University of California
Agriculture and Natural Resources
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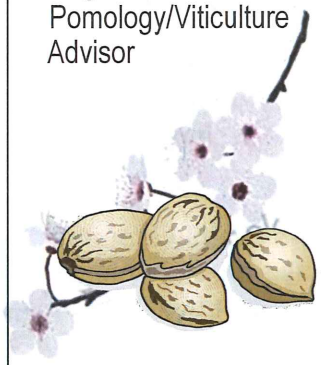
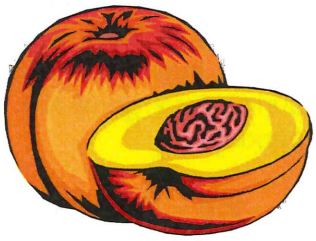
THE SCOOP

on fruits and nuts in Stanislaus County

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

Roger Duncan
Pomology/Viticulture
Advisor





2015 North San Joaquin Valley Almond Day

Sponsored by
University of California Cooperative Extension

Tuesday, February 10, 2015 8:30 a.m. - 12:00 noon

Modesto Junior College Pavilion (West Campus)
2201 Blue Gum Avenue, Modesto

2.5 Hours of Continuing Education Credit pending

3.0 Hours of CCA hours pending

7:30 Registration opens

8:30 Program begins

New Research on Navel Orangeworm Management
Frank Zalom, Professor of Entomology, UC Davis

Bee Biology and Protecting Bees During Bloom
Gordon Wardell, Bee Biologist, Paramount Farming
Bob Curtis, Associate Director of Agricultural Affairs, Almond Board

Water Management in a 4th Drought Year
David Doll, UC Cooperative Extension Advisor, Merced County

Update on Local Almond Research Trials
Roger Duncan, UC Cooperative Extension Advisor, Stanislaus County

Hull Rot, Almond Scab and Navel Orangeworm Update
Brent Holtz, UC Cooperative Extension, San Joaquin County

Biology and Management of Bacterial Spot
Jim Adaskaveg, Professor of Plant Pathology, UC Riverside

12:00 Program Concludes

MJC parking fee will be waived for Almond Day meeting attendees.

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Bacterial Spot of Almond

Jim Adaskaveg, Brent Holtz, Roger Duncan & David Doll

Bacterial spot on Fritz

Diseased mummies are an important source of the bacteria

In the spring of 2013, we reported a high incidence of bacterial spot in some North San Joaquin Valley almond orchards, especially on the 'Fritz' variety. It was also found on 'Butte', but at much lower levels. The disease has not been documented in orchards in the southern San Joaquin valley. In 2014, we verified the presence of the disease at previous and additional locations in California, although at levels much lower than in 2013.

Bacterial spot is caused by *Xanthomonas arboricola* pv. *pruni* and has also been referred to as bacteriosis, bacterial leaf spot, or bacterial shot hole. Bacterial spot occurs on leaves, twigs, and fruit of almost all stonefruit species. The pathogen commonly causes bacterial spot of peach in the eastern United States and is one of the major occaisional foliar diseases in high rainfall years. On almonds, it is a significant problem in Australia because of mid-season rain events there.

Symptoms on almond may develop on leaves and shoots, but the most obvious symptoms are on fruit. Typically, almond hull lesions start as small, watery blemishes that produce light to dark amber gumming. Lesions slowly increase in size to 1/16 to 1/4 inches in diameter during the season as the infection extends into the hull. The amber color of the gumming is important for diagnosis because this helps distinguish bacterial spot disease from the clear gum of leaf footed bug feeding injury. Infections starting early in the season can cause substantial fruit drop. Infections that reach the kernel on fruit that don't drop may cause kernel blemishes. Symptoms are usually first visible 7 to 21 days after infection, depending on temperature. Small angular lesions may develop on leaves at the leaf tip, mid-rib, or along the leaf margin. Infected leaves may prematurely drop. Leaves are most susceptible before becoming fully expanded. Twig lesions may develop on green shoots. These lesions are not obvious on almond in California.

Epidemiology. The pathogen is readily isolated from overwintering symptomatic fruit mummies well into the spring season, indicating their role as primary inoculum sources during infection periods. Infections appear to initiate on developing fruit during or immediately after shuck split under favorable conditions. The bacterial pathogen needs splashing water to spread and wet conditions to infect. On other crops in the eastern United States, high winds during rain generally cause more severe infection periods.

