoctonia</i> spp. <i>Verticillium</i> spp. Sclerotinia diseases <i>S. minor</i> <i>S. sclerotiorum</i> Southern blight <i>Sclerotium rolfsii</i> Clubroot <i>Plasmodiophora brassicae</i> Common scab <i>Streptomyces scabies</i>	1-4 qt	Cotton Oil seed crops Peanut Tobacco Vegetables
Root Shield® Granules	<i>Trichoderma harzianum</i>	Damping-off and root rots <i>Pythium</i> spp. <i>Rhizoctonia</i> spp. Wilts <i>Fusarium</i> spp.	3-12 lb	Bedding plants Flowers Herbs Hydroponic crops Oil seed crops Ornamentals Pome and stone fruit Tree nuts Vegetables

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Product Choices ²	Biocontrol Organism	Target Diseases	Rate ³	Crops
SoilGard I2G	<i>Trichoderma virens</i>	Damping-off and root rots <i>Pythium</i> spp. <i>Rhizoctonia</i> spp.	See label ⁵	Bedding plants Herbs Ornamentals Vegetables
T22 HC	<i>Trichoderma harzianum</i>	Damping-off and root rots <i>Fusarium</i> spp. <i>Pythium</i> spp. <i>Rhizoctonia</i> spp.	16-32 oz	Herbs Vegetables

¹For more information on microbial biopesticides for the management of soilborne pathogens in organic farming, refer to the Ohio State University factsheet HYG-3310-08 (Raudales and McSpadden Gardener, 2008).

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³Rates are the amount of formulation per acre unless otherwise indicated.

³For agronomic field and row crops, alfalfa hay and forage, small grains and corn apply 1-3 oz/acre.

⁴For use on plants in containers, plug trays or flats.

⁵Rates vary considerably depending on crop and production stage. Refer to labels for specific rates and timing.

The soil treatment section was revised December 2019 by Dr. R. Singh.