PLANT-PARASITIC DAMAGE LEVELS FOR OREGON NURSERY CROPS:

A LITERATURE SURVEY.

DRAFT: 2000

Biology, Host Ranges, and Damage Levels

of Root-parasitic Nematodes

on Oregon Nursery Crops

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Categories of host plants and page numbers in hard copy

Damage Levels: An Introduction

How many plant-parasitic nematodes will damage a particular plant species? This is the most frequently asked question of the Nematode Testing Service at Oregon State University. This literature survey is an attempt to answer that question for nursery crops grown in Oregon. Non-quantitative host range information is also included to facilitate control through crop rotation: if remaining volunteers are host to a plant-parasitic nematode, the nematode population can be maintained in the volunteers even if the crop itself is not a host.

Host plants are listed alphabetically by host genus within large categories. Common names are included for most taxa. To search this simple, unadorned yet informative text file on the web, use the "find in file" function on your web browser to search for the plant by latin or common name.

Most information listed below is from replicated studies or systematic surveys. Studies conducted in pots are indicated. Study conditions may deviate from local Oregon conditions in soil type, climate, moisture, and other factors. Cultivars often vary in susceptibility to parasitic nematode damage and in the number of nematodes they will support.

Numbers of most plant-parasitic nematodes vary seasonally. In many of these studies, the season at which samples were taken is not indicated. In some, however, nematode numbers are designated as initial or as final levels.

These studies report levels at which damage has occurred rather than predict damage that will occur. Therefore, these data are presented only as statements of nematode levels at which damage occured.

If a particular crop is not included in the list, no information has been found for that crop. If a nematode species of concern is not listed under a particular crop, no information has been found on the species for that crop. A lack of information does not necessarily imply a lack of damage.

Nematode damage numbers in this survey are expressed in this survey as nematodes/100 grams (g) soil or number of nematodes/100 cubic centimeters (cm3 or cc) soil. Numbers/100 g soil may be multiplied by 20 to give the number of nematodes/2000 g soil (traditionally designated by the OSU Nematode Testing Lab as one "quart"). Nematode numbers from the OSU Nematology Lab are reported as number/100 g and are corrected for soil moisture.

Nematode numbers/100 cm3 soil can provide a rough estimate of numbers/100 g soil corrected for dry weight but should be divided by the soil bulk density for accuracy. Bulk densities of clay, clay loam, and silt loam surface soils range from about 1.0 to 1.6 g/cm3, and those of sands and sandy loams range from about 1.2 to 1.8 g/cm3 (Buckman and Brady 1969). However, the bulk density of the sample actually processed is dependent upon packing density during measurement. Since bulk densities are not frequently reported in studies in which nematode numbers are expressed on a volume basis, accurate conversion of numbers/100 cm3 to numbers/100 grams soil is not usually possible. Nevertheless, since the variation associated with bulk density conversions is generally less than the variation associated with field sampling, numbers/100 cm3 soil provide an acceptable approximation of numbers/100 g soil for making management decisions.

Host designations based on gall ratings: These designations apply only to *Meloidogyne.* A rating of "1" = no galls (resistant); "2" = 1 to 10 galls; "3" = 11 to 100 galls; "4" = more than 100 galls (susceptibile) (LaMondia 1995, LaMondia 1996).

Host designations based on Reproductive factor (Rf). Rf = final population/initial population. An Rf of over 10 indicates an excellent host; an Rf of 1 to 10 indicates a good host; an Rf of about 1 indicates a maintenance host; and an Rf of between 1 and 0 indicates a poor host or nonhost (Ferris et al. 1993).

Host designations based on number of plants infected compared to number of plants inoculated. This is expressed as a fraction. If 10 plants were inoculated and 5 were infected, then 5/10 inoculated plants were infected (Faulkner and McElroy 1964).

HOST RANGES AND DAMAGE LEVELS

POMES

Comments regarding all pomes

Criconemella xenoplax and C. curvata do not apear to be a major problem on apple or pear in temperate climates. *Criconemella xenoplax* was associated with apple in South Africa. Pear was not a host vor *C. xenoplax* after 6 months under greenhouse conditions (Nyczepir and Halbrendt 1993).

Pratylenchus spp.:

25 to 150/100 cm3 soil are considered damaging but can vary depending on soil texture, climate, and additional pathogens (Nyczepir and Halbrendt 1993).

Pratylenchus penetrans:

Considered important on fruits in temperate areas (Nyczepir and Halbrendt 1993).

Pratylenchus crenatus:

Recorded (Kleynhans et al. 1996)

Pomes are hosts in California (Norton et al. 1984).

Pratylenchus neglectus

Pomes are hosts in California (Siddiqui et al 1973).

Recorded (Kleynhans et al. 1996)

Pratylenchus penetrans:

Initial population of 30/100 g soil necessary for growth reduction; involved in pear replant problems in the USA and Canada (Nyczepir and Halbrendt 1993).

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 50 *P. penetrans* and *P. projectus*/100 g did not weight significantly more and were not significantly taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

Recorded (Kleynhans 1996).

Pratylenchus thornei

Recorded (Kleynhans et al. 1996)

Pomes are hosts in Holland (Fortuner 1977).

Xiphinema americanum has been associated with unthrifty growth and poor yield of pome fruit in the eastern USA; reduced growth of apple seedlings was accompanied by roots with brown lesions, swollen tips, necrosis, and sloughing off of the cortex (Nyczepir and Halbrendt 1993).

***Malus domestica* (apple)**

Meloidogyne chitwoodi

Golden Delicious in pots: no reproduction: non-host (O'Bannon et al. 1984).

Meloidogyne hapla:

No data on susceptibility (Nyczepir and Halbrendt 1993).

Malus sylvestris (= M. pumila, M. domestica; Apple)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Criconemella (= Mesocriconema) xenoplax

Apples are host in commercial crop, urban area, and nursery in California (Sidiqqi et al. 1973)

Pratylenchus crenatus

Apples are hostost in California (Norton et al. 1984).

Pratylenchus neglectus

Apples are hostost in California (Siddiqui et al 1973).

Recorded (Kleynhans et al. 1996)

Pratylenchus penetrans:

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 452 P. penetrans and P. projectus/100 g weighed 59% more and were 65% taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

20 to 50/100 g soil (Barker et al. 1976).

Initial population of 15/100 g soil necessary for growth reduction (Nyczepir and Halbrendt 1993).

Pratylenchus thornei

Causes growth stagnation in Holland (Fortuner 1977).

Apples are hostost in California (Siddiqui et al. 1973)

Recorded (Kleynhans et al. 1996)

Paratrichodorus allius

Apple is a host (SON 1984).

Xiphinema americanum

Rootstocks tolerant to TmRSV (vectored by Xiphinema americanum) include MM.106, EM 7a, EM 26, EM 9, MAC 39, MAC 9, P2, and Budogovsky 9; resistant rootstocks include M.4, M.7, Ottawa 3, and Novole. Fruiting varieties resistant to TmRSV include Red Delicious, Quinte, Tydeman's Red, Jerseymac, and Jonathan; susceptible varieties Golden Delicious, Empire, and York Imperial are susceptible. Cherry raspleaf causes flat apple disease on Red and Yellow Delicious (Nyczepir and Halbrendt 1993).

100/cm3 soil significantly reduced fresh and dry weight of seedlings (Nyczepir and Halbrendt 1993).

Pathogenic on apple (Carpenter et al. 1982; Jaffee et al. 1987).

No evidence of a relationship between the ability of a New York population to transmit Tomato Ringspot Virus and the prevalence of apple union necrosis incited in apple by this virus; X. americanum and X. rivesi transmit the virus with comparable efficiency (Georgi 1988a).

In pots after 3 months, New York populations increased (Georgi 1988b)

Apple Union Necrosis and Decline (AUND) developed in apple trees inoculated with Tomato Ring Spot Virus (TomRSV). However, Delicious/MM.106 inoculated with "Chicadee" TomRSV isolates did not develop AUND (Rosenberger et al. 1985).

Apple Union Necrosis and Decline (AUND) is probably caused by Tomato Ring Spot Virus (TomRSV), which was detected in 89% of trees with AUND. TomRSV infects apricot, is transmitted by X. americanum, infects weeds, and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Xiphinema rivesi

No evidence of a relationship between the ability of a local (New York) population to transmit Tomato Ringspot Virus and the prevalence of apple union necrosis incited in apple by this virus; X. americanum and X. rivesi transmit the virus with comparable efficiency (Georgi 1988a).

Vectors TomRSV to apple rootstock cuttings (Forer et al. 1984).

In pots after 3 months, New York populations increased (Georgi 1988b)

Pyrus communis (Pear)

Criconemella (= Mesocriconema) xenoplax

Densities around Bartlett were no higher than those in fallow treatments: non-host (Lownsbery 1964).

Pear is host in commercial crops and nurseries in California (Siddiqui et al. 1973).

In pots, Rf = 0 after 3 months (Seshadri 1964).

Meloidogyne hapla:

Found on pear in Japan but is not considered a major pest (Nyczepir and Halbrendt 1993).

Pear is host in California (Siddiqui et al. 1973).

Pratylenchus spp.:

The only nematode genus considered important to pear production in North America (Nyczepir and Halbrendt 1993).

Pratylenchus crenatus:

Recorded (Kleynhans et al. 1996)

Pear is host in California (Norton et al. 1984).

Pratylenchus neglectus

Pear is host in California (Siddiqui et al 1973).

Recorded (Kleynhans et al. 1996)

Pratylenchus penetrans:

Initial population of 30/100 g soil necessary for growth reduction; involved in pear replant problems in the USA and Canada (Nyczepir and Halbrendt 1993).

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 50 P. penetrans and P. projectus/100 g did not weight significantly more and were not significantly taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

Recorded (Kleynhans 1996).

Pratylenchus thornei

Recorded (Kleynhans et al. 1996)

Pear is host in Holland (Fortuner 1977).

Xiphinema spp.

Dagger nematodes are not a problem on pear, and its host status has not been evaluated (Nyczepir and Halbrendt 1993).

Xiphinema is a problem on pear if it vectors Tomato Ringspot Virus, which causes Black Line Disease (R. Ingham, pers comm.)

Xiphinema americanum

Bartlett is a very good host in pots; maintained population 24 times higher than fallow (Lownsbery 1964).

Associated with numerous crop and nursery plantings in California (Siddiqui et al. 1973).

DRUPES (Prunus spp.)

Comments applying to all Prunus species:

Pratylenchus penetrans: is considered important on fruit in temperate areas (Nyczepir and Halbrendt 1993).

Meloidogyne hapla is frequently associated with the roots of native Prunus spp. in Minnesota (Crow and MacDonald 1978).

Prunus armeniaca (Apricot)

Criconemella (= Mesocriconema) xenoplax

Supported densities 800 times higher than those in fallow treatment (Lownsbery 1964).

Apricot is host in California commercial crop and in nurseries (Sidiqqi et al. 1973)

In pots, Rf = 2867 on Royal after 6 months (Seshadri 1964).

Pratylenchus crenatus:

Apricot is host in California (Norton et al. 1984).

Pratylenchus neglectus

Apricot is host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Apricot is host in California (Siddiqui et al. 1973).

Pratylenchus thornei

Apricot is host in California (Siddiqui et al. 1973).

Xiphinema americanum

Supported densities 6 times higher than those in fallow treatement (Lownsbery 1964).

Associated with several crop, nursery, and urban plantings in California (Siddiqui et al. 1973).

Xiphinema americanum acquired Peach Yellow Bud Mosaic Virus from cucumber (Cucumis sativa National Pickling) and transmitted to to the roots of Royal apricot. Because movement of PYBMV from roots to tops has not

been demonstrated for apricot, it is still possible that its use as a rootstock for peach might be a barrier to the virus (Teliz et al. 1967).

Prunus avium (Mazzard cherry, Sweet cherry)

Criconemella (= Mesocriconema) xenoplax

Supported densities 78 times higher than those in fallow treatment (Lownsbery 1964).

In pots, Rf = 6 after 6 months (Seshadri 1964).

Sweet cherry is host in California commercial crops (Siddiqui et al. 1973)

Meloidogyne hapla:

No data on susceptibility (Nyczepir and Halbrendt 1993).

Xiphinema americanum

Supported densities 8 times higher than those in fallow treatement (Lownsbery 1964).

Associated with many crop and nursery plantings in California (Siddiqui et al. 1973).

Xiphinema index

Associated (SON 1984).

Pratylenchus crenatus:

Sweet cherry is host in California (Norton et al. 1984).

Pratylenchus neglectus

Sweet cherry is host in California (Siddiqui et al 1973).

