

# **SERA-IEG 23 Cotton Insects Meeting Minutes**

## **November 11, 2003**

### **Tunica, MS**

#### **DAY ONE**

##### **Introduction - (Scott Stewart)**

- Welcome. It has been 1½ years since our last meeting. A few people from Georgia, Texas, and the USDA personnel will be unable to attend because of scheduling conflicts.
- Michael Boyd will be taking your registration fees and minutes for this meeting.
- Before we get started I'd like to ask the group's opinion on the value of this meeting in its current format.
- I've also invited the Bayer folks in to discuss two-spotted spider mite monitoring and product updates. They want the group's perspective on the pest significance of spider mites.

(Ralph Bagwell) - I'd also like to welcome you to this meeting on the part of the Southern Regional Directors. Jim Harper couldn't make it because of scheduling conflicts. I think the objective of this meeting has changed from the boll weevil (waning due to eradication) to other insects (see handout). We have multiple opportunities to refocus this group's agenda (ex. cotton IPM).

Asked Randy Luttrell for need and funding for regional cotton IPM projects.

(Stewart) Is there financial support for regional publications?

(Luttrell) We need to better coordinate research (USDA-ARS and university) and to increase the emphasis of extension programs.

(Stewart) Information exchange is redundant; therefore, we need to evolve this group into regional projects. Regional directors recognize us as an academic group with value.

(Scott Andrews) There are more production interests rather than research for this group.

##### **Boll Eradication – (Ron Seward)**

- Only one weevil was collected (September 24th in Mobile County, AL) from post eradication programs (approximately 3.5 million acres) east of Mississippi. Post eradication trapping scheme has changed to 1:20 acres on roadsides along with an extended 3-week trap run. A trial run conducted in Georgia in 2002 on 200,000 acres went well. This change in the program is to save on labor costs. Only full-time field unit supervisors (FUS) will be hired to monitor 25,000-35,000 acres from late June to frost. In the Delta regions the FUS's will cover up to 40,000 acres, whereas, in Florida they'll only cover 20,000 acres since fields are spaced further apart. An experienced FUS can cover a route within two weeks.

(Aubrey Harris) What are the rules on roadside trapping?

(Seward) It will not be a traditional grid system with only cotton fields being trapped. There is a two trap minimum per field on quarter mile interval. Fields with five or less acres will only have one trap.

(Charles Suh) Are there any concerns about a 3-week trapping interval as it relates to triggering insecticide treatments?

(Seward) No, after lure was successfully tested in Weslaco.

(Luttrell) We need to start looking at an index field versus field-by-field program.

(Harris) There's a concern about the long-term cost of monitoring programs versus potential weevil outbreaks.

(Seward) There's pressure by Southeast growers (particularly new ones) to further decrease program monitoring costs.

- In Missouri, there were approximately 400,000 acres and the program just completed its second year. Over 75% of the boll weevils caught in MO were collected from the 15-mile wide buffer zone from the AR state line N to US Hwy 412 to AR state line. In MO we also found flowering plants along I-55, and we collected two pickup loads of cotton stalks with squares.

(Dick Hardee) I'm concerned about the 3% zero fields in Dunklin County, MO.

- In central Tennessee 0 weevils were caught on 23,628 acres. In West Tennessee Region 1 had highest number of weevils, with vast majority caught along the MS River. We had a setback with Region 1 program because regions 2 and 3 didn't start as planned in 1999. The southeast counties in Region 1 will be entering post-eradication program. Most weevils caught in Region 1 were found in Shelby and Tipton counties close to the MS River. In Region 3 we went from six insecticide sprays in 2002 to less than one in 2003. A buffer zone from I-155 south along US 51 then west along mid-Shelby County will be established. In this buffer zone we treated 432,000 acres 4.25 times; whereas, outside this zone but within the same counties we treated each field less than once. Outside this buffer zone and in the remaining counties, the average number of insecticide sprays was 0.25. Our goal is to keep weevil populations in check and not eradicate them because the costs vastly outweigh benefits with the eradication approach.

(Hardee) Will there be a different trapping program within the buffer zone?

(Seward) Yes, within the buffer zone the trapping density will be 1:1 with an emphasis on an east to west orientation.

