

Crop Insect Losses and Impact Assessment Working Group (2005 – 2006)
Progress Report to the Western IPM Center
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Abstract

Impact assessment is central to the evolution and evaluation of our IPM programs. Quantifiable metrics on insecticide use patterns, costs, targets, and frequency, crop losses due to all stressors of yield and quality, and other real world economic data (e.g., crop value) are our most objective tools for assessing change in our systems. Our efforts prior to establishment of this work group have been organized around cotton. This project has enabled us to formalize and extend this process to melons and lettuce in AZ and extend our coverage to the low deserts of CA. The data generated are useful for responding to pesticide information requests generated by EPA, and can provide a basis for regulatory processes such as Section 18 or 24c requests, as well as for evaluating the impact of our extension programs on risk reduction to growers. In this project term, the process for interacting with stakeholders was further refined, and mailed surveys supplemented data generated in face-to-face meetings for all crops. Plans were established for a series of Alfalfa Insect Losses meetings in Fall 2006 in sites in CA and AZ.

Stakeholder Engagement

The Process. The development of accurate “real world” data on crop insect losses is facilitated by face-to-face administration of a survey instrument in an interactive process that encourages (and rewards) stakeholder input. Growers, pest control advisors (PCAs), Extension personnel and industry professionals attend Crop Insect Losses and Impact Assessment Working Group (CILIAWG) meetings, complete the survey instrument in a guided process, and are offered incentives to offset the costs of participation. In our first year (2003), we developed a presentation that establishes the incentives for participation, explains the crop insect loss system, and walks the participants through the estimation process. This presentation was customized for each crop. In the recent granting cycle, further refinements were made to the survey instruments, including detailed collection of additional data on insecticide use patterns and target pests. These data identify the frequency of use of various chemistries and will allow us to track changes in insecticide use patterns over time in great detail for each of the crops involved. In addition, the guided process has also been improved in direct response to clientele feedback.

Meeting Participation

Cotton. In November 2005, three interactive cotton stakeholder sessions were held in three locations, Maricopa and Yuma Arizona and Blythe California. A total of 55 stakeholders attended these sessions (down from 72 the previous year). Despite the down-turn in attendance, the number of completed surveys was similar between the two years (35 in 2004 and 33 in 2005). Of about 239,000 acres of cotton in Arizona, 82,000 acres (about 34%) was directly represented in these sessions by the pest control advisors responsible for prescriptive use of insecticides for that acreage. Somewhat less acreage in Palo Verde, CA was represented. Other industry and University (Cooperative Extension) personnel provided estimates of insect losses over larger geographic acreage in their respective areas as well, representing an even larger portion of the state (combined, ca. 58%). Stakeholder feedback about the process was uniformly positive and reflected a desire to continue in this process each year, though concerns were raised on two issues. One was the timing of the meetings, held during Thanksgiving week in 2005. This was considered too early, in conflict with holiday-compressed work schedules, and for Yuma, still within an active portion of the fall vegetable season. The second issue was one of overall industry morale and complacency, due to shrinking profits and acreage and increasing pressures of urbanization.

Lettuce. In the 2004-2005 granting cycle, the crop insect losses effort was expanded to include lettuce and melons in AZ and CA. Shifting from mailed surveys to the workshop format resulted in an improved response rate (e.g., 17 completed lettuce surveys versus 3 or 4 completed mail surveys) and more dependable data, since the questions were explained to participants in full detail during the meeting. The 2006 Lettuce Insect Losses workshop in Yuma was attended by 55 California and Arizona growers, PCAs, Extension personnel and other stakeholders (up from 42 the previous year). A total of 19 surveys were completed, representing about 80% of the combined lettuce acreage in the Yuma and Imperial Valley areas (up about 15% from the previous year).

Melons. In 2006, melon insect losses data were collected during two meetings held in Yuma and Phoenix, AZ. A total of 16 stakeholders participated in the meetings (down from 23 last year). Growers and PCAs from California were present. Data from central Arizona collected at the Phoenix meeting on July 13 have not yet been analyzed. A total of 6 completed surveys collected at the Yuma meeting represent 56% of the Yuma and Imperial Valley acreage for spring cantaloupes and 60% of the Yuma and Imperial Valley acreage for watermelons (down from 90% and 76%, respectively).

Table 1: Survey responses summary by crop and year for lettuce and melons.

