Reduced Risk Pest Management Approaches – Pest Management Alliance II Project

Project No.: **09-STEWCROP2-Verdegaal**

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Objectives:

OBJECTIVE 1: Update and analyze current data on NOW, mites, diseases and invasive species

Project partners updated almond pest management studies and resulting practices in order to expand outreach efforts to growers and Pest Contral Advisors (PCAs) by understanding use patterns and geographical data relevant to targeted compounds (i.e., reduced risk vs. organophosphate (OP), carbamate, and pyrethroid use) and alternative strategies. The three highest-priority regions were identified and used for regional demonstration sites. The three sites worked with UC IPM, UCCE, and local PCAs, to implement reduced risk practices and assess their potential for sustained success.

OBJECTIVE 2: Outreach and education to expand on the success of Almond PMA I for growers needs

Almond PMA II encouraged California almond growers to adopt reduced risk practices, both for environmental benefits and for cost advantages in producion. Growers and PCAs learned about alternatives to OPs, carbamates, and pyrethroids, and the impact these products can have on environmental resources, human and wildlife health, and VOC emissions. Building upon successes and lessons learned during Almond PMA I, an outreach program coordinated by California Alliance of Family Farmers (CAFF) and the Almond Board of California, Almond PMA II utilized the expertise of project partners (UC IPM staff, UC scientists, and UC farm advisors) to educate both new and experienced almond growers through regional demonstration sites, field days, newsletters, and websites.

Objective 3: Continuing Education for Almond PCAs
Almond PMA II involved PCAs as leaders in project implementation to develop their skills and commitment to expansion of IPM practices. PCAs have an enormous influence on how growers manage orchards by providing information for decisions. PCAs provide a crucial link in successfully reaching growers, including urging growers to consider better monitoring of pests, and alternative control strategies using newly available materials and methods in orchard management. This project addressed the need for continuing PCA education about reduced risk practices in almond orchards through presentations, trainings and involving local PCAs in demonstration site design.

Objective 4: Partner with support industry and suppliers
Almond PMA II provided the framework for more dialogue with chemical suppliers about supporting reduced risk options for almond production. Registrants were urged to work on international maximum residue limits for newer, reduce risk products in their portfolios.

Interpretive Summary:
Almond Pest Management Alliance II (PMA II) was primarily a demonstration/education project whereby information developed for the Almond PMA I would be expanded and fine tuned. We were also interested in further validating sampling plans (primarily Navel orangeworm (NOW), mites, ants and San Jose Scale (SJS)) and undertaking localized research for pest problems peculiar to each location. A set of comparative demonstration plots with to assess monitoring options and choice of control materials was conducted with local growers.

The grower cooperators and pest control advisers were an integral part of the outreach and adoption. Their experiences and results from the plots were shared in meetings and newsletters to provide ideas from successes (or failures) and also to help deliver information. Dan Rivers was responsible, as a UC Research Associate in the project, to help monitor conditions and pests, such as NOW (egg traps), PTB (pheromone traps), ants (spring counts only), and leaffooted plant bug (observation of gumming on nuts and presence of eggs on leaves). He collected the data and summarized this information from regions throughout the San Joaquin and Sacramento Valleys during 2008-10.

The primary focus of this project was the reduction in use of organophosphates, especially Lorsban, and reliance on pyrethroid sprays. The project helped to build on the data that was available to document the efficacy of new products; in particular material such as Intrepid, Delegate or Altacor for NOW. Work done by Frank Zalom has also demonstrated the efficacy of products such as Dimilin, Success, and Intrepid for peach twig borer (PTB) in the dormant and bloom sprays, along with even newer materials. Some of these products were used in the reduced risk portion of the orchards or local experiences of PCAs were sought. We also tried to integrate and effectively use May treatment timings for NOW and PTB to reduce hull split or dormant applications and to compare this in one of the plots (Ripon). Grower interest is in new products which avoid disruption of beneficial insect populations which in turns helps reduce or avoid spider mite problems.