Pratylenchus penetrans:

Initial population of 80/100 g soil necessary for growth reduction (Nyczepir and Halbrendt 1993).

In NE U.S., reduced yield and shortened productive life of Montmorency cherry on Mazard and Mahaleb rootstocks; parasitized trees were less winter hardy (Nyczepir and Halbrendt 1993).

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 7 P. penetrans and P. projectus/100 g weighed 46% more and were 64% taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

Pratylenchus thornei

Sweet cherry is host in California (Siddiqui et al. 1973).

Prunus cerasus (morello or amarelle cherry)

Meloidogyne hapla:

Susceptible (Nyczepir and Halbrendt 1993).

Pratylenchus penetrans:

Initial population of 80/100 g soil necessary for growth reduction (Nyczepir and Halbrendt 1993).

In NE U.S., reduced yield and shortened productive life of Montmorency cherry on Mazard and Mahaleb rootstocks; parasitized trees were less winter hardy (Nyczepir and Halbrendt 1993).

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 7 P. penetrans and P. projectus/100 g weighed 46% more and were 64% taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

Prunus cerasifera (Myrobalan plum)

Pratylenchus penetrans:

Initial population of 320/100 g soil necessary for growth reduction (Nyczepir and Halbrendt 1993).

Paratrichodorus allius

3J is a host (SON 1984).

Xiphinema americanum

Supported populations 13 times higher than those in fallow treatment: good host (Lownsbery 1964).

Prunus domestica (Plum, Prune)

Criconemella (= Mesocriconema) xenoplax

In pots, elimination by fumigation of 98/100 cm^3 soil at planting resulted in Myrobalan seedlings or Marianna 2624 trees from cuttings weighing 1.6 times more ($p < 0.05$) and being being significantly taller after 16 months than those in non-fumigated soil (Mojtahedi and Lownsbery 1975).

In pots, 167/100 cm^3 soil at planting resulted in significantly lower N, P, and K levels in leaves after 4 months (Mojtahedi and Lownsbery 1975).

In pots, non-inoculated Myrobalan seedling roots weighed 2.0 times more ($p < 0.01$) than those inoculated with 167/100 cm^3 soil at planting after 18 weeks (Mojtahedi and Lownsbery 1975).

In pots after 9 months at 42/100 cm^3 soil at planting, C. xenoplax numbers increased 12.8 to 27.0 times on the following hosts: Prunus cerasifera cf Corotto Marianna, Myrobalan 3J, Myrobalan Herbst Bros, Myrobalan 29C; P. subcordata X P. domestica Etter's Best; P. cerasifera X P. munsoniana Marianna F, Marianna 2624, Marianna 2623, Marianna 4001; P. cerasifera var. atropurpurea (= Prunus moseri); P. persica (Lovell Peach); and P. persica X P. amygdalus (Peach X almond) (Mojtahedi and Lownsbery 1975).

Prunus cerasifera 29C supported densities 750 times higher than those in fallow controls (Lownsbery 1964).

On Marianna 2624 plum, more cankers developed on branches, and water stress was greater, in trees whose roots were infected by C. xenoplax than on control trees.

Plant weights were not reduced by 7/100 cm^3 soil but were reduced 14% by 67/100 cm^3 soil and 30% by 667/100cm^3 soil. Top/root ratios were higher (3.02 to 3.04) in plants inoculated with all three densities of Criconemella than in controls (2.64) (Mojtehedi et al. 1975).

Plum is host in commercial crops and nurseries in California (Siddiqui et al 1973).

In pots, Rf = 4338 on Myrobalan 3J after 6 months (Seshadri 1964).

Pratylenchus neglectus

Plum is host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Plum is host in California (Siddiqui et al. 1973).

Pratylenchus thornei

Plum is host in California (Siddiqui et al. 1973).

Xiphinema americanum

Xiphinema americanum acquired Peach Yellow Bud Mosaic Virus from cucumber (Cucumis sativa National Pickling) and transmitted it to the roots of Damson plum. Because movement of PYBMV from roots to tops has not been demonstrated for plum, it is still possible that its use as a rootstock for peach might be a barrier to the virus (Teliz et al. 1967).

Associated with numerous crop and nursery plantings in California (Siddiqui et al. 1973).

Apple Union Necrosis and Decline (AUND) is probably caused by Tomato Ring Spot Virus (TomRSV), which was detected in 89% of trees with AUND. TomRSV infects Prunus domestica, is transmitted by X. americanum, infects weeds, and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Xiphinema index

Associated (SON 1984).

Prunus mahaleb (Mahaleb Cherry)

Criconemella (= Mesocriconema) xenoplax

Supported densities 16 times higher than those in fallow treatment (Lownsbery 1964).

Meloidogyne hapla:

No data on susceptibility (Nyczepir and Halbrendt 1993).

Pratylenchus penetrans:

Initial population of 80/100 g soil necessary for growth reduction (Nyczepir and Halbrendt 1993).

In NE U.S., reduced yield and shortened productive life of Montmorency cherry on Mazard and Mahaleb rootstocks; parasitized trees were less winter hardy (Nyczepir and Halbrendt 1993).

In pots, seedlings grown for 12 weeks in steam-fumigated orchard soil with a history of replant disease containing a mixed population of 7 P. penetrans and P. projectus/100 g weighed 46% more and were 64% taller than seedlings grown in non-treated soil (Mai and Abawi 1978).

Xiphinema americanum

Supported densities 7 times higher than those in fallow treatement (Lownsbery 1964).

TomRSV infects peach, cherry (P. mahaleb), prune (Prunus domestica), apricot (P. armeniaca), raspberry (Rubus idaeus), ash (Fraxinum spp), dogwood (Cornus spp.), Vitis lambrusca, and V. vinifera.. TomRSV is transmitted by X. americanum, infects weeds and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Prunus persica (Peach)

Criconemella (= Mesocriconema) curvata

Associated with decline of peach trees in Maryland and New Jersey; found in 20 of 25 peach orchards in Pennsylvania (Jaffee et al. 1987).

Criconemella (= Mesocriconema) simile

Associated with decline of peach trees in Maryland and New Jersey (Jaffee et al. 1987).

Criconemella (= Mesocriconema) xenoplax

Tree death in North Carolina was likely at 38-83/100 cm^3 soil (no time of year given); the specific role of this nematode in the PTSL disease complex is not completely understood. Yield in a PTSL test orchard was increased by 11,288 kg/ha when preplant soil fumigation with methyl bromide was used (Nyczepir and Halbrendt 1993).

Peach tree short life did not occur in the absence of C. xenoplax, but "old" orchard sites are not requred. At 2208-4385/100 cm^3 soil, 77% more December-pruned trees than March-pruned trees developed peach tree short life; December pruning increases cold injury. In greenhouse tests, C. xenoplax/g dry root for nematode-inoculated plots was greater ($p < 0.05$) for pruned (7816) than for non-pruned (4101) plants, and root mass of pruned seedlings (7.6 g) was less ($p < 0.01$) than unpruned seedlings (12.1 g) for Nemaguard and Lovell root stock (Nyczepier 1990).

In pots inoculated with approximately 33/100 cm^3 soil, Nemaguard dry root weights were 21% lower and dry shoot weights were 33% lower after 6 months than those of uninoculated controls ($p = 0.01$) (Nyczepir et al. 1988)

Found in 20 of 25 peach orchards in Pennsylvania (Jaffee et al. 1987).

In pots, tree survival was 100% at 0.46/100 cm3 but less at all higher initial population levels. All seedlings exposed to 119, 478, and 956/100 cm3 soil were dead by 270 days. After 270 days, height increase was 43, 82, and 82% less, and dry root weight was 39, 62, 35% less at initial population levels of 0.46, 1,9, and 7.5/100 cm3 soil, respectively (Nyczepir et al. 1987).

Criconemella xenoplax, Fusarium solani, and F. oxysporum caused necrosis of Nemagaurd peach feeder roots in greenhouse tests. Root necrosis was more extensive in the presence of either fungus than with C. xenoplax alone. Shoot growth and plant height were less for plants inoculated with F. oxysporum or F. solani than for plants inoculated with the fungi plus C. xenoplax. Neither synergistic nor additive effects on root necrosis or plant grwoth occurred between C. xenoplax and the fungal pathogens (Nyczeper and Pusey 1986).

In pots, after 90 days, reproductive factor was 8.80 from initial population of 250/100 cm3 soil: host (Zehr et al. 1986).

Roots of 1-month-old Lovell seedlings grown in uninfested soil weighed 26% more than seedlings grown in soil with 733 C. xenoplax/100g. Roots of 1-month-old Nemaguard seedlings grown in uninfested soil weighed 7% more than seedlings grown in soil with933 C. xenoplax/100g. Roots of 7-month-old Lovell herbaceous cuttings grown in uninfested soil weighed 66% more than cuttings grown in soil with 4533 C. xenoplax/100g. Roots of 7-month-old Nemaguard herbaceous cuttings grown in uninfested soil weighed 40% more than cuttings grown in soil with 5267 C. xenoplax/100g. (Okie and Reilly 1984).

In Georgia field trials in soil with 322/100 cm3, nematode numbers were 69% lower and growth was better in sites receiving postplant DBCP (1,2-dibromo-3-chloropropane) than in control sites. In peach tree short life studies, Criconemella xenoplax was usually the only factor associated with tree death; populations correlated negatively with tree death (Wehunt and Weaver 1982).

Damage level in South Carolina is 50/100 cm3 soil (no time of year given) (Conrad et al. 1982).

In pots, 175 C. xenoplax/100 cm3 soil reduced Nemaguard and Lovell fresh tree weight by 44 and 70% alone and 57 and 70% with Pseudomonas syringae. Fay Elberta peach trees grown on wither Lovell or Nemaguard rootstocks were highly susceptible to bacterial canker if inoculated with C. xenoplax, and serious canker did not develop without the nematode (Lownsbery et al. 1977).

In pots, 9, 90, and 180 C. xenoplax/100 cm3 soil decreased top height of Nemaguard seedlings by 19, 12, and 55%, respectively, after 7 months, but root weight and top weight did not differ significantly. In pots, 9, 90, and 180 C. xenoplax/100 cm3 soil decreased root weight of Nemaguard seedlings by 7 and 24%, respectively, but top weight and top height did not differ significantly (Barker and Clayton 1973).

In field plots, inoculation of 10,000 C. xenoplax into field soil around 50 cm high Lovell seedlings resulted in less than 20/100 cm3 soil after 6 months and about 10,000/500 cm3 soil after 18 and 30 months. 10,000 C. xenoplax into field soil around 50 cm high Nemaguard seedlings resulted in less than 100/500 cm3 soil after 6 months, about 7000/500 cm3 soil after 18 months, and nearly 13,000/500 cm3 soil after 30 months. Seedling top weights and basal cross sectional tree trunk area were not significatnly reduced (Barker and Clayton 1973).

Criconemella xenoplax added to Carolyn peach on Lovell rootstock at planting time reduced peach tree trowth and increased susceptibility to Pseudomonas syringae (Lownsbery et al. 1973).

Lovell supported densities 177 times higher than those in fallow controls (Lownsbery 1964).

Lovell and S-37 are poor hosts. In a lathhouse test, peach seedlings were not injured by C. xenoplax at population levels as high as any found in California peach orchards (Lownsbery 1961).

In pots, Rf = 5.1 on Lovell after 6 months (Seshadri 1964).

Longidorus elongatus

Associated (SON 1984).

Peach is host in New Zealand (Knight et al. 1997).

Meloidogyne hapla:

Nemagaurd, Lovell, and Okinawa rootstocks are susceptible; no data on Nemared. Results from tank test indicated that young Okinawa and Nemaguard were infected, but no field reports of damage. (Nyczepir and Halbrendt 1993).

Pratylenchus spp.

All commercial peach rootstocks are susceptible to root-lesion nematodes, but some evidence for resistance has been shown in Rubira, Pisa, Rutgers Red Leaf, Tzim Pee Tao, and in some hybrids of Rugers Red Leaf X Tzim Pee Tao (Nyczepir and Halbrendt 1993).

Pratylenchus crenatus:

Peach is host in California (Norton et al. 1984).

Pratylenchus neglectus

Peach is host in California (Siddiqui et al 1973).

Pratylenchus penetrans:

5/100 g soil (Barker et al. 1976).

Root impairment results in loss of vigor and yields of mature trees, but P. penetrans' role in orchard replant problems is probably more economically important (Nyczepir and Halbrendt 1993).

In pots, seedling height was significantly reduced 40% by 114/100 cm3, 60% by 228/100 cm3, and 75% by 457/100 cm3.

Pratylenchus thornei

Associated with nectarine (P. persica var. nectarina) in California (Fortuner 1977).