		2004-2005	2005-2006
Head Lettuce	Responses	15	19
<i>(Yuma/Imperial)</i>	# acres surveyed	33140	46270
	% of total acres	63	81
Spring Cantaloupes	Responses	8	6
<i>(Yuma/Imperial)</i>	# acres surveyed	3805	2280
	% of total acres	90	56
Watermelons	Responses	8	6
<i>(Yuma/Imperial)</i>	# acres surveyed	1370	950
	% of total acres	76	60
Spring Cantaloupes	Responses	6	n/a
<i>(Maricopa, La Paz, Pinal)</i>	# acres surveyed	7561	n/a
	% of total acres	85	n/a
Watermelons	Responses	6	n/a
<i>(Maricopa, La Paz, Pinal)</i>	# acres surveyed	2685	n/a
	% of total acres	50	n/a

Data Summary

Cotton

Our work in 2005 has been instrumental in documenting major changes in cotton pest management this past year. The 2004 crop year was significant by virtue of the exceptionally light insect pressure and near historic lows in foliar insecticide use. However, 2005 was a reversal of fortune, and a combination of natural environmental factors that affected much of the West — one need only see the pictures of Death Valley in bloom for the first time in decades — along with a number of significant operational factors conspired to make for some of the worst whitefly pressure that some growers had seen since 1995. In fact, this was the highest foliar intensity, control costs, and yield loss associated with this insect since the introduction of the selective insect growth regulators (IGRs) in 1996.

Continued efforts with this working group will be critical in 2006, because this is the first year of a major insect control program, the Pink Bollworm Eradication Program. Our data should be one of the few objective sources of information on change in insecticide use and arthropod incidence as a result of this program. However, it will also bring new challenges, because there is central authority over some aspects of chemical control practiced on non-Bt cotton acreage. Thus, we anticipate the need for close interaction with the Arizona Cotton Research & Protection Council (a grower organization charged with the boll weevil and pink bollworm programs) in order to document the inputs provided by this agency. Furthermore, it is anticipated that we will see a large increase in the number of adopting acres to Bt cotton, because this is a primary control element of the program in the program areas (central and eastern AZ).

Table 2: 2003 Cotton Insect Losses, foliar sprays						
	Bt cotton (74% of A)			Non-Bt cotton (26% of A)		
	Insecticide applications	Control costs	Yield loss	Insecticide applications	Control costs	Yield loss
Pest	(No./A)	(\$/A)	(%)	(No./A)	(\$/A)	(%)
Lygus bugs	1.983	\$34.51	3.647	1.903	\$33.11	2.986
Pink bollworm	0.000	\$0.00	0.030	1.612	\$24.69	2.264
Whitefly	1.341	\$36.92	0.994	1.252	\$34.45	0.984
Other pests	0.444	\$5.48	0.57	0.853	\$11.74	0.956
All Pests	3.768	76.91	5.241	5.620	\$103.99	7.19

Table 3: 2004 Cotton Insect Losses, foliar sprays						
	Bt cotton (80% of A)			Non-Bt cotton (20% of A)		
	Insecticide applications	Control costs	Yield loss	Insecticide applications	Control costs	Yield loss
Pest	(No./A)	(\$/A)	(%)	(No./A)	(\$/A)	(%)
Lygus bugs	0.852	\$12.72	2.138	0.730	\$11.65	2.074
Pink bollworm	0.000	\$0.00	0.040	1.647	\$21.71	2.828
Whitefly	0.975	\$29.29	1.605	0.975	\$29.84	1.399
Other pests	0.453	\$5.73	0.767	0.943	\$12.06	1.189
All Pests	2.280	\$47.74	4.55	4.295	\$75.26	7.49

Table 4: 2005 Cotton Insect Losses, foliar sprays						
	Bt cotton (74% of A)			Non-Bt cotton (26% of A)		
	Insecticide applications	Control costs	Yield loss	Insecticide applications	Control costs	Yield loss
Pest	(No./A)	(\$/A)	(%)	(No./A)	(\$/A)	(%)
Lygus bugs	1.636	\$28.04	4.183	1.433	\$24.04	4.216
Pink bollworm	0.020	\$0.28	0.012	2.525	\$36.87	2.450
Whitefly	2.095	\$59.97	3.295	2.006	\$53.18	2.820
Other pests	0.573	\$9.14	0.600	0.755	\$12.26	0.924

Lettuce

Lettuce production covered by this survey includes Yuma Valley, AZ and Imperial Valley, CA. The most important pests for fall 2005 lettuce in terms of estimated yield loss were flea beetles (1.0%), beet armyworm (1.0%), cabbage looper (0.9%), seedling pests such as ground beetles, earwigs and crickets (0.8%) and silverleaf whitefly (0.6%). The average number of insecticide treatments in fall lettuce was highest for beet

armyworm (3.6), cabbage looper (2.9), salt marsh caterpillar (2.0) and budworm/bollworm (1.6). Silverleaf whitefly received an average of 1.4 applications. In general, the same pests were important in the previous year (fall 2004), with slightly higher yield losses and similar insecticide use levels recorded.

