



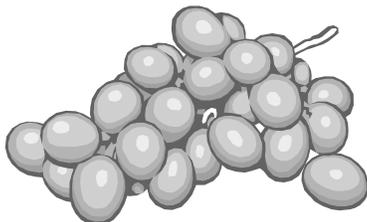
THE SCOOP

On Fruits and Nuts in Stanislaus County

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Pomology and
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Lower Limb Dieback Disease

We are noticing more dieback of lower limbs in many almond orchards this year. This disease has become quite significant in some orchards, killing a large percentage of the lower wood. Padre appears to be the most seriously affected variety, although Butte can be very bad also. Nonpareil and Carmel are affected to a lesser degree. The problem appears to occur primarily in orchards older than ten years.

Symptoms. The problem is associated with weaker, small diameter wood in the lower canopy, although shoot death sometimes extends ten feet or more from the ground. Beginning in late April, leaves on affected limbs first turn yellow, then brown as the limb collapses. Limbs may die right up to the point of attachment but the disease does not appear to enter the large wood of the scaffolds. If the bark on yellowing limbs is scraped away with a knife, you can often see brown spots underneath. These spots appear to grow together to form large dead areas which then causes the whole limb to collapse. Shoots continue to collapse throughout the summer. Sometimes darkened cankers can be seen extending deep into the middle of the branch if you cut the branch in cross section. Sometimes the cankers are wedge-shaped, sometimes they are not.

The Cause. We have surveyed several orchards from Stanislaus and Merced Counties to try to determine the cause of this problem. It clearly is not caused by excessive shading, anthracnose, *Alternaria*, or bread mold. In most surveyed orchards, two different species of fungi were consistently isolated in the lab from affected limbs. Sometimes both fungi were found on the same affected limb. One of the suspected pathogens is an unidentified species of *Phomopsis*. There are many species of *Phomopsis* that cause canker diseases in grapes, figs and other plants. *Phomopsis amygdale* was shown to be the cause of a fruit rot and associated limb dieback in a Butte County almond

U.S. Department of Agriculture, University of California, and Stanislaus County Board of Supervisors cooperating

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orchard in 1998 after an unusually wet spring. Diseases caused by *Phomopsis* species are often most severe when we have late, warm rains. *Phomopsis* was the pathogen that was isolated most often from affected limbs in our survey.

The second fungus commonly isolated from affected shoots was *Botryosphaeria dothidea*. This is the fungus that causes band canker, a fairly rare disease affecting the trunks and scaffolds of young almond trees. It is also the cause of panicle and shoot blight of pistachio, a serious disease for that industry. Recently, this fungus has been shown to cause shoot dieback in local walnut orchards. During our survey, we found this fungus sporulating on dead walnut shoots in trees and on the ground in walnut orchards next to affected almond orchards. We also found spore-producing structures in nearby cedar and redwood trees. *Botryosphaeria* fruiting bodies were rarely found on the affected almond wood. It is unclear at this time if one or both of these fungi are responsible for this lower limb dieback disease. If these fungi are involved, we don't know yet when infection is occurring.

This spring, we tried to reduce lower limb dieback in a badly affected Butte/Padre orchard by spraying Abound[®] fungicide from petal fall through June 1. Of course, we would never want to apply any fungicide that often back to back in the real world, but we were just trying to determine if the problem could be reduced with spring-time fungicide sprays. Unfortunately, even trees sprayed four times after petal fall had just as much lower limb dieback this year as the unsprayed trees. Abound[®] should have been very effective against both of these fungi. This information suggests that infection had already occurred prior to petal fall and that it may take several months for the dieback symptoms to show. We will try some fall and/or dormant treatments in the future. However, based on conversations with growers, typical dormant copper applications do not seem to make a difference.

Both fungi are fairly weak pathogens and probably only affect limbs weakened by shade and/or San Jose scale. Therefore it is important to keep scale populations low with an occasional

dormant oil application. Guidelines to determine when a San Jose scale treatment is necessary can be found at <http://ipm.ucdavis.edu> or you can give me a call. It may also be important to prune out dead limbs to reduce the amount of inoculum in the orchard.

We will continue to work on this problem and hopefully come up with some answers for next season.

Collect Nuts and Hulls at Harvest

As I am writing this, growers of Nonpareil are preparing their orchards for harvest. It is too soon to tell how much insect damage to expect this year. Yield of Nonpareil will be lower in most orchards than the past few years, which may mean higher insect damage on a percentage basis. Harvest your Nonpareils as soon as they are ready in order to reduce the chance of a late season navel orangeworm infestation.

Your pest management program for 2006 should begin with the 2005 harvest. In order to have an effective and cost efficient pest management program, you have to know which pests are causing your rejects. Be prepared to collect a few hundred nuts from each orchard so you can determine the percent damage from peach twig borer, navel orangeworm, ants and other pests. Sampling directly out of the windrows will give you much more accurate information than you will get from your handler. This will also serve as a record to compare with the grade given by the huller. Be sure to take handfuls of nuts randomly through the orchard. About half of a brown grocery bag should tell you what you need to know. You can put the bags in the refrigerator or freezer if you won't have time to crack out your almonds for a month or more. Photographs of PTB, NOW and ant damage can be found in the UC IPM Manual, the UC Almond Production Manual, or on the UC IPM website at <http://ipm.ucdavis.edu>. You are also welcome to bring samples by our office if you need further assistance identifying pest feeding damage.

