

Root knot nematodes on carrot

Meloidogyne incognita, M. hapla, M. javanica



Root system of carrot deformed from infection with root-knot nematode, *Meloidogyne* sp. (Jonathan D. Eisenback, Virginia Polytechnic Institute and State University, Bugwood.org)

Prevention	Monitoring	Direct Control
<ul style="list-style-type: none"> • Before planting, sample for nematodes at the end of a growing season, when crop residues remain (when nematode populations are high): <ul style="list-style-type: none"> • Collect soil and root samples from 10 to 20 locations in the field, at a depth of 15-25 cm, using a cylindrical sampling tube, trowel or shovel. Emphasise taking soil samples across rows rather than within rows • Take one sample per 5-10 acres. Samples should be taken when soil is not extremely wet or dry • Add a 1-2 pint sub-sample to a plastic bag. Keep well sealed and at ambient temperature and light levels. Send these to a lab • If at least 5 root knot nematodes are found in 200 g soil then consider control options before planting, or planting a less susceptible crop (see below) • Adjust planting dates to cooler times in the season when nematodes are less active • Plant clean certified seeds or seedlings from reliable sources • Use clean irrigation water (water which is unlikely to have run through nematode infested fields) • Encourage healthy plant growth by maintaining optimal irrigation and fertilization levels. Healthier plants are more resistant to nematode damage • Clean farm tools and machinery with water after working in different areas of the field to prevent spread of nematodes • Do not introduce soil from an infested field into one which is not infested • Rotate every season with groundnuts, cereals (maize, sorghum, millet) and nappier, onions or garlic as these crops are less susceptible to nematodes • Plant marigolds (<i>Tagetes</i> spp.) as a cover crop at least two months before planting carrots since these plants suppress nematodes. Grow them as solid planting for an entire season. Cut or mow plants before flowers open to prevent seed getting into soil. • Leave the field fallow for 1-2 years to lower nematode populations. During this time, keep the soil moist but remove weeds. Nematode eggs will hatch but will not have anything to feed on so they will die. 	<ul style="list-style-type: none"> • Look out for: <ul style="list-style-type: none"> • Slow/stunted growth above ground, yellowing of the leaves, wilting of plant despite adequate soil water content • Forked, distorted or stunted taproot • Fleshy galls on the roots that do not flick off easily on touching • Formation of many adventitious roots • Numerous death of plants in the seed bed and seedlings do not survive transplanting • Collapse of the individual infected plants • Symptoms can look similar to that of nutrient deficiency (stunting, leaf discolouration) and injury to the growing root tip (forking of the taproot). However, these do not result in root galls caused by nematodes • Check for nematodes by digging up plants from several areas of the field and checking for galls. If 25-30% of the plants show symptoms then consider taking action. 	<ul style="list-style-type: none"> • After harvest, solarize soil by ploughing fields, moistening the soil and covering using a plastic sheet for 4-6 weeks during the hottest part of the year • Alternatively, plough infested fields deeply to expose soil to sunshine for a month during the hot seasons before planting the next crop

Note: Pesticides may be available to control this pest. Please check with the Ministry of Agriculture in your country to find out which pesticides are registered in your country and the local restrictions for their use.