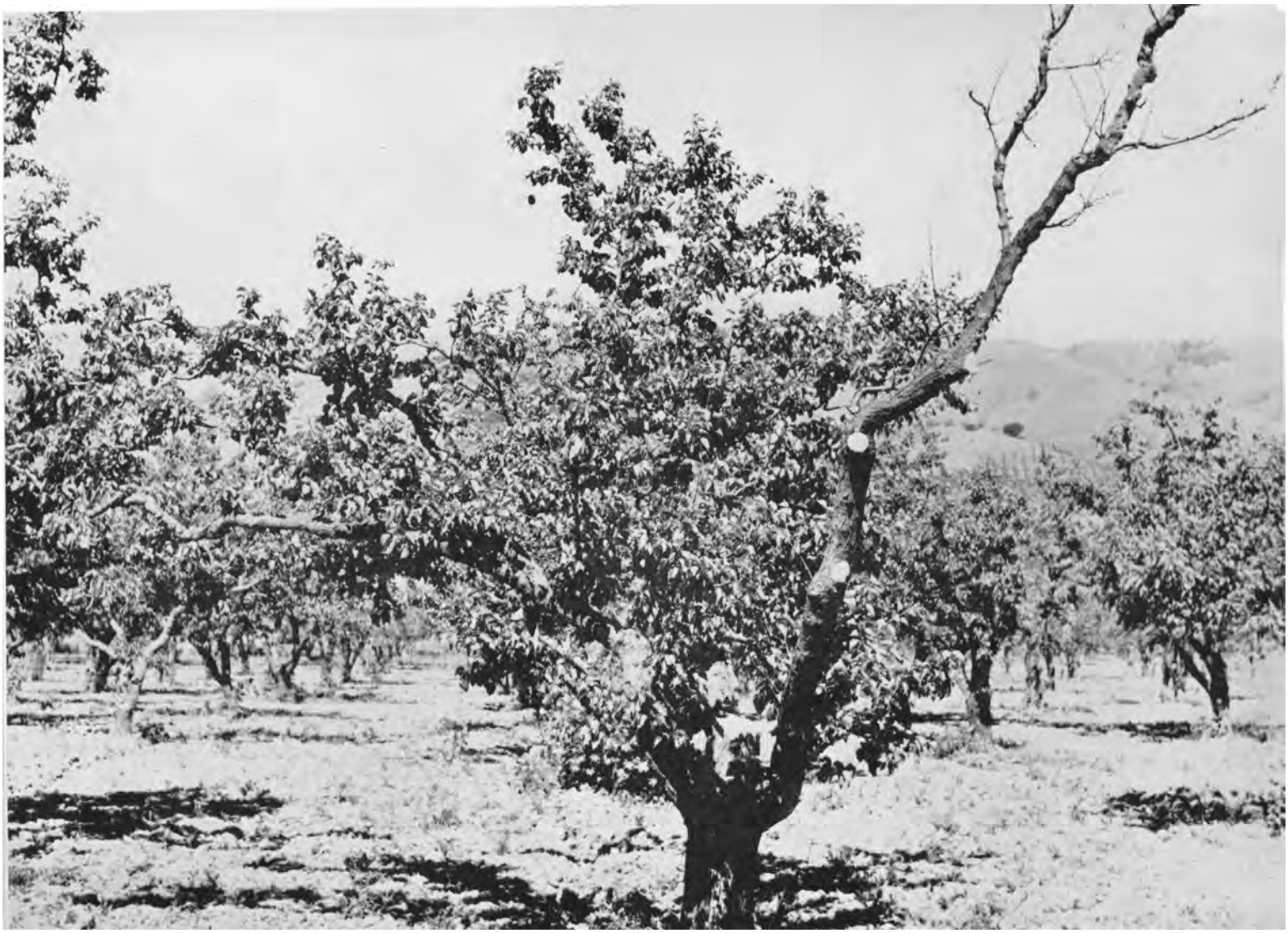


Dieback of Blenheim apricot caused by the Cytosporina fungus. Pruning dead lateral branches failed to eliminate the fungus because (1) the fungus may have already advanced into the main limb and would not have been eliminated by removing the lateral branches; or (2), the fungus could have been spread from cut to cut by pruning tools.

