DIAGNOSIS. ETIOLOGY, EPIDEMIOLOGY. AND MANAGEMENT OF CANKER DISEASES IN DRIED PLUMS

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OBJECTIVE

1. The overall objective of this research is to determine how dried plum trees get infected by canker fungi.
2. To develop management tools to prevent or reduce such infections.

INTRODUCTION

In the last decade or so, wood-canker and branch killing of dried plum (*Prunus domestica*) and other *Prunus* species have been a major concern to farmers throughout California. Over the years in our laboratory, we have received samples from Tulare to Tehama counties with canker diseases of prunes. We have isolated from these samples *Cytospora leucostoma, Lasiodiplodia theobromae, Nattrassia mangiferae* (*Hendersonula toruloidea*), *Botryosphaeria dothidea*, other *Botryosphaeria* and *Phomopsis* species, *Paecilomyces variotii, Aspergillus niger*, and *Fusarium* species (Table 1). Although Ceratocystis canker has been reported in prunes years ago, in recent years Ceratocystis canker has not been diagnosed in prunes, although it has been found commonly in almonds in Stanislaus and Colusa Counties from samples sent to our laboratory. Ceratocystis cankers are mainly associated shaker damage due to invasion of the fresh wounds by ascospores of the pathogen.

Surprisingly, in the last decade or so, we have received a large number of samples of *Prunus* species (i.e. dried plum, peach, almond, cherry, pluots, apricots, and nectarines.) comprised mainly of trunk cankers and branch dieback symptoms. These diseases can cause significant yield losses either by killing entire trees (trunk cankers), part of the trees (branch killing), or weakening the branches and resulting in breakage. Ceratocystis and Cytospora cankers were diagnosed as major problems of dried plums in the early 1970s (Devay et al., 1962). Control approaches consist of pruning the infected parts to reduce inoculum and avoiding sunburn stress and/or shaker damage to prevent new infections. However, no work has been done to determine if pruning wounds themselves are susceptible to infection or if there are other means of infection in addition to bark damage by the tree shaker or sunburn. In addition, isolation of other canker fungi (Table 1) makes this research timely since these fungi can have different modes of infection. For instance, some fungi in the Botryosphaeriaceae family do not require a wound to infect some hosts, and others, like *Nattrassia* (new name: *Neoscytalidium dimitiatum*) has not been reported from dried plums, while *Phomopsis* has been reported in causing decay of dried plum fruit in the field before harvest (Michailides, 1987). In the past few years, severe wood cankers and branch dieback have been reported by farm advisors and growers and

confirmed by diagnostic laboratories. Most recently, a few cling peach orchards showed severe infections of their trunks with *Lasiodiplodia citricola* which is a member of the Botryosphaeriaceae (Chen et al., 2013).

No surveys have been conducted throughout various counties where dried plums are growing to determine and characterize the extent of the wood canker problems. Furthermore to make things worse, there is no new information about the old dried plum (prune) diseases, Ceratocystis and Cytospora cankers, nor is much known about the biology and epidemiology of the other canker-producing fungi on dried plum.

Some of the same species of fungi that cause cankers in crops like almond, pistachio and walnut; also attack prunes. A sample collected from a severely damaged prune orchard in Tulare County revealed fungi other than *Cytospora*. Fungi such as *Nattrassia mangiferae* or *Scytalidium* sp. that are known to infect walnuts were found in cankers of prunes. Another group of fungi isolated was *Botryosphaeria* species, which are known to cause severe blight and cankers in pistachio and almonds. The same fungi cause Botryosphaeria canker in peaches grown in North Carolina and Georgia States. These results indicate that changes in the cultural practices of orchards might have altered environmental conditions resulting in infection from these fungi. The increase in nut crop acreage may have brought these pathogens proximal to prune orchards (i.e., nut crops are frequently infected by Botryosphaeriaceae fungi). Although this is a hypothesis, the isolation of new canker pathogens from cankers of prune trees supports the contention that we are now dealing with new canker pathogens that had not been a problem to this crop in past years. A systemic survey is needed in order to characterize the incidence and importance of the canker diseases of prune and identify the pathogens causing these cankers. Orchards in the two main prune growing areas (Sacramento and South/Central/ Valleys will be sampled systematically.

PROCEDURES

This project has been delayed for a year, therefore we report general information gained from studies of similar diseases in other crops and that may be relevant to dried plum canker disease.

RESULTS OF PREVIOUS WORK

Botryosphaeria blights of woody plants have been known since the early 1900's. These pathogens attack more than 50 plant species representing more than 35 genera in more than 20 plant families that include apple, almond, avocado, citrus, grapes, olive, pistachio, peach, fig, blueberries, giant sequoia, coastal redwood, liquidambar, cedar, willow, cottonwood, fig, and other woody trees and shrubs. In California, members of the Botryosphaeriaceae fungi attack both pistachio and almond and in the last few years have been frequently isolated from walnut. These fungi have also been isolated from prunes and peaches several times in various counties. The extent of the damage these fungi can cause on prunes is not known. What is known is that in crops where these fungi have been studied, it was found that they caused serious diseases, resulting in tremendous yield losses by killing

vegetative and reproductive buds, fruit, leaves, shoots, and major branches of trees. For instance, only recently, after the canker fungi had been spread widely throughout the walnut orchards, we realized the damage these fungi can cause working their way slowly and establishing in the fruit and nut tree orchards. Results of our research relevant to dried plum will be reported in 2014 Annual Report.

REFERENCES

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Table 1. Fungi recovered from samples with canker diseases collected or submitted to our laboratory.

Year	Prune	Peach	Cherry
2006	*Cytospora leucostoma* *Phytophthora* (roots)	*Cytospora leucostoma* *Armillaria* (roots)	*Cytospora leucostoma*
2008	*Cytospora leucostoma*		*Cytospora leucostoma*
2009	*Cytospora leucostoma* (*Leucostoma sincta*) *Diplodia seriata*	*Lasiodiplodia theobromae*	*Cytospora leucostoma*
2010	*Cytospora leucostoma* *Lasiodiplodia theobromae* *Nattrassia mangiferae* *Paecilomyces variotii*, *Phoma* species		*Cytospora leucostoma*
2011	*Cytospora leucostoma*		*Cytospora leucostoma*
2012	*Cytospora leucostoma* *Fusarium* species	Bacterial canker	Bacterial canker *Botryosphaeria* sp. *Cytospora*, *Fusarium*, *P. variotii*
2013	*Cytospora leucostoma*, *Paecilomyces variotii*, *Chondrostereum purpureum*, *Botryosphaeria* spp., Foamy canker	*Cytospora leucostoma* *Lasiodiplodia citricola*	Blast (*Pseudomonas syringae*) *Cytospora leucostoma*