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## Susceptibility of Palms to Lethal Yellowing: Two Species of *Veitchia*

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### ABSTRACT

Approaches to determining the resistance of palm species and varieties to lethal yellowing (LY) disease are discussed. The field test approach is illustrated with an example: the results of a field test in Florida to compare the susceptibility to lethal yellowing (LY) of two species of *Veitchia* palms were that 91.9% of *V. merrillii* (Beccari) H. E. Moore and 19.3% of *V. montgomeryana* H. E. Moore contracted LY. Thus, *V. merrillii* is apparently highly susceptible and *V. montgomeryana* moderately susceptible to LY.

In southern Florida and areas of the Caribbean Region affected by lethal yellowing (LY), the landscape can be protected from the devastating effects of this disease by planting only disease-resistant palms. However, it is difficult to obtain information on resistance and susceptibility of palms to LY. The traditional method of screening for resistance is to plant palms where the disease is present with the idea that they will eventually be exposed to it; that is, that insect vectors carrying the pathogen will feed on the palms. If the palms are susceptible, an infection will develop; if resistant, the palms will not develop the disease. Of course, the experimenters have little or no control over parameters such as the number of infected palms in the area, the population levels of insect vectors, the percentage of inoculative vectors capable of infecting palms, their feeding rate, etc. A minimum of 20 palms is considered by some researchers to be necessary to adequately test a species. Of course, palm species of known susceptibility should be included in the test for comparison. Thus, field testing for LY resistance requires large experimental plots, and is usually a lengthy process, perhaps taking years to obtain results. Resistant varieties of coconut (*Cocos nucifera* L.), notably the 'Malayan dwarf' varieties and the 'Maypan' hybrid, were discovered by field testing in Jamaica (Harries 1973).

Testing young palm seedlings by intense expo-

sure to LY-infected insect vectors would seem to be a way of expediting determinations of relative resistance levels. The feasibility of such a method was demonstrated (Howard et al. 1984), but was found to be highly labor-intensive and with unpredictable results, again because there is no method of controlling parameters such as those mentioned above.

What we know about the resistance or susceptibility of palm species other than coconut is based mostly on observations of survivorship of palms in areas affected by LY, especially in Florida, where a relatively high diversity of ornamental palms is present. To obtain such information, two approaches were used: (1) Estimates of the degree of susceptibility of 386 species of palms were derived from observations in Fairchild Tropical Garden during the LY epidemic that started in the early 1970s (Howard et al. 1979). (2) The palm species known to be susceptible to LY were rated as highly, moderately, or slightly susceptible according to a consensus of several LY researchers who had made observations throughout the LY-affected area of Florida. Palm species that were ubiquitous in the region and had never been known to contract LY were considered highly resistant (Howard and Barrant 1989). The advantage of the first approach was that a large number of species were included in the observations. However, the considerable variability in the numbers of individuals representing different species, planting densities, amount of shade, ages, heights, and other factors, would have affected the susceptibility of different species and thus compromised these estimates. The second approach had the advantage that it concentrated on the popular species, thus the large numbers of individuals of each species included in the observations would have somewhat compensated for their variability in age and other factors.



1. Experimental planting of *Veitchia merrillii* alternating in the same row with *V. montgomeryana*. Most *V. montgomeryana* survived, while most *V. merrillii* died and only the stumps are visible in the photograph.

To obtain more precise data on resistance/susceptibility of palms, field trials of popular and promising species are being conducted at the Fort Lauderdale Research & Education Center. The present is a report of results of a field trial of two species of *Veitchia*.

### Methods

The palms were grown from seed from two local sources. Seeds of *V. merrillii* (Beccari) H. E. Moore were obtained from the Baxter Gentry Estate on Sugarloaf Key. The source of seeds of the second species was a palm in Fort Lauderdale, which Dr. Scott Zona of Fairchild Tropical Garden identified as *Veitchia montgomeryana* H. E. Moore from material that we mailed him. The palms were grown in containers for two years and then planted in the field in 1992 at the Fort Lauderdale Research & Education Center, with the two species alternating in a single row. Forty of each of these species were planted, but after losses the first year due to "transplanting failure" there were 37 *V. merrillii* and 36 *V. montgomeryana* remaining. The planting was adjacent to a large planting of coconut palms and other susceptible palms.

Lethal yellowing had been present in this planting during most of the 1980s, had disappeared after 1989, and began to infect palms again in early 1993.

The palms were examined several times per week for disease symptoms. Leaf samples were taken from symptomatic palms and assessed for infection by the LY pathogen. For this purpose, deoxyribonucleic acids (DNA) were extracted from each sample and tested by the polymerase chain reaction (PCR) using a pair of oligoprimers that selectively amplify DNA of the LY pathogen only (Harrison et al. 1994). Unequivocal detection of the pathogen in leaf samples from all symptomatic palms was achieved by this means, thereby confirming earlier tentative diagnoses of LY in these palms on the basis of symptoms.

The experiment was terminated in April 1996, at which time considerable numbers of one species had died from LY and no new cases had appeared in this planting for more than a year.

### Results

The first cases of LY in the experimental planting were in June 1993. As of January 1996, 34 *V.*

*merrillii* (91.9%) and seven *V. montgomeryana* (19.3%) had died of LY (Fig. 1). We could thus characterize *V. merrillii* as highly susceptible and *V. montgomeryana* as moderately susceptible to LY. These ratings agree with those based on Meerow's (1992) general observations. Susceptibility rates of these same species would probably vary under different conditions. Also, within species there is normally some variability in any trait, including disease resistance. However, both species of *Veitchia* can be assumed to be represented in Florida by narrow gene pools. Given the wide difference in their susceptibility in our experiment, we would expect *V. merrillii* to be the more susceptible of these two species, regardless of the seed source in Florida or the conditions under which the palms are grown.

In spite of its well-known high susceptibility to LY, *V. merrillii* is still widely grown as an ornamental in southern Florida. It is attractive and its small stature at maturity makes it compatible with many landscaping schemes. Because it is relatively inexpensive and fast-growing, palms lost to LY can be easily replaced. However, we recommend against planting this palm in areas that are affected or threatened by LY, because all available evidence indicates that the rate of spread of LY increases with the density of susceptible palms in the area. In other words, large numbers of susceptible palms encourage epiphytotic.

The susceptibility of *V. montgomeryana* should not discourage a limited use of this palm in special plantings, e.g., botanical collections. About 80% of the palms of this species survived in our trial planting. The parent palm from which the seeds of this species were obtained is one of two palms about 18 years old and 10 m tall in 1996 that survived in an area of Fort Lauderdale that has been affected by LY since the 1970s.

Where small stature is a requirement for certain landscape designs, *V. montgomeryana*, with a "typical height" more than twice that of *V. merrillii* (Meerow 1992) would not be an appropriate substitute for it. The ornamental qualities of *V. montgomeryana* are more like those of *Carpentaria acuminata* (H. Wendland & Drude) Beccari and to a lesser extent *Archontophoenix alexandrae* (F. Mueller) H. Wendland & Drude. Both of the latter species have been grown widely in southern Florida and no cases of LY have been reported in either species.

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