Cytosporina Dieback of Apricot

HARLEY ENGLISH · H. J. O'REILLY · L. B. MC NELLY · J. E. DE VAY · A. D. RIZZI

Since about 1957 increasing numbers of apricot trees in coastal and central California counties have suffered from a limb dieback disorder that, until recently, was confused with the bacterial canker disease. This disease is now known to be caused by a fungus called Cytosporina, **or in the sexual stage,** Eutypa armeniacae, **that had been previously reported as causing a serious limb dieback disease of apricots in Australia.**

IN CALIFORNIA, a limb dieback of apricots has been observed in Monterey, San Benito, Santa Clara, Alameda, Contra Costa, Solano, Yolo, San Joaquin, and Stanislaus counties. It appears to be more destructive in the coastal regions than in interior valleys. There is a possibility that *Cytosporina* dieback has existed unidentified in California for about 20 years. During the past few years *Cytosporina* has increased to the point that it is now a serious threat to apricot production in most coastal apricot areas. In California orchards, the disease has been found only on apricots—occurring in Blenheim (Royal), Tilton, Derby Royal and possibly in Moorpark varieties. In Australia, about 30 varieties of apricot were found to be susceptible to the disease, as well as prunes, apples, peaches, and nectarines.

Mode of infection

Cultures of this fungus, when inoculated into apricot branches in the orchard and young apricot trees in the greenhouse, have caused branch and tree

SUMMARY OF CYTOSPORINA CONTROL MEASURES

1. Burn nearby abandoned apricot trees and grapevines.
2. Remove and burn all infected limbs after spring rains have ceased. Be sure to cut back to healthy wood.
3. Disinfect pruning tools in a 5% formalin solution.
4. Seal large pruning wounds immediately with grafting wax or an oil base paint.
5. Use a modified pruning system to avoid or minimize cuts on the main leaders.

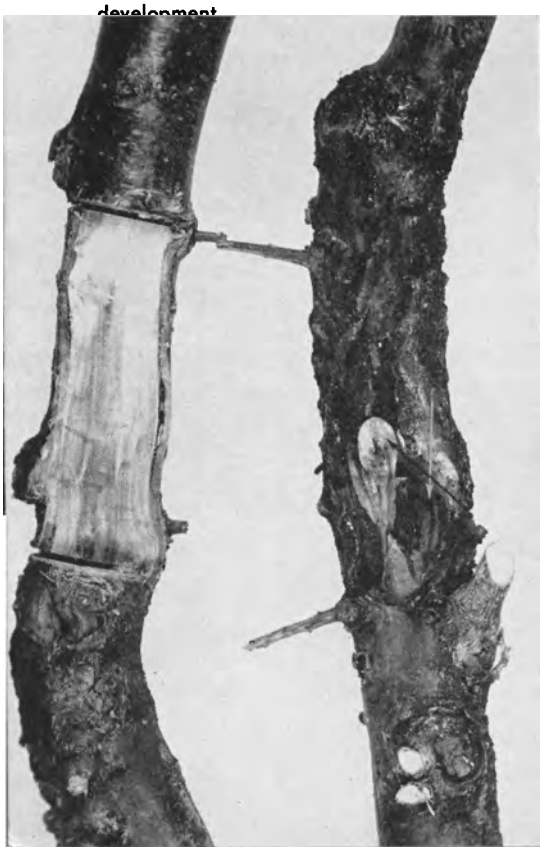
Blenheim apricot affected by the Cytosporina dieback disease. Removal of the infected scaffold limb failed to eliminate the Cytosporina fungus which had already spread to the adjoining scaffold limbs (see arrows). This pruning cut was made too late to save the tree.

death. The method of spread of *Cytosporina* in California apricot orchards is not yet understood. However, the sexual spore form (*Eutypa*), which enables the fungus to be widely disseminated in air currents, has recently been found. This discovery, and information from Australia, supports our belief that *Cytosporina* comes into contact with pruning wounds largely by two methods:

(1) fungus-containing sawdust or other wood or bark fragments carried on pruning tools, or

(2) aerial movement of infective spores produced by the fungus on dead wood of apricot or other woody plants.

Pruning wound infection on Blenheim apricot caused by the Cytosporina fungus. Limb on the right shows the canker developing around a pruning wound (see arrow) through which the fungus entered. Limb on the left shows a similarly infected branch cut open to show the internal dark discoloration accompanying canker development.



The disease is observed mostly in mature trees and frequently attacks a succession of limbs until all of the main branches are involved. Profuse exudates of gum may ooze from diseased bark in older branches, whereas in young infected branches the gum accumulations may form as soft blisters. The wood of infected limbs is often discolored light tan to dark brown, and as the infections become older, the wood becomes increasingly dry and brittle, readily breaking under stress from the weight of a crop. The bark covering this discolored wood becomes dry, shrinks, and may take on a glazed varnish-like appearance resulting from the dissolution of gummy exudates by rain. Limbs often die during the growing season and the brown colored or dead leaves remain attached to the branches. In some instances, leaves on diseased branches become cup shaped and have burned or scorched margins.

