

Plant Parasitic Nematodes

Problems related to clover and organic farming

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Nematodes - a challenge to organic farming

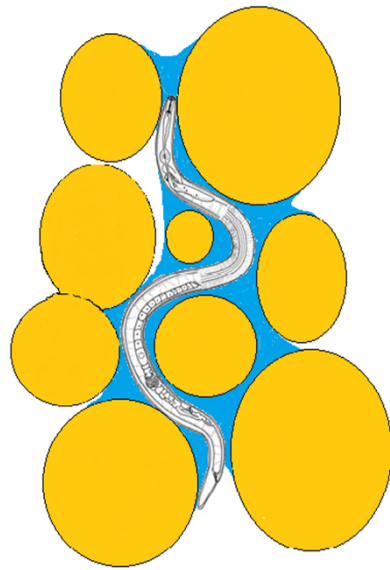
Clovers - excellent hosts for many plant parasitic nematodes

Many nematodes damage clover

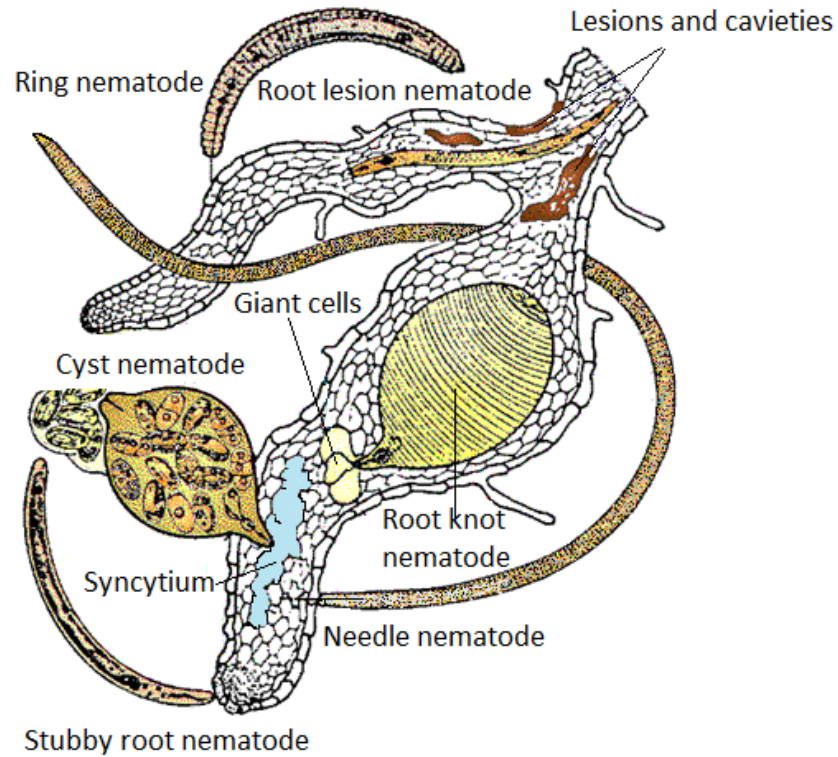
Nematodes may contribute to clover-fatigue