In spring 2006 lettuce, the most important pests in terms of estimated yield loss were green peach aphid (1.2%), cabbage looper (0.7%), thrips (0.6%), beet armyworm and foxglove aphid (0.5% each). The average number of insecticide treatments in spring lettuce was highest for thrips (2.2), lettuce aphid (1.9), green peach aphid (1.9), and foxglove aphid (1.6). Silverleaf whitefly received an average of 1.0 applications. Comparatively, the previous year (spring 2005) showed much higher losses to many of these pests (e.g., seedling pests 1.4%; thrips 1.7%; beet armyworm 1.0 and cabbage looper 1.1). In spring lettuce in 2005 as 2006, various aphid species accounted for the highest average number of insecticide applications (2.0 to 2.5), apart from thrips (2.5).

A complete summary of the 2006 Lettuce Insect Losses Survey are attached to this report.

Melons

Melon losses data from central Arizona for 2006 were still being compiled and analyzed at the time of this report. However, based on statewide data for 2005, the major pests in cantaloupes were cabbage looper (80.2% of acres treated with an average of 1.1 sprays) and whiteflies (64.7% of acres treated with an average of 1.3 sprays). For watermelons in 2005, whiteflies and cabbage loopers were also the most important pests statewide. 100% of acres were treated for both of these pests, with whiteflies receiving an average of 2.0 sprays and cabbage looper receiving an average of 1.7 sprays. Cabbage looper was responsible for 1.1% of cantaloupe yield losses and less than 0.1% of watermelon yield losses. Whiteflies accounted for 1.3% of watermelon yield losses but did not have a major impact on cantaloupe yields. In addition, seed corn maggot was an important pest in cantaloupes, accounting for 0.8% of the yield loss statewide. Based on Yuma and Imperial Valley data for 2006, whiteflies and cabbage looper continue to be the most important pests in cantaloupe, with 1.3% and 0.6% yield loss, respectively. In watermelons, cabbage looper accounted for 1.1% of yield losses and whiteflies only 0.3%, but beet armyworm was important, accounting for 0.7% of yield losses. Average foliar sprays in Yuma and Imperial Valley to control each of these pests in watermelon were up from last year's state average: 2.3 for whiteflies and 2.2 each for cabbage looper and beet armyworm.

A complete summary of Yuma and Imperial Valley data from the 2006 Melon Insect Losses Survey are attached to this report.

Meetings and Activities

Crop Insect Losses Working Group Meetings (Fall 2005 – Summer 2006)

(These are meetings for this grant term at which the Crop Insect Losses data collection process was introduced and explained to participants and they were guided in completion of the survey instrument.)

- Cotton Insect Losses & Impact Assessment Working Group, Maricopa Agricultural Center, Maricopa, AZ, November 21, 2005 (11 Attendees from CA and AZ).
- Cotton Insect Losses & Impact Assessment Working Group, Booth Machinery, Yuma, AZ, November 22, 2005 (36 Attendees from CA and AZ).
- Cotton Insect Losses & Impact Assessment Working Group, Riverside County Cooperative Extension office, Blythe, CA, November 22, 2005 (8 Attendees from CA and AZ).
- Lettuce Insect Losses & Impact Assessment Working Group, Yuma Convention Center, Yuma, AZ, May 2, 2006 (55 Attendees from CA and AZ).
- Melon Insect Losses & Impact Assessment Working Group, Yuma County Cooperative Extension office, Yuma, AZ, June 28, 2006 (9 Attendees from CA and AZ).
- Melon Insect Losses & Impact Assessment Working Group, Maricopa County Cooperative Extension office, Phoenix, AZ, July 19, 2006 (7 PCAs, industry and Extension representatives attended).