Cytosporina dieback has been confused with other diseases including bacterial canker, *Verticillium* wilt, crown rot, and *Ceratocystis* canker. Bacterial canker is a disease primarily of young trees, and the canker activity usually extends into the spring for only a short period; whereas in *Cytosporina* dieback, disease development appears to extend throughout the year. The bacteria responsible for bacterial canker are thought to enter the tree primarily through leaf and blossom buds during winter and early spring. The buds and spurs are killed, and gummy cankers usually develop in the supporting branches. The inner bark of girdled branches often shows a light-tan discoloration and emits a sour sap odor when the outer bark is removed. *Verticillium* wilt is another disease common in young trees and produces little or no gum or bark splitting, as is found in *Cytosporina* dieback.

Crown rot is caused by a soil fungus that invades the trunk near the soil line and induces the formation of girdling or nongirdling cankers that sometimes extend almost into the lower scaffolds. Under favorable conditions, the cankers develop rapidly and exude gum profusely. There is relatively little wood discoloration since the fungus is restricted largely to the bark. Young trees tend to be more severely damaged than mature trees, and often die shortly after leafing out in the spring. Because of the location

Branches of Blenheim apricot with leaves showing cupping and marginal leaf scorch often associated with Cytosporina dieback. Branch to right is from a healthy tree.

of the cankers near the ground line, crown rot is more easily confused with *Ceratocystis* canker than with *Cytosporina* dieback.

Ceratocystis canker usually may be distinguished from *Cytosporina* dieback in that most cankers are centered at bruise injuries in the trunk and lower scaffolds, caused by harvesting or cultivation equipment. *Cytosporina* cankers, on the other hand, develop almost entirely at pruning wounds.

Until research now underway is completed, California apricot growers must depend largely on information obtained by Australian investigators, including these control suggestions:

(1) All dying or abandoned apricot trees in the vicinity of commercial apricot orchards should be removed and burned. Nearby dead or weakened grapevines should also be removed because they may harbor *Cytosporina* fungus.

(2) Infected limbs should only be removed and burned when the spring rains have ceased. Otherwise, fresh pruning cuts made in the fall and winter may provide entry points for the fungus. Spores are produced most abundantly during the wet months. Where possible, cuts should be made one or two feet below external signs of infection. If, after a cut is made, there is evidence of discolored wood on the freshly exposed surface, another cut must be made below it, *after sterilizing the saw.* Pruning tools should be sterilized after cutting through a canker by using a 5% formalin solution. This is prepared by adding five parts of commercial formalin (approximately 40% formaldehyde) to 95 parts of water.

(3) Seal large pruning wounds with a grafting wax or oil base paint.

(4) Using a modified system of pruning will reduce cuts on the main leaders to a minimum. Young trees should be headed back in the usual way during the first two years and the fresh wounds coated with one of the materials mentioned previously. Pruning can be reduced to a minimum thereafter and confined to the laterals which should be cut as far from the leaders as is possible. Bearing orchards may be converted to this modified system of pruning in some cases. The procedure confines potential infection to the laterals and permits removal of the infected portions without sacrificing leaders. This modified system of pruning has not been tried extensively in California, and caution should be exercised in its adoption on a large scale.

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Sprinkler OF CONTAINER

A. W. FRY

Advantages of using overhead rotating sprinklers to irrigate container plants in the nursery outweighed disadvantages in a recent trial at Sacramento. Some of the factors to be considered in each case to determine feasibility include: soil drainage, size of plants, costs of system, water needs, water quality, and evaporation.

OVERHEAD rotating sprinklers were used effectively at Sacramento to irrigate container plants grown on a wholesale nursery basis. The sprinklers were installed in an 8-foot lath house as well as in uncovered can areas. The sprinkler system was arranged so that the risers were placed along the sides of the roadways and at the end of the can beds. As near as possible, an average spacing of 30×46 ft. was used. Part-circle heads were used along the main roadways and the edges of the lath house, and full-circle heads were used at all other locations. The sprinkler heads applied four gallons per minute, operating at 50 pounds per square inch, and giving an application rate of 0.279 inch per hour. The depth of irrigation was controlled by the length of time the system was allowed to run. Nutrient solution was added to the irrigation water at each irrigation, and an excess of water over consumptive use was applied to prevent a salt buildup in the cans. All main lines and lateral lines were buried to prevent interference with