- In Mississippi regions 2 and 3 we had the highest percent treated fields (24.5% and 25.5%, respectively). Helicopters were used in hotspots around the Tunica casinos, Natchez, Yazoo City to Grenada, and in Desoto County. In Yazoo City there were problems with aerial applications and trap monitoring around housing developments. We've also went to a 1 trap / 600 feet density but that's dropped to 1 / 350 feet with infested fields.

(Andrews) Region 3 is entering its post-containment program.

(Harris) We can be more aggressive in post-containment program by treating on single captures.

(Jeremy Greene) Were there problems with regrowth, particularly in reduced-till fields?

(Seward) Economics are definitely a limiting factor with continued fall sprays, but cool nights help decrease weevil development.

(Stewart) What about cotton plants in soybean fields?

(Seward) These fields will be sprayed and growers assessed a charge if weevils were caught in the soybean fields. Fees will be prorated based on the number of insecticide treatments.

(Gus Lorenz) In AR there was a 95% decrease in weevil populations across all regions. We are still spraying because a killing frost hasn't arrived yet. In eastern Craighead and Mississippi Counties the program has finally started. An average of 7.5 sprays had been applied as of August 15th, but the crop has had a lot of regrowth. A lawsuit was filed by an individual to stop program.

(Glenn Studebaker) Some growers are finally starting to recognize weevils are causing some yield losses.

(Hardee) I'd like Dr. Suh to comment on USDA's research on boll weevil biological control program.

(Suh) Because of the nation-wide boll weevil eradication program, we have de-emphasized our boll weevil program (Weslaco only location that will conduct research) and refocused on the plant bug complex. Rearing of boll weevils also is being phased out.

(Seward) We still need weevils for quality control of pheromone lures.

(Stewart) How does homeland security affect the program?

### **Insecticides Review - (Aubrey Harris)**

Seed treatments supplanting Temik but reinform nematode populations have been increasing in AR. NC and VA still show a need for foliar sprays (1st and 2nd true leaf) even with seed treatments.

(Roger Leonard) Does Vydate provide any nematode control?

(Lorenz) Its effect is inconsistent even at 0.5 pound rate. We do not recommend Vydate for nematode control. Vydate does suppress plant bug populations up to 50%. DuPont is pushing it again with Temik's declining use, and the company says plant bug control is equal to Bidrin and Orthene.

(Stewart) Vydate has activity on stink bugs when it's (.33) mixed with Capture (.05-.06) to recommendation

(Leonard) The 0.33 oz rate is not good on brown stink bugs but the 0.5 oz rate was effective. Capture is good at 0.05 – 0.06 rates.

(Stewart) What rate of Intruder is recommended for aphids?

(Others) The 0.6 oz rate is approximately \$5.

(Leonard) We see excellent activity at 0.3 oz rate (usually tank-mixed with other materials for plant bug control).

(Lorenz) Diamond will be marketed at 6-9 oz rate. Better efficacy for plant bug control when used in a multiple applications protocol. Its activity seems mostly limited to immature tarnished plant bugs. We also have data that shows the 12 oz rate has limited lepidopteran activity.

(Greene) Diamond has same activity on adults.

(Leonard) I'm concerned about the overuse of existing products; therefore, we need additional newer compounds. For example, ethiprol is very effective on plant bugs, stink bugs, etc. It was originally being developed by R&P but was acquired by BASF.

(Bagwell) Fipronil is a dead issue with EPA.

### **New Pests**

Carmen mites in cotton (= red mites in soybean)

(Jack Reed) Western flower thrips help decrease populations of mites.

(Stewart) We have a more consistent problem with mites in middle TN, and they appear to be arriving earlier and persisting longer. We're also seeing more activity from cloudy plant bugs.

(Leonard) We've seen more cutworm (black, granulated, variegated) control failures with pyrethroids in burndown situations. I question if insecticide resistance isn't present, or it's because growers are decreasing insecticide use rates too much.

(Suh) Is anyone working on cotton fleahoppers?

(Group) No, more common where weeds were not burned down.

(Studerbaker) We have observed more of them in past two or three years on evening primrose.

