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Development of *Lonicera* Cultivars Resistant to the Honeysuckle Aphid (*Hyadaphis tataricae*)[1]

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Abstract

Lonicera taxa growing in collections at the University of Minnesota Landscape Arboretum have been evaluated and observations are given for resistance to the honeysuckle witches broom aphid, *Hyadaphis tataricae*. A breeding program is in progress to develop superior resistant cultivars of honeysuckle for landscape use in informal hedge, screen, and windbreak plantings. A resistant selection has been approved for introduction to fill the nursery and landscape needs until better cultivars can be developed.

Index words: *Lonicera,* honeysuckle, resistance, honeysuckle aphid, *Hyadaphis tataricae*

Introduction

The honeysuckle "witches broom" aphid (*Hyadaphis tataricae*) was first described in 1935 from a collection of the insect made near Moscow, U.S.S.R. Since that time it has been seen commonly in eastern Europe. The aphid first entered North America about five to six years ago in Quebec on infested plants from Europe (1). The insect was first observed in the U.S. by a horticulturist in Lake County, Illinois, in 1979. This infestation may have been introduced by imported infested plants from Canada, or directly from Europe. Since 1979, the insect has established itself in much of the midwest.

The aphids are found on upper sides of leaves that fold longitudinally to enclose the insects, making chemical control difficult. Witches brooms are formed due to a reduction in shoot elongation and a proliferation of bud break. Scattered flowers may form on these areas. These stems will eventually die. Reports from Europe indicate that recurring infestation can even cause the death of the plant. This insect is found only on the genus *Lonicera,* and the eggs apparently overwinter on the brooms.

Materials and Methods

Soon after the discovery of *Hyadaphis tataricae* in Minnesota in 1981, a study was initiated to identify *Lonicera* taxa possessing resistance to this pest. Notes were taken on the occurrence of witches brooms on the various species and cultivars growing in collections at the University of Minnesota Landscape Arboretum.

Using this resistant germplasm a breeding program was initiated in 1982 to develop resistant cultivars suitable for informal hedge, screen, or windbreak plantings to replace *Lonicera korolkowii* 'Zabelii' and *Lonicera tatarica.* The objective is to incorporate aphid resistance with the rosy red flower color and showy red fruit of Zabel honeysuckle on a vigorous, free branching plant.

To speed up evaluation of large seedling populations, seedlings from crosses are grown and screened in the greenhouse. During the winter when populations of hybrid seedings reach 5-8 cm (2-3 in) in height, dormant infested plants are moved to the same greenhouse bench for forcing. Aphid populations develop rapidly on the surrounding susceptible seedling plants and the typical witches brooms develop on the terminal growth. Susceptible plants are discarded at this stage. Those without symptoms are field planted in the spring for additional testing and selection for desired plant form and aesthetic qualities.

Results and Discussion

Table 1 gives data on aphid resistance of honeysuckles observed in our collections as well as observations from other locations (1, 2, 3, 4). Many plants in the collections have not been verified as to accuracy of identification so some error could exist. Honeysuckles within a complex often cross readily when grown in close proximity. Thus hybrids often exist when plants have been propagated by seed. This hybrid origin and resulting inaccuracy in identity may account for the variation in resistance reported for a given species.

An individual, inaccurately named plant possessing

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Table 1. Honeysuckle aphid infestation observed at the University of Minnesota Landscape Arboretum (MLA) and reported at other locations on *Lonicera* taxa.

Taxa	Witches brooms observed at MLA	literature reports	literature reference
L. alpigena 'Nana'	no		
L. x amoena		susceptible	2
L. x amoena 'Alba'		resistant	3
L. x bella	yes	resistant	1
		susceptible	2,4
L. x bella 'Albida'	yes		
L. x bella 'Atrorosea'	yes		
L. x bella 'Dropmore'	yes	low damage	1
L. caerulea	no	resistant	1
L. caerulea var. edulis	no	resistant	1
L. caerulea var. viridifolia		resistant	1
L. chrysantha	yes	resistant	1
L. conjugialis		susceptible	2
L. discolor	yes		
L. ferdinandii	no		
L. insularis	yes		
L. korolkowii var. floribunda	no	no damage	1
L. korolkowii 'Zabelii'	yes	heavy damage	1
L. ledebourii		low damage	1
L. maackii		no damage	1
L. maackii var. podocarpa	yes		
L. maximowiczii		low damage	1
L. maximowiczii var. sachalinensis	no		
L. x minutiflora	yes	low damage	1
		susceptible	2,4
L. morrowii		no damage	1
		susceptible	2
L. x muendeniensis		resistant	3
		susceptible	2,4
L. x muendeniensis var. xanthocarpa		low damage	1
L. x muscaviensis		susceptible	4
L. x notha	yes	resistant	3
L. orientalis	yes	low damage	1
L. reflexa	yes		
L. ruprechtiana	yes	susceptible	2
L. rupicola	yes		
L. syringantha	no	low damage	1
L. tatarica	yes	susceptible	2,4
L. tatarica 'Alborosea'	yes		
L. tatarica 'Angustifolia'	yes	low damage	1
L. tatarica 'Arnold Red'	no	low damage	1
		resistant	3
L. tatarica 'Beavermor		low damage	1
L. tatarica 'Grandiflora'		heavy damage	1
L. tatarica 'Morden Orange'	yes	resistant	1
L. tatarica 'Nana'	yes		
L. tatarica 'Rosea'		heavy damage	1
L. tatarica 'Rubra'		low damage	1
L. tatarica var. salicifolia		low damage	1
L. tatarica 'Virginalis'	yes		
L. tatarica 'Wheeling'	yes		
L. tatarinovii		low damage	1
L. vesicaria	no		
L. x xylosteoides		resistant	3
L. x xylosteoides 'Clavey's Dwarf'	no		
L. xylosteum	no	low damage	1
L. xylosteum 'Emerald Mound'	no		
L. xylosteum 'Hedge King'	no		