Materials and Methods:

Almond Board funding helped to leverage the development and expansion of environmentally responsible pest management. CAFF coordinated a statewide project, and arranged contractual agreements with participating PCAs, UCCE (to provide technical and IPM expertise) and the Almond Board.

Three demonstration locations were established, each with two growers. One was a replicated field trial in Ripon. The others were an IPM orchard in Escalon and an organic orchard north of Escalon. These orchards provided data and also served as primary sites for field days. In addition, an observation trial was established with San Joaquin Delta College for monitoring of seasonal pests.

The general work plan for both 2009 and 2010 included: spur monitoring for SJS and PTB; mummy counts of NOW; and sampling for mite eggs as presence/absence evaluation. In addition, weed species were recorded to set a baseline and observe any population shifts, especially in the organic production blocks. In February, detailed lab counts were made for mites, scale and NOW; PTB emergence rates were also reported. Traps were set out in late February and monitored through March and April. Bloom counts were conducted at SJ Delta College Farm in February and March, along with continued pest monitoring. In April and May more intensive mite sampling was done, with a field meeting on the topic held in Ripon.

Mite sampling continued throughout the current season. Hull split was evaluated in July and August at SJ Delta College Regional Variety Trial. Nut sampling for pest damage, taken at harvest for comparison from all trials, was completed for 2009. Seasonal data collected will be summarized through the project end in August of 2010.

Field meetings were conducted and handouts produced for grower decision-making during the season (e.g. resistance management grouping lists), newsletters, and web site update for UCCE - San Joaquin County.

Local meetings and a regional symposium for growers and PCAs were held in 2009 and 2010. Topics in monitoring, resistance management and alternative strategies of major insect pests including recent NOW research developments and projects were the focus.

Results and Discussion:

Meetings

2008 Dec 17	Field Meeting on Winter Monitoring	Escalon	30
2009 Feb 5	Organized tour for the AAIE Conference this included Almond PMA site.	Manteca	45
2009 Apr 21	Field day on IPM & irrigation	Ripon	51
2009 Nov 5	Almond Pest Management Training for PCAs	Stockton	90
2009 Dec 11&12	Almond Research Conference	Modesto	-
2010 Feb 9	Resistance Management and IPM	Stockton	75