A total of 126 people attended this year's meetings, down from 144 last year. Participation in the lettuce meeting increased while the numbers were down for both cotton and melons. While the reason for the overall decrease in participation was not clear, we expect that some of the difference could be accounted for by growers or others with limited knowledge (who do not complete surveys) attending once and not returning the following year. The majority of acres for each of the target crops are scouted by a limited number of pest control advisors (PCAs). These are the most knowledgeable individuals with respect to crop losses. The total number of attendees is far less important than having good representation of the right PCAs at the meetings. Nonetheless, particularly for cotton and melons this year, fewer key PCAs attended than last year. Surveys were mailed to key PCAs not in attendance for each of the 3 crops, which helped to improve the scope and quality of the data collected.

One significant change in the meetings from last year that we feel may positively impact future attendance was offering participants the choice between travel reimbursement (as provided in previous years) and a token of appreciation (in this case, UA caps) for their time. We have found it is psychologically important to acknowledge the value of the time contributed by these busy professionals to provide us with these data. We found that nearly all participants opted for the caps over the monetary reimbursement. This reduced time and costs associated with processing a large amount of paperwork and also ensured

that all participants got something for their time. (In the past, many have opted out of completing the paperwork required to process a reimbursement.)

The value of the direct contact with Arizona and California stakeholders (PCAs, growers, and industry representatives) provided by these meetings goes beyond the obvious value of the data they help us develop. Typically, the interactive discussions that develop around crop losses and insect management decisions provide PIs and county Extension agents with important feedback on social and economic factors affecting crop yields and pest management decisions that are not easily captured in the survey.

Impact of the Data

These data and this Work Group serve to address any Federal, regional, state, and local requests for information on the impact of insects or insecticides on our key crops. As coordinator of the Arid Southwest IPM Network (another Western IPM Center – funded project), Al Fournier uses these data to respond to federal pesticide information requests for the crops involved. We had numerous informal requests for information in 2005 and 2006, and one formal request by the Arizona Cotton Growers Association to present comparative data on Bt versus non-Bt cottons on a continual basis.

What makes these data unique with respect to pesticide (and IPM) policy is that we are directly measuring the “intent” of each insecticide input. That is, stakeholders are asked to identify the specific intent or intended target or targets of their management decisions and inputs. For example, a pest manager might elect to spray compound X with a written prescription for pest A; however, through this dialog, we might learn that this pest manager intended to directly control pest B, C, and D in addition to A. Therefore, the apportionment of that spray might be 0.7 "sprays" towards A and 0.1 against each of B, C, and D. So in addition to the rich quantitative data collected in this exercise, we also have unique qualitative insights into the decision-making experience of the pest manager. These insights will help guide our existing and new programs of research, implementation and IPM outreach.

The data provided through this process are also useful in evaluating aspects of our IPM programs over time (e.g., changes in insecticide use or changes in pest status for these crops) and quickly responding to the changing needs of grower communities. Not only do we hope to sustain these activities to continue to maintain current insect loss data for cotton, lettuce and melons, we hope to expand these efforts over time to include more crops and more types of pests (e.g., weeds, nematodes and insect pathogens).

Current Status

In the past year, the Arizona Pest Management Center (APMC) has become well established as the organization hub for IPM activities in Arizona and in collaboration with our neighboring southwest states through the Arid Southwest IPM Network. The hiring of Al Fournier as a dedicated IPM Program Manager (since May 2005) has contributed to the success of the Crop Insect Losses and Impact Assessment Work Group

by providing organizational and material support to these efforts. An internal UA College of Agriculture and Life Sciences (CALs) grant to support the crop insect losses effort was funded for \$2,500 last year, providing leverage dollars to offset the considerable cost of meetings, meals and logistics for this project. We have received additional (but reduced) leveraged dollars for the coming year.

We are excited about the prospect of expanding to a new crop—alfalfa—in the coming year. Our University of California collaborator, Mike Rethwisch, will develop the survey instrument with Peter Ellsworth and work with Al Fournier to identify key PCAs and other participants, and to organize the first Alfalfa Insect Losses meeting before the end of the year. Alfalfa has been an increasingly important and profitable crop in the desert Southwest in support of the burgeoning dairy industry throughout the West, and we look forward to gathering baseline data on insect losses and insecticide use. Although the additional meetings required to expand to a new crop will increase our meeting expenses, we are offsetting this increase by requesting a smaller portion of work group funds for Al Fournier's salary in the coming term. His time dedicated to this project will not diminish, but his efforts will be leveraged through other sources of support.

Attachments: Head Lettuce Insect Losses 2006 Summary
Melon Insect Losses (Yuma) 2006 Summary