Host in California (Siddiqui et al. 1973).

Recorded (Kleynhans et al. 1966).

Xiphinema americanum

Coincident with heavy damage in peach in South Africa (Meyer and Hugo 1994).

Supported densities 9 times higher than those in fallow treatment (Lownsbery 1964).

Xiphinema americanum acquired Peach Yellow Bud Mosaic Virus from cucumber (Cucumis sativa National Pickling) and transmitted it to the roots of Lovell peach. Because movement of PYBMV from roots to tops has not been demonstrated for plum and apricot, it is still possible that their use as rootstocks for peach might be a barrier to the virus (Teliz et al. 1967).

TomRSV infects peach, is transmitted by X. americanum, and infects weeds and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Xiphinema index

Associated (SON 1984).

Prunus serotina (American black cherry)

P. penetrans:

Associated with injury in The Netherlands (Ruehle 1967).

Xiphinema americanum

In pots, 169 days after inoculation with 72/100 g soil, the final population was 94/100 g soil (Miller 1980).

Prunus sp. (unspecified cherry and plum)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Pratylenchus thornei

Prunus spp. is host in Holland (Fortuner 1977).

SMALL FRUITS

Actinidia deliciosa (kiwi fruit)

Meloidogyne hapla:

Causes damage (Brown et al. 1993).

Kiwi is a host in New Zealand (Knight et al. 1997).

Fragaria X annasa, F. chiloensis, F. chioensis var. ananassa (strawberry)

Pratylenchus crenatus:

Strawberry is a host in California (Norton et al. 1984).

Pratylenchus neglectus

Strawberry is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Strawberry is a host in California (Siddiqui et al. 1973).

15/100 g soil have decreased growth, but sometimes higher levels have no effect (Pscheidt, 1997).

Pratylenchus thornei

Strawberry is a host in California, especially in nurseries (Siddiqui et al. 1973; Fortuner 1977).

Paratrichodorus allius

cv. Fresno is a host (SON 1984).

Criconemella (=Mesocriconema) xenoplax

Densities around Fragaria X ananassa were no higher than those in fallow treatments: non-host (Lownsbery 1964).

Associated with roots of Fragaria spp. (Kleynhans et al. 1996).

Criconemella (=Mesocriconema) curvata

Strawberry is a host (Loof 1974)

Longidorus elongatus (= L. sylphus)

Tolerance for top weights is 20/100 soil. Tolerance for root weights is 15/100 g soil. 30 or fewer/100 g soil caused a decrease in plant weight (Seinhorst 1966).

Strawberry is a host (SON 1984, Knight et al. 1997).

May cause severe damage. It can also infect strawberry with raspberry ringspot virus (RRV) and tomato black ring virus (TBRV) (Hooper 1973). These viruses may not have been reported in the Pacific Northwest.

Meloidogyne chitwoodi

In pots, Quinault was a non-host (Rf = 0) for race 2 (alfalfa race) (Mojtahedi et al. 1988b).

In pots, trace reproduction: very poor host (O'Bannon et al. 1984).

Meloidogyne hapla

Threshold is 5 J2/100 cm3 soil (Barker and Olthof 1976).

Second most damaging nematode to strawberries in Korea (Brown et al. 1993).

In pots, moderately susceptible; 5/5 inoculated plants infected (Faulkner and McElroy 1964).

In pots, X Fragaria ananassa is severely susceptible (Gaskin and Crittenden 1956).

Xiphinema americanum

Causes decline of strawberry in Wisconsin: sunken reddish-brown lesions in roots may progress to blackening of th entire root system (Perry 1958).

Important on strawberry in North America (Brown et al. 1993).

Fragaria X ananassa supported densities 8 times higher than those in fallow control (Lownsbery 1964).

In pots, 169 days after inoculation with 72/100 g soil, the final population was 24/100 g soil (Miller 1980).

Xiphinema bakeri

In pots, heavy damage and 837% population increase on Fragaria ananassa cv. "Northwest" after 12 weeks (McElroy 1972).

In pots, heavy damage and 260% population increase on Fragaria vesca cv. "East

Malling Vesca) after 12 weeks (McElroy 1972).

Fragaria chiloensis var. ananassa is a host (SON 1984).

Ribes grossularia (gooseberry)

Pratylenchus penetrans

Gooseberry is a host in California (Siddiqui et al. 1973).

Ribes sativum (currant)

Meloidogyne hapla:

In pots, Perfection was moderately susceptible, and 8/10 inoculated plants were infected. Red Lake and Wilder were slightly susceptible, and 4/10 and 3/10 inoculated plants, respectively, were infected (Faulkner and McElroy 1964).

Ribes sp.; possibly rubrum (currant)

Pratylenchus thornei

Currant is a host in Holland (Fortuner 1977).

Rubus idaeus (red raspberry)

Pratylenchus neglectus:

Red raspberry is a host in Vermont and Maryland (Norton et al. 1984).

Pratylenchus penetrans:

Threshold is 100/100 cm3 soil at planting; 200 to 800/100 cm3 in established plantings (McElroy 1992).

1000/g root may be found in damaged plantings, and 5000/100g soil at planting will probably cause significant damage (Brown et al. 1993).

Rubus idaeus (Red raspberry)

Longidorus elongatus

Red raspberries are non-hosts or poor hosts and may show considerable root galling (Hooper 1973).

Although a poor host for the nematode, it is readily infected with raspberry ringspot virus and tomato black ring virus. Although the nematode does not retain infectivity for much more than two months, it is able to reinfect itself from the many weed hosts that also carry the virus and which are probably more responsible for dispersal of the virus than the nematode (Hooper 1973). These viruses may not have been reported in the Pacific Northwest.

Xiphinema americanum

Densities on Willamette in the Willamette Valley were highest in December through March or April. (Lolas 1991).

TomRSV infects peach (Prunus persica), cherry (P. mahaleb), prune (Prunus domestica), apricot (P. armeniaca), raspberry (Rubus idaeus), ash (Fraxinum spp), dogwood (Cornus spp.), Vitis labrusca, and V. vinifera.. TomRSV is transmitted by X. americanum, infects weeds, and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Xiphinema bakeri

In pots, 100 and 200 X. bakeri/100 100 cm3 reduced mean root weights by 54 and 77%, top weights by 59 and 78%, and linear growth by 48 and 78%, respectively. Populations as low as 20/100 cm3 soil reduced root and top growth by 40 to 50% (McElroy 1972).

In pots, severe damage and 313 % population increase after 12 weeks (McElroy 1972).

Fall plant weight was suppressed 43% and yield was suppressed by 26%, by spring inoculation of 50X. bakeri/100 cm3 soil (McElroy 1976).

Rubus loganobaccus (loganberry)

Pratylenchus neglectus

Loganberry is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Loganberry is a host in California (Siddiqui et al. 1973).

Pratylenchus thornei

Loganberry is a host in California (Siddiqui et al. 1973).

Xiphinema americanum

Associated with crop, nusery, and urban plantings in California (Siddiqui et al. 1973).

Rubus occidentalis (black raspberry or blackcap)

Pratylenchus crenatus:

Recovered from soil associated with black cap; may have been parasitizing graminaceous weeds (Merrifield 1998).

Rubus spp. (caneberries)

Longidorus elongatus

Associated (SON 1984).

Pratylenchus crenatus

Rubus spp. are hosts (SON 1984).

Vaccinium macrocarpon (Cranberry)

Criconemella (=Mesocriconema) rusium

Associated with cranberry in the eastern US (Zuckerman et al. 1964).

Criconemella (=Mesocriconema) xenoplax

In pots, mean number and length of runners was reduced by a combination of C. xenoplax and Hemicycliophora similis. Fresh weight of tops was reduced 44% after 60 days and 29% after 90 days by a combination of C. xenoplax and Hemicycliophora similis (Bird and Jenkins 1964).

Meloidogyne hapla

Did not maintain itself on cranberry in New Jersey (Bird and Jenkins 1964).

Pratylenchus penetrans:

75/100 cm3 soil significantly reduced runner number and root and top weight (Bird and Jenkins 1964).

Vaccinium corymbosum (Blueberry)

Xiphinema americanum

Vectors Tobacco and Tomato Ringspot viruses and can be damaging at very low levels. Populations may be very low in late summer when other plant-parasitic nematode densities are high (Pscheidt and Ocamb 1998).

Xiphinema americanum is a vector for necrotic ringspot of blueberry (McGuire and Wickizer 1981; Griffin et al. 1963).

Xiphinema bakeri

In pots, heavy damage and 51 % population increase after 12 weeks (McElroy 1972).

Xiphinema index

Associated (SON 1984).

Vitis vinifera (wine grapes), V. labrusca (concord-type grapes), and other Vitis spp. (grapes)

Criconemella (=Mesocriconema) xenoplax

In pots, Concord grape top and root growth were suppressed 57 and 49% (p = 0.05) by 133/100 cm3, 23 (p = .05) and 11 % (NS) by 13/100 cm3, and 16 and 8% (NS) by 1.3/100 cm3, respectively (Santo and Bolander 1977).

C. xenoplax on Concord grape was controlled for 3 years by fumigation with 1,3-dichloropropene (Telone). The highest densities were at 40 cm below the surface. Densities exhibited multiyear cycles. (Bird and Ramsdell 1985).

In Washington, 120/100g soil reduced Concord grape yields (Pscheidt 1997).

V. vinifera Thompson Seedless is a good host (Lownsbery 1961).

V. vinifera Thompson Seedless supported densities 250 times higher than those in fallow treatment (Lownsbery 1964).

In pots, Rf = 2,443 on Thompson seedless after 6 months (Seshadri 1964).

Meloidogyne chitwoodi

In pots, light reproduction on both Concord and Semillon (V. vinifera): very poor hosts (O'Bannon et al. 1984).

Meloidogyne hapla:

In pots, root and shoot weight of V. vinifera vines inoculated with 1000 eggs/100 cm3 was significantly lower than that of uninoculated vines. V. vinifera cv. Columbard is susceptible (Reprod ratio = .05), but V. champinii cv. Ramsey is not susceptible to M. hapla, although both grape cultivars are susceptible to M. javanica and M. incognita. (Walker 1997).

An alfalfa isolate differed from a Concord grape and a red currant isolate in reproduction on Concord grape. In pots, Concord grapes were reduced 37% (p = 0.01) by 200 Concord grape isolate M. hapla/100g soil compared to controls but were not reduced by the alfalfa and red currant isolates; Rf was 20.7 (Santo and Hackney 1980).

Yield loss has been associated with population densities greater than 120/100 g soil in eastern Washington (Pscheidt 1997).

In pots, Concord was slightly susceptible, and 8/10 inoculated plants were infected (Faulkner and McEvoy 1964).

Densities exhibited multiyear cycles on Concord grape (Bird and Ramsdell 1985).

Meloidogyne thamsei

Host; reported in California (SON 1984).

Longidorus elongatus

Associated with one commercial crop in California (Siddiqui et al. 1973).

Associated (SON 1984).

Pratylenchus spp.

Several Pratylenchus spp. have been associated with poor growth in grapevines (Brown et al. 1993).

Pratylenchus crenatus

Grapes are hosts in California (Norton et al. 1984).

Pratylenchus neglectus

Recovered from Concord grape (V. labrusca) soil (Bird and Ramsdell 1985).

Vitis californica in nurseries and V. vinifera in many vineyards are hosts in California (Siddiqui et al 1973).

Pratylenchus thornei

Grapes are hostsost in California (Siddiqui et al. 1973).

Xiphinema americanum

Populations remained below detectable levels for 8 years following fumigation with 1,3-dichoropropene (Telone). Most in non-treated areas were in the upper 50 cm of soil, but a few were as low as 180 cm. The mean population density cycle was 2.5 years. (Bird and Ramsdell 1985).

Densities 14 times higher than those on fallow treatments were supported by Vitis vinifera Thompson Seedless (Lownsbery 1964).

Peach Rosette Mosaic Virus (PRMV) in V. labrusca Concord is spread solely by X. americanum. It is seed-borned in Chenopodium quinoa and grape. The virus was found in Rumex crispus, Solanum carolinense, Taraxacum officinale. Tomato Ringspot Virus was found in Plantago major. X. americanum was found to a depth of 5 feet in one vineyard and 7 feet in another (Ramsdell and Myers 1978).

Found as deep as 7 ft below infected vines. PRMV spreads at a rate of about 1 vine/year in a circular pattern.

Xiphinema index (reported in Oregon (SON 1984) but rare).

