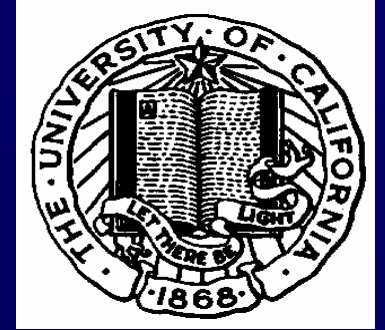




Environmentally Responsible Almond Pest Management

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Almond Pest Management

Insects & Mites

Primary

- Naval Orangeworm
- Peach Twig Borer
- San Jose Scale
- Mites
- Ants

Secondary

- Oblique-banded leafroller
- peach tree borer
- plant bugs
- leaf hoppers

“Treat your trees every year for peach twig borer with a dormant spray of oil and organophosphate insecticide.”

Integrated Pest Management for Almonds

University of California, Integrated Pest Management Program
1985

Impetus for finding “alternative”, “reduced risk”, or “environmentally responsible” practices

- Food Quality Protection Act
- Pesticide residues in waterways of the state
- Farm worker safety
- Pesticide resistance
- Economics



Developing a Pest Management Program

- Begin developing your pest management plan at the previous harvest.
- Grower should ask for detailed analysis of rejects from processor.
- Grower and/or PCA should collect 200 nut samples from windrows.
- Learn to identify damage.

Developing a Pest Management Program

- You can't target a pest if you don't know it is causing your problem.
- Understanding lifecycle of pest important
 - know it's weak spot.
- Understand economic threshold.
- Personal threshold is often different than economic threshold.

PTB Feeding



NOW Feeding



**Know Your
Rejects!**

Ant Feeding



Should I Dormant Spray?

- Decision to dormant spray should be based on need to control San Jose scale
- Sample spurs in December for scale decision

San Jose scale



Red 'halos' caused by toxin of San Jose Scale



San Jose Scale

- Mostly a problem in Southern San Joaquin Valley
- Not normally an issue in North S.J. Valley unless using in-season OP & no dormant spray
- Inject toxin at feeding sight, killing tissue
- Lower shoots turn yellow, then die
- Overwinter as juvenile (black cap stage)

San Jose Scale Management

- In NSJV, management means “don’t mess it up”.
- Scale is usually controlled through natural enemies.
- Monitor in late fall to determine if need to treat.
- Easiest to find scale in prunings from tree tops.

Monitoring San Jose Scale

- Collect spurs or small green shoots in fall.
- Infestation of about 10% triggers treatment.
- Moderate levels can be controlled with dormant oil spray (5-6 gallons) alone.
- Extremely high numbers require dormant spray with oil plus an OP or Esteem.
- Pyrethroids do not control scale
- Delayed dormant is best timing

Table 3. Dormant treatment decision table based on percentage infested spurs*

Pest	Percentage infested spurs	Threshold
European fruit lecanium	24 % or fewer	No spray
	Over 25 %	Oil only
Overwintering mite eggs†	20 % or fewer	No spray
	Over 20 %	Oil only
San Jose scale	Below 5%	No spray
	5 to 10%	Oil at 4 to 6 gals/acre (37 to 56 L/ha)
	Over 10 to 60%	Oil at 6 gals/acre (56 L/ha)
	Over 60%	Oil with insecticide (see tables 1 and 2)

* Complete description of sampling method and sampling form can be found in UC IPM Pest Management Guidelines: Almond.

† Oil works best closer to delayed dormant timing or on warmer days when eggs are respiring. Dormant oil by itself does not provide adequate control for European red mites in Kern County.

