Almond Culture and Orchard Management

Project No. 00-RB-o0

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Objectives

1. Wood chipping to reduce air pollution and build soil organic matter.
2. Survival and growth of fall transplanted potted almond nursery trees compared to spring transplanted bareroot trees.
3. Controlling alternate bearing in almonds with foliarly applied giberellic acid.
4. A comparison of the responses of peach twig borer, San Jose scale and the scale parasitoid, *encarsia perniciosi* to dormant sprays in almond.
5. Slip Plow Tillage Effects in Almonds
6. Correcting zinc deficiencies in young almond trees.

Results/Discussion

1. Wood Chipping to Reduce Air Pollution and Build Soil Organic Matter — Brent A. Holtz, Madera County, and Michael McKenry, KAC

The wood chipping of almond prunings instead of burning as a method to reduce air pollution and return organic matter to soils could become an important orchard practice for almond growers. Wood chipping could provide an alternative to burning which would not contribute to PM-10 pollution while at the same time add valuable organic matter to soils. The success of wood chipping will depend on whether the chips decompose quickly and are incorporated into the soil, or whether they are harvested with nuts and increase foreign material and industrial waste.

Basidiomycetes, specifically wood-rotting fungi, which produced basidiocarps, (mushrooms) were surveyed in orchard plots where orchard prunings had been chipped and then compared to orchard plots where prunings were neither chipped nor shredded.

The fungal species were identified down to Genus. *Panaeolus, Marasmius*, and *Lycoperdon* were the basiciomycetes found in the greatest number during surveys on January 28, and Feb 2, 2000. Other common Genera observed included *Caprinus* and *Chlorophyllum*. In all instances the number of fungi observed were significantly greater in the wood chipped plots when compared to the non-wood chipped plots.

The project was expanded to include a replicated experiment where wood chips were added to 35-gallon containers with a single almond tree per container. The experiment also consisted of containers with the same soil type but without the woodchips. This experiment allowed us to begin a quantitative examination of the effect of wood chips on soil borne organisms living within the root zone (fungi, bacteria, and nematodes) and to study the effects of the woodchips on tree growth and nutrient availability. Wood chip concentrations were artificially increased in order to observe potential benefits or risks. Within the woodchip treatments, fifty percent of the soil volume contained wood chips. Before implementing treatments the soil used was analyzed for nematodes, and will continue to be monitored annually.

Tissue analysis was performed on leaf petioles to determine whether the high quantities of wood chips were affecting nutrient availability. From the trees growing with the wood chips the percent nitrogen, zinc, and manganese were significantly decreased, while phosphorus was the only nutrient which significantly increased. Leaf potassium, sodium, boron, calcium, magnesium, iron, and copper had no significant differences between treatments. Tree shoot growth was also measured; trees grown with the wood chips had significantly less shoot growth when compared to those grown without the wood chips.

2. Survival and Growth of Fall Transplanted Potted Almond Nursery Trees Compared to Spring Transplanted Bareroot Trees — Wilbur Reil, U.C. Farm Advisor in Yolo and Solano Counties

Almond trees on peach/almond hybrid rootstock have been difficult to transplant and grow if the bareroot trees are planted in mid to late spring from nursery trees stored in cold storage. Death losses in some cases have been over 20%. One nursery currently has been growing nursery trees in containers and selling the potted grafted trees for transplanting at any time of the year. The objective of this trial is to evaluate potted tree transplants planted in the orchard in the fall compared to spring planted bareroot nursery trees. The trial was conducted on class 1 silty clay loam in Yolo County on previously planted almond ground. The experiment is a randomized complete block design of five replicates of four trees per replicate. There are two treatments (potted vs. bareroot trees) and three varieties (Nonpareil, Sonora, and Butte). The five-month-old growing potted trees were planted on September 18, 1998 and the bareroot 5/8-inch dormant trees were planted in late January 1999. All trees were headed at 36 to 38 inches.

Average trunk cross sectional area was measured in October 2000. The trees, planted as potted trees, were statistically larger in trunk diameter than trees planted as bareroot. In 1999 the trees planted as potted trees were also statistically larger in trunk diameter than trees planted bareroot. All trees continue to grow well and visually appear to be equal. The average trunk cross sectional area was 63.3 square centimeters for trees planted as potted trees and 57.9 square centimeters for trees planted as bareroot trees.

