



Root-knot Nematodes: Biocontrol with Marigolds

www.ncagr.gov/agronomi/uyrnem.htm

Root-knot nematodes (*Meloidogyne* spp.) can be effectively managed in home gardens without pesticides. One alternative to using nematicides is to intercrop and rotate vegetables with marigolds. Most cultivars of African marigold (*Tagetes erecta*) and French marigold (*T. patula*) are effective in reducing the most common root-knot nematode populations — *Meloidogyne incognita* and *M. javanica* (TABLE 1).

The roots of these attractive flowering plants contain chemicals that kill nematodes. As a method of biocontrol, growing marigolds is not only pleasing to the eye but economically and environmentally sound as well. One drawback, however, is that the benefits are not realized until the following year. Also, the treatment frequently needs to be repeated with marigolds and vegetables grown in alternate years.

Be careful when you buy marigolds to help control nematodes. Not all marigolds sold as bedding plants are effective against nematodes. *Tagetes signata* cv. Tangerine Gem, for example, will not control root-knot nematode.

To use marigolds to manage root-knot nematodes, follow these steps.

- Collect a soil sample from the rhizosphere (root zone) of a living, but apparently unhealthy, plant. Include roots in the sample. Submit this sample to the Nematode Assay Section of the NCDA&CS Agronomic Division to verify that root-knot nematode is the problem. It is also a good idea to send a separate soil sample to the Soil Testing Section for lime and fertilizer recommendations.
- At the end of the growing season, remove roots from the soil by pulling, plowing or tilling. Doing so will reduce the number of safe places where nematodes can survive during the winter.
- In winter, till the soil several times to expose nematodes to sun and weather.
- Apply lime according to soil test recommendations.
- In spring, plant half the garden with marigolds and half with root-knot resistant vegetable cultivars. Plantings in blocks or strips are easy to manage (FIGURE 1). Strips may comprise one or several rows of vegetables.

TABLE 1. Some marigold cultivars effective against root-knot nematode *Meloidogyne incognita*.*

Species	Cultivars
<i>Tagetes erecta</i>	Crackerjack, Flor de Muerto
<i>Tagetes patula</i>	Bonita Mixed, Gypsy Sunshine, Scarlet Sophia, Single Gold, Tangerine

* Ploeg AT. 1999. Greenhouse studies on the effect of marigolds (*Tagetes* spp.) on four *Meloidogyne* species. J Nematol 31(1):62–9.

NCDA&CS
AGRONOMIC DIVISION
NEMATODE ASSAY SECTION

PHYSICAL ADDRESS
4300 REEDY CREEK ROAD
RALEIGH NC 27607-6465

MAILING ADDRESS
1040 MAIL SERVICE CENTER
RALEIGH NC 27699-1040

PHONE: 919-733-2655
FAX: 919-733-2837

DR. WEIMIN YE
NEMATOLOGIST

DR. COLLEEN HUDAK-WISE
DIVISION DIRECTOR

STEVE TROXLER
AGRICULTURE COMMISSIONER

TABLE 2. Marigold seed or plant requirements per treatment area.

Total area in marigolds	Seed required	Plants required
100 sq. ft.	6 packets (~350 seeds)	300
1,000 sq. ft.	0.5 oz	3,000
1 acre	17.5 oz	130,680

Contact the county Cooperative Extension office for information on resistant varieties. TABLE 2 indicates the amount of marigold seeds or plants needed based on area.

- Use a marigold variety known to be *Tagetes erecta* or *T. patula*.
- Space marigold plants, or thin seedlings, so they are 7 inches apart (FIGURE 2).
- Fertilize according to soil test recommendations. Nutrient imbalances can make nematode problems worse.
- Early in the growing season, cultivate between marigolds regularly to keep weeds under control.
- Before the first frost, remove as many seed-bearing flower heads as possible so you will have seed for next year's marigold patches and fewer volunteer marigolds will sprout among your vegetables.
- In the fall, take another soil sample for nematode assay from the marigold area if you want to monitor effectiveness.
- Till the remaining marigolds into the soil.
- The following spring, repeat the process with this exception: plant marigolds where you planted vegetables the previous year and vice versa.

For Additional Assistance

- Call your NCDA&CS regional agronomist or the Agronomic Division office in Raleigh (919-733-2655).
- Visit the NCDA&CS Agronomic Division Web site at www.ncagr.gov/agronomi/.
- Visit your county Cooperative Extension office.
- Refer to one or more of the following online publications:
 - ***Pests in gardens and landscapes and gardens: nematodes*** (University of California, 2001) — www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7489.html
 - ***Sustainable practices for vegetable production in the South*** (N.C. State University, 2001) — www.cals.ncsu.edu/sustainable/peet/IPM/nematodes/c06nemat.html
 - ***Control root-knot in your garden*** (University of Arkansas, 2002) — www.uaex.edu/Other_Areas/publications/PDF/FSA-7529.pdf



FIGURE 1. Strip-crop arrangement.

FIGURE 2. Detail of marigold spacing on 7-inch centers.