In pots, approximately 18/100cm3 virus-free X. index/pot suppressed shoot and root growth of Vitis vinifera "Thompson seedless" 2-bud cuttings. Leaf area was 1.6, 1.8, and 1.5 times greater, top weights of control plants were 2.2, 1.7, and 1.7 times greater, and root weights were 1.4, 1.6, and 1.2 times higher on contol than inoculated plants after 135, 255, and 362 days, respectively (p = 0.05) (Pinochet et al. 1976).

In pots, approximately 18/100cm3 suppressed Vitis vinifera "Thompson seedless" 2-bud cuttingsshoot weight by 44%, root weight by 37%, and plant height by 37% (p = 0.01) (Hafez et al 1981).

Nineteen of the 23 Californian hybrid Vitis spp. rootstocks were resistant, as were "Harmony", "Freedom", Scwarzmann", and "3309". Two hybrids of V. rufotomentosa, "171-52" and "176-9" may be immune. The rootstocks "ARG 1", 110 R", "1212", and "1616", which are used commercially for phylloxera resistance, were susceptible (Harris 1983).

In pots, root and shoot length of (susceptible) French Columbard were retarded by 47 and 37%, respectively, and root length of (resistant) Rubired was retarded by 44% by 25 virus-free X. index/100 cm3 soil(p = ,0.05) (Anwar and Van Gundy 1989).

In pots, X. index transmitted grape fanleaf virus to V. vinifera Mission and V. rupestris St. George. X. index is parasitic on Tokay (Hewitt et al. 1958).

Vitis acerifolia, V. champini, V. champini cv Salt Creek,V. rupestric cv. Metallique, V. vinifera cv. Almeria, Colombard, Thompson Seedless are hosts (SON 1984).

X. occiduum

Present in a wide range of soil types on every variety surveyed in British Columbia (Vrain et al. 1988).

Xiphinema pachtiacum (included in X. americanum sensu latu).

Yield loss in eastern Washington has been associated with population densities greater than 10/100 g soil. If Tobacco and Tomato Ringspot Viruses are not present, the nematode by itself may not be a problem (Pscheidt and Ocamb 1998).

Associated with V. labrusca (SON 1984).

Xiphinema thornei

Present in a wide range of soil types on every variety surveyed in British Columbia (Vrain et al. 1988).

NUTS

Juglans nigra (Northern California Black Walnut: (common rootstock for J. regia).

Criconemella (= Mesocriconema) xenoplax

In pots, plant weight was reduced 32% by 42/100 cm3 soil (NS), 47 and 45% by 417 and 4167/100 cm3 soil (p = 0.01) than in non-treated controls. In pots, after 2 years, fresh weights of plants in soil with 833/100 cm3 were 51% less (p = 0.01) than control plants (Lownsbery et al. 1978).

Supported densities 490 times higher than those in fallow treatments (Lownsbery 1964).

Meloidogyne hapla:

Black walnut is host (Siddiqui et al. 1973)

No data on susceptibility (Nyczepir and Halbrendt 1993).

Pratylenchus penetrans:

P. penetrans is considered important on nuts in temperate areas (Nyczepir and Halbrendt 1993).

Pratylenchus thornei

Found but not associated with disease in California (Ruehle 1967, Fortuner 1977).

Pratylenchus spp.

25 to 150/100 cm3 soil are considered damaging but can vary depending on rootstock tolerance, soil texture, climate, additional pathogens; they are primarily a replant problem on walnuts (Nyczepir and Halbrendt 1993).

Xiphinema americanum

Supported populations 9 times higher than those in fallow treatment (Lownsbery 1964).

Black walnut is a host in native plant communities in California (Siddiqui et al. 1973).

Juglans regia (English or Persian Walnut)

Criconemella (= Mesocriconema) xenoplax

In pots after 14 months, fresh weights of control plants were 62% higher than plants in soil with 100/100 cm3 (p = 0.01). In pots, after 2 years, fresh weights of cv "Serr" in soil with 833/100 cm3 were 33% less than control plants, but the difference was not significant. In pots, after 2 years, fresh weights of cv "Eureka" in soil with 833/100 cm3 were 37% less (p = 0.01) than control plants (Lownsbery et al. 1978).

No resistant rootstocks are currently available (Nyczepir and Halbrendt 1993).

Pratylenchus penetrans:

P. penetrans is considered important on nuts in temperate areas (Nyczepir and Halbrendt 1993).

Pratylenchus thornei

Found but not associated with disease in California (Ruehle 1967, Fortuner 1977).

Pratylenchus spp.

25 to 150/100 cm3 soil are considered damaging but can vary depending on rootstock tolerance, soil texture, climate, additional pathogens; they are primarily a replant problem on walnuts (Nyczepir and Halbrendt 1993).

Xiphinema index

Host (Siddiqi 1974).

Pistacia vera (Pistachio)

Xiphinema index

Host (Siddiqi 1974).

WOODY ORNAMENTALS AND FOREST TREES

General comments applying to all woody plants

Many Criconemella species other than C. xenoplax have been round associated with roots of many tree species but not with injury (Ruehle 1967).

Xiphinema spp. can predispose seedlings to winterkill (Sutherland and Webster 1993)

Xiphinema spp. have been found associated with the roots of many tree species but have not caused apparent injury (Ruehle 1967).

Significantly more X. bakeri were associated with diseased than with healthy seedlings. Disease occurred at soil densities as low as 4/100g (Sutherland and Dunn 1970).

Abies concolor (white fir)

Pratylenchus crenatus

White fir is a host in California (Norton et al. 1984).

Pratylenchus penetrans

White fir is a host in California (Siddiqui et al 1973).

Abies grandis (grand fir)

Pratylenchus penetrans

Grand fir is a host in nurseries in California (Siddiqui et al 1973).

Xiphinema bakeri

Grand fir is a host (SON 1984)

Associated (SON 1984)

Abies lasiocarpa (alpine fir)

Pratylenchus crenatus

Alpine fir is a host in California (Norton et al. 1984).

Abies procera (noble fir)

Pratylenchus penetrans

Noble fir is a host in California (Siddiqui et al 1973).

Acer macrophyllum

Longidorus elongatus

Associated (SON 1984).

Acer rubrum ()

Criconemella (= Mesocriconema) xenoplax

Positive host relationship in pots; nematode number in some pots showed increase over inoculum number (Ruehle 1971).

Found but not associated with injury in New Jersey (Ruhle 1967).

Acer rubrum ()

Longidorus elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Acer rubrum (red maple)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Found but not associated with injury in New Jersey (Ruehle 1967).

Acer saccharinum ()

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Associated with injury in Wisconsin; found but not associated with injury in New Jersey (Ruhle 1967).

Xiphinema americanum

Decline symptoms occurred in roots with which X. americanum was associated (DiSanzo and Rohde 1969).

Associated with injury in Wisconsin (Ruehle 1967).

Acer spp. (unspecified maple)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Longidorus elongatus

Unspecified maples are hosts (SON 1984).

Pratylenchus spp.

Found but not associated with injury in Maryland, Massachussetts, and Rhode Island (Ruehle 1967).

Pratylenchus crenatus

Unspecified maples are hosts (SON 1984).

Trichodorus sp.

Found but not associated with injury in Massachussets, Maryland, and Rhode island (Ruehle 1967).

Aesculus hippocastanum (horsechestnut)

Pratylenchus penetrans

Associated with plant injury in The Netherlands (Ruehle 1967).

Alnus spp. (alder)

Pratylenchus crenatus

Alder is a host (SON 1984).

Ampelopsis aconitifolia

Xiphinema index

Ampelopsis aconitifolia is a host (Siddiqi 1974)

Araucaria sp. (monkey puzzle tree, Chile pine, Norfolk Island pine)

Pratylenchus neglectus

Araucaria is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Araucaria is a host in California (Siddiqui et al 1973).

Pratylenchus thornei

Araucaria is a host in California (Siddiqui et al 1973).

Arbutus spp. (Madrone, others)

Trichodorus aequalis

Arbutus sp. is a host (SON 1984).

Arctostaphylos sp. (Manzanita)

Trichodorus aequalis

Manzanita is a host (SON 1984).

Trichodorus obscurus

Manzanita is a host (SON 1984).

Baccharis halmifolia

Trichodorus sp.

Found but not associated with injury in Florida (Ruehle 1967).

Berberis julianae (barberry)

Pratylenchus penetrans

In pots, tops weight was decreased 46% and root weight decreased 50% by

2500/100cm3. Roots exhibited lesions (Heald and Jenkins 1964).

Berberis spp. (barberry)

Meloidogyne hapla

Recorded (Southey 1993).

Betula populifolia

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Pratylenchus spp.

Found but not associated with injury in Maryland (Ruehle 1967).

Pratylenchus crenatus

Betula populifolia is a host (SON 1984).

Buxus serpervirens (European Boxwood)

Criconemella (= Mesocriconema) xenoplax

Boxwood is a host (Siddiqui et al. 1973).

Xiphinema americanum

Boxwood is a host in urban areas and nursery in California (Siddiqui et al. 1973)

Ceanothus spp. (Ceanothus, Buckthorn)

Trichodorus obscurus

Ceanothus is a host (SON 1984).

Cedrus deodara ()

Criconemella (=Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Cedrus deodora (cedar or deodar)

Pratylenchus penetrans

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus thornei

Cedrus deodora is a host in California (Siddiqui et al. 1973).

Cedrus libani (cedar of Lebanon)

Pratylenchus penetrans

Found but not associated with injury in New Jersey (Ruehle 1967).

Cedrus sp.

Longidorus elongatus

Associated (SON 1984).

Chamaecyparis lawsonii (Port Orford cedar)

Pratylenchus penetrans

Associated with plant injury in Belgium (Ruehle 1967).

Chamaecyparis obtusa

Trichodorus sp.

Associated with injury in Japan (Ruehle 1967).

Clematis sp. (clematis)

Meloidogyne hapla

Clematis cv. Hagley hybrid is susceptible (Gall rating 4.0) (LaMondia 1995).

Recorded (Southey 1993).

Cornus florida (eastern dogwood)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Longidorus elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Meloidogyne hapla

Found but not associated with injury (Ruehle 1967).

Pratylenchus crenatus, P. penetrans, P. neglectus

All found but not associated with injury in New Jersey (Ruehle 1967).

Cornus serecia (Creek dogwood, red osier)

Xiphinema americanum

In pots, 169 days after inoculation with 72/100 g soil, the final population was 120/100 g soil (Miller 1980).

Cornus spp. (Dogwood)

Xiphinema americanum

Apple Union Necrosis and Decline (AUND) is probably caused by Tomato Ring Spot Virus (TomRSV), which was detected in 89% of trees with AUND. TomRSV infects dogwood, is transmitted by X. americanum, infects weeds, and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Cornus spp.()

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Trichodorus sp.

Found but not associated with injury in New Jersey and Pennsylvania (Ruehle 1967).

Corylus avellana (filbert or hazelnut)

Pratylenchus crenatus

Filbert is a host in California (Norton et al. 1984).

Pratylenchus penetrans

Found but not associated with injury in The Netherlands (Ruehle 1967).

Cotoneaster integerrimussp.(Cotoneaster)

Pratylenchus penetrans

Associated with injury in The Netherlands (1967).

Cotoneaster spp.()

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Pratylenchus neglectus

Cotoneaster is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Associated with injury in The Netherlands (1967).

Xiphinema americanum

Cotoneaster was noted as a host in an urban area in California (Siddiqui et al. 1973)

Crataegus oxyacantha (hawthorne)

Pratylenchus penetrans

Associated with injury in The Netherlands (1967).

Cryptomeria japonica (Japanese cedar or cryptomeria)

Pratylenchus penetrans

Associated with plant injury in Japan (Ruehle 1967).

Trichodorus sp.

Associated with injury in Japan (Ruehle 1967).

Cupressus macrocarpa (Monterey cypress)

Pratylenchus neglectus

Monterey cyprus is a host in California (Siddiqui et al 1973).

Xiphinema americanum

Monterey cyprus is a host in urban area in California (Siddiqui et al. 1973)

Eleagnus spp.(Oleaster, Russian olive)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Fagus grandiflora (American beech)

L. elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Fagus silvatica (European beech)

Pratylenchus penetrans

Associated with injury in The Netherlands (Ruehle 1967).

Trichodorus sp.

Found but not associated with injury in Germany (Ruehle 1967).

Xiphinema index

European beech is a host (Siddiqi 1974)

Ficus elasticus (Rubber tree)

H. humuli

Rubber tree is a poor host (Stone and Rowe 1977)

Ficus spp. (fig)

Meloidogyne hapla:

HFig is a host (Kleynhans et al. 1996).