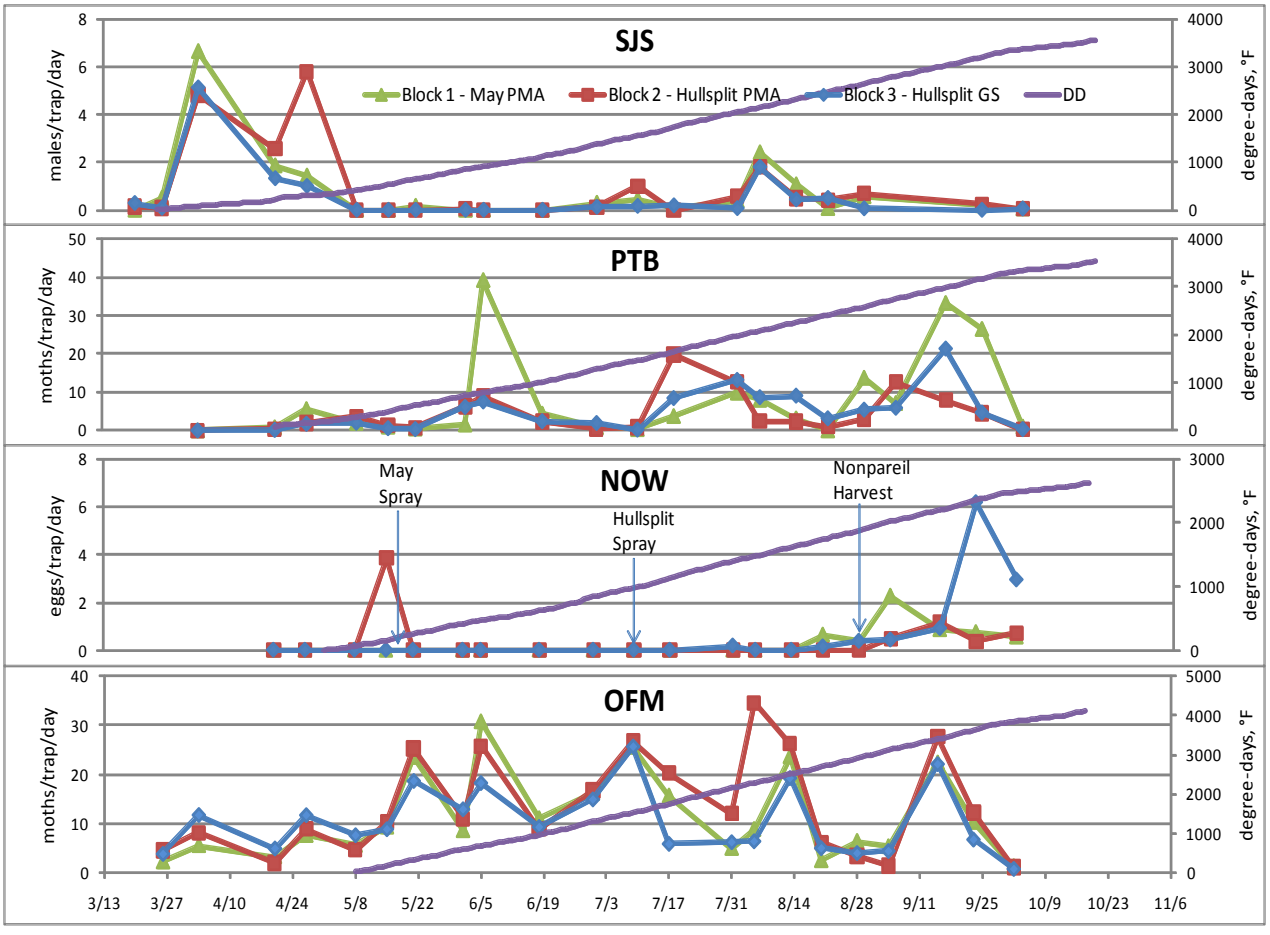
Recent Publications:

2008 Dec 10-11 Almond Research Conference Project Poster, Modesto
2008 - 2010 quarterly, Crop Digest San Joaquin County, UC Cooperative Extension
Quarterly articles on Almond situation
2009 Dec 11-12 Almond Research Conference Project Poster. Modesto

Data

Trap data collection was done for both years with harvest data collected in 2009. Pest pressures in both 2009 and 2010 were about average for the San Joaquin county area. The following tables summarize the years for 2009 followed by 2010.

Figure 1. Trapping data for San Joaquin B demonstration orchard
SJS = San Jose Scale; PTB = Peach Twig Borer; NOW = Navel Orangeworm; OFM = Oriental Fruit Moth; DD= Degree-Day



Dormant sampling in 2009 was done at the Ripon field trial site and is summarized below in **Table 1**.

Table 1. 2009 Dormant samplings summary

Orchard	Block	Varieties	Mummies/tree (UC: < 2)	Infested spur % (UC: less than 20%) LiveSJS	ParasitizedSJS	EFL	MiteEggs
SJ A	1	Nonpareil, Carmel, Monterey	1.1	1	0	0	0
SJ B	1	Nonpareil, Aldrich, Monterey	0.8	15	7	0	2
SJ B	2	Nonpareil, Sonora, Monterey	0.7	2	5	0	8
SJ B	3	Nonpareil, Carmel, Monterey	0.9	7	9	0	28
SJ C	1	Nonpareil, Carmel, Fritz	11.6	0	0	0	6
Merced	1	Nonpareil, Carmel, Monterey	2.2	1	9	19	5
Merced	2	Nonpareil, Carmel, Sonora	1.2	54	23	12	14

SJS = San Jose Scale; EFL = European Fruit Lecanium

At the Ripon site (**Table 2),** a comparative trial showed three different strategies to be not significantly different in the amount of nut damage. In most years, rejects tend to be fairly low compared to statewide averages. The fact that there were no differences seen in this field trial helped encourage growers to consider alternative materials and strategies in pest management.

