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ALMOND BOARD OF
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Almond Board of California
1996 Comprehensive Report
February 14, 1997

Project No: 96-YC Investigations of Yellow Canopy Disorders

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Objectives:

To determine graft-transmissibility of two yellow canopy syndromes in Wood Colony and Padre almonds.

To continue surveys of affected orchards and determine incidence of newly affected trees.

Work accomplished to date:

Fresno County. During August 1995, Farm Advisor Mark Freeman and I made a farm visit of two almond blocks planted in 1994 located on the west side of the valley. Block 17 was 40 acres in size and block 18, 20 acres. Both were planted to 1/3 each of Butte, Livingston, and Padre/Hansen rootstock. But, due to a shortage of Padre/Hansen trees, extra rows of Livingston and Butte/Hansen trees were planted in every third row in block 18 and in a half row in block 17. Then at or near budbreak, Padre scions were whip-grafted onto the Livingston and Butte trees, thereby producing Padre trees with an interstem of Livingston or Butte. All trees grew well in 1994 (first-leaf). However, by early summer 1995 (second-leaf) every interstem tree exhibited an off-colored canopy and drooped leaves. By mid-summer, 715 affected Padre trees began to defoliate, followed by tree death well in advance of dormancy. In block 18, only 19 Padre trees survived. [Note. A close examination of the surviving Padre trees on October 24, 1996 revealed that these were all nursery budded trees; i.e., without the Livingston or Butte interstems.]

In August 1995, young leaves/shoots and budwood were collected from 6 symptomatic and 3 "healthy" Padre trees (from Livingston interstem trees) in block 18 and 4 symptomatic Padres (from Butte interstem trees) from the half row and 2 healthy Padre from a different row in block 17. The tender leaves and shoots were assayed for ilarviruses and for phytoplasma; they were negative. The budwood collections were T-budded onto healthy Carmel/Nemaguard trees at UCD on August 30, 1995 and during the dormant season

pruned to the top bud in an effort to force shoot growth in 1996. The bud-grafts were examined on August 30, 1996 and all developing Padre shoots (irrespective of source) as well as the host Carmel trees appeared normal.

In 1996 also, nursery produced Padre/Hansen trees were purchased from the same supplier of trees used to plant blocks 17 and 18 (see above) and planted at UCD. Then, a collection of scionwood from the original 19 surviving Padre/Hansen trees in block 18 and from another block, where pollinizer limbs of Padre developed by top-working onto mature trees in 1994, were made (the Padre scionwood was the same collection as those used to make the Padre interstem trees in blocks 17 and 18). The Padre collections were T-budded on June 18, 1996 and the insert buds forced to grow. Developing shoots were read on October 22, 1996 and all appeared normal.

Due to the fact that death of the Padre interstem trees occurred in the second season after grafting, the Padre shoots developing on bud-grafted trees of Carmel and Padre at UCD need to be examined in 1997. If a graft-transmissible agent is involved, disease symptoms should become evident after two years incubation.

In 1996, further developments in the almond/Hansen trees in block 18 included: All first-leaf replants of Padre/Hansen (>700 trees) were growing normally. However, now every third row of Butte/Hansen was exhibiting symptoms similar to the Padre/interstem trees. Unlike the Padre/interstem trees, the affected Butte trees had not died prior to dormancy.

During the summer of 1996, the grower had hired a consultant to investigate the problem. On October 23, 1996, all interested parties met in the orchard to review and discuss our findings and observations. Based on our preliminary data, I concluded to the group that the disorder affecting Padre/interstem and now the Butte trees did not appear to be associated with a biotic agent and that some onsite (abiotic) factor should be considered.

Working in a collaborative effort, we (group comprised of the grower, the nursery supplier, the hired consultant, and me) have jointly agreed to an experiment to be implemented this spring. The treatments will include grafting diseased and healthy Butte scion buds on reciprocal trees of diseased and healthy Butte trees (onsite and in a healthy orchard). In another experiment, Mark Freeman is developing a project to determine if boron toxicity may be involved.

San Joaquin County. Yellowed canopied trees involved mature trees of Wood Colony almond/peach rootstock. In 1995, a collection of diseased and healthy shoots/leaves and budwood was made and scionbuds graft-inoculated on trees of Nonpareil almond/Nemaguard peach, Thompson almond/Marianna 2624, and Fay Elberta

peach/Nemaguard. Also, extracts prepared from the shoot/leaf tissues were assayed for ilarviruses and phytoplasma; none of these potential pathogens was detected. At harvest, nuts were sampled and kernels examined for shriveling (indicating infection by peach yellow leafroll phytoplasma); all kernels appeared normal.

The Wood Colony orchard was resurveyed in 1996 and 2 trees now exhibited the yellow canopy symptoms observed the year before. The others were in remission. A more detailed examination of both trees revealed bark cankers with margins extending downward from the tree crotch. Immediately adjacent to all known affected tree sites was a sprinkler and during an irrigation cycle we observed water being projected into the tree crotch. These preliminary findings suggest that the yellow canopy condition in Wood Colony may be related to prolong wetting of bark tissues and water-borne pathogens such as *Phytophthora* spp., and does not involve a viral or a graft-transmissible agent.

In partial agreement with the above, all graft-inoculated indicator trees appeared normal a year later. However, completion of the test require a second reading, i.e., to span a two-year incubation period.