

Schematic diagram of nonpersistent virus transmission by aphids.

little effect on total yield (3 percent overall increase) and would not justify the cost of applications. Mineral oil at 2 gal/acre increased yields by 10 percent, but, at 4

gal/acre, no yield increase was observed, and the practical use of these oil formulations would not be justified. This approach to virus spread control does have great potential, however, if suitable formulations can be identified.

Mulch treatments were extremely effective in increasing squash production. Over the entire harvest period, both aluminum foil and white plastic mulches increased production by 45 percent over untreated controls. Total yields in both mulched treatments were 558 cartons/acre (5 tons) from more than 20,000 fruit averaging 47 cents per pound of fruit (table 4). This rate of production would increase gross income by more than \$750/acre (at \$4.50/carton) and would justify the initial mulching costs of between \$150 and \$200 per acre.

The effect of mulched treatments on yield was particularly evident in the early harvest with 86 percent and 76 percent increases in the aluminum foil and white plastic plots, respectively. Such an intensification of early production would be doubly beneficial because it would concentrate peak production when market price is likely to be highest and would allow early termination with accompanying labor savings and a reduced effect of late-season mosaic infection.

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Wilt and dieback of Canary Island palm in California

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Canary Island palm (*Phoenix canariensis* Hort. ex Chab.) is used extensively as an ornamental throughout inland and coastal areas of California. In 1938 a disease of these palms in California was reported as a bud rot caused by the fungus (*Gliocladium vermoeseni* (Biourge) Thom. (*Penicillium vermoeseni*). Other fungi were not associated with this disease, and it was of minor importance on *P. canariensis* palms. However, during 1973-1977 a vascular wilt and bud rot caused by the fungus *Fusarium oxysporum* Schlecht. was reported on *P. canariensis* in Italy, France, and Japan.

In recent years many mature palms in Los Angeles, Orange, San Bernardino, and San Diego counties have been destroyed by a severe and rapidly spreading disease, which reduces the canopy of affected trees. The fungi *G. vermoeseni* and *F. oxysporum* have been consistently cultured from leaves of diseased trees, and these fungi, both singly and in combination, are pathogenic on 4- to 6-month-old *P. canariensis* seedlings. This is the first report of the occurrence and symptomatology of a disease complex of *G. vermoeseni* and *F. oxysporum* on *P. canariensis* palm.

The disease causes the continuing death of leaves until only juvenile leaves remain intact. New leaves are not produced and the bud is invaded and eventually dies. Collapse of an affected tree may occur within several months or the tree may survive for several years. Symptoms first appear on

mature or recently matured leaves. Typically, the spines or pinnae on one side of the leaf base become brown and dry and die along the rachis from the base towards the tip of the leaf. Pinnae on the other side of the leaf then die from the tip to the base. Occasionally, pinnae on both sides of the rachis die from the tip of the leaf to the base. Before individual pinnae die, dark or necrotic streaks may be observed along their length. As the leaf dies, a brown discoloration appears on the bottom side of the rachis and may extend the rachis length and width. Pink spore masses of *G. vermoeseni* may be seen in blisters under the brown epidermis of the affected leaf or on old leaf bases on the tree.

A black-brown dry rot, usually adjacent to the outer discoloration, may be found upon dissecting the leaf rachis. When the rachis is sectioned longitudinally, discolored vascular bundles and tissue adjacent to the bundles are visible as thin brown streaks. Frequently, a brilliant pink-purple discoloration is present within the leaf rachis. Both *G. vermoeseni* and *F. oxysporum* may be isolated, either in combination or in pure culture, from any of the affected areas of the rachis. However, pure cultures of *F. oxysporum* are usually isolated from the discolored vascular bundles and pure cultures of *G. vermoeseni* are usually isolated from the black-brown dry rot areas.

To date this disease complex has been

found only on *P. canariensis* palms in southern California. In areas where the disease is present there have been considerable tree losses in the past two years. The disease seems to be spread rapidly and there is cause for concern if diseased palms are found among healthy trees. Field observations of disease spread and past cultural histories of different plantings provide evidence that the disease may be rapidly spread by pruning practices.

The only precaution that can be recommended at present is to avoid excessive pruning of *P. canariensis* palms. Trees are commonly pruned once every 1 to 2 years and are cut back to 10 to 20 leaves. If possible, only dead fronds should be removed and pruning tools should be disinfested as workers move from tree to tree. One part of liquid household bleach (sodium hypochlorite) to four parts water is a suitable disinfectant. The relationship and relative importance of *G. vermoeseni* and *F. oxysporum* in this disease complex are unknown. Further studies on the nature and possible control of the disease are in progress.

Photos page 20.

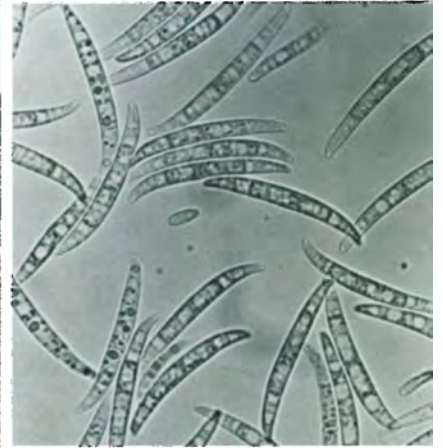
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Healthy *Phoenix canariensis* palm with complete canopy.

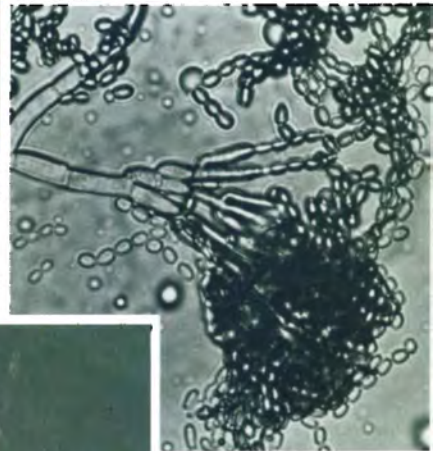


Diseased *Phoenix canariensis* palms lose leaves which causes a reduction in canopy; only juvenile leaves remain intact.



Fusarium oxysporum macro- and microconidia, actual print magnification 580X.

Gliocladium vermoeseni conidia and phialides, actual print magnification 287.5X.



Cultures of *Fusarium oxysporum*, left, and *Gliocladium vermoeseni*, right. Both fungi were grown on potato dextrose agar. *F. oxysporum* was grown under continuous artificial light.

Diseased leaf with unilateral death of pinnae and brown discoloration along rachis.



Gliocladium vermoeseni spore mass underneath brown epidermis of leaf rachis.



Longitudinal section of diseased leaf rachis with vascular discoloration, brown rot, and pink discoloration.

