

SUSCEPTIBILITY OF VARIOUS LANDSCAPE TREES TO ROOT-KNOT NEMATODES

by Frank S. Santamour, Jr. and Louise G.H. Riedel

Abstract. Young plants of one species of each of 17 genera (*Aesculus*, *Ailanthus*, *Celtis*, *Fagus*, *Ginkgo*, *Gleditsia*, *Juglans*, *Koelreuteria*, *Liquidambar*, *Maclura*, *Magnolia*, *Pyrus*, *Robinia*, *Sassafras*, *Sophora*, *Ulmus*, *Zelkova*) and three species each of *Betula* and *Prunus* were inoculated with the four common root-knot nematodes (*Meloidogyne* spp.). Of 23 tree species tested, the majority were susceptible to one or more of the nematodes but *Ailanthus altissima*, *Fagus grandifolia*, *Gleditsia triacanthos*, *Juglans nigra*, *Liquidambar styraciflua*, *Maclura pomifera*, *Magnolia grandiflora*, *Prunus avium*, *Pyrus calleryana*, and *Sassafras albidum* exhibited a tolerant or resistant response to all of the nematodes.

Root-knot nematodes (*Meloidogyne* spp.) may stunt the growth of young plants and form disease complexes with certain soil-borne fungal disease pathogens. Our understanding of the influence of these nematodes on landscape trees has been limited by a lack of knowledge of the potential tree hosts of these pests. In order to rectify this situation, we have published, in recent years, a comprehensive compilation of the world literature on this topic (3) and major surveys of nematode susceptibility in species of *Salix* (4), *Quercus* (1), and *Acer* (2). There are many other important tree genera in which extensive surveys would be desirable, but such analyses could constitute an almost "never-ending" series. On the other hand, there are many tree genera in which only one, or a few, species are widely grown in urban landscapes. Therefore, in the present study, we have limited our nematode inoculations to some of these species.

The following discussion of previous reports of root-knot nematodes on the 19 tree genera tested in the present study (see Table 1) is based on the data presented in our earlier compilation (3), rather than being referenced to the original literature.

1. There have been no reports of any root-knot nematodes parasitizing *Ailanthus altissima*, *Celtis occidentalis*, *Fagus grandifolia*, *Maclura pomifera*, or *Sassafras albidum*.

2. *Betula nigra*, *Ginkgo biloba*, *Gleditsia triacanthos*, *Koelreuteria paniculata*, *Magnolia grandiflora*, *Prunus avium*, *Prunus cerasifera*, *Prunus mahaleb*, *Sophora japonica*, and *Ulmus parvifolia* have been noted only as hosts of unidentified nematodes.

3. There have been no reports of *Aesculus flava*, *Betula platyphylla* var. *japonica*, *Betula populifolia*, or *Pyrus calleryana* as hosts of any of the common root-knot nematodes, although other species in these genera have been noted as hosts of unidentified or rare nematode species.

4. Both *Robinia pseudoacacia* and *Zelkova serrata* have been noted as hosts of one or more of the common root-knot nematodes.

5. *Liquidambar styraciflua* was not susceptible to inoculations with the common root-knot nematodes but was reported as a host of an unidentified species.

6. *Juglans nigra* was reported as a host of *M. ovalis* Riffle and an unidentified nematode species.

Materials and Methods

The seedlings used in this study were grown from seed collected from one tree of each species. Plants of *Betula nigra* 'Heritage' were grown from rooted cuttings. Nematode inoculation procedures were as outlined in previous reports (1,2,3) and evaluations made 70 to 90 days after inoculation.

Results and Discussion

The results of our tests are given in Table 1. It is noteworthy that seedlings of many species exhibited a tolerant or resistant response to all of the nematodes. *Gleditsia triacanthos* and *Magnolia grandiflora* are two of the most widely planted native American landscape trees, and both have been reported as hosts of unidentified root-knot nematodes (3). Our findings indicated that both

Table 1. Response of various landscape trees to inoculation with root-knot nematodes (*Meloidogyne* spp.)^{1/}