Table 2. 2009 Harvest evaluation – San Joaquin B demonstration orchard

Treatment				Harvest	Sample	Serious Defects (% nut meats)					Other
Block	Material	Timing	Variety	Date	Size	Mold	NOW	Ants	PTB/OFM	Bug	Defects
1	Intrepid	May	Nonpareil	9/3	1000	0.1	0.2	0	0	0	1.0
2	Intrepid	Hullsplit	Nonpareil	9/3	1000	0	0.9	0	0	0	1.3
3	Warrior II	Hullsplit	Nonpareil	8/28	1000	0	0.8	0	0	0	1.9

A summary of several comparisons throughout the statewide project is presented in the following table.

2009 PMA II Project Results

Demonstration Orchards		Mummy Nut Count[a]		Ground Nuts	Mite[c]	Worm Treatment[d]		Ave. total[d]	Block	Harvest	Serious Harvest Defects (%)[e]					Other[f]
Grower	Block	Nuts/tree	% w/NOW	% w/NOW	Treatment	Material	Timing	NOW eggs	Varieties	Date	Mold	NOW	Ants	PTB/OFM	Bug	Defects
Merced A	1	2.2	11	2	Threshold	Belt	Hullsplit	40	Nonpareil	8/26	0	3.2	0	0	0	2.1
									Carmel	9/16	0.1	0.5	0	0	0.4	0.2
									Monterey	9/24	0.3	1.4	0	0	0	0.7
Merced A	2	1.2	5	1	Threshold	Belt	Hullsplit	139	Nonpareil	8/26	2.3	1.7	0	0	0	2.3
									Sonora	9/2	0	1.7	0	0	0	2.8
									Carmel	9/16	1.2	0.7	0	0	0	1.5
San Joaquin A	1	1.1	13	6	Preventive	Intrepid	Pink+Hull	185	Nonpareil	9/9	0	2.3	0.1	0	0	1.2
									Carmel	10/2	0	0.4	0	0	0	0.5
									Monterey	10/12	0	1.2	0	0	0	0.4
San Joaquin B	1	0.8	7[b]	0.5	Preventive	Intrepid	May	52	Nonpareil	9/3	0.1	0.2	0	0	0	1.0
									Aldrich	9/29	0	0.4	0	0	0	0.2
									Monterey	10/23	-	-	-	-	-	-
San Joaquin B	2	0.7	7[b]	6	Preventive	Intrepid	Hullsplit	57	Nonpareil	9/3	0	0.9	0	0	0	1.3
									Sonora	9/29	0.1	1.2	0	0	0.1	3.0
									Monterey	10/9	0	2.4	0.1	0	0.1	1.1
San Joaquin B	3	0.9	7[b]	4	Preventive	Warrior II	Hullsplit	133	Nonpareil	8/28	0	0.8	0	0	0	1.9
									Carmel	10/2	0	0.3	0	0	0	1.6
									Monterey	10/23	-	-	-	-	-	-
Sutter A	1	-	-	-	Preventive	Untreated		115	Nonpareil	-	-	-	-	-	-	-
									Carmel	9/11	-	0	1.9	0	0.6	2.1
Sutter B	1	1-2	-	-	Untreated	Untreated		97	Nonpareil	8/21	-	0.6	0	0	0	0.2
									Carmel	-	-	-	-	-	-	-
Yolo A	1	-	-	-	Threshold	Belt	Hullsplit	29	Nonpareil	8/25	1.6	0.2	1.6	0.8	0.4	2.0
									Sonora	8/25						
									Monterey	10/2	0.6	0	0.2	0.4	0.8	1.8

[a] Dormant period sampling in January. Mummy nuts were counted in 20 trees throughout each block. For the most part, where growers practiced winter sanitation, the target of < 2 mummies per tree was reached. 100 mummies and 100 ground nuts were collected and examined for overwintering navel orangeworm (NOW).

