

Some Plant Parasitic Nematodes Associated with Crops in San Mateo County

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Problems with Poor Plant Growth

The authors always consider the possible relationship of plant parasitic nematodes to poor plant growth. This standard procedure is based on experience gained during the past 24 years while studying the importance of nematodes to vegetable and ornamental crops in San Mateo County.

Whenever abnormalities in growth are observed, samples of soil and plant materials are examined in the laboratory for plant parasitic nematodes. This is followed by extensive experimental trials on a variety of crops to determine the importance of the nematodes and possible controls. Generally, plant growth problems can be caused by the physical or chemical condition of the soil, improper nutrition, bad water management practices, insect and mite infestations, diseases caused by viruses, fungi, bacteria and, of course, nematodes. It is not an easy matter to look at tops of plants and determine if plant parasitic nematodes are present. Only with special extraction techniques and microscopic examination, can accurate identification be made.

What are Nematodes?

Most plant parasitic nematodes are so small that they must be observed under a microscope to determine body shape, size, and other details. They sometimes are called "eelworms" because of their basic long, cylindrical shape. In some, the females become enlarged, forming lemon, pear, round, or irregular body shapes. They feed on plant tissues by means of a hollow spear or stylet. Many species feed on roots, either by entering the root and feeding from the inside or from outside the root by inserting their stylets. On roots, they may cause formation of galls, lesions, "hairy" or "stubby" growth patterns, and generally reduce root growth and activity. This results in a reduction of plant vigor and growth with accompanying lower yields and quality. Some nematodes attack "above-ground" parts of the plant. This may result in distorted foliage, necrosis, discoloration, leaf spots, lesions, and seed and leaf galls. Other nematodes are vectors of some important plant viruses.

It has become increasingly apparent that plant parasitic nematodes are widespread. Further, both field and greenhouse crops are readily attacked. This is particularly true if:

- (1) The crop is a good host for a species of nematodes.
- (2) Consecutive plantings of the same susceptible crop are made without rotation to nonsusceptible types. A build-up of high nematode population results.
- (3) Soil fumigants for nematode control are not used on a regular basis.
- (4) Steam sterilization with pipes on top of the soil (Thomas method) is employed. This technique does not kill nematodes more than a few inches below the soil surface.
- (5) Infected plant material is used in vegetative propagation.
- (6) Seed is grown in infested soil, and transplants are placed in clean or treated fields.

A summary of host plants and plant parasitic nematodes found in San Mateo County is included in this report (see lists 1 and 2, which follow). Fortunately, there are excellent nematicides available that will effectively control nematodes. Field experiments have been conducted for many crops and nematode types to determine the most efficient and economically feasible treatments for reducing nematode populations which in turn improves plant quality and yields.

List 1 Host Plants and Nematodes Associated with Them

1. African violet	<i>Aphelenchoides fragariae</i>	12. Broccoli	<i>Heterodera schachtii</i> <i>Heterodera cruciferae</i> <i>Rotylenchus robustus</i>
2. Artichoke	<i>Meloidogyne hapla</i> <i>Pratylenchus sp.</i> <i>Rotylenchus robustus</i> <i>Trichodorus sp.</i> <i>Tylenchorhynchus sp.</i>	13. Brussels sprouts	<i>Heterodera schachtii</i> <i>Heterodera cruciferae</i> <i>Rotylenchus robustus</i>
3. Baby's tears	<i>Aphelenchoides rizemabosi</i>	14. Cabbage	<i>Heterodera schachtii</i> <i>Heterodera cruciferae</i> <i>Rotylenchus robustus</i>
4. Azalea	<i>Helicotylenchus sp.</i> <i>Rotylenchus robustus</i>	15. Carnation	<i>Criconemella curvata</i> <i>Criconemella sp.</i> <i>Paratylenchus dianthus</i> <i>Paratylenchus sp.</i> <i>Rotylenchus robustus</i> <i>Pratylenchus sp.</i>
5. Bachelor button	<i>Paratylenchus sp.</i> <i>Pratylenchus vulnus</i>	16. Carrot	<i>Rotylenchus robustus</i>
6. Basil	<i>Tylenchorhynchus sp.</i>	17. Cauliflower	<i>Heterodera schachtii</i> <i>Rotylenchus robustus</i>
7. Bean, garbanzo	<i>Meloidogyne sp.</i>	18. Celery	<i>Rotylenchus robustus</i>
8. Bean, fava	<i>Pratylenchus sp.</i> <i>Tylenchorhynchus sp.</i>	19. Chard	<i>Heterodera schachtii</i> <i>Rotylenchus robustus</i>
9. Beet, red	<i>Heterodera schachtii</i> <i>Rotylenchus robustus</i>	20. Chives	<i>Ditylenchus dipsaci</i> <i>Rotylenchus robustus</i>
10. Begonia, rieger	<i>Aphelenchoides fragariae</i>	21. Chrysanthemum	<i>Meloidogyne hapla</i> <i>Paratylenchus sp.</i>
11. Boxwood	<i>Pratylenchus sp.</i> <i>Rotylenchus sp.</i> <i>Trichodorus sp.</i>	22. Daisy, marguerite	<i>Meloidogyne hapla</i> <i>Paratylenchus sp.</i> <i>Pratylenchus crenatus</i> <i>Rotylenchus robustus</i>
		23. Fern, birdsnest	<i>Aphelenchoides fragariae</i>
		24. Fern, adiantum gracillium	<i>Aphelenchoides fragariae</i> <i>Paratylenchus sp.</i>
		25. Ficus repens	<i>Aphelenchoides fragariae</i>
		26. Ficus benjamina	<i>Meloidogyne sp.</i>
		27. Ficus radicans	<i>Aphelenchoides fragariae</i>
		28. Garlic	<i>Ditylenchus dipsaci</i>
		29. Ginkgo	<i>Helicotylenchus sp.</i>
		30. Heather	<i>Pratylenchus sp.</i>
		31. Hydrangea	<i>Crossonema sp.</i> <i>Paratylenchus sp.</i> <i>Pratylenchus sp.</i> <i>Rotylenchus robustus</i>
		32. Iris	<i>Rotylenchus robustus</i>
		33. Kale	<i>Rotylenchus robustus</i>
		34. Lily, easter	<i>Pratylenchus penetrans</i>
		35. Lilac	<i>Meloidogyne hapla</i>
		36. Lettuce, iceberg	<i>Meloidogyne hapla</i> <i>Rotylenchus robustus</i>
		37. Lettuce, red leaf	<i>Rotylenchus robustus</i>
		38. Lettuce, romaine	<i>Rotylenchus robustus</i>
		39. Mint	<i>Pratylenchus penetrans</i>
		40. Myoporum laetum	<i>Paratylenchus sp.</i>
		41. Magnolia	<i>Meloidogyne sp.</i>
		42. Mustard	<i>Heterodera schachtii</i>
		43. Onion	<i>Ditylenchus dipsaci</i> <i>Meloidogyne hapla</i>
		44. Pansy	<i>Pratylenchus sp.</i> <i>Rotylenchus robustus</i>
		45. Pepper	<i>Meloidogyne sp.</i>
		46. Pittosporum	<i>Rotylenchus robustus</i>
		47. Podocarpus	<i>Crossonema sp.</i>
		48. Potato	<i>Meloidogyne hapla</i>
		49. Rose	<i>Meloidogyne hapla</i> <i>Pratylenchus penetrans</i> <i>Pratylenchus vulnus</i> <i>Pratylenchus sp.</i> <i>Trichodorus sp.</i> <i>Tylenchorhynchus sp.</i> <i>Xiphinema americanum</i>