(Luttrell) More where 2-4D was not used to control weeds like tropic croton

### **Bt cotton (John Adamczyk)**

(Hardee) We respect to our monitoring efforts, we've doubled our number of laboratory colonies. Bollworm colonies mostly came from 13 states (still need CA, NM, and MO). Tobacco budworms have been more difficult to collect, and the existing 36 colonies mostly came from TX. Field collected males were mated with laboratory females. No evidence of Bt resistance in F1, and similar to what we've seen with the pyrethroid monitoring program. J.R. Bradley also did not observe any signs of resistance in NC.

(Mike Capiro) I question whether we would detect recessive resistance (most resistance has been recessive) with F1 screening. More classes of resistance than what we say with F1 screening.

(Andrews) What was the source of insects?

(Hardee) Males from pheromone traps.

(Harris) Any use of light traps?

(Hardee) Yes, we distributed light traps to help collect gravid females.

Adamczyk – We're testing gravid females plus offspring brought into lab; selection experiments indicate bollworm resistance may be dominant.

(Luttrell) We originally collected baseline Bt information in '92 and '93 in MS. We resumed this line of research in AR beginning in 2000. Since then we've measured a 10-fold or larger shift in tolerance. In the 30-40 colonies we looked at in 2003 we found more variability than 10 years ago. We only observed a <10% increase in LC50 with Cry1Ac for bollworms and tobacco budworms. The highest LC50 were from insects collected from some 50-70 Bt cotton fields late in year. Laboratory and field colony's 95% CI didn't overlap in 2003. We suspect this effect has a strong maternal trait after field colonies were mated with lab. Susceptible ones. Selection may be going on in the insect even though colonies collected later in the year (Aug) were 2X more susceptible than those from June and July colonies.

(Caprio) Resistance tends to show up late in year (like Luttrell's data shows).

(Adamczyk/Gore) We also are generating similar data as Luttrell's. We're seeing the same maternal effect with Cry1Ac in Bollgard II cotton.

(Adamczyk) We've changed our monitoring techniques to include other sources (light traps, egg collection, and etc.). We're observing more damage in Bt cotton now than in '96-'97

(Bagwell) Current varieties have lower Bt expression than was observed with 33B.

### **Efficacy of Bollgard II, WideStrike, and VIP on bollworms**

(Adamczyk) We observed 4% boll damage in our WideStrike plots. There's argument about whether small 'grazed' bolls will abort as consultants contend or will be retained by the plant as industry officials say. My opinion is 2-3 day old bolls will abort regardless of the type of damage (grazing or penetration).

(Leonard) Many folks will probably overspray WideStrike. Bollworms tend to feed more in terminal than with Bollgard, and this will alarm consultants. More live 1st and 2nd instar larvae also were observed. We need a program to monitor expression in lines of different varieties. If environmental conditions remain the same and pyrethroids remain available, technologies are essentially the same.

(Bagwell) Dow AgroSciences' data shows differences in expression for different plant parts.

(?)WideStrike viewed by EPA as a number 1 gene technology due to cross resistance

(Group) Should spraying of second generation Bt cotton continue based on egg thresholds? A disadvantage if 95% sure larvae are bollworms, but it will prevent larvae from being protected by bloom tags.

(Leonard) If you don't have pyrethroids available, then you will probably spray based on egg counts. We should consider decreasing frequency of pyrethroid use since they're also being applied more often on other crops.

(Stewart) In TN we use 50 to 60% egg threshold.

(Luttrell) Is anybody testing pyrethroid selection for bollworms (egg vs. larval)?

(Adamczyk) What about using egg thresholds in BG versus BG II cotton?

(Leonard) Pyrethroid sprays based on egg thresholds may expedite resistance.

(Stewart) AGDIA is dropping the egg kits from its product. Value of egg kits is mostly limited to non-Bt. Sonny Ramaswamy is developing a test to identify the larvae of each species.

(Leonard) VIP performance is highly dependent upon lines evaluated, and product being evaluated may not be what hits the market (which will probably have a second gene).

(Gary Lentz) We had no lepidopteran pressure in our VIP plots this year.

(Luttrell) We had up to 16% boll damage in the 100 series.

(Leonard) Is there a difference in species composition infesting VIP 100 (16 % boll damage) vs. VIP 200 ( Syngenta's marketing choice)?

(Andrews) Anybody seeing fall Armyworm damage in BG2 cotton.

(Stewart) Yes.

