

# Nematode Control in Turfgrass

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Disease	Nematicide	Rates	Remarks
Nematodes	abamectin Divanem	3.125–6.25 fl oz/1000 sq ft	<b>Restricted Use.</b> Special Local Needs Label for Georgia (24c). For golf greens, tees, and fairways. Apply as an early curative treatment (after appropriate nematode extraction, identification, and counts). Apply in the early morning while grass is wet with dew or irrigate prior to application with 0.1 inches of water. Within one hour following application, irrigate with 0.1 to 0.25 inches of water to move the treatments through the thatch. Do not over irrigate. Apply 3–4 consecutive applications at 14–21 day intervals. Apply in 2 gallons of water / 1000 ft <sup>2</sup> (approximately 100 gpa) with a non-ionic surfactant (0.25% v/v) included. Including Heritage (azoxystrobin) with applications has demonstrated healthier turf.
	azadirachtin AzaGuard	15 fl oz/A	Apply in sufficient amount of water to penetrate in the soil to a depth of 12 inches. Repeat applications every 3–4 weeks or as needed.
	Bacillus firmus strain I-1582 Nortica	0.7–2.3 lb (10–30 oz)	For turf, lawns, sod farms, and golf courses. Make applications every 3 months as necessary and irrigate to a depth of 4". For warm-season grasses make the first application prior to first flush of roots (e.g. 65° F soil temperature at the 4" depth). Do not exceed a 20% concentration of the suspension (30 lb Nortica/20 gal of water or 100 lb Nortica/100 gal of water).
	fluensulfone Nimitz ProG	60–120 lb/A (22–44 oz/1000 sq ft)	To improve product penetration to the root zone/soil, the broadcast application should follow aerification prior to application. Irrigation is required following application with an adequate amount of water (generally 0.5 inches). For golf courses, sports fields, sod farms, commercial and residential lawns.
	fluopyram Indemnify	0.195–0.39 fl oz/1000 sq ft	Irrigate to root zone. For golf courses, sod farms, sport fields, residential, institutional, commercial, and other turfgrass areas.
	furfural MultiGuard Protect	High infestation: 8 gal/A (0.184 gal/1000 sq ft) Maintenance: 5.5–8 gal/A (0.126–0.184gal/1000 sq ft)	Irrigate to root zone. For golf courses and sod farms. Prior to application, treated area should be at 70% field capacity (i.e. well irrigated). Apply at 5.5–8 gpa (a 1:9 dilution with water). Incorporate with irrigation (0.25–0.5 inch) within 15 min of application. Two hour reentry following application. Up to 6 applications/year are permissible.
	1,3-dichloropropene Curfew	3–5 gal/A	<b>Restricted Use.</b> For golf course and athletic field use only. Must be applied by an approved applicator. Liquid soil fumigant placed in the soil a minimum of 5 inches deep. Apply 0.25–0.5 inch of water immediately after application. This product has a 24 hour reentry restriction and cannot be applied within 30 ft. of an occupied structure. Not for use on turfgrass being grown for sale or other commercial uses as sod or seed production.
	sesame oil Neo-Tec S.O.	3.5 oz/1000 sq ft	Apply Neo-Tec in the late afternoon or evening, particularly in warm weather.
	Telone II	5–10 gal/A	<b>Restricted Use.</b> Liquid soil fumigant placed in the soil a minimum of 12" deep. Do not mow or fertilize treated areas for 5 days after application. This product cannot be applied within 100 ft of an occupied structure (Sod Production Only).

Recommended site usages were from label of each product. Some labels listed a general "Turfgrass" use and specific site uses; other site uses were prohibited (e.g. "do not use"). A "Y" indicates specific mention on the label, an "N" indicates not labeled for that site, and a blank means the site was not mentioned. Labels change, so read and follow label recommendations.

## ADDITIONAL NOTES ON NEMATODE CONTROL IN TURFGRASS

Nematodes are soil-dwelling, microscopic, colorless, unsegmented, round worms that can be plant parasitic or plant beneficial. Depending on the species of parasitic nematode and the numbers in soil, they are capable of causing turfgrass decline.