[b] In the interest of time, with so few mummies present, a composite sample of 100 mummy nuts was collected across the three San Joaquin B blocks.

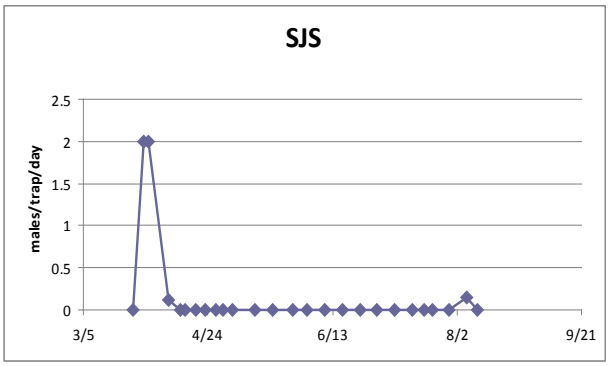
[c] Orchards were either treated with a preventive mite spray or treated after mite flareups were observed by presence/absence leaf sampling. Miticides used were Abba, Agrimek, Ecotrol and Onager. In the end, all but the Sutter B orchard were treated for webspinning mites. In the untreated Sutter B block, late-season mite activity contributed to some harvestime defoliation.

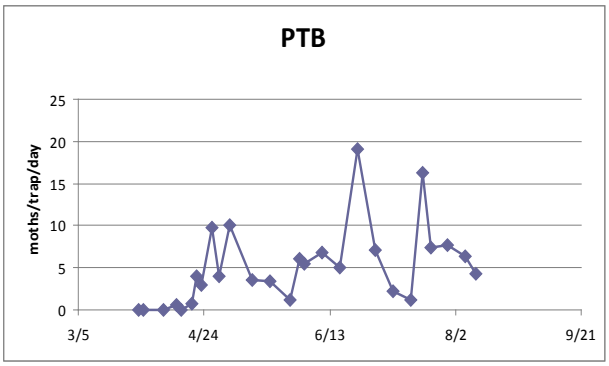
[d] Included here are average per-trap totals of NOW eggs caught over the entire season. Egg traps were used to identify periods of egg laying and, along with degree-day models to time treatments. Totals do not necessarily reflect the degree of NOW pressure or predict harvest damage.

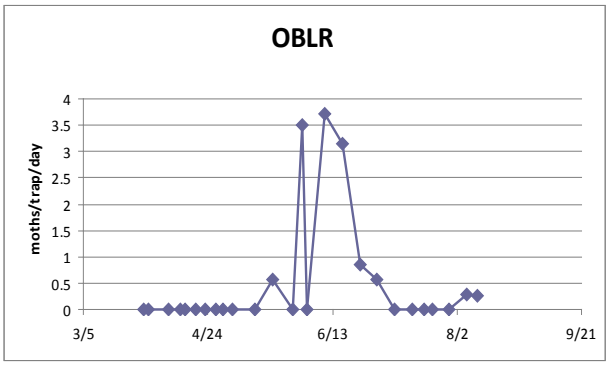
[e] Harvest samples of 500-1000 nuts were collected from each variety in each block before the nuts were swept into windrows. These were evaluated for pest damage and other defects.

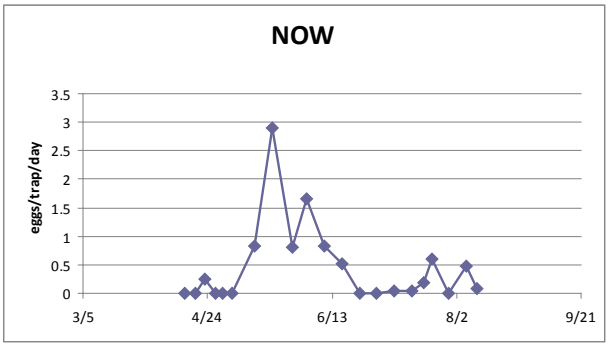
[f] Includes shrivel, gumming and discoloration.