Peach Twig Borer



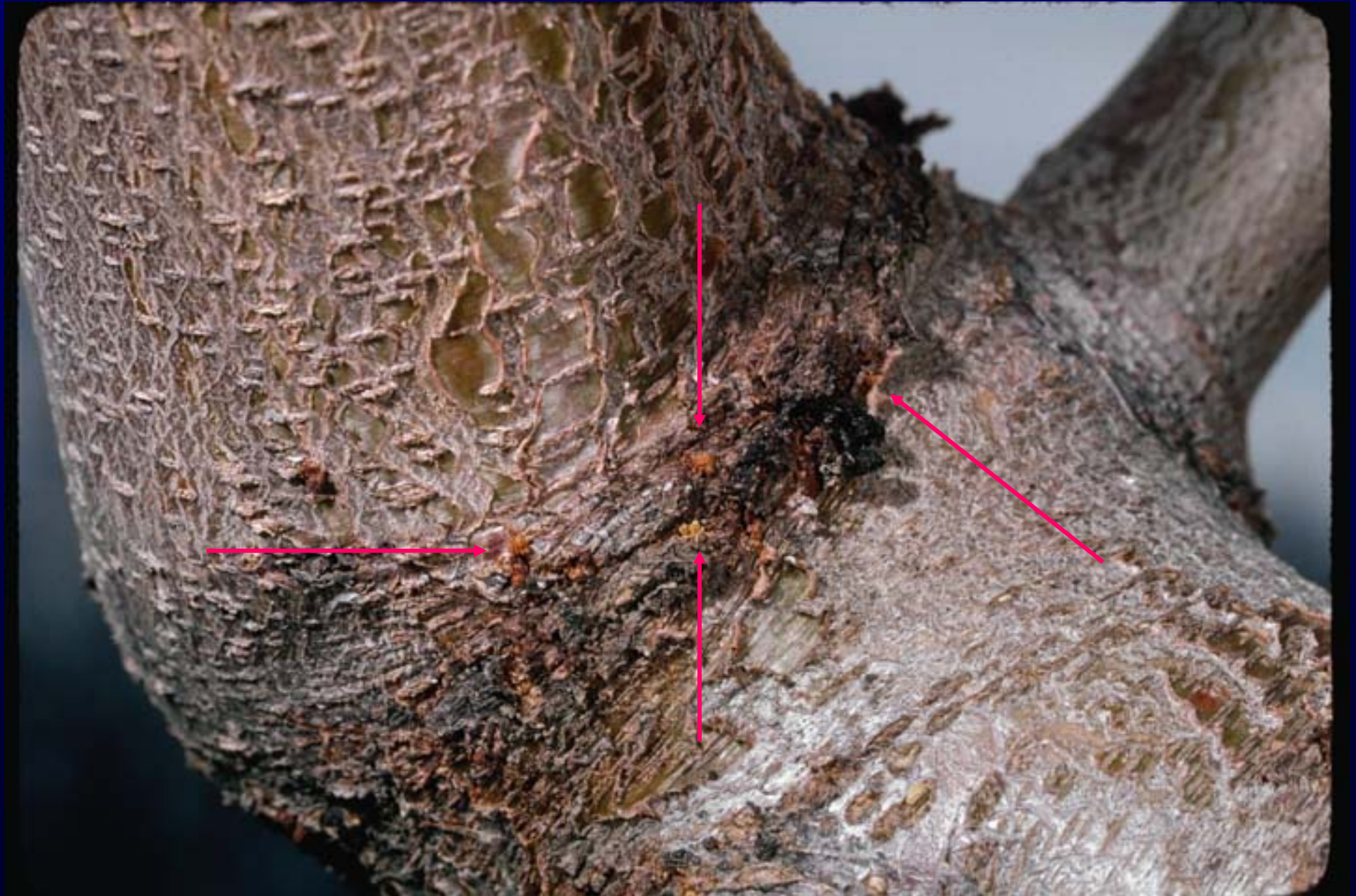
Peach Twig Borer

- May be as important as NOW
- Most feed in shoots but some may get into nuts
- Nuts damaged by PTB are preferred by NOW

Peach Twig Borer - Lifecycle

- Overwinter as larvae in wood (in hibernacula).
- Emerge during bloom, feed on buds & leaves, tunnel into shoot.
- First generation larvae hatch in late May (May spray 400 - 500 DD after biofix).
- Feed on shoots or green nuts - attractive to NOW.

PTB Hibernacula



Peach Twig Borer - Control

- Dormant Spray
 - Kills overwintering larvae
 - Becoming more highly regulated
- Bloom spray(s) - preferred time
 - Can be just as effective as dormant spray
 - Must time sprays with emergence of larvae
- May spray - not necessary if dormant or bloom spray
 - Must time for egg hatch using pheromone traps and DD model
 - Disruptive to beneficial insects (scale)

Navel Orangeworm

Navel Orangeworm Adult



Navel Orangeworm - Lifecycle

- Overwinter as larvae in mummies (weak spot).
- First flight moths lay eggs on mummies again in April - May.
- Second flight (July) lays eggs on mummies or PTB damaged hulls (early) or splitting hulls (later).
- Cannot enter varieties with well sealed shells.
- Third flight offspring (August or Sept.) may hatch early enough to infest late harvested Nonpareil - overwintering generation.

Mummies harbor NOW



- Egg traps can help time NOW sprays



Navel Orangeworm - Control

- Winter Sanitation!!
 - Remove mummies (less than 2 per tree)
 - destroy
- Hull Split Spray
 - at best around 50% effective
 - may get better control if bracket spray
- Dormant Sprays do not Control NOW!