On an adjoining block the grower planted several rows of potted nursery trees and also several rows of bareroot trees that had been in cold storage approximately 3 weeks until they were planted in mid March. Survival was observed on a random 200 trees in each section. While it is not a replicated trial the observation showed that 4 trees out of 200 died in the bareroot section (2%) and no trees died in the potted tree section.

3. Controlling Alternate Bearing in Almonds with Foliarly Applied Giberellic Acid — William H. Krueger, University of California Cooperative Extension, Glenn County

Certain almond cultivars such as Price can be extremely alternate bearing with heavy crops leading to limited bloom and therefore reduced pollenizer value and crop in the "off" year. Giberellic Acid (GA) is registered for controlling alternate bearing on certain stone fruits such as prunes. In this case GA is applied during the summer of the "off" year prior to flower bud differentiation to reduce flowering and therefore cropping during the coming "on" year, resulting in disruption of the alternate bearing cycle.

Objective

Evaluate the use of foliarly applied GA for the disruption of alternate bearing in almond.

Initial GA treatments applied on 7/3 or 8/6 in 1998 to "off " year Price trees showed no differences in 1998 yield or 1999-bloom density (flowers/ cm of shoot growth). Because we felt that treatments may have been initiated too late in 1998 (after flower bud initiation) 1999 treatments were applied on 6/15, 6/29 and 7/12 to fifth leaf Sonora trees which had lost their crop to frost. In 2000 no differences were seen in bloom density but leaf buds/ cm of shoot growth were significantly greater for the first treatment timing only. No differences were recorded for the 2000 yield. Again in 2000 treatments were applied to "off" year Price trees beginning even earlier, 5/ 25, 6/9 and 6/23. No significant differences were noted for the 2000 yield but the lowest yields corresponded to the highest GA treatments, particularly for the first two treatment timings. No phytotoxicity was noted for any of the treatments. Bloom density and yield data will be collected in 2001 with the hope that the treatments will show a reduction in flower density and yield which will lead to the disruption of the alternate bearing cycle.

In all three years of the experiment treatments were applied with a handgun sprayer to 5 single-tree replicates arranged in a randomized complete block. In 1998 and 2000 concentrations of 25, 50 and 100 grams ai/ac were used. In 1999 the single concentration of 48 grams ai/ac was used. In 1998 treatments were applied in 100 gpa and in 1999 and 2000, at the recommendation of the manufacturer, 200 gpa was used. Yield is determined by harvesting individual trees and bloom density is determined by counting flowers per 4, 30 cm shoots per tree. In the 1999 trial leaf buds for the same shoots were also counted. In 1999 yield data was not collected from the 1998 experiment because bloom data indicated no differences between treatments. Yield was not collected in 1999 from the 1999 treatments because the crop was lost to frost. Data is analyzed for significant differences at the 5% level using Fischer's least significant difference test.

4. A Comparison of the Responses of Peach Twig Borer, San Jose Scale and the Scale Parasitoid, *ENCARSIA* Perniciosi to Dormant Sprays in Almond — Lonnie C. Hendricks, UC Farm Advisor in Merced County

Dormant sprays of oil plus insecticide can adversely impact beneficial arthropods, which can possibly lead to increased problems with San Jose scale (SJS) and web-spinning summer mites. This experiment was conducted to test the response of PTB, SJS, the scale parasitoid *Encarsia perniciosi,* and summer mites to several dormant spray combinations.

Mature almonds were sprayed at 100 gpa in late January 2000 with the following combinations:

1) Diazinon 4EC @ 2 qt/ac + supreme oil @ 5 gpa + 8 # Kocide 101
2) Success® 2SC @ 6 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101
3) Asana® XL @ 10 oz/ac + supreme oil @ 5 gpa + 8 # Kocide 101
4) Oil-only check with supreme oil @ 5 gpa + 8 # Kocide 101
5) Untreated check

Results

PTB- In 1998 all treatments, and in 1999 the Asana® treatment reduced first flight PTB catches in pheromone traps by 50% to 60%. In year 2000 no reduction of catches was seen due to dormant treatments. Nut quality evaluations of windrow samples will be completed in October.