Crops following clover damaged by high nematode populations

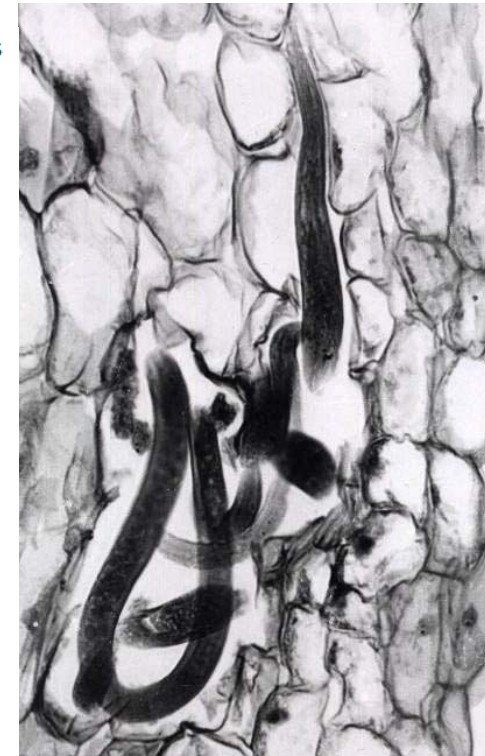
How plant parasitic nematodes live



In soil

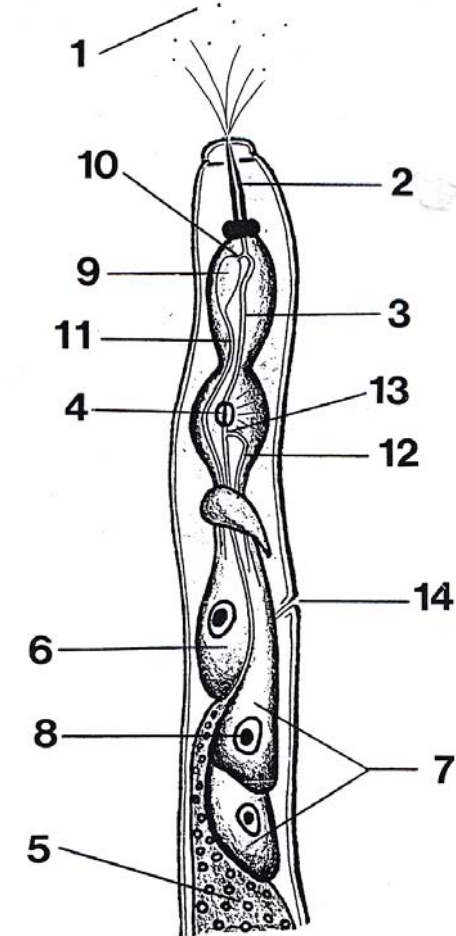


On roots



In stems

Small but powerful



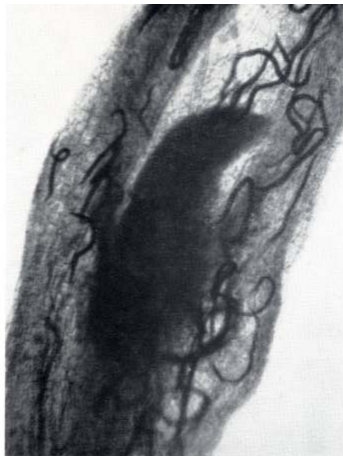
Damaging nematodes



Type of nematode	Clover	Cereals	Potato	Carrot	Strawberry
Stem	X				X
Potato rot	X		X	X	
Stunt	XX	XX	XX		
Spiral	XX	XX	XX		
Pin	XX	X	X	XX	
Stubby root	XX	XX	XX	XX	
Needle	XX			XX	XX
Root lesion	XX	XX	XX	XX	XX
Cereal cyst		XX			
Clover cyst	XX				
Potato cyst			XX		
Carrot cyst				XX	
Root knot	XX	XX		XX	

X = Occasional; XX=Frequent; **XX**=Damaging

Stem nematode *Ditylenchus dipsaci*



Field and plant damage caused by the stem nematode.

Potato rot nematode *Ditylenchus destructor*



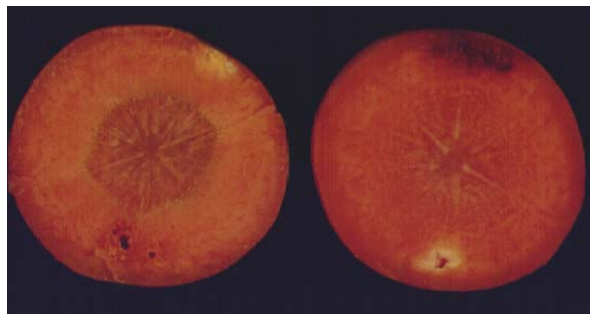
Cracks on tuber



Internal rot



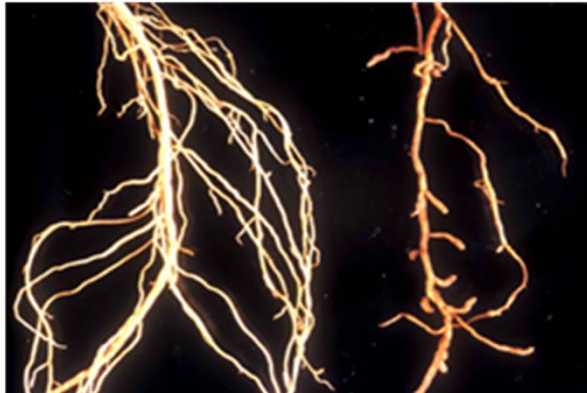
Cracks on carrot



Internal spots

Weed hosts: *Mentha arvensis*, *Stochys palustris*, *Rumex acetocella*, *Potentilla anserina*, *Sonchus arvensis*, *Cirsium arvense*.