Forsythia intermdeia (forsythia)

Pratylenchus penetrans

Cuttings were reduced by 86% 76 days after inoculation (need literature check to record inoculum level) . No above ground disease symptoms were observed (Osborne and Jenkins 1962).

Fraxinus americana (American, Canadian, or white ash)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Longidorus sp.

Found but not associated with injury in New York (Ruehle 1967).

Longidorus elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Trichodorus sp.

Found but not associated with injury in New jersey (Ruehle 1967).

Fraxinus excelsior (European ash)

Pratylenchus penetrans

Associated with injury in The Netherlands (Ruehle 1967).

Fraxinus pennsylvanicus. (American, Canadian, red, or white ash)

Xiphinema americanum

White ash is a host (Siddiqi 1974).

Fraxinus velutina (ash)

Pratylenchus neglectus

F velutina is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Modesto was a host in a California urban area (Siddiqui et al. 1973).

Pratylenchus thornei

F velutina is a host in California (Siddiqui et al. 1973).

Fraxinus spp.(ash)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Xiphinema americanum

Apple Union Necrosis and Decline (AUND) is probably caused by Tomato Ring Spot Virus (TomRSV), which was detected in 89% of trees with AUND. TomRSV infects ash, is transmitted by X. americanum, infects weeds, and is seed-transmitted in several species including Taraxicum officianale. (Rosenburger et al. 1983).

Ginko biloba (ginkgo or maidenhair tree)

Pratylenchus penetrans

Associated with injury in The Netherlands; found but not associated with injury in New Jersey (Ruehle 1967).

Host in California (Siddiqui et al. 1973).

Heteromeles arbutifolia (toyon)

Pratylenchus neglectus

Toyon is a host in California (Siddiqui et al 1973).

Hibiscus syriacus (Hibiscus, Rose of Sharon)

Pratylenchus penetrans:

Associated with injury in The Netherlands (Ruelhe 1967).

Hibiscus spp.(various unspecified mallows)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Hydrangea sp. (Hydrangea)

Pratylenchus crenatus

Hydrangea is a host (SON 1984).

Ilex aquifolium (European holly)

Pratylenchus spp.

Found but not associated with injury in New Jersey (Ruehle 1967).

Ilex cornuta (Rotunda holly)

Criconemella (= Mesocriconema) xenoplax

Rotunda holly is a host (Barker et al. 1979).

Ilex crenata (Japanese Holly)

Criconemella (= Mesocriconema) xenoplax

In pots and later in field plots, at approximately 8 and 77 C. xenoplax/100 cm3 soil at planting, after 39 months, inoculated plants were significantly less vigorous, and top weights of controls were 2.1 and 2.7 times greater than those of inoculated plants, on cvs. "Helleri" and "Rotundifolia", respectively. On cv "Convexa", inoculated plant

vigor was significantly, but top weights were not significantly different. Symptoms included inverveinal chlorosis, leaf drop, and stunted plants. (Aycock et al. 1976).

Pratylenchus penetrans

In pots, tops weight was decreased 38% and root weight decreased 60% by 2500/100cm3 Roots exhibited lesions (Heald and Jenkins 1964).

Ilex glabra (inkberry)

Pratylenchus penetrans

In pots, tops and roots were not stunted; P. penetrans population decreased by 2500/100cm3 (Heald and Jenkins 1964).

Ilex opaca (American holly)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Ilex rotundifolia (holly)

Pratylenchus penetrans

In pots, tops weight was decreased 50% and root weight decreased 68% by 2500/100cm3 Roots exhibited lesions (Heald and Jenkins 1964).

Ilex spp.(Holly)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Xiphinema americanum

Holly species were hosts in two urban areas and one nursery in California (Siddiqui et al. 1973)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Juglans hindsii (Northern California Black Walnut)

Xiphinema americanum

Supported populations 9 times higher than those in fallow treatment (Lownsbery 1964).

Juniperus chinensis var. sargenti (ornamental juniper)

Pratylenchus penetrans

Associated with plant injury in Nebraska (Ruehle 1967).

Kalmia latifolia (Mountain laurel, calico bush)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Laburnum anagyroides (golden chain)

Pratylenchus penetrans

Associated with plant injury in The Netherlands (Ruehle 1967).

Larix leptolepsis (Japanese larch)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Associated with plant injury in Nebraska; found but not associated with injury in Japan (Ruehle 1967).

Lavandula angustifolia Munstead Dwarf (lavender)

Meloidogyne hapla

Moderate host (Gall rating 3.0) (LaMondia 1995).

Ligustrum ovalifolium (privet)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Found but not associated with injury in New Jersey (Ruehle 1967).

Grew better and wilted less where P. penetrans was controlled (McDonald and Mai 1963).

Ligustrum spp.(Privet)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Longidorus elongatus

Associated (SON 1984).

Liquidamber styraciflua (Sweetgum)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Doubtful host-parasite relationship (Ruhle 1971).

Pratylenchus spp., P. penetrans

Associated with plant injury in Missisippi (Ruehle 1967).

Trichodorus sp.

Associated with injury in Mississippi (Ruehle 1967).

Liquidambar sp. (Red Gum, Sweet Gum)

Xiphinema americanum

Red gum is a host in one urban areas in California (Siddiqui et al. 1973)

Lonicera spp. (honeysuckle)

Meloidogyne hapla:

Recorded (Southey 1993).

Liriodentron tulipifera (Tulip tree, yellow poplar)

Criconemella (= Mesocriconema) xenoplax

Doubtful host-parasite relationship (Ruhle 1971).

Liriodendron tulipifera (tulip tree, tulip poplar, or yellow poplar)

Pratylenchus penetrans

Associated with plant injury in The Netherlands (Ruehle 1967).

Magnolia tripetala (Magnolia)

Criconemella (= Mesocriconema) xenoplax

Magnolia tripetala is a host in urban area (Siddiqui et al. 1973).

Magnolia grandiflora (magnolia)

Pratylenchus spp.

Associated with plant injury in Texas (Ruehle 1967).

Magnolia spp. (Magniolia)

Xiphinema americanum

Magnolia spp. were hosts in urban areas in California (Siddiqui et al. 1973)

Malva alcea Fastigiata (rose mallow)

Meloidogyne hapla:

Rose mallow is a moderately poor host (Gall rating 2.4) (LaMondia 1996).

Malva moschata Alba (musk mallow)

Meloidogyne hapla

Musk mallow is a moderately poor host (Gall rating 1.7) (LaMondia 1995).

Morus alba (White mulberry)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Xiphinema index

White mulberry is a host (Siddiqi 1974)

Morus sp. (mulberry)

Meloidogyne hapla

Found but not associated with injury (Ruehle 1967).

Xiphinema index

Mulberry species are hosts (SON 1984)

Parthenocyssis tricuspidata (Virginia creeper, Boston ivy)

Xiphinema index

Virginia creeper is a host (Siddiqi 1974, SON 1984)

Philadelphus spp.(mock orange)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Meloidogyne hapla

Recorded (Southey 1993).

Picea abies (= P. excelcia; Norway spruce)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Associated with injury in The Netherlands; found but not associated with injury in Germany, Japan, and New Jersey (Ruehle 1967).

Picea abies

Tylenchorhynchus sp.

Associated with plant injury in Bermany; found but not associated with injury in Rhode Island.

Picea abies

Trichodorus christei

Associated with injury in the United States (Ruehle 1967).

Picea glauca (White spruce)

Criconemella (= Mesocriconema) xenoplax

Associated with injury in Wisconsin (Ruhle 1967).

Pratylenchus neglectus

P. glauca is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Associated with plant injury in Nebraska (Ruehle 1967).

Pratylenchus spp.

Found but not associated with injury in Canada and Rhode Island (Ruehle 1967).

Picea glauca (Spruce, White)

Xiphinema americanum

Caused stunting in USA and Canada (Sutherland and Webster 1993)

Associated with injury in Wisconin; found but not associated with injury in Canada (Ruehle 1967).

Associated with stunting and winter kill of var. densata (Black Hills spruce) in ornamental nurseries in Wisconsin. Winter kill ranged from 25% of plants at 11/100 cm^3 soil pot to 100% of plants at 21/100 cm^3 soil. After 4 months, 11/100 cm^3 soil reduced average dry root weight by 66% (Griffin and Epstein 1964).

Xiphinema bakeri

Pathogenic in British Columbia (Sutherland and Webster 1993)

Picea pungens (Colorado blue spruce)

Criconemella (= Mesocriconema) xenoplax

Associated with injury in Wisconsin (Ruhle 1967).

Two seasonal population peaks, one from April-August and one from Sept to January, occurred in an ornamental nursery. Criconemella xenoplax increased when X. americanum decreased, suggesting antagonism (Griffin and Darling 1964).

Pratylenchus spp.

Found but not associated with injury in Michigan and Maine (Ruehle 1967).

P. neglectus

Recovered from soil in which Colorado Blue Spruce was growing (Merrifield 1998).

Colorado blue spruce is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans

Associated with plant injury in Nebraska; found but not associated with injury in Indiana and Germany (Ruehle 1967).

Colorado blue spruce is a host in California (Siddiqui et al. 1973).

Picea pungens (Blue spruce)

Trichodorus sp.

Found but not associated with injury in Michigan (Ruehle 1967).

Xiphinema americanum

Caused stunting in USA and Canada (Sutherland and Webster 1993)

Associated with injury in Wisconsin (Ruehle 1967).

Associated with stunting and winter kill in ornamental nurseries in Wisconsin.

Winter kill ranged from 25% of plants at 11/100 cm^3 soil to 100% of plants at 21/100 cm^3 soil. After 4 months, 11/100 cm^3 soil reduced average dry root weight by 9 to 44 %, and 21/100 cm^3 soil reduced dry root weight 25 to 66% (Griffin and Epstein 1964).

Two seasonal population peaks, one from April-August and one from Sept to January, occurred in an ornamental nursery. Criconemella xenoplax increased when X. americanum decreased, suggesting antagonism (Griffin and Darling 1964).

Picea sitchensis (Sitka spruce)

Trichodorus sp.

Found but not associated with injury in England (Ruehle 1967).

Tylenchorhynchus sp.

Associated with plant injury in Germany (Ruehle 1967).

Pratylenchus penetrans

Found but not associated with injury in Germany (Ruehle 1967).

Xiphinema bakeri

Associated in Canada (Sutherland and Webster 1993)

Picea spp.(various unspecified spruces)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Pieris japonica (Andromeda, pieris)

Pratylenchus penetrans

Top and root weights were not reduced by 10,000/GET UNIT OF SOIL (Heald and Jenkins 1964).

Pinus densiflora (Japanese pine)

Pratylenchus penetrans

Found but not associated with injury in Japan (Ruehle 1967).

Pinus mugo var mughus (mugo pine)

Pratylenchus penetrans

Associated with injury in The Netherlands; found but not associated with injury in Germany (Ruehle 1967).

Pinus nigra (Austrian pine)

Pratylenchus crenatus

Austrian pine is a host in California (Norton et al. 1984).

Pratylenchus penetrans

Found but not associated with injury in New Jersey (Ruehle 1967).

on var. austriaca, associated with injury in Belgium and The Netherlands (Ruehle 1967).

on var. calabrica, associated with disease in The Netherlands (Ruehle 1967).

Pinus ponderosa (Ponderosa Pine)

Criconemella (= Mesocriconema) xenoplax

150 cm3 pots. In pots, fresh weight of shoots of plants inoculated with 2000/100 cm3 was 20% less and of roots was 38% less (p = 0.01) than those of uninoculated controls (Vielierchio 1979).

Longidorus elongatus

Associated (SON 1984).

Xiphinema americanum

In pots, no growth reduction was observed after inoculation with 4.5/100 g soil, althouth the final population was 18/100 g (Riffle 1970).

Associated with injury in Nebraska (Ruehle 1967).

Xiphinema index

In pots, fresh weight of shoots of plants inoculated with 67/100 cm3 was 9% less (NS) and of roots was 19% less (p = 0.01) than those of uninoculated controls (Vielierchio 1979).

Pinus radiata (Monterey pine)

Pratylenchus thornei

Monterey pine is a host in California (Siddiqui et al. 1973).

Pinus resinosa (red pine)

Pratylenchus penetrans

Found but not associated with injury in Japan (Ruehle 1967).

Pinus rigida (common name unclear; a pine)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Pinus strobus (Eastern white pine)

Criconemella (= Mesocriconema) xenoplax

Rf = 146 (Ruehle 1966).

Found but not associated with injury in New Jersey (Ruhle 1967).

Dubtful host-parasite relationship (Ruhle 1971).

Paratrichodorus minor

Rf = 113 (Ruehle 1966).

Pinus sylvestris (Scots pine)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Associated with injury in The Netherlands; found but not associated with injury in Japan (Ruehle 1967).