### **Review of Heliothine Knowledge Base (Randy Luttrell)**

(Luttrell) What's new with pesticide management?

(Stewart) Need to synthesize information more and interact more on projects and publications.

(Suh) USDA-ARS has dropped heliothine work, but Westbrook is still working on bat predation.

(Hardee) MS unit of ARS is the only one working on heliothines. Tipton unit focuses on corn.

(Adamczyk, Hardee) ARS is no longer working on migration studies after 20-30 years.

Augmentation / sterile hybrid programs are dead.

(Leonard) Who are the lead cotton researchers at TX A&M?

(Group) Jim Leser, John Norman and Ray Parker for applied work.

(Luttrell) What's our mandate?

(Leonard) It should be the long-term monitoring of pyrethroid resistance plus insecticide screening. We're continuing our long-term pyrethroid monitoring program and we'll send vials to any other state (including corn from across the country) that wants to test their populations. Looking at movement of lepidopterans in Bt cotton, a new ET for 2nd generation Bt cotton, and need for foliar sprays in Bt cotton. We're also looking at spatial population distribution through aerial surveying. LSU efforts on heliothines has scaled down 25-30% - Jim Ottea backing off insecticide resistance work, Gene Burris spending more time with sweet potato IPM, Steve Mickinski is doing much of the transgenic screening work.

(Bagwell) LA is 85% Bt. Bollworms are #3 behind plant bugs and stink bugs.

(Greene) Continue with insecticide termination work with COTMAN. Cooperating with Dr. Hardee on moth screening for Bt, and with Don Johnson on pyrethroid screening. Luttrell is also conducting pyrethroid screening in NE, SE, and SW AR (need to look at larval metabolic resistance). Gus Lorenz conducts most of the moth trapping work.

(Luttrell) We're looking at alternate host as it relates to population structure of lepidopteran pests (bollworm and tobacco budworm) by monitoring 100 traps. We have cooperated with Monsanto on testing moths to see if they're from C3 and C4 host plants. A doctoral student is looking at landscape distribution across 10-15 thousand acres. A master student is looking at overwintering

survival in NE AR. We've also found tobacco budworm neonates on corn silk (survival is weak) in the Red River Valley.

(Lorenz) Were control failures in sweet corn with pyrethroids due to a tobacco budworm infestation?

(Adamczyk) There's no evidence because 4th-5th instar larvae were ?.

(Michael Boyd) What are the most important spring hosts for budworms?

(Group) Crimson Clover, geranium.

(Lentz) Larvae we've collected were *suflexia* (favors ground cherry) not *virescens*.

(Adamczyk) I don't think they can survive on ground cherry without fruit.

(Lentz) Fall '02 hatch project focused on landscape ecology for heliothines, stink bugs, and increased use of biological control.

(Stewart) Moth trapping; bollworm still # 2 or 3 pest in TN

(Luttrell) Why do TN growers plant so much Bt cotton?

(Stewart) Bt cotton planted because of diversity of management styles.

(Group) In AR and LA Bt cotton planted because we cannot otherwise afford to control tobacco budworms. In SE states Bt cotton still required multiple oversprays for bollworms.

(Leonard) What's the threshold based on - eggs?

(Capiro) Insecticide oversprays may select for Bt and pyrethroid resistance at the same time.

(Lorenz) I think we've selected for moths to lay eggs deeper in the canopy with Bt cotton.

(Harris) Back in the 1960's we observed variable bollworm egg lays within the canopy.

(Stewart) Pulled bloom tags

(Leonard) Before Bt cotton we only checked terminals, but increased larval movement within the canopy has changed that approach.

(Lorenz) Marvin Wall looked at whole plants and he thought moth behavior has changed.

(Luttrell) Phil Tugwell says we need to help consultants feel more confident about not spraying based on egg thresholds.

(Stewart) I'd point out that automatic pyrethroid oversprays almost always increase yield.

(Adamczyk) Have (or should) we drop any insecticide resistant management approach for pyrethroids?

(Bagwell) We know pyrethroid failures will occur but other groups not interested in insecticide resistance.

(Andrews) Farmers ultimately pay for insecticide resistance thus proactive approach is not favored.

(Group) IRM cause hurt by lack of alternatives to cheap pyrethroids (ex. generic cypermethrin).