(Continued)

**List 1 (continued)
Host Plants and Nematodes
Associated with Them**

50. Shallots	<i>Ditylenchus dipsaci</i>
51. Silver nettle	<i>Aphelenchoides fragariae</i>
52. Snapdragon	<i>Meloidogyne hapla</i> <i>Pratylenchus</i> sp. <i>Pratylenchus vulnus</i> <i>Tylenchorhynchus</i> sp.
53. Spinach	<i>Rotylenchus robustus</i>
54. Spinach, New Zealand	<i>Paratylenchus</i> sp. <i>Rotylenchus robustus</i>
55. Squash	<i>Meloidogyne</i> sp.
56. Statice	<i>Paratylenchus</i> sp. <i>Pratylenchus</i> sp.
57. Strawflower	<i>Paratylenchus</i> sp. <i>Pratylenchus</i> sp. <i>Rotylenchus robustus</i>
58. Tomato	<i>Meloidogyne</i> sp.
59. Turf grass (<i>Poa</i> sp.) (various)	<i>Anguina</i> sp. <i>Criconemella</i> sp. <i>Heterodera</i> sp. <i>Rotylenchus robustus</i> <i>Tylenchorhynchus</i> sp.
60. Viola	<i>Pratylenchus</i> sp. <i>Rotylenchus robustus</i>

**List 2
Plant Parasitic Nematodes
Recovered from Plant and
Soil Samples in San Mateo County**

1. <i>Anguina</i> sp.	Grass gall nematode
2. <i>Aphelenchoides fragariae</i>	Foliar nematode
3. <i>Aphelenchoides ritzemabosi</i>	Foliar nematode
4. <i>Criconemella curvata</i>	Ring nematode
5. <i>Criconemella</i> sp.	Ring nematode
6. <i>Crossenema</i> sp.	Spine nematode
7. <i>Ditylenchus dipsaci</i>	Stem and bulb nematode
8. <i>Helicotylenchus</i> sp.	Spiral nematode
9. <i>Heterodera cruciferae</i>	Cabbage cyst nematode
10. <i>Heterodera schachtii</i>	Sugar beet cyst nematode
11. <i>Meloidogyne hapla</i>	Root knot nematode
12. <i>Meloidogyne incognita</i>	Root knot nematode
13. <i>Meloidogyne</i> sp.	Root knot nematode
14. <i>Paratylenchus dianthus</i>	Pin nematode
15. <i>Paratylenchus</i> sp.	Pin nematode
16. <i>Pratylenchus penetrans</i>	Lesion nematode
17. <i>Pratylenchus crenatus</i>	Lesion nematode
18. <i>Pratylenchus vulnus</i>	Lesion nematode
19. <i>Pratylenchus</i> sp.	Lesion nematode
20. <i>Rotylenchus robustus</i>	Spiral nematode
21. <i>Trichodorus</i> sp.	Stubby-root nematode
22. <i>Tylenchorhynchus</i> sp.	Stunt nematode
23. <i>Xiphinema americanum</i>	Dagger nematode
24. <i>Xiphinema</i> sp.	Dagger nematode

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