Pinus spp. (unspecified pine)

Trichodorus aequalis

Pine species are hosts (SON 1984).

Trichodorus obscurus

Pine species are hosts (SON 1984).

Longidorus elongatus

Associated (SON 1984).

Pratylenchus thornei

Associated in California (Fortuner 1977).

Trichodorus aequalis

Pine species are hosts (SON 1984).

Trichodorus obscurus

Pine species are hosts (SON 1984).

Platanus occidentalis (American sycamore)

Criconemella (= Mesocriconema) xenoplax

Doubtful host-parasite relationship (Ruhle 1971).

Planatus spp, (unspecified sycamore or plane tree)

Xiphinema americanum

Sycamores are hosts in urban areas in California (Siddiqui et al. 1973)

Populus deltoides (Cottonwood)

Xiphinema bakeri

Cottonwood is a host (SON 1984, Siddiqi 1974)

Populus tremuloides (Aspen)

Trichodorus aequalis

Aspen is a host (SON 1984).

Populus sp. (hybrid poplar)

Pratylenchus neglectus

Recovered from soil in which hybrid poplar was growing (Merrifield 1998).

Prunus virginiana ()

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Pseudotsuga menziesii (Douglas fir)

Pratylenchus crenatus:

Douglas fir is a host in California (Norton et al. 1984).

Pratylenchus penetrans

Douglas fir is a host in California (Siddiqui et al. 1973).

Found but not associated with injury in New Jersey (Ruehle 1967).

Xiphinema americanum

Associated in USA (Sutherland and Webster 1993)

Associated with a nursery planting in California (Siddiqui et al. 1973).

Xiphinema bakeri

Inoculations demonstrated pathogenicity at population densities typical of nurseries with diseased (corky root) seedlings (Sutherland and Webster 1993)

Pathogenic in British Columbia (Sutherland and Webster 1993)

Pseudotsuga spp. (Unspecified Douglas fir or big-cone spruce)

Trichodorus obscurus

One or more Pseudotsuga spp. are hosts (SON 1984).

Pyracantha spp, (Pyracantha, Firethorn)

Xiphinema americanum

Pyracantha is a host in urban areas in California (Siddiqui et al. 1973)

Quercus borealis (oak; common name unclear)

Xiphinema americanum

In pots, 169 days after inoculation with 72/100 g soil, the final population was 180/100 g soil (Miller 1980).

Quercus rubra (American red oak)

Criconemella (= Mesocriconema) xenoplax

Found but not associated with injury in New Jersey (Ruhle 1967).

Longidorus elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Longidorus sylphus (= L. elongatus)

Associated (SON 1984).

Quercus spp.(unspecified oaks)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Pratylenchus thornei

Found associated with oak in California (Fortuner 1977).

Found but not associated with injury in California (Ruehle 1967).

Trichodorus obscurus

One or more oak spp. are hosts (SON 1984).

Rhamnus frangula (Tallhedge)

Xiphinema americanum

Associated with plants of poor vigor. Rhamnum frangula grown 2 years in a field with undetectable levels of X. americanum following sudan grass-winter rye rotation increased popultaions to 250/100 cm^3 soil.

Rhododendron subg. Azalea (azalea)

Meloidogyne naasi

Azaleas are non-hosts (Golden and Taylor 1967).

Rhododendron spp. (unspecified rhododendron)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Pratylenchus crenatus

One or more rhododendron spp. are hosts (SON 1984).

Xiphinema americanum

One or more rhododendron spp. are host in urban areas in California (Siddiqui et al. 1973)

Rosa canina (rose)

Meloidogyne hapla:

Four months after inoculation with 352 J2/100g soil, 72 females and 7.8 J2 + eggs/g root were recovered from R. canina of unspecified cultivar (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 80 females and 11.5 J2 + eggs/g root were recovered from Pollmers (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 31 females and 4.7 J2 + eggs/g root were recovered from Inermis (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 32 females and 5.2 J2 + eggs/g root were recovered from Schmidts Ideal (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 21 females and 4.0 J2 + eggs/g root were recovered from Brogs Stachellose (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 7 females and 1.9 J2 + eggs/g root were recovered from Pfander (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 5 females and 0.4 J2 + eggs/g root were recovered from Success (Coolen and Hendrickx 1972).

Four months after inoculation with 352 J2/100g soil, 3 females and 0.2 J2 + eggs/g root were recovered from Heinsohn's Rekord (Coolen and Hendrickx 1972).

Pratylenchus penetrans

6.5 months after inoculation with 113 P. penetrans/100 g soil, 12.2/g root were recovered from Pollmers (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 12.1/g root were recovered from Brogs Stachellose (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 10.6/g root were recovered from Inermis (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 7.9/g root were recovered from Pfander (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 7.1/g root were recovered from Heinsohn's Rekord (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 6.4/g root were recovered from Success (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 6.3/g root were recovered from R. canina without cultivar designation (Coolen and Hendrickx 1972).

Rosa chinensis (rose)

Pratylenchus penetrans

6.5 months after inoculation with 113 P. penetrans/100 g soil, 5.5/g root were recovered from Manettii (Coolen and Hendrickx 1972).

6.5 months after inoculation with 113 P. penetrans/100 g soil, 1.5/g root were recovered from Major (Coolen and Hendrickx 1972).

Rosa dumetorum (rose)

Meloidogyne hapla:

Four months after inoculation with 352 J2/100g soil, 166 females and 51.2 J2 + eggs/g root were recovered (Coolen and Hendrickx 1972).

Pratylenchus penetrans

6.5 months after inoculation with 113 P. penetrans/100 g soil, 4.0/g root were recovered from Laxa (Coolen and Hendrickx 1972).

Rosa multiflora (rose)

Meloidogyne hapla:

Four months after inoculation with 352 J2/100g soil, 142 females and 42.9 J2 + eggs/g root were recovered (Coolen and Hendrickx 1972).

Pratylenchus penetrans

6.5 months after inoculation with 113 P. penetrans/100 g soil, 15.0/g root were recovered (Coolen and Hendrickx 1972).

Rosa rubignosa (rose)

Meloidogyne hapla:

Four months after inoculation with 352 J2/100g soil, 18 females and 2.4 J2 + eggs/g root were recovered from Inermis(Coolen and Hendrickx 1972).

Pratylenchus penetrans

6.5 months after inoculation with 113 P. penetrans/100 g soil, 4/g root were recovered (Coolen and Hendrickx 1972).

Rosa spp. (rose)

Meloidogyne hapla:

Reproduced well on R. odorata, R, multiflora, and Rosa sp. "Dr. Huey" and poorly on R. noisettiana "Manetti" (Santo and Lear 1976).

Longidorus elongatus

Associated (SON 1984).

Pratylenchus crenatus

One or more Rosa spp. are hosts (SON 1984).

Pratylenchus thornei

One or more Rosa spp. are host in Belgium (Fortuner 1977).

Xiphinema americanum

Rosa sp, Better Times, probably on R. noisettiana rootstock is a good host for greenhouse maintenance of X. americanum cultures (Flores and Chapman 1968).

Xiphinema index

One or more Rosa spp. are host (SON 1984)

Sequoidendron giganteum (Sequoia)

Pratylenchus crenatus

Sequoidendron giganteum is a host (SON 1984).

Pratylenchus thornei

Sequoidendron giganteum is a host in California (Siddiqui et al. 1973).

Sequoia sempervirens (Coast Redwood)

Xiphinema americanum

Associated in a California forest (Siddiqui et al. 1973).

Sidalcea hybrida Party Girl (miniature hollyhock)

Meloidogyne hapla:

Resistant (Gall rating 1.0) (LaMondia 1996).

Sorbus aucuparia (mountain ash, rowan, or quickbeam)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus penetrans

Associated with injury in The Netherlands (Ruehle 1967).

Syringa vulgaris (Lilac)

Xiphinema americanum

President Lincoln is a host (Schmitt 1973).

Syringa spp.(lilacs and relatives)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Tamarix spp.(tamarisk)

C. curvata

Associated only in nurseries in New Jersey (Loof 1974)

Taxus baccata var. davastoni (English yew)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Taxus spp.(unspecified yew)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Thuja spp.(unspecified arbor-vitae; western red cedar and relatives)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Tilia europaea (basswood or linden)

Pratylenchus crenatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Pratylenchus spp.

Found but not associated with injury in New Jersey (Ruehle 1967).

Tsuga heterophylla (Western hemlock)

Xiphinema bakeri

Pathogenic in British Columbia (Sutherland and Webster 1993)

Ulmus americana (American elm)

Criconemella (= Mesocriconema) xenoplax

Associated with injury in Canada (Ruhle 1967).

Ulmus spp. (unspecified elms)

Xiphinema americanum

Host (Siddiqui 1973).

Umbellularia californica (California Laurel; "Oregon myrtlewood")

Criconemella (= Melocriconema) xenoplax

California laurel is a host in native plant communities (Siddiqui et al. 1973).

Meloidogyne hapla

Infected in areas never under cultivation (Raski 1957).

Trichodorus aequalis

California laurel is a host (SON 1984).

Trichodorus obscurus

Host (SON 1984).

Xiphinema americanum

Associated with native plant community in California (Siddiqui et al. 1973).

Vaccinium spp. (unspecified blueberry, huckleberry, whortleberry)

Trichodorus aequalis

One or more Vaccinium spp. are hosts (SON 1984).

Viburnum lantana (viburnum, wayfaring tree, or twistwood)

Pratylenchus penetrans

Associated with plant injury in The Netherlands (Ruehle 1967).

Viburnum prunifolium (black haw)

Longidorus elongatus

Found but not associated with injury in New Jersey (Ruehle 1967).

Viburnum spp.(unspecified viburnum or wayfaring tree)

Criconemella (= Mesocriconema) curvata

Associated only in nurseries in New Jersey (Loof 1974)

Meloidogyne hapla:

Recorded (Southey 1993).

Found but not associated with injury (Ruehle 1967).

Weigela spp.(common name unclear; Caprifolicaeae)

C. curvata

Associated only in nurseries in New Jersey (Loof 1974)

Wisteria sp. (wisteria)

P. crenatus

Wisteria is a host (SON 1984).

HERBACEOUS ORNAMENTALS (All trials in pots unless otherwise stated).

Acanthus spinosissimus Coronation Gold (bears breeches)

Meloidogyne hapla

Acanthus is susceptible (Gall rating 4.0) (LaMondia 1995).

Achillea sp. (yarrow)

Meloidogyne hapla

Yarrow is resistant (Gall rating 1.0) (LaMondia 1995).

Aconitum arendsii (monkshood)

Meloidogyne hapla

Monkshood is susceptible (Gall rating 4.0) (LaMondia 1995).

Adenophora confusa (ladybells)

Meloidogyne hapla:

Adenophora confusa is a moderately good host (Gall rating 3.6) (LaMondia 1996).

Ajuga reptans Burgundy glow (bugleweed)

Meloidogyne hapla

Bugleweed is susceptible (Gall rating 4.0) (LaMondia 1995).

Alchemilla mollis Improved Form (lady's mantle)

Meloidogyne hapla

Alchemilla mollis is a moderately poor host (Gall rating 1.7) (LaMondia 1995).

Althea rosea Chater's Doubles (hollyhock)

Meloidogyne hapla

Hollyhock is a moderately poor host (Gall rating 1.7) (LaMondia 1995).

Amaranthus spp. (amaranth)

Meloidogyne chitwoodi:

In pots, Amaranthus retroflexus UC275, A. caudatus UC4, UC37, UC54; A. hypochondriacus UC119, and A cruentus UC87 and UC192 were poor hosts for race 1 (Ferris et al. 1993).

Anchusa azurea cv. Dropmore (alkanet)

Meloidogyne hapla:

Alkanet is susceptible (Gall rating) (LaMondia 1996).

Anemone hupehsis (windflower, anemone)

Meloidogyne hapla

Anemone hupehsis is a host in nurseries (Siddiqui et al. 1973).

Anemone sylvestra Queen Charlotte (windflower)

Meloidogyne hapla:

Anemone sylvestra is susceptible (Gall rating 4.0) (LaMondia 1996).

Arabis caucasia Compinkie (rockcress)

Meloidogyne hapla

rockcress is a moderately poor host (Gall rating 1.5) (LaMondia 1995).

Artemesia sp. Silver Mound (wormwood)

Meloidogyne hapla

Artemesia sp. Silver Mound is susceptible (Gall rating 4.0) (LaMondia 1995).

Asclepias tuberosa (butterfly weed)

Meloidogyne hapla:

Butterfly weed is resistant (Gall rating 1.0) (LaMondia 1996).