Genus Species	M. arenaria		M. hapla	M. incognita	M. javanica
	Race 1	Race 2			
<i>Aesculus flava</i> Ait.					
(<i>A. octandra</i> Marsh.)	S (3-+)	S (5-+)	—	S (3-+)	S (5-+)
<i>Ailanthus altissima</i> (Mill.)Swingle	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Betula nigra</i> L. 'Heritage'	—	S (5-+)	—	—	—
<i>Betula platyphylla</i> Suk. var. <i>japonica</i> (Miq.) Hara	—	S (5-+)	S (4-+)	S (5-+)	S (4-+)
<i>Betula populifolia</i> Marsh.	S (4-+)	S (4-+)	—	S (5-+)	S (4-+)
<i>Celtis occidentalis</i> L.	T (2-0)	S (3-+)	R (0-0)	S (3-+)	S (3-+)
<i>Fagus grandifolia</i> Ehrh.	T (2-0)	T (1-0)	R (0-0)	R (0-0)	R (0-0)
<i>Ginkgo biloba</i> L.	S (3-+)	S (4-+)	T (1-0)	S (3-+)	S (3-+)
<i>Gleditsia triacanthos</i> L.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Juglans nigra</i> L.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Koelreuteria paniculata</i> Laxm.	S (4-+)	S (2-+)	T (2-0)	S (4-+)	S (3-+)
<i>Liquidambar styraciflua</i> L.	R (0-0)	T (1-0)	R (0-0)	T (2-0)	R (0-0)
<i>Maclura pomifera</i> (Raf.)Schneid.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Magnolia grandiflora</i> L.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Prunus avium</i> L.	T (1-0)	T (1-0)	T (2-0)	T (2-0)	T (4-0)
<i>Prunus cerasifera</i> Ehrh.	S (4-+)	S (5-+)	S (4-+)	S (5-+)	S (4-+)
<i>Prunus mahaleb</i> L.	S (5-+)	S (5-+)	S (5-+)	S (5-+)	S (5-+)
<i>Pyrus calleryana</i> Dcne.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Robinia pseudoacacia</i> L.	S (5-+)	S (5-+)	S (5-+)	S (5-+)	S (5-+)
<i>Sassafras albidum</i> (Nutt.) Nees.	R (0-0)	R (0-0)	R (0-0)	R (0-0)	R (0-0)
<i>Sophora japonica</i> L.	S (5-+)	—	—	—	T (2-0)
<i>Ulmus parvifolia</i> Jacq.	S (3-+)	S (4-+)	R (0-0)	S (4-+)	S (4-+)
<i>Zelkova serrata</i> (Thunb.) Mak.	R (0-0)	S (2-+)	R (0-0)	T (1-0)	S (3-+)

^{1/} Key to Table. **S** = susceptible, galls and egg masses noted; **T** = tolerant, some galls but no egg masses; **R** = resistant, no galls and no egg masses. First figure in parentheses refers to gall rating: 0 = no galls; 1 = from one to two galls; 2 = three to 10 galls; 3 = 11 to 30 galls; 4 = 31 to 100 galls; 5 = more than 100 galls per root system. (+) denotes that two or more egg masses with potentially viable eggs were found. (0) denotes that no egg masses were found.

species were completely resistant to parasitization by the common nematode species. Thus, it would be of great scientific interest if nurserymen or arborists who find nematode galls on the roots of these trees would collect such material and bring it to the immediate attention of nematologists in their area to determine if new and heretofore unknown nematode species are involved.

Acknowledgments. The authors would like to thank Monique L. Petersen, Biological Technician, for her assistance in this study.

Literature Cited

1. Santamour, F.S., Jr. 1992. *Susceptibility of oaks to root-knot nematodes*. J. Arboric. 18: 216-219.
2. Santamour, F.S., Jr. 1992. *Susceptibility of maples to root-knot nematodes*. J. Arboric. 18: 262-265.
3. Santamour, F.S., Jr. and J.M. Batzli. 1990. *Host checklist of root-knot nematodes on broad-leaved landscape trees*. J. Arboric. 16: 162-168.
4. Santamour, F.S., Jr. and J.M. Batzli. 1990. *Root-knot nematodes on willows: Screening of Salix species, cultivars, and hybrids for resistance*. J. Arboric. 16: 190-196.

*Research Geneticist and Horticulturist,
respectively*

*U.S. National Arboretum
Agricultural Research Service
U.S. Department of Agriculture
Washington, DC 20002*

Résumé. De jeunes sujets, à raison d'une espèce par genre (*Aesculus*, *Ailanthus*, *Celtis*, *Fagus*, *Ginkgo*, *Gleditsia*, *Juglans*, *Koelreitia*, *Liquidambar*, *Maclura*, *Magnolia*, *Pyrus*, *Robinia*, *Sassafras*, *Sophora*, *Ulmus*, *Zelkova*) et de trois espèces pour les genres *Betula* et *Prunus*, étaient inoculés avec quatre nématodes communs de racines (*Meloidogyne* spp.). Des 23 espèces testées, une majorité était susceptible à un ou plusieurs des nématodes en question, mais *Ailanthus altissima*, *Fagus grandifolia*, *Gleditsia triacanthos*, *Juglans nigra*, *Liquidambar styraciflua*, *Maclura pomifera*, *Magnolia grandiflora*, *Prunus avium*, *Pyrus calleryana* et *Sassafras albidum* présentaient une tolérance ou une résistance à tous les nématodes.

Zusammenfassung. Junge Pflanzen einer Art von jeder der 17 Gattungen (*Aesculus*, *Ailanthus*, *Celtis*, *Fagus*, *Ginkgo*, *Gleditsia*, *Juglans*, *Koelreutia*, *Liquidambar*, *Maclura*, *Magnolia*, *Pyrus*, *Robinia*, *Sassafras*, *Sophora*, *Ulmus*, *Zelkova*) und drei Arten jeweils von *Betula* und *Prunus* wurden geimpft mit vier gewöhnlichen Wurzelneematoden (*Meloidogyne* spp.). Von dem 23 getesteten Arten war die Mehrzahl anfällig gegenüber einer oder mehrerer Neematoden, aber *Ailanthus altissima*, *Fagus grandifolia*, *Gleditsia triacanthos*, *Juglans nigra*, *Liquidambar styraciflua*, *Maclura pomifera*, *Magnolia grandifolia*, *Prunus avium*, *Pyrus calleryana* und *Sassafras albidum* reagierten auf alle vier Neematoden tolerant oder resistent.