

**Project No. 93-ZG4 - Four Projects on Fungal Disease**

- 1. Relationship or Irrigation and N Fertilization to Occurrence of Hull Rot.**
- 2. Wound Treatments to Control Ceratocystis Canker.**
- 3. Bloom Disease Control.**
- 4. Effect of Shot Hole Infection on Almond Fruit.**

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- Objectives:**
1. Relationship of Irrigation Cut-off date to Occurrence of Hull Rot:
    - a. Determine the relationship of various irrigation and nitrogen fertilization regimes on natural occurrence of hull rot.
    - b. Observe the effect of these same irrigation and fertilization practices on loosening of the hull.
    - c. Determine the effects of the various irrigation and nitrogen fertilization regimes on infection of fruit inoculated with *R. stolonifer* and *M. fructicola*.
  2. Wound Treatments to Control Ceratocystis Canker:
    - a. To test several wound dressing materials for prevention and control of Ceratocystis infections.
    - b. To evaluate several wound dressing materials for wound healing characteristics.
    - c. To determine the relationship of time between wounding and infection and infection and treatment on control of current season infections.
    - d. To test effectiveness of surgery and topical treatment on established cankers.

### 3. Bloom Disease Control:

- a. Evaluate several treatment programs for control of bloom diseases and effects on yield.
- b. Test various fungicides and application timings for control of almond scab.

### 4. Effect of Shot Hole Infection on Almond Fruit:

- a. Determine the effect of repeated infection by the shot hole fungus on drop of almond fruit at early and later stages of development.
- b. Determine the effects, if any, on nut size and quality of fruit sustaining heavy infection during development.

## Results:

### 1. Relationship of Irrigation and N Fertilization to Occurrence of Hull Rot.

**Irrigation:** The experiments were conducted in the deficit irrigation trial managed by Dr. Dave Goldhamer located in a commercial orchard in Kern County. Fruit with split but fully attached hulls and located next to healthy leaves were inoculated on 16 July (early hull split) and 27 July (full hull split) with suspensions of *Monilina fructicola*, *Rhizopus stolonifer* or not inoculated. On 3 August the leaves next to each test fruit were identified as either dead or healthy, the fruit were collected and the hulls examined for lesions and fungal growth. Generally, less hull rot occurred in treatments which received less water. Treatments irrigated with a constant reduced amount of water (85 or 70 percent of full ETc all season) had more hull rot than did treatments which received similar overall amounts of water but were stressed (50% ETc) only during summer. Similar relationships were found for natural infection counts of strikes per tree and inches dead wood. Short -term limited stress (reduced ETc) was more effective in reduction of hull rot damage than was constant mild stress. Inoculation with *M. fructicola* resulted in greater percent hull rot than with *R. stolonifer*. Greater amounts of water were accompanied by slower rates of hull loosening.

**Nitrogen:** The experiments were conducted in the two trials managed by Dr. Steve Weinbaum in commercial orchards in Stanislaus County. Fruit were inoculated then leaves and fruit evaluated for leaf death, hull lesion development and fungal growth as described above. Higher percentages leaf death were found in the higher (500 and 250) than in the lower (125 and control) nitrogen treatments. Similar responses were counted in natural infection counts. Inoculation with *M. fructicola* resulted in greater percent hull rot than with *R. stolonifer*. Higher levels of nitrogen were accompanied by slower rates of hull loosening.

Brown rot infection was evaluated in spring in one nitrogen trial orchard. Severity of brown rot decreased with decreasing amounts of applied nitrogen in both Nonpareil and Carmel trees.

## **2. Wound treatments to Control Ceratocystis Canker.**

The experiments were conducted on Mission almond trees grown at Kearney Agricultural Center. Ceratocystis cankers had developed on main scaffolds as a result of inoculations made in 1990. Infected bark at these cankers were removed using a draw knife to make deep cuts which removed the infected bark and part of the wood, shallow cuts that left part of the bark intact or no surgery. Cankers with each of these surgical treatments were treated immediately with Nectec, Enzone, Kocide plus boiled linseed oil, or lanolin. Surgery and treatments were applied 26 and 27 January 1993. No differences were found among treatments in cessation of canker growth or severity of infection.

## **3. Bloom Disease Control.**

Various registered materials were tested on Carmel trees in commercial orchards in Kern and Merced Counties and on Mission trees at Kearney Agricultural Center. Scab was best controlled by treatments that included Benlate, Captan was more effective than Ziram, Maneb was comparable to Captan and Rovral was not effective. An application at 2 weeks after petal fall was more effective than treatments made at 5, 8 or 11 weeks after petal fall. Dormant Kocide did not improve control over that attained by post petal fall treatments alone.

Brown rot data were collected in the experiments at Merced and Kearney Agricultural Center. Brown rot control was improved with application at two weeks after petal fall where no bloom applications had been made. The importance of post bloom treatments for brown rot control need further study.

The yield trial was inadvertently oversprayed thus yield data were not collected. Cumulative data on shot hole over the five years of collection indicate a steady increase in disease incidence in the nontreated control trees. In 1993, when all trees received the same treatment in spring, shot hole nonetheless was greater on trees that had been the non treated control than on those that had been treated the previous four years.

## **4. Effect of Shot Hole on Almond Fruit.**

High inoculum levels applied to almond fruit from the time they emerge from the jacket until approximately 25 mm in length results in fruit drop. Older larger fruit do not drop but develop shot hole lesions.

Nuts were not evaluated at harvest for effects of shot hole on quality because crows consumed the nuts from the entire experiment.