Aster novae-angliae Harrington's Pink (aster)

Meloidogyne hapla

Aster novae-angliae Harrington's Pink is resistant (Gall rating 1.0) (LaMondia 1995).

Aster novae-angliae "September Ruby"(aster)

Meloidogyne hapla

Aster novae-angliae "September Ruby" is resistant (Gall rating 1.0) (LaMondia 1995).

Aster (no Latin name specified)

Pratylenchus crenatus

This plant taxon was a host (SON 1984).

Pratylenchus penetrans

This plant taxon grew 20-40% better in fumigated soil or soil in which marigolds had been grown than in soil that had grown weed hosts (Miller and Ahern 1969).

Astilbe x arendsii Peach Blossom (feather flower)

Meloidogyne hapla

Feather flower is susceptible (Gall rating 4.0) (LaMondia 1995).

Astilbe sp. (Astilbe)

P. crenatus

Astilbe is a host (SON 1984).

Astrania major "Pink Symphony" (masterwort)

Meloidogyne hapla:

Materwort is susceptible (Gall rating 4.0) (LaMondia 1996).

Begonia sp. (Begonia)

Xiphinema americanum

Found in one nursery in California (Siddiqui et al. 1973).

Belamcanda chinensis (blackberry lily)

Meloidogyne hapla

Blackberry lily is resistant (Gall rating1.0) (LaMondia 1995).

Boltonia asteroides Pink Beauty (Bolton's aster)

Meloidogyne hapla:

Bolton's aster is susceptible (Gall rating 4.0) (LaMondia 1996).

Campanula poscharskyana (bell flower)

Meloidogyne hapla

This bell flower species is susceptible (Gall rating 4.0) (LaMondia 1995).

Centrathus ruber Albus (valerian)

Meloidogyne hapla:

This valerian species is susceptible (Gall rating 4.0) (LaMondia 1996).

Chelone obliqua (turtlehead)

Meloidogyne hapla

Turtlehead is resistant ((Gall rating 1.0) LaMondia 1995).

Chrysanthemum coccineum Giant Hybrids (painted daisy)

Meloidogyne hapla

Painted daisy is a moderately good host (Gall rating 3.6) (LaMondia 1995).

Chrysanthemum parthenium (feverfew)

Meloidogyne hapla

Feverfew is a moderate host (Gall rating2.7) (LaMondia 1995).

Chrysanthemum x superbum Polaris (Shasta daisy)

Meloidogyne hapla

Polaris is a moderately good host (Gall rating 1.0) (LaMondia 1995).

Chrysanthemum x superbum Exhibition (Shasta daisy)

Meloidogyne hapla

Exhibition is resistant (Gall rating 3.0) (LaMondia 1995).

Cichorium intybus (chicory)

Meloidogyne hapla

In pots, moderately susceptible (Gaskin and Crittenden 1956).

Cimicifuga acerina (fairy candles)

Meloidogyne hapla

Cimicifuga acerina is susceptible (Gall rating 4.0) (LaMondia 1995).

Cimicifuga dahurica (fairy candles)

Meloidogyne hapla

Cimicifuga dahurica is susceptible (Gall rating 4.0) (LaMondia 1995).

Cimicifuga simplex White Pearl (fairy cndles)

Meloidogyne hapla

Cimicifuga simplex is susceptible (Gall rating 4.0) (LaMondia 1995).

Convallaria majalis (Lily-of-the-valley)

Pratylenchus penetrans

Causes damage (Slootweg 1957).

Coreopsis verticillata Moonbeam (tickseed)

Meloidogyne hapla

Tickseed is susceptible (Gall rating 4.0) (LaMondia 1995).

Dahlia spp. (Dahlia)

Pratylenchus crenatus

One or more dahlie spp. are hosts (SON 1984).

Xiphinema americanum

Widespread in nurseries in California (Siddiqui et al. 1973)

Delphinium grandiflorum Blue Mirror (delphinium)

Meloidogyne hapla

This delphinium is a moderately good host (Gall rating 3.2) (LaMondia 1995).

Dendrathema spp. and related hybrids (chrysanthemum)

Meloidogyne hapla:

Meloidogyne hapla increased the intensity of Fusarium wilt (Littrell and Heald 1967).

1800/kg soil of a different strain ofM. hapla at a slightly lower temperature did not increase the intensity of Fusarium wilt but stunted Yellow Delaware and White Iceberg (Johnson and Littrell 1969).

Meloidogyne hapla significantly increased fusarium wilt symptom severity on Yellow Delaware. Yellow Iceberg was a M. hapla host, but the nematode did not affect wilt symptoms. Meloidogyne hapla had no effect on plant growth compared to noninoculated controls (Littrell and Heald 1967).

Pratylenchus thornei

Host in Belgium (Fortuner 1977).

Dianthus barbatus Indian Carpet (sweet william)

Meloidogyne hapla

Sweet William is resistant (Gall rating 1.0) (LaMondia 1995).

Pratylenchus neglectus:

Sweet William is a host (Townshend and Anderson 1976).

Pratylenchus penetrans

Sweet William is a host in California (Siddiqui et al. 1973).

Dianthus caryophyllus (Carnation)

Criconemella (= Mesocriconema) xenoplax

86/100 cm3 soil cause reduced root system, stunted top growth, and reduced number of flowers. Increased 120-fold in 90 days (Sher 1959).

Associated (Richardson and Grewal 1993).

Criconemella (= Mesocriconema) curvata

Carnation is a host (Loof 1974)

Heterodera trifolii

A species thought to be H. trifolii is a serious pest of cariatnion in Italy and in glasshouses in the South of France (Mulvey and Anderson 1974)

Meloidogyne thamsei

Carnation is a host; reported in California (SON 1984).

Pratylenchus neglectus:

Associated with rapid decline (Kleynhans et al. 1996, Townshend and Anderson 1976).

Dicentra spectabilis (Dutchman's Breeches)

P. penetrans

D. spectabilis is a host in California (Siddiqui et al. 1973).

Dicentra sp. Alba (bleeding heart)

Meloidogyne hapla

One or more bleeding heart spp. are moderate hosts (Gall rating) (LaMondia 1995).

Digitalis ambigua (foxglove)

Meloidogyne hapla

D. ambigua is a moderately poor host (Gall rating 1.4) (LaMondia 1995).

Digitalis purpurea Excelsior hybrids (foxglove)

Meloidogyne hapla

D. purpurea is resistant (Gall rating 1.0) (LaMondia 1995).

Pratylenchus penetrans:

< 10/100 g soil (Barker et al. 1976).

Doronicum sp. (leopardbane)

Meloidogyne hapla

Leopardbane is a moderate host (Gall rating 2.3) (LaMondia 1995).

Echinacea purpurea Bright Star (purple coneflower)

Meloidogyne hapla:

Purple coneflower is resistant (Gall rating 1.0) (LaMondia 1996).

Echinops bannaticus Taplow Blue (globe thistle)

Meloidogyne hapla:

Globe thistle is a moderately poor host (Gall rating 1.5) (LaMondia 1996).

Epimedium versicolor "Sulphureum" (yellow barrenwort)

Meloidogyne hapla:

Yellow barrenwort is resistant (Gall rating 1.0) (LaMondia 1996).

Filpendula venusta venusta magnifica (meadowsweet)

Meloidogyne hapla

Meadowsweet is a moderately poor host (Gall rating 1.8) (LaMondia 1995).

Fuchsia spp. (Fuschsia)

Pratylenchus crenatus

One or more Fuchsias are hosts (SON 1984).

Gaillardia x grandiflora Goblin (blanket flower)

Meloidogyne hapla

Blanket flowers are resistant (Gall rating 1.0) (LaMondia 1995).

Gentiana sp. Benichidori (gentian)

Meloidogyne hapla:

This plant taxon is a moderately good host (Gall rating 3.6) (LaMondia 1996).

Geranium dalmaticum (cranesbill)

Meloidogyne hapla

This cranesbill is a moderate host (Gall rating 3.0) (LaMondia 1995).

Geranium x oxonianum Thurstonianum and Geranium x magnificum (crane's bill)

Meloidogyne hapla:

This cranesbill is susceptible (Gall rating 3.7, 3.8) (LaMondia 1996).

Gerbera jamesonii (African daisy)

Meloidogyne hapla:

Gerbera jamesonii is a host in New Zealand (Knight et al. 1997).

Geum spp. (geum)

Meloidogyne hapla:

Recorded (Southey 1993).

Gladiolus x hortulanus (Gladiolus)

Pratylenchus penetrans:

Retards growth and forms small reddish-brown lesions on roots (Slootweg 1957).

Helianthus annuus (Sunflower)

Pratylenchus crenatus:

Recorded (Kleynhans 1996).

Pratylenchus neglectus

H. annuus is a host in California (Siddiqui et al 1973).

Pratylenchus penetrans:

Recorded (Kleynhans 1996).

Pratylenchus thornei:

Recorded (Kleynhans 1996).

Helichrysum bracteatum (straw flower)

Meloidogyne hapla:

Straw flower is a host in New Zealand (Knight et al. 1997).

Helenium autumnale (sneezeweed) Brilliant

Meloidogyne hapla

Brilliant sneezeweed is resistant (Gall rating 1.0) (LaMondia 1995).

Helicotrichon sempervirens (blue oat grass)

Meloidogyne hapla:

Blue oat grass is a moderately poor host (Gall rating 2.0) (LaMondia 1996).

Heliopsis helianthoides Karat (orange sunflower)

Meloidogyne hapla

H. helianthoides is susceptible (Gall rating 4.0) (LaMondia 1995).

Hemerocallis sp. (daylily)

Meloidogyne hapla:

Daylily is a moderately poor host (Gall rating 1.5) (LaMondia 1996).

Heuchera sanguinea (Coralbells)

Pratylenchus penetrans

H. sanguinea is a host in California (Siddiqui et al. 1973).

Hypericum polyphyllum (St. John's wort)

Meloidogyne hapla

H. polyphyllum is a moderately good host (Gall rating 3.4) (LaMondia 1995).

Iberis sp. (Candytuft)

Pratylenchus thornei

One or more candytuft spp. are hosts (Fortuner 1977).

Impatiens spp. (Impatiens, Balam, Busy Lizzy)

Pratylenchus penetrans

Grew 20-40% better in fumigated soil or soil in which marigolds had been grown than in soil that had grown weed hosts (Miller and Ahern 1969).

Iris germianica Afternoon Delight (bearded iris)

Meloidogyne hapla

Bearded iris is susceptible (Gall rating 4.0) (LaMondia 1995).

Iris pumila Elfin Queen (dwarf iris)

Meloidogyne hapla

Dwarf irises are moderately poor hosts (Gall rating 1.6) (LaMondia 1995).

Iris siberica Maranantha (Siberian iris)

Meloidogyne hapla

Siberian irises are resistant (Gall rating 1.0) (LaMondia 1995).

Iris sp. (Iris)

Pratylenchus crenatus

One or more iris spp. are hosts (SON 1984).

Xiphinema index

Associated (SON 1984)

Lathyrus odoratus (Sweet Pea)

Heterodera goettingiana

Some reports indicate L. odoratus is a host, but others indicate that it is not (Stone and Course 1974).

Heterodera schachtii

Sweet pea is a host in California (Siddiqui et al. 1973)

Meloidogyne hapla

Sweet pea is a moderate host (Gall rating 2.7) (LaMondia 1995).

Paratrichodorus allius

Floribunda is a host (SON 1984).

Pratylenchus neglectus:

Sweet pea is a host in California (Norton et al. 1984).

Pratylenchus penetrans

Sweet pea is a host in California (Siddiqui et al. 1973).

Xiphinema americanum

Found in association with commercial crop in California (Siddiqui et al. 1973).

Leptinella sp. (cotula)

Longidorus elongatus

Associated (SON 1984).

Leptinella sp. is a host in New Zealand (Knight et al. 1997).

Xiphinema americanum sensu lato

Leptinella sp. is a host in New Zealand (Knight et al. 1977)

Liatris scariosa White Spires (gay feather)

Meloidogyne hapla

Gay feather is resistant (Gall rating) (LaMondia 1995).

Ligularia dentata Desdemona Strain (senecio)

Meloidogyne hapla

L. dentata is susceptible (Gall rating 4.0) (LaMondia 1995).

Lilium longiflorum var. eximium (Lily)

Pratylenchus crenatus

Lilium longiflorum var. eximium is a host in California (Norton et al. 1984).

Pratylenchus neglectus:

0.5/100 cm3 (Corbett 1973).

Lilium speciosum (Lily)

Pratylenchus penetrans

Causes damage (Slootweg 1957).