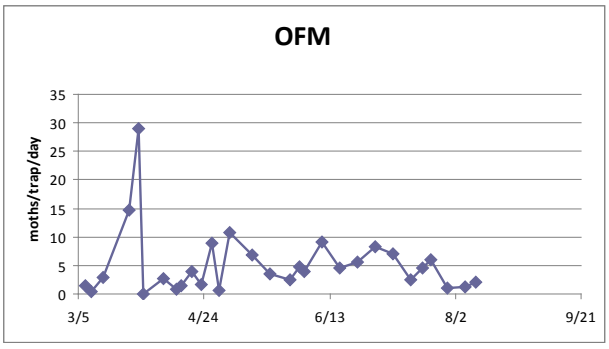
In 2010, data collected from traps indicated very low pest activity for the growing season compared to 2009. One of the specific goals of the project was to demonstrate the benefit of having monitoring data as part of a classic IPM strategy. Below are the trap data results for SJ Delta College in 2010 for the various pests.





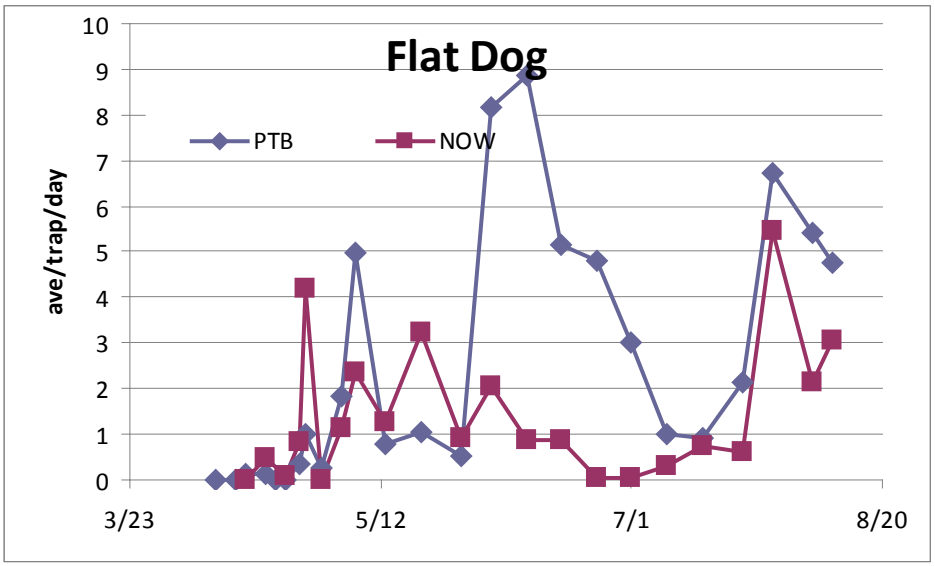






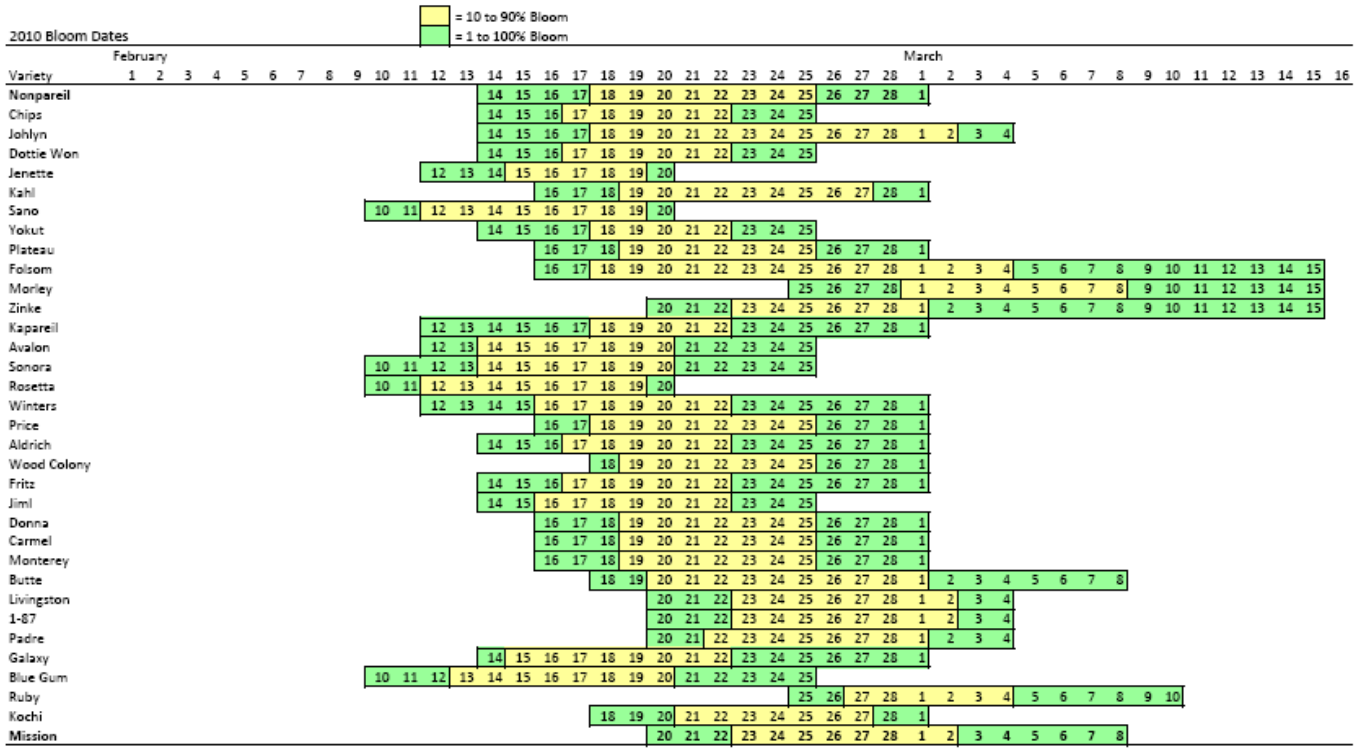
These results can be compared with the data collected at the Flat Dog Orchard for PTB and NOW. At that site pest activity was higher than at the SJ Delta College Farm site, but still relatively low.

Dormant sprays have become less common over recent years, but at times they can be an important strategy to avoid potentially disruptive in-season sprays. However, new materials are providing growers with additional alternatives. In either case, a regular pest monitoring program can help make a decision more appropriate for the target pest and the economic bottom line.