(Harris) I've changed the emphasis of my program to remote sensing and site specific management (measure crop maturity with NAWF = 5 with imaginary but correlation is not good). Imaginary formerly aerial-based but were moving more toward satellite-based. John Sanders (student of Dan Reynolds) conducting defoliation work. New Hatch project involves testing resistant varieties (nectariless for plant bugs). Jim Robbins is doing insecticide screening work.

(Caprio) John Schneider is testing hypothesis of alternate hosts for tobacco budworms. We're cooperating with Don Parker on modeling programs. Growers are not the only stakeholders involved in Bt refuge management as environmental quality to the general public is also important. Monitoring strategy related to insect movement.

(Stewart) Logistics, Bt cotton, and lack of scouts (in some areas) are driving the need for area-wide treatment thresholds; however, there is one problem - changing Bt technologies.

(Hardee) How will (directed at Caprio/Parker/Schneider) use Bt coming from Congress?

(Caprio) We'll continue research.

(Harris) We'll conduct landscape classification research. We need more economic analysis of Bt cotton.

(Caprio, Luttrell) I'd like to remind the group about Chi-Fa's papers in *Envir.Ent.* about temporal variation in population structure and movement of bollworms and tobacco budworms as it relates to genetic drift. He found budworms were more localized during the summer but bollworms were the opposite.

(Andrews) We don't need insecticide resistant programs that also don't include field people. We're testing Diamond, and looking at insecticide termination programs in different production systems [skip row, irrigated (more expensive to manage), non irrigated].

(Adamczyk) We're conducting isotope work to determine bollworm and budworm hosts (C3 vs. C4 plants). May be able to separate out those from cotton and soybeans. Jeff Gore is working on action thresholds in BG1 and BG2 within 1/8 acre cages. I'm interested in moth production in Bt corn (bollworm survival significant, but smaller moths and fecundity decreases 75% in the lab). We're still screening transgenics (Bt and Wide Strike only). Looking at grain sorghum and soybean as hosts for *H. zea*. Checking genes in Bt cotton (? foreign DNA and protein there) – 99% accurate.

(Reed) We published a '01 paper on spray parameters for stink bugs. You shouldn't exceed 12 GPA plus smaller droplets are more effective in controlling larvae lower in the canopy.

(Suh) Juan Lopez is conducting similar work in TX.

(Hardee) The Dallas meeting in March was probably the last one focusing on heliothine work.

(Lorenz) Minimal time spent on research priorities - what and how much insecticides used for what pests (see handout).

(Stewart) See Southwest Entomologist article published in 2000; we need more regional publication on the plant bug complex.

## **Publications**

Monsanto needs to submit a literature review for its package to EPA. John Benedict was contracted by Monsanto to write literature review of Heliothines.

(Hardee) I'm concerned the focus is too narrowed on just Bt crops.

(Leonard) Monitoring data was included in regional publication.

### **Bugs (Jeremy Greene)**

Regards to TPB – threshold gaps during midseason – preferences for fruit, compensation/injury level, and movement – his program will look at above plus finding alternative chemistry.

(Luttrell) A 'bug' meeting was held two weeks ago in Stoneville.

(Suh) In TX we're looking at alternative hosts, dispersal patterns, overwintering survival, etc. for stink bugs (This will be focus our focus for next 5 years). We've seen stink bugs overwintering in pecan orchards. In-field sticky traps give us an index of cotton fleahopper populations, but we still see big population fluctuations.

(Leonard) Meg Parojoule is doing a lot of plant bug work (alternate hosts, dispersal patterns). In LA, we've looked at tarnished plant bug data gaps between first flower and cut-out with respect to economic threshold, plant injury and compensation, intra- and interplant movement, field movement, and alternate host plants. We need to push agrochemical companies to develop more alternate insecticidal products for plant bugs. I think management on a landscape level is very important. We're also looking at stink bug injury as it relates to late-season plant injury (i.e. boll lock and rot, weather-induced fruit loss). Green stink bug populations are more variable than those of brown and southern green stink bugs. We're also looked at thresholds and alternate hosts but less work being done with green stink bugs.

(Greene) What about trap cropping with soybeans?