San Jose Scale and *Encarsia* insecticide treatments in 2000 had no clear effect on SJS male counts in pheromone traps in the small 1st flight in March, nor on the larger August-September flight. As in past years, trap counts of *Encarsia* **perniciosi** were reduced in the April flight period by the Asana® dormant spray, and total *Encarsia* numbers for the season were lowest in the Asana® treatment. A small number of *Encarsia* were trapped in May-June but very few were found after June in any treatment or check.

Two-spotted spider mites- Mite levels were low until July with no difference in mite numbers between treatments. In July the 2-spotted mites increased and the grower sprayed a low rate of Omite to the entire orchard. Mite levels then remained low through harvest. In three years of the dormant spray tests in this orchard we have not seen a mite response to dormant sprays.

Conclusions

PTB trap catches in the first flight period are depressed by the dormant sprays in some years, and Asana® is usually the most active. SJS and *Encarsia* catches in the first flight can be reduced by dormant sprays, especially Asana®, and season-long catches of *Encarsia* are generally reduced most by Asana®. None of the dormant sprays have clearly increased the summer mite problem. No dormant treatments have demonstrated a clear benefit in controlling PTB, SJS or NOW in this orchard.

Many thanks to our cooperator David Arakelian at Arakelian Farms in Livingston.

5. Slip Plow Tillage Effects in Almonds — John P. Edstrom, UCCE Farm Advisor

Expansion of orchard plantings in California has exhausted the supply of prime orchard ground forcing new plantings onto poorer soils. These are often characterized by stratified layers of clay, hardpan or gravel and shallow topsoil.

To overcome soil limitations, substantial new almond acreage has been established using deep tillage slip plows at considerable expense - $300-500/acre. At the same time, adoption of micro-irrigation has allowed growers to supply tree roots with a more optimal and continuous supply of moisture. Soil physical characteristics have to some extent been overcome by the use of micro irrigation, especially under close tree spacing.

A large scale field trial at the Nickels Soil Lab in Arbuckle is evaluating the effects of slip plow soil modification on three varieties of almonds: 'Nonpareil', 'Carmel' and 'Aldrich' planted in 1997 at 16' X 22'. Prior to planting, replicated areas of this 20-acre block received a commercial slip operation on a 10-foot grid to a depth of 6 feet in a north/south direction and with a diagonal pass (SE-NW) to a 5 ft. depth. The planting receives irrigation via micro sprinklers. Trees are planted to Lovell rootstock.

Results

Tree performance for 'Nonpareil' between slipped and non-slipped areas were evaluated by measuring tree height and trunk size, and by determining crop yield. This year's data represents the first commercial harvest. Yield data shows no statistical difference between slip and non-slip areas, 7.6 lbs./tree vs. 7.2 lbs./tree respectively. Measurements taken 10/2000 (3 years + 7 months after planting) reveal no differences in either trunk circumference or tree height. To date there are no detectable differences between trees planted in slip plowed and non-slip areas.

6. Correcting Zinc Deficiencies in Young Almond Trees — Mario Viveros, UC Farm Advisor, Kern County

A just completed zinc spray experiment in young almond trees showed zinc deficiencies can be corrected with a single zinc spray application in the spring. Multiple applications (spring-summer, spring-summer-fall, and spring-summer-fall-winter) did not increase the zinc levels in the leaf tissue. This experiment suggests one application is needed to correct zinc deficiency symptoms. The purpose of a new experiment is to determine when is the best time to apply a zinc spray.

An experiment was established in a one-year-old orchard with the following zinc spray treatments: spring, summer, fall, spring-summer-fall-winter and control. Each treatment is replicated five times. There are five trees per plot and leaf samples are being taken from the three middle trees in each plot. There will be two forms of zinc used for this experiment. The spring and summer spray application will done using zinc chelate and the fall and winter will be done using basic zinc sulfate.

A pre-treatment leaf sample was taken and sent to our laboratory at UC Davis. To this date, the spring and summer treatments have been applied and the fall and winter sprays will be applied at the proper time. There is no data to report at this time since we have not applied all of the zinc application treatments.