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Hull Analysis. Now that you have collected nut samples from your orchard, you can send your hulls to the lab for boron analysis. Because boron accumulates in almond hulls but not in leaves, hulls are a more sensitive indicator of boron status. Stanislaus County almond orchards are notoriously low in boron, especially east of the San Joaquin River. Orchards with mild boron deficiencies will not show visible symptoms, but nut set will be reduced. If your hulls have less than 120 ppm boron, you may significantly increase your 2006 yield with a postharvest boron foliar spray this fall. Fall boron sprays temporarily replenish a transient deficiency in the dormant fruit bud. The concentration of boron in the spray is more important than the actual amount of boron applied. The general rule is 0.4 pounds of B in 100 gallons of water. That comes out to two pounds of a 21% boron product in 100 gallons of water. Foliar boron sprays will not improve the overall boron status of deficient trees. If trees are low in boron (less than 80 ppm in the hulls), larger rates of boron fertilizer must be applied to the ground. Apply 2–4 pounds of actual B (10–20 pounds of a 21% product) per acre to the soil. This must be broadcast, not applied in a concentrated band. Some growers have successfully applied boron in their herbicide strips. Be careful, excessive boron fertilization will quickly lead to toxicity.

Verticillium Wilt

This has been a particularly bad year for Verticillium wilt, especially on the west side in old row crop ground. Many second and third-leaf orchards have extensive limb death. Affected trees will have to be retrained or replaced. Even first-leaf trees are affected this year, which is pretty unusual. All *Prunus* species trees (almond, apricot, cherry, plum, peach, etc.) are susceptible.

The soil-borne fungus invades trees through the root and grows up into the water-conducting pipes (xylem) in the trunk and limbs. The fungus eventually clogs the pipes and then shoots die from lack of water. Affected limbs collapse quickly and shoot tips often turn dark and curl into a characteristic “shepherds hook”. If you cut

cross ways through an affected limb, you can often see a darkened ring. This is the area of clogged xylem vessels. Extended, cool spring weather like we had this year favors growth of the fungus which leads to more extensive problems. Once temperatures heat up in the summer, the fungus dies out in the upper part of the tree and no more shoots die. Although shoot dieback is rarely observed in almond and stonefruit trees older than five years, it is very likely that tree growth and yield will be affected even in the absence of disease symptoms. Pistachios on susceptible rootstock can have serious shoot dieback problems for the entire lifespan of the orchard.

This fungal pathogen is generally present at very low levels in most San Joaquin Valley soils. High populations of Verticillium develop in soils where susceptible crops are grown, such as tomatoes, cotton, cucurbits (melons) and strawberries. Vert can also build on weeds such as pigweed, groundsel, London rocket, nightshade and dandelion. Verticillium forms resistant spores called microsclerotia that can survive for 6-12 years in the soil.

There is no “cure” for an infected tree. If you plan to plant an orchard in ground previously planted to susceptible row crops, you should take soil samples to determine your risk of Verticillium wilt. Only sample the top twelve inches of soil because the microsclerotia are pretty shallow. Significant Verticillium wilt disease can occur in almond orchards when there are only three microsclerotia present per gram of soil. Only one microsclerotia per gram is necessary for significant problems in pistachio. Following a susceptible annual crop, there may be 60 or more microsclerotia per gram in the top foot of soil.

Solarization with clear plastic is very effective in killing Verticillium. Fumigating with chloropicrin or combinations of methyl bromide or Telone[®] that contain chloropicrin can be effective in reducing Verticillium. All peach and peach/almond hybrid rootstocks are very susceptible. Marianna 2624 plum rootstock is somewhat resistant, but probably not worth the trouble.

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Hull Rot

We are seeing a fair amount of hull rot (commonly called “bread mold”) again this year in Nonpareil and Sonora almonds. Last year I tried spraying Botran[®], a very effective fungicide against Rhizopus (but not registered on almonds) at 5% hull split and again at about 60% hull split. Even at the highest label rate, we saw no significant reduction in hull rot compared to unsprayed trees. Brent Holtz, UCCE Farm Advisor in Madera County, tried a more extensive list of fungicides than I did, including sulfur. Unfortunately, Brent was no more successful than I was in reducing hull rot. It appears that fungicide sprays during hull split are not the answer for hull rot. We probably just cannot get the material inside the splitting hull, which is where the infection is occurring. However, we know that we can make matters significantly better (or worse) through our cultural operations. Hull rot is generally worse in well-watered and excessively fertilized orchards. Growers should avoid applying nitrogen fertilizer in June and July. Growers with drip and microsprinklers should reduce their irrigation by 50% during the first three weeks of hull split (assuming the trees are well watered to begin with).

Pistachio Shortcourse

November 8 – 10, 2005

Fresno, CA

Contact JoAnn Coviello; 559-646-6500 or

Register online at: <http://fruitsandnuts.ucdavis.edu/crops/pistachio.shtml>

This course is only offered once every five years.