Evaluation of the effect of treatments on the carrot cyst nematode (*Heterodea carotae)*

Method/protocol submitted by:

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Objectives of the method/protocol:

This method is aimed at quantifying cyst nematode populations before and after treatment, and evaluating their impacts on the harvest before and after treatment.

Brief description of the method/protocol:

The protocol consists in a collection and extraction method of carrot cyst nematodes, and a quantification method of population densities and damages caused (yield loss).

Possible uses of this method/protocol:

It is used to evaluate the efficiency of treatments (fumigation and solarisation) on carrot cyst nematode populations.

Method/protocol:

- Observation unit:

Identify a suitable field for trial known for areas with uniform cyst densities. Split the area in 4 m^2 plots (2 × 2 m each) spaced 50 cm from each other. Randomize blocks for the different treatments (fumigation and solarisation), with six replications, and select untreated plots as controls.
The best experimentation starting period for Southern Italy summer conditions is mid-July.

- Treatments:

Apply fumigants with a hand injector at 20 cm depth for 1,3 D at 250 l/Ha or 35 cm depth at 100 l/Ha.
Irrigate the plots to reduce fumigant losses.
Irrigate again after 10 days, and mulch solarisation plots with transparent 50 µm-thick polyethylene film.

- Collection of soil samples:

Before sowing and after treatments, collect soil samples (80 cores, mean weight 2 kg) from the centre square meter of each plot, using a 30 cm long and 1 cm wide auger.
After harvest, collect soil samples (80 cores, mean weight 2 kg) from the centre square meter of each plot, add 3 g of feeder roots per sample.

- Evaluation of the effects of treatments on cyst viability:

For the samples collected before sowing and after treatments, extract cysts from 200 cm^3 soil per soil sample with a Fenwik apparatus.
Incubate the cysts at 20°C for 14 weeks in 30 days old carrot root leachate.
Count emerging juveniles and unhatched eggs at weekly intervals when renewing the incubating solution.

  - Determine the total number of eggs per cyst to compare treated/untreated plots.
  - Express the numbers of emerging juveniles as % of those emerging from the same number of cysts collected from control samples to compare treated/untreated plots.

- Evaluation of the effects of treatment on harvest:

For the samples collected at harvest, dry soil and extract cysts from 200 g soil per soil sample with a Fenwik can.
Separate the cysts from the debris by the ethanol flotation method (Seinhorst,1974), substituting ethanol for a MgSO4 solution (1.25 spec. gravity).

- Crush the cysts (Seinhorst & Den Ouden, 1966) and count the eggs. Compare the densities before and after treatments with Student's t-test.
- Record the weight of total plant and tap root. Compare the mean plant and root weight with Duncan's multiple range or Student's t-tests.
- Record the soil temperatures under mulch and in the control plots to relate them to solarisation efficiency.

References or examples of studies carried out by using this method/protocol:

Greco et al., 1990. Nematologia mediterranea, 18: 261-264.
Seinhorst, J.W. & Den Ouden, H. 1966. Nematologica 12: 170-171.
Seinhorst, J.W. 1974. Nematologica 20: 367-369.