Management. Strains of the pathogen collected in California almonds and evaluated to date were all copper-sensitive. Field trials on management of the disease were conducted in the North San Joaquin Valley and included dormant and in-season applications. Late-dormant treatments (late January) with copper, copper-mancozeb, or other combinations significantly reduced the incidence of disease. Early dormant treatments that were applied in mid-November or mid-December 2013 did not reduce disease in spring 2014. In-season treatments were most effective when timed around rain events and before temperatures started to increase above 77ºF (25°C) in the springtime. No copper phytotoxicity was observed after four applications when copper rates were successively reduced

from 1.0 lb. to 0.25 lb of metallic copper equivalent/acre.

All copper products significantly reduced disease. Among products evaluated, Kocide 3000®, Badge X2®, Champ-Ion^{2+}®, and Cuprofix® were more effective than Cueva®. A single delayed dormant (copper-mancozeb) and a single in-season treatment (copper alone or copper + mancozeb) in mid-March timed before rainfall and warm conditions provided excellent control and was equivalent to five applications (delayed dormant and four applications in 10- to 14-day intervals starting at full bloom) using the same chemicals.

Other experimental treatments with high efficacy included Kasumin-Manzate®, Kasumin-Captan®, Kocide-Tanos®, Mycoshield/Fireline® (oxytetracycline; federally registered on peach for this disease), Serenade Optiva®, and the new bacterial membrane disruptor Ceragenin. Kasugamycin® was accepted into the IR-4 program in 2014 for registration on almonds and peaches in the United States.

Summary. Bacterial spot is a new bacterial disease of almond in California that is caused by *Xanthomonas arboricola* pv. *pruni*. The disease mainly occurs on cultivar 'Fritz' when weather conditions are conducive for disease and most commonly develops on fruit. Based on our first year of research, the pathogen primarily overwinters on diseased mummified fruit and infection periods are during warm, wet conditions during the spring as fruit and leaves develop. Our results from this past season indicate that the most effective management program for bacterial spot includes a delayed dormant (late January) bactericide (e.g., copper-mancozeb) application to reduce inoculum and at least one in-season application around rainfall events and rising temperatures (e.g., mid- to late March) to prevent new infections. In a wet spring, additional in-season applications may be needed to protect developing fruit. Most fixed-copper products and copper-mancozeb treatments are highly effective. To validate this, field trials will be conducted again in the coming season.

Dormant Sprays not Reducing Lower Limb Dieback

Lower limb dieback (LLDB) continues to be a problem in some area almond orchards, especially in the Padre and Butte varieties. Beginning in late April or early May, leaves on affected lower limbs begin to yellow and then turn brown. Eventually, entire limbs die and by late summer, significant death of lower canopy wood can occur. Early studies indicated that species of Botryosphaeria and Phomopsis fungi played a significant role in this problem, but later efforts indicated that LLDB may not be a disease at all. Multiple spring fungicide applications did not reduce limb death. The bottom line is that LLDB is still not well understood although a compromised root system, especially from overly wet soils in the spring, may contribute to the problem.

Some people have wondered if the industry's move away from dormant sprays may have led to increased LLDB. To test this theory, we started a field trial two years ago in two young Butte & Padre orchards. The six and seven-year-old orchards, which only had very minor signs of LLDB at the time, were divided up like a checkerboard; some areas receiving a dormant spray of 12 pounds of Kocide 2000® (4.2 lb. metallic copper equivalent) + oil in 100 gallons of water and some areas were not dormant sprayed. In 2014, LLDB symptoms were substantial in these blocks. Unfortunately there was no visible difference between areas dormant sprayed for two consecutive years and areas that were not dormant sprayed. We will continue with this project for at least a third year to see if there are any long-term effects of dormant copper sprays on LLDB. Thanks to John Starn for cooperating in this project.

Tree & Vine IPM Breakfast Meetings

will be continued on the 1st & 3rd Wednesday
of the month from March – June
Old Mill Café
600 9th Street, Modesto, CA
7: a.m.—8:00 a.m.
1.0 Hr. Continuing Education
First meeting begins on Wed., March 4, 2015

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Inside the Scoop:

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