Above-ground symptoms of nematode damage begin with a yellowing of turf, followed by wilting and slow recovery from wilt, poor response of turf to fertilization and eventual thinning in irregular shapes, followed by weed invasion. These symptoms occur over months and years. While below-ground or root symptoms are characterized by short, stubby roots with few branch roots compared to healthy roots. Roots may have a dark brown color, and sometimes (with sting or stubby root nematodes) exhibit swollen root tips. In sod with severe infestations, the sod strength is low.

Soil sampling is necessary for accurate diagnosis. A quart-size sample is needed and your County Extension Agent can help you submit samples to the Extension Nematology Laboratory at The University of Georgia (2350 College Station Road, Athens GA 30602). The number of nematodes recovered from the soil sample can vary greatly, depending on the time of year and the growth stage of the plant at the time the samples are taken. Samples taken during the winter and early spring are less reliable, and some nematode species may be missed entirely. For routine assays, sample during the time of year that the turf is growing. For warm-season turfgrasses, June or July is an optimal time to detect high population densities. For cool-season grasses, late spring or early summer should detect harmful populations. If nematodes are not found in damaging numbers, it does not preclude their role if the time of year the sample was taken was unfavorable for their survival.

Most grasses can withstand moderate numbers of most kinds of nematodes. If nematode populations are high, improving turf management practices, planting a new grass type, and chemical control are management strategies. Usually a combination or integrated approach leads to the best success. Deep, infrequent watering encourages deeper rooting, allowing grass to obtain more water and nutrients than a turf having a short root system due to shallow, daily watering. Avoid excess nitrogen fertilization; this encourages lush, succulent roots conducive to nematode population buildup. Avoid stresses to turf such as mowing too short. Alleviate compacted soils and correct any nutrient deficiencies. No variety of turfgrass is known to have true resistance to all nematodes, but planting another grass species may be a choice if the new grass provides acceptable quality and is adapted to the site. Using proper management practices and the best-adapted turfgrass species is the most practical approach to nematode management.

Because crop rotation, varietal resistance, biological control and several other disease management strategies are not practical or effective for turfgrass nematode control, the use of chemical nematicides is the next available and most reliable approach to reducing parasitic nematode levels. Chemical nematicides can be applied as pre-plant fumigants and as post-plant non-fumigant contact chemicals. Fumigants are toxic to plants and are labeled for use only before establishment of the turfgrass stand. In established turfgrass, contact nematicides come in granular or spray formulations and are always watered-in immediately after application. Nematicides can be toxic to humans and animals and should be handled with all precautions indicated on the product label. No single product is effective against all nematodes on a given turfgrass species.

Soil fumigants are chemicals applied as gases or liquids that readily vaporize. They are toxic to the turfgrass but may be used to treat soil prior to seeding or planting to reduce populations of plant parasitic nematodes, weeds, fungal pathogens, and other soil-borne microorganisms. The exceptions are Curfew and Telone II, which can be applied to actively growing turfgrass if delivered below the root system (e.g. 5 to 12 inches deep). All labeled soil fumigants are Restricted Use pesticides that usually require special equipment and application by licensed professionals.

Chemical nematicides have shown best results when the turf is first stripped from the affected area, followed by thorough tilling of the soil two-weeks prior to the nematicide application, this practice allows for adequate decomposition of old roots. Additionally, tilling loosens the soil and permits more rapid and uniform diffusion of the fumigant. At the time of application the soil should be moist (not water-saturated). Too much fumigant escapes in dry soil and too little diffuses when pores are filled with water. The 4-inch soil temperature should be 50° to 80°F. Too much fumigant evaporates from hot soil, whereas, diffusion is too slow in cold soil. For maximum effectiveness, the treated area should be sealed immediately with a plastic tarp for several days. Nematicide applications should be made in autumn or spring, before nematode population peak and according to the product label.

The effects of nematicides are temporary. Fumigants have no residual activity; therefore nematodes which survived the treatment or were brought in on new grass can re-colonize the rootzone. Nematicide treatment cannot provide improved growing conditions unless other stresses are alleviated, and nutrients (especially potassium) and water are readily available.