Ant Species Damaging to Almonds



Pavement Ant



Southern Fire Ant

Not all ants are bad



California Gray Ant

Ants - Control

- Monitor for colonies
 - Monitor in May - June
 - Almond or hot dog traps give a clue
 - Counting colonies is best
- Treat if monitoring shows it is necessary
 - Lorsban
 - Baits

Ant Damage as Related to Colony Density

No. of Colonies per 5000 ft ²	Days Nuts are on Ground				
	4	7	10	14	21
15	0.9%	1.8%	2.1%	3.1%	4.9%
45	1.4	2.3	3.2	4.7	7.0
185	2.0	3.6	5.0	7.0	11.1

Suggestions for Reduced Risk Almond Pest Management

- **Dormant Spray**
 - Only if fall monitoring shows it is necessary for scale.
 - Probably not necessary in our area more than once every 3, 4, 5 years? Never in some orchards??
 - Six gallons of oil alone unless scale has gotten away from you.
- **Winter mummy removal and destruction.**
 - Fewer than 2 mummies per tree
 - Watch for mummies in limb crotches and herbicide strips

Suggestions for Reduced Risk Almond Pest Management

- **Bloom-time spray (tank mix with fungicides)**
 - Use Success, Insect Growth Regulators, Bt
 - Base need on orchard PTB damage history
- **In season sprays (May spray, hull split spray)**
 - We do not have good tools to predict necessity of sprays
 - Consider past insect reject levels in each orchard
 - Shoot tip strikes on replants may be indicator for PTB sprays
 - Good winter sanitation may eliminate need for hull split spray.
 - Be careful of in-season OPs and no dormant spray

Suggestions for Reduced Risk Almond Pest Management

- **Ants**

- Monitor ant colonies:
 - Count colonies in April or May
 - Use hot dog or almond baiting technique
 - Use ant bait materials 4-7 weeks before harvest

- **Mites**

- Monitor mites using presence / absence technique.
- Apply miticide only if monitoring shows it is necessary.
- Consider treating edges instead of whole field.
- Tolerate some mite damage - your trees do.

The key is monitoring and understanding (trusting) economic thresholds

- You must know which insects are present / causing problems before you can properly treat them.
- Ask for detailed analysis of rejects.
- Better yet, take samples from windrows.



Seasonal Guide to Environmentally Responsible Pest Management Practices in Almonds



DORMANT PERIOD

Winter Sanitation to Reduce Navel Orangeworm Infestation

- ◆ Winter sanitation is the most effective control method for navel orangeworm.
- ◆ Count mummy nuts in 20 trees per block by January 15. Remove mummy nuts to fewer than 2 per tree before February 1.
- ◆ Make certain that overwintering mummy nuts with navel orangeworm inside have been destroyed by March 15, either from rotting in wet weather or from flail mowing. Because of low rainfall levels in the San Joaquin Valley, mummies there must be removed from herbicide strips and destroyed by flail mowing.

Dormant Sprays

What does a dormant oil spray control?

- ◆ Overwintering European red mite and brown almond mite eggs. These two species are much less damaging than the webspinning mites that can cause defoliation later in the growing year.
- ◆ San Jose scale (low to medium populations). High San Jose scale populations may require supplemental insecticides in the lower San Joaquin Valley, where they have been found to be resistant to insecticides. See population/treatment breakdowns in table 3.
- ◆ Soft scales such as the European fruit lecanium.
- ◆ NOT peach twig borer or webspinning mites.

What does a dormant oil plus insecticide spray control?

- ◆ Peach twig borer, obliquebanded leafroller, and high populations of San Jose scale.
- ◆ Beneficial insects and predatory mites are less affected by broad-spectrum pesticide applications during the dormant period than by similar insecticides applied during the growing season.

What does a dormant-applied insecticide spray NOT control?

- ◆ Navel orangeworm and oriental fruit moth. (During the dormant period they are in a stage that is unaffected by pesticides.)
- ◆ Webspinning mites that overwinter on the ground and in bark crevices on the lower trunk.
- ◆ Plant bugs that overwinter in broadleaf weeds and under debris. (They are very mobile and so are not controlled by dormant sprays.)

How to tell if you need a dormant spray for San Jose scale, brown almond mite, and European red mite

◆ Dormant spur sampling:

- Collect 100 spurs (5 spurs from inside and outside the tree canopy of 20 trees in a block) anytime from early November through early January. If you collect from known hot spots you will be able to tell whether



Dormant spur

Thank You

Questions?

Comments?