resistance to the honeysuckle aphid and having a form satisfactory for screen plantings was found in our collections. This plant will be named and introduced to serve as a substitute for Zabel and Tatarian honeysuckle until a better selection can be developed or identified. The plant is most closely related to *Lonicera korolkowii,* but is probably of hybrid origin. It has blue-green foliage, red berries, and white flowers with a pink tinge. Although this plant has not been tested widely, introduction will proceed because of the serious aphid damage on honeysuckle taxa presently available in the nursery trade. Plants were distributed for planting in the spring of 1984 to cooperators in several areas of Minnesota and surrounding states for evaluation. Limited field performance data will be available when the plants are ready for distribution by cooperating production nurseries (probably in the spring of 1986). Propagation material has been provided to nurseries cooperating in

the Minnesota Nurserymen's Research Corporation royalty program.

Lonicera tatarica 'Arnold's Red' and the selection described above have produced a number of resistant offspring when crossed with each other and with *Lonicera korolkowii* 'Zabelii.' Many of these resistant offspring should flower in spring of 1985. Selection for flower color can occur and they can also be used as parents to produce subsequent generations.

Significance to the Nursery Industry

Lonicera is a particularly important plant to the nursery industry in the midwest where honeysuckle is commonly used for informal hedge, screen and windbreak plantings. Zabel and Tatarian honeysuckle are the most widely used honeysuckles and both are very susceptible to the honeysuckle aphid. A resistant cultivar with suitable plant form and aesthetic qualities is needed to replace susceptible clones in nursery inventories. Observations indicate that resistant germplasm is available. Results of early crossing efforts indicate that resistance is readily transmitted to a large number of offspring. Insufficient data is available to determine mode of inheritance.

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Effect of Seedling Size and Transplant Bed Density on Performance of Eastern Hemlock Planting Stock[1]

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Abstract

After grading two-year-old Eastern hemlock (*Tsuga canadensis* (L.) Carr.) seedlings by height, performance was examined for one year under various transplant bed densities, and for 2 years in the field. In the nursery, average diameter growth and dry matter production were influenced by bed density; height growth was not. A transplant bed density of 65 plants/m^2 (6/ft^2) resulted in the greatest average diameter and dry weight, but densities up to 151 plants/m^2 (14/ft^2) yielded more usable transplants per unit of nursery bed. Although there were residual effects of transplant bed density, the major differences in growth after 2 growing seasons in the field were due to initial seedling size. Transplants originating from large seedlings outperformed those from small seedlings. Compared to small seedlings, larger plants require less time in transplant beds, are less troublesome to maintain in the field, and reach marketable size in fewer years, all of which increase their value relative to small seedlings.

Index words: *Tsuga canadensis,* Canadian Hemlock, transplanting

Introduction

Many factors affect the performance of plants in seedbeds, transplant beds and the field. Nursery bed density and seedling grade are two of the most important. In general, average plant size increases as bed density decreases (14), and the percent yield of usable seedlings is frequently higher at lower bed densities (9). Average size may occasionally decrease at extremely wide spacings if other factor(s) become limiting (13). Extremely low densities are not economical owing to the excessive nursery area required to produce a large crop. Thus, selection of optimum bed density (density which produces the maximum number of usable seedlings per unit area) often represents a compromise between the logistical problems of managing a nursery and the biological capabilities of the crop plant (9).

Seedling grade or quality is important, but there is no single parameter which adequately assesses quality (2). The easiest to measure are height and stem diameter, which are often well-correlated with later growth in the field (5, 14). Physiological indices of quality include root regeneration potential (11), nutrient status (14)

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