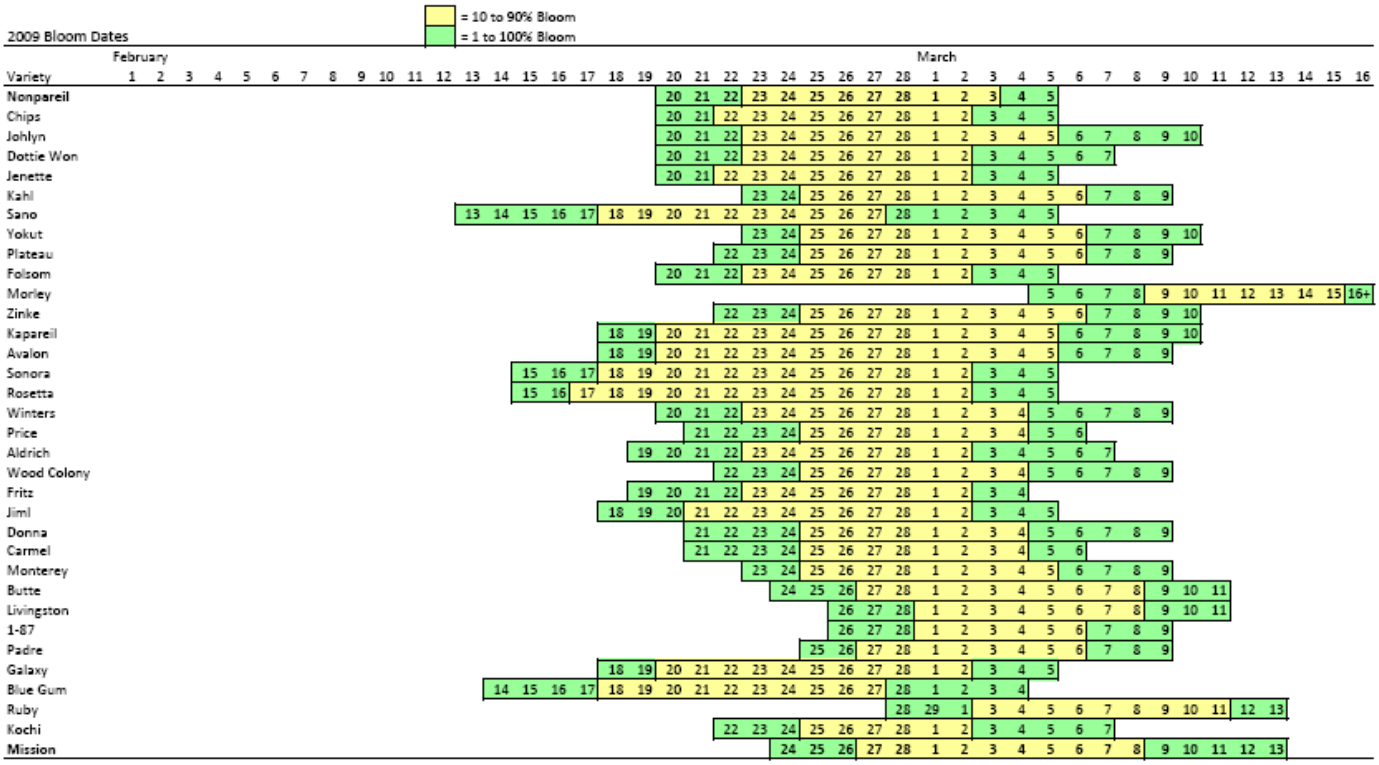


Data summarized during the project also include the average progression of bloom and hull split for the variety trial established in 1993 at San Joaquin Delta College laboratory farm, located in Manteca. Information on varieties and how they compare to eachother and across seasons can be an important tool to assist in IPM decisionmaking, both in orchard design at establishment and during the production years.

San Joaquin Delta College Almond Regional Variety Trial, Manteca



San Joaquin Delta College Almond Regional Variety Trial, Manteca



Average Hull Spilt Progression 1998-2010 Manteca RVT

Variety	10%	90%
Kapareil	7/16	7/26
Nonpareil	**7/20**	**8/4**
Kochi	7/27	8/22
Jiml	7/29	8/10
Johlyn	7/29	8/13
Zinke	7/29	8/10
Galaxy	7/30	8/14
Folsom	7/31	8/11
Sonora	8/3	8/15
Price	8/5	8/16
Rosetta	8/5	8/14
Donna	8/5	8/18
Jenette	8/7	8/22
Morley	8/10	8/21
Yokut	8/11	8/27
Dottie Won	8/14	8/28
Plateau	8/14	8/28
Wood Colony	8/14	8/28
Sano	8/15	8/30
Aldrich	8/15	8/30
Winters	8/16	8/31
1-87	8/16	8/31
Chips	8/17	8/30
Kahl	8/18	9/5
Savana	8/18	9/7
Livingston	8/18	9/2
Blue Gum	8/18	9/4
Avalon	8/22	9/6
Padre	8/25	9/8
Butte	8/26	9/8
Carmel	8/27	9/11
Monterey	8/29	9/14
Ruby	8/29	9/14
Mission	**9/1**	**9/15**
Fritz	9/6	9/15

In conclusion, an effective IPM program that is cost efficient and sustainable needs to include information on pests, the crop and local growing conditions. The PMA II project helped to generate experience and data that were disseminated to growers and PCAs. There still remains much to be learned about new materials and strategies for the future. In addition, the increased frequency of new invasive species will require an ongoing effort to adapt pest control tools through both research and field experience.