(Leonard) We are evaluating this approach. It does appear that brown stink bugs are becoming more common in corn, and they're causing more 'cow-horned ears' and deadheart (recognizable before axial development) to appear. We've noted significant yield decrease and deadheart when stink bug treated with methyl parathion before silk emerges and ear about 4-5 inches long. Southern green stink bugs still dominate in Group V soybeans beans. Group IV soybeans highly favored by stinkbugs and they also high favor red clover.

(Leonard) What can be an important host for brown stink bugs?

(Greene) Wheat for both brown and rice stink bugs.

(Teague) We also see rice stink bugs in corn.

(?) Stink bugs highly favor red clover.

(Luttrell) On a landscape management scale stink bugs stay in group IV soybeans until they mature and then go to V's (obvious movement and host selection process).

(Boyd) Group IV soybeans make a great trap if farmers will use them.

(Greene) We need a regional trap cropping effort.

(Leonard) There's funding opportunities available.

(Greene) We are spending a lot of effort to close some information gaps - when to stop spraying, thresholds (but 20% internal boll damage threshold doesn't work as well in the MS Delta because it's complicated by TPB activity).

(Gore, Leonard) We're planning threshold work, and also conducting efficacy work with all bugs.

(Harris) Years ago I had a student working on boll ages and found no difference between non-Bt and Bt cotton. In MS, we've worked with Tyler H. on boll age susceptibility and found no difference in TPB susceptibility among varieties. We're following up Jeff Willard's on site-specific insecticide applications and plant bugs. The concept seems to be working but we need to know more about how discriminating plant bugs can be. Stink bugs stay in group IV and V soybeans whereas plant bugs stay in cotton. What kind of trap for TPB?

(Greene) We've been looking at the effect of trap cropping before movement into corn and cotton fields. The species composition shifts from southern green stink bugs (more common) to brown stink bugs.

(Andrews) We're still monitoring and conducting area-wide TPB management work. I think we're seeing two TPB 'biotypes' in the Delta.

(Adamczyk) Jeff Gore observed groups IV, V, and V soybeans for stink bugs. Gordon Snodgrass still testing Orthene, Malathion, Vydate, and cypermethrin resistance.

(Hardee) The area wide approach has merits but challenges remain (? consultants' spray timing). The program is funded by USDA-ARS to a tune of \$1.4 million through '06. Growers receive a benefit of \$8-9 for every one dollar they spend, and they (growers) eventually take it over.

(Reed) The 20% economic threshold level for stinkbugs does not hold because of plant bug infestations and boll damage.

(Luttrell) JEE publications on buttonbush as a clouded plant bug in the Grenada Lake area

(Stewart) Cloudy plant bug confounds boll damage rating.

(Williams) Clouded plant bug is a full-season pest when populations flare-up since they begin infesting fields at the pinhead square stage.

(Stewart) Insecticide control for tarnished plant bugs is equal to that for clouded plant bugs. Feeding behavior is somewhat similar, but we observed more boll damage by clouded versus tarnished plant bugs.

(Leonard) Funding opportunity for extension and research for southern IPM program. For example, Dick's cooperative aphid project (possibly make an experiment station publication).

(Luttrell) It's a political process.

(Leonard) Administrators view projects more favorably when ARS becomes involved.

(Stewart) We need better coordination with grants submissions and plant bug publications. I'll lead the effort to get an SR-IPM Ext./Research grant on trap crops stink bugs.

(Greene) I'm already in discussions with potential contributors on a regional bug publication.

(Bagwell) Cotton Foundation also may fund publications. We also shouldn't have a problem

with the Southern Regional Directors since Washington D.C. is pushing for more multi-state projects.

(Lentz) Research and extension efforts are important for getting publications out, but who funds and for how much?

(Stewart) I'd say about \$15-20 thousand each.

### **Closing**

(Leonard) I propose this meeting become part of the SEB-ESA as a symposium (2 hours for papers and 2 hours for a meeting). This will give us more opportunities for publications plus decrease meeting duplication and hopefully increase meeting participation.

(Lorenz) I like this meeting's association with the mid-South Working Group.

(Capiro) Discussion will be severely limited by this proposed format.

(Hardee) I nominate Randy Luttrell for President and Roger Leonard for Secretary; motion seconded by Gus Lorenz, and given 100% approval.