Ectoparasites



Needle nematode *Longidorus elongatus* on strawberry



Pin nematode *Paratylenchus bukowinensis* on carrot



Needle nematode and stubby root nematode damage to onion



Needle nematode and stubby root nematode root damage on onion

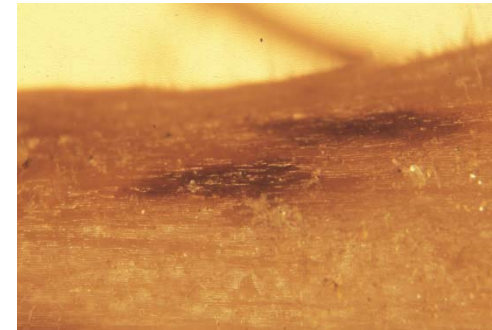
Root lesion nematode *Pratylenchus* spp.



Root lesion nematode in strawberry root



Root lesions in stolon of potato



Cracks on carrot caused by *P. penetrans*



P. penetrans damage in Saturna potato Norway

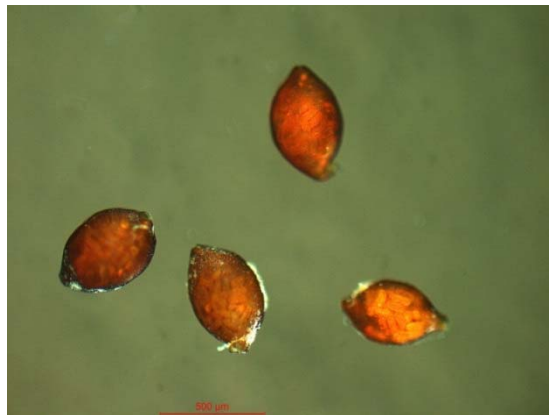
Cyst nematodes *Heterodera* spp.



Cereal cyst nematode (*H. avenae*)
root damage on wheat / Photo: B. Hammeraas



H. carotae on carrot.
www.rennes.inra.fr



Clover cyst nematode
H. trifolii / Photo: C. Magnusson



Low frequency of
clover in ley / Photo:
B. Hammeraas



Field damage by *H. trifolii* Ås Norway
/ Photo: C. Magnusson

Potato Cyst Nematodes (PCN) *Globodera* spp.



Damage from potato cyst nematode / www.sorost.lr.no



Damaged plant on the right. Reduced growth, bushy roots with adhering soil



G. rostochiensis, yellow PCN / Photo: B. Hammeraas



G. pallida, white PCN / Photo: B. Hammeraas

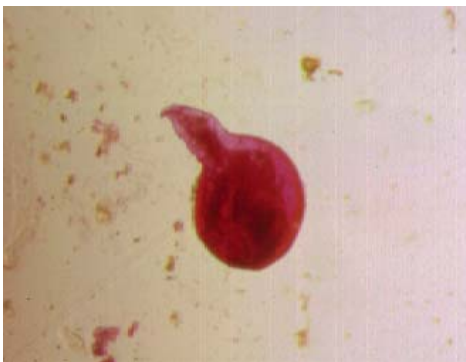
Root knot nematode *Meloidogyne*



M. hapla damage to carrot / Photo: B. Hammeraas



M. hapla damage to carrot. Note the galls on the roots. Photo: SLU



M. hapla, young female from gall / Photo: B. Hammeraas

Weeds



NEMATODES (250 ml jord)	TIMOTHY	WEEDS
<i>Tylenchus sensu lato</i>	1275	675
Spiralnematodes (<i>Helicotylenchus canadensis</i>)	325	1250
Root lesion nematode (<i>Pratylenchus crenatus</i>)	25	200



Conclusions

Pay attention to plant vigour

Be observant on nematode symptoms

Keep track on nematode populations

Sample for nematodes on a regular basis

Plan for good rotations

Keep weeds out

A microscopic image showing a central, dark brown, textured mass surrounded by numerous small, dark, oval-shaped structures and several long, thin, curved structures. The background is a light blue-grey color. The text "THANK YOU!" is overlaid in large, white, bold, sans-serif capital letters across the center of the image.

THANK YOU!