Liriope muscari Variegata (lilyturf)

Meloidogyne hapla:

Lilyturf is resistant (Gall rating 1.0) (LaMondia 1996).

Lithospermum diffusa Grace Ward (lithodora)

Meloidogyne hapla:

Lithodora is resistant (Gall rating 1.0) (LaMondia 1996).

Lilium spp.

Heterodera trifolii

One or more Lilium spp. are hosts in California (Siddiqui et al. 1973)

Lobelia cardinalis Complement Scarlet (cardinal flower)

Meloidogyne hapla

Cardinal flower is susceptible (Gall rating 4.0) (LaMondia 1995).

Lupinus sp. (lupinus) Russell Hybrids

Meloidogyne hapla

Russell hybrids are moderate hosts (Gall rating 3.0) (LaMondia 1995).

Lychnis sp. (lychnis)

Meloidogyne hapla

Recorded (Southey 1993).

Lysimachia clethroides (circleflower)

Meloidogyne hapla:

Circleflower is a moderately good host (Gall rating 3.2) (LaMondia 1996).

Lythrum sp. Morden's Pink (purple loosestrife)

EXTREMELY SERIOUS WEED: Do not plant without contacting the Oregon Department of Agriculture.

Meloidogyne hapla

Purple loosestrife is susceptible (Gall rating 4.0) (LaMondia 1995).

Malva alcea Fastigiata (rose mallow)

Meloidogyne hapla:

Rose mallow is a moderately poor host (Gall rating 2.4) (LaMondia 1996).

Malva moschata Alba (musk mallow)

Meloidogyne hapla

Musk mallow is a moderately poor host (Gall rating 1.7) (LaMondia 1995).

Matthiola sp. (Unspecified matthiola species)

Pratylenchus penetrans

Matthiola grew 20-40% better in fumigated soil or soil in which marigolds had been grown than in soil that had grown weed hosts (Miller and Ahern 1969).

Miscanthus sinensis (silver feather) Silberfeder

Meloidogyne hapla:

Silberfeder is susceptible (Gall rating 4.0) (LaMondia 1996).

Monarda didyma Cambridge Scarlet (bee balm)

Meloidogyne hapla

Bee balm is resistant (Gall rating 1.0) (LaMondia 1995).

Myosotis alpestris Indigo Blue (forget-me-not)

Meloidogyne hapla:

M alpestris is resistant (Gall rating 1.0) (LaMondia 1996).

Narcissus pseudonarcissus and other Narcissus spp. (Daffodil)

Pratylenchus crenatus

Daffodils are hosts in California (Norton et al. 1984).

Pratylenchus penetrans:

Threshold is 0.2 to 1.0/100 g soil (Barker et al. 1976).

Parasitic on the roots of N. exertus (Haw.) Pugsley var ornatus Pugsley and provides the fungus Cylindrocarpon radicicola a means of entry. Planting of Crocosmia crocosmiflora N. E. Br. var meteor Hort. or var. fantasia Hort in heavily infected areas resulted in 52% better Narcissus yield (Slootweg 1957).

Following cropping of Tagetes (marigold) and incorporation of roots only, Narcissus yield increased 190%. Following cropping of Tagetes and incorporation of whole plants or removal of whole plants, Narcissus yield increased 141% (Slootweg 1957).

About 90% reduction of Pratylenchus penetrans populations is normally obtained compared with other crop and with fallow and is apparently due to nematicidal action of the plants (Oostenbrink et al. 1957).

Nepeta cataria (catnip)

Meloidogyne hapla:

483 galls/g root after 50 days in pots inoculated with 3600 J2 (Townshend and Davidson 1962).

Pachysandra terminalis (pachysandra)

Meloidogyne hapla

P. terminalis is a moderate host (Gall rating 2.4) (LaMondia 1995).

Pachysandra procumbens (Allegheny spurge)

Meloidogyne hapla

P. procumbens is resistant (Gall rating 1.0) (LaMondia 1995).

Paeonia spp.(Peony)

C. curvata

Associated only in nurseries in New Jersey (Loof 1974)

Meloidogyne hapla:

Involved in aberrant gall formation and may cause considerable stunting if attack is severe (Williams 1974).

Can cause side-type large galls (Eversmeyer and Dickerson 1966).

Papaver orientale (Oriental Poppy)

Pratylenchus penetrans

Oriental poppy is a host in California (Siddiqui et al. 1973).

Papaver orientale (oriental poppy) Carousel

Meloidogyne hapla

Carousel is resistant (Gall rating 1.0) (LaMondia 1995).

Pelargonium spp. (Geranium)

Xiphinema americanum

Pelargonium spp. are osts in nurseries in California (Siddiqui et al. 1973)

Penstemon digitalis Husker Red (beard tongue)

Meloidogyne hapla:

P. digitalis is resistant (Gall rating 1.0) (LaMondia 1996).

Perovskia atriplicifolia (Russian sage)

M. hapla:

Russiansage is susceptible (Gall rating 3.8) (LaMondia 1996).

Russian sage is a moderately good host (Gall rating 3,4) (LaMondia 1995).

Petunia X hybrida (Petunia)

Pratylenchus crenatus

Petunia is a host (SON 1984).

Pratylenchus penetrans

Grew 100% better in fumigated soil or soil in which marigolds had been grown than in soil that had grown weed hosts (Miller and Ahern 1969).

Paratrichodorus allius

Petunia is a host (SON 1984).

Phlox paniculata Fairest One (garden phlox)

Meloidogyne hapla

P. paniculata is resistant (Gall rating 1.0) (LaMondia 1995).

Phlox stolonifera Bruce's White (creeping phlox)

Meloidogyne hapla

P. stolonifera is resistant (Gall rating 1.0) (LaMondia 1995).

Phlox sp.

Longidorus elongatus

Associated (SON 1984).

Physostegia virginiana Summer Snow (false dragonhead)

Meloidogyne hapla:

False dragonhead is resistant (Gall rating 1.2) (LaMondia 1996).

Polemonium reptans Firmament (Jacob's ladder)

Meloidogyne hapla

P. reptans is a moderately poor host (Gall rating 2.0) (LaMondia 1995).

Potentilla nepalensis Miss Wilmott (cinquefoil)

Meloidogyne hapla

P. nepalensis is a moderate host (Gall rating 3.0) (LaMondia 1995).

Pratia spp. (pratia)

Meloidogyne hapla

Recorded (Southey 1993).

Primula x polyanthus Crescendo Mix (primrose)

Meloidogyne hapla

This primrose taxon is resistant (Gall rating 1.0) (LaMondia 1995).

Rudbeckia sp. Gold Drop (coneflower)

Meloidogyne hapla

Gold drop is resistant (Gall rating 1.0) (LaMondia 1995).

Salvia azurea (meadow sage) Grandiflora

Meloidogyne hapla

Grandiflora is a moderate host (Gall rating 2.3) (LaMondia 1995).

Salvia haematodes (meadow sage)

Meloidogyne hapla

S. haematodes is susceptible (Gall rating 4.0) (LaMondia 1995).

Sanguisorba obtusa (Japanese burnet)

Meloidogyne hapla

S. obtusa is a moderately good host (Gall rating 3.4) (LaMondia 1996).

Scabiosa caucasica Fama (pincushion flower)

Meloidogyne hapla

S. caucasica is susceptible (Gall rating 4.0) (LaMondia 1995).

S. caucasica is a host in New Zealand (Knight et al. 1997).

Sinningia speciosa (Gloxinia)

Heterodera trifolii

S. speciosa is a host in California (Siddiqui et al. 1973)

Solidago sphacelata Golden Fleece (goldenrod)

Meloidogyne hapla:

Golden Fleece is resistant (Gall rating 1.0) (LaMondia 1996).

Stachys byzantina Lanatna (lamb's ear)

Meloidogyne hapla

S. byzantina is susceptible (Gall rating 4.0) (LaMondia 1995).

Stokesia laevis Blue Danube (Stoke's aster)

Meloidogyne hapla

Stoke's aster is a moderately poor host (Gall rating 1.4) (LaMondia 1995).

Tagetes spp.(Marigold). Note: Highly variable results have been observed in marigold trials. Consult experts for further information.

Criconemella (= Mesocriconema) xenoplax

Marigold did not suppress C. xenoplax when grown in association with peach trees (Whittington and Zehr 1992).

Meloidogyne hapla

Of 11 M. hapla populations, one population from Virginia caused extensive galling and lateral root proliferation, and 3 populations caused single galls and egg masses. Other populations failed to reproduce (Eisenback 1987).

Of 5 Tagetes patula, 3 T. erecta, and 1 T. signata pumila cultivars and one triploid hybrid (T. patula X T. erecta), fallow and all other marigold cultivars resulted in significantly less galling 4 Meloidogyne spp than the double-cropped tomato check except for T. erecta "diamond Jubilee" and the French marigold "Petite Harmony" allowed significant galling by M. arenaria on tomato test plants (Rickard and Dupree 1978).

In pots, African Double Mixed was lightly susceptible (Gaskin and Crittenden 1956).

Meloidogyne spp.

Gall and egg mass formation varied among "Tangerine", "Petite Harmony", "Petite Gold", and "Goldie". No galls or egg masses were observed on "Tangerine". Fewer mature Meloidogyne females resulted from interplantings of "Rutgers" tomato with "Tangerine" than with tomato plantings alone. Certain French marigold cultivars serve as a trap crop rather than as producers of nematicidal substances (Motsinger et al. 1977).

Pratylenchus spp.

Tagaetes (marigold) suppresses lesion nematode populations, and some members of the mustard family are comparatively poor hosts (Evans et al. 1993).

Pratylenchus penetrans

Marigold is a poor host. T. patula dwarf double French cv. Spry greatly reduced P. penetrans populations in soil for three years after cropping. Good cover crop for nurseries because they prodice extended nematode control, but interplanted with strawberries, tomatoes, and gladioli, they did not increase yields but rather acted like weeds, competing for water and nutrients (Miller and Aherns 1969).

Following cropping of Tagetes (marigold) and incorporation of roots only, Narcissus yield increased 190%. Following cropping of Tagetes and incorporation of whole plants or removal of whole plants, Narcissus yield increased 141% (Slootweg 1957).

Tanacetum cinerariifolium (pyrethrum)

Meloidogyne hapla:

50% loss in flower yield and decrease in pyrethrin content in Kenya close to the equator at 2,000 m (Franklin 1979).

Teucrium fruticans (germander)

Meloidogyne hapla:

Germander is a host (Siddiqui et al. 1973).

Thalictrum speciosissimum (meadow rue)

Meloidogyne hapla

This meadow rue species is a moderately good host (Gall rating 3.4) (LaMondia 1995).

Thymus serphyllum Album (thyme)

Meloidogyne hapla:

Thyme is a moderately good host (Gall rating 3.2) (LaMondia 1996).

Tradescantia sp. J. C. Weguelin (spiderwort)

Meloidogyne hapla

Spiderwort is a moderately good host (Gall rating 1.0) (LaMondia 1995).

Trollius hybrida Lemon Queen (globe flower)

Meloidogyne hapla:

Globe flower is a moderate host (Gall rating 3.0) (LaMondia 1996).

Tulipa sp. (tulip)

Longidorus elongatus

Tulip is a host in New Zealand (Knight et al. 1997).

Pratylenchus penetrans

Parasitization results in growth retardation, ruddy color at the end of the growing period, and many small lesions visible on the roots (Slootweg 1957).

Verbascum phoeniceum Benary's Hybrid (mullein)

Meloidogyne hapla

Benary's Hybrid is a moderately poor host (Gall rating 1.4) (LaMondia 1995).

Veronica spicata (speedwell) Icicle

Meloidogyne hapla

Icicle is susceptible (Gall rating 4.0) (LaMondia 1995).

Vinca minor Bowles variety (periwinkle)

Meloidogyne hapla

V. minor is resistant (Gall rating 1.0) (LaMondia 1995).

Xiphinema americanum

V. minor is a host in declining plantings (Siddiqui 1973)

Viola cucullata Priceana (swiss violet)

MeloidogynehaplaF

V. cucullata is a moderately poor host (Gall rating 2.0) (LaMondia 1995).

Viola tricolor (Viola)

Pratylenchus penetrans

V. tricolor is a host in California (Siddiqui et al. 1973).

Zinnia elegans (Zinnia)

Meloidogyne hapla

In pots, Z. elegans was severely susceptible, and 3/3 inoculated plants were infected (Faulkner and McElroy 1964).

Zinnia sp. (Unspecified zinnia)

P. penetrans

Zinnia sp. grew 50-75% better in fumigated soil or soil in which marigolds had been grown than in soil that had grown weed hosts (Miller and Ahern 1969).

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