

SUSCEPTIBILITY OF PLANETREES TO ANTHRACNOSE AND POWDERY MILDEW IN CALIFORNIA

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Abstract. When five sycamore cultivars (Bloodgood, Columbia, Liberty, Yarwood, and Saratoga 86-336-C), grown in 5 gallon containers, were exposed to natural infection by the sycamore anthracnose fungus, *Apiognomonia platani*, Bloodgood was significantly less affected than Columbia, Yarwood and Liberty. Saratoga 86-336-C was highly susceptible. In contrast, Bloodgood was highly susceptible to powdery mildew, *Microsphaeria penicillata*, while Yarwood displayed the highest degree of resistance to the disease.

In 1935 Walther (1) documented differences and variation in susceptibility to anthracnose, caused by *Apiognomonia platani*, among London planes (*P. X acerifolia*) in San Francisco, California. Santamour (2) described the resistance of different *Platanus* spp. progenies to anthracnose. He found that *Platanus orientalis* and some hybrids between this species and the susceptible *P. occidentalis* were highly resistant to the disease. In 1984 'Columbia' and 'Liberty' planetrees were introduced by the U.S. National Arboretum (3). 'Yarwood' was introduced in 1978 (4) while 'Bloodgood' had been planted for a number of years.

In California, the native western sycamore, *P. racemosa*, is highly susceptible to anthracnose in both native stands and landscape plantings. The main distribution of *P. racemosa* is in the coastal counties of southern California and the tree gradually diminishes in density to the north, perhaps because of anthracnose. Seeds rarely are produced on trees heavily infected by anthracnose since floral tissues are also blighted. In contrast, London plane is widely planted throughout California and exhibits both susceptibility and resistance to anthracnose (Fig. 1).

In 1986, spring rainfall in California was plentiful and there were many reports of severe anthracnose and differences in disease severity among

planetree cultivars.

The objective of this study, that started in 1987, was to determine the relative susceptibility of planetrees to anthracnose in Northern California.

Materials and Methods

Four cultivars, 'Bloodgood', 'Columbia', 'Liberty', and 'Yarwood', were chosen for this study. Seven bare-rooted saplings of each cultivar (propagated by the J. F. Schmidt & Sons Nursery, Boring, Oregon) were planted into 5 gal. containers in November, 1987 and maintained in a lath house at the University of California Deciduous Fruit Field Station, San Jose, CA. In the spring of 1988 they were moved to Sycamore Park in Livermore, CA.

Those four sycamore cultivars were evaluated for reaction to *A. platani* in the field during 1988. Another planetree selection ('Saratoga 86-336-C') from Saratoga Horticultural Foundation, Saratoga, California was added to the tests for the 1989, 1990 and 1991 evaluations. The research site was a natural stand of *P. racemosa* at Sycamore Park which was heavily infected with anthracnose. To ensure an even infection, the containerized trees were placed in a randomized complete block design under the canopy of an infected tree and left there during March and April of each year for exposure to anthracnose spores washed from the infected twigs and foliage above. There were seven replications of four cultivars in 1988. Five replications of five cultivars were made during 1989, 1990 and 1991.

Plants were monitored weekly for disease development. On May 10, 1988 a disease evaluation was made by counting all infected leaves on each cultivar. During the rainless springs of 1989



Figure 1. A group of sycamores susceptible to anthracnose was completely defoliated while resistant strains maintain the foliage.

and 1990 disease did not develop and evaluations were not made. In 1991 two separate evaluations that included counts of blighted and healthy buds were made: 1) on May 2, following several rainy days in the last week of April; and 2) on May 10, after a rain on May 7. Each year, after the evaluation was completed, the plants were returned to the lath house and their performance evaluated biweekly for recovery from the anthracnose infection. Evaluations for powdery mildew were made on August 8, 1988. In subsequent years powdery mildew was light and evaluations were not made. The data were subjected to analysis of variance and Duncan-Waller K-ratio test was used to rank cultivar responses.

Results and Discussion

Total leaf count (infected vs uninfected leaves) and bud count (infected vs uninfected buds) essen-

tially gave the same results. 'Bloodgood' was significantly less affected by anthracnose than 'Yarwood', 'Columbia', 'Liberty', and 'Saratoga' (Table 1). These differences persisted to the end of May. By the end of June the trees had recovered from anthracnose and differences no longer were evident.

'Yarwood' foliates much later than the other cultivars and, in years of light spring rains, it can escape infection. Rains in May normally are very light in California. At the end of May each year, 'Bloodgood' and 'Yarwood' presented a satisfactory appearance, while 'Columbia' and 'Liberty' achieved an acceptable appearance by the middle of June or later. It is intriguing that 'Columbia' and 'Liberty' perform so well in the East. 'Columbia' has never suffered from twig blight in 3 separate test areas while 'Liberty' has never had more than 5% twig blight — especially during the recent heavy

Table 1. Susceptibility of London plane to anthracnose and powdery mildew.

Cultivar	1988		1991
	Anthracnose ¹	Mildew ²	Anthracnose ³
Bloodgood	14.4a ⁴	35.4d	5.1a
Yarwood	28.0b	0.6a	21.5b
Columbia	31.4b	11.1c	35.7b
Liberty	34.4b	3.9b	57.0c
Saratoga	--	--	78.8d

¹ Blighted leaves; ave. from 7 trees.

² Leaves with mildew; ave. from 7 trees. Analysis on transformed data, $\sqrt{x+172}$.

³ Per cent blighted buds; ave. from 5 trees. Analysis on transformed data, $\sqrt{x+172}$.

⁴ Values in each column followed by the same letter are not significantly different; P=0.01

anthracnose years of 1988, 1989, 1990 (F.S. Santamour, Jr., personal communication). It is possible that different strains of the fungus exist in these two isolated geographical regions (6).

In California London planes are susceptible to powdery mildew, *Microsphaeria penicillata*. When heavily pruned, the disease is particularly severe. The terminal growth that develops after the normal flush in the spring is distorted and covered by powdery mildew. In some years even non-pruned trees are disfigured. 'Yarwood' is the exception and, while not immune to mildew, the amount of disease that does develop on pollarded trees is barely noticeable. For this reason it is the preferred planetree for sites where severe pruning (pollarding) is to be practiced or where mildew is disfiguring.

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Resumé. Lorsque cinq cultivars de platane acérifolié (Bloodgood, Columbia, Liberty, Yarwood et Saratoga 86-336-C), en croissance en pots de cinq gallons, furent exposés à l'infection naturelle par l'anthracnose du platane, *Apiognomonium platani*, Bloodgood fut significativement moins affecté que Columbia, Yarwood et Liberty. Saratoga 86-336-C y fut hautement sensible. Par contre, Bloodgood fut hautement sensible au mildiou farineux, *Microsphaeria penicillata*, tandis que Yarwood exhibait le degré le plus élevé de résistance à la maladie.

Zusammenfassung. Fünf verschiedene Platanen-Hybriden (Bloodgood, Columbia, Liberty, Yarwood und Saratoga 86-336-C) wurden in 22,5l Containern herangezogen und einer natürlichen Infektion mit der Platanenanthracnose (*Apiognomonium platani*) ausgesetzt. Die Blattgood-Hybriden waren signifikant geringer befallen als die Columbia-, Yarwood- und Liberty-Hybriden. Saratoga 86-336-C war hochempfindlich. Im Gegensatz dazu war Bloodgood gegenüber Mehltau (*Microsphaeria penicillata*) sehr empfindlich, während Yarwood gegen diese Krankheit die höchste Resistenz zeigte.