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Genetic Characteristics of Local Lygus lineolaris Populations

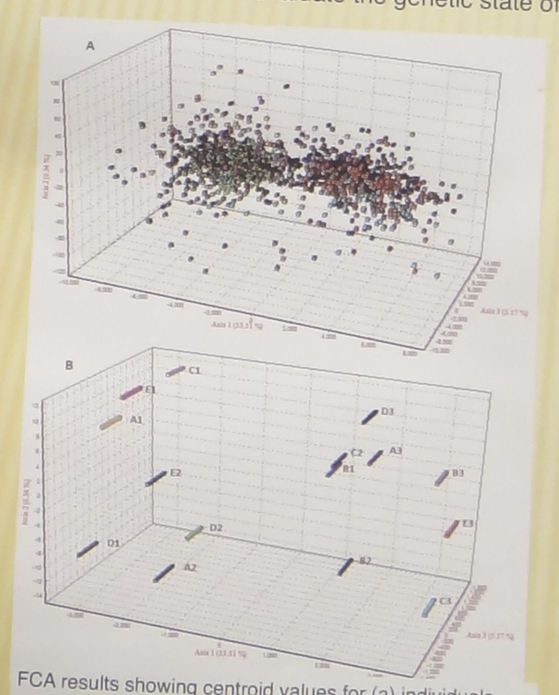
By Ari Esters

USDA-ARS, Southern Insect Management Research Unit

Lygus lineolaris, also known as the tarnished plant bug (TPB), is an agricultural pest affecting the growth of various crops in many parts of North America, including the southern United States. As of now, synthetic insecticides specifically tailored to control TPB populations are administered to crops multiple times throughout each growing season. However, continual insecticide usage has prompted genetic selection within *TPB* populations, resulting in widespread insecticide resistance in *L. lineolaris*. In other words, insecticides eliminated most of the insects, excluding those that have genes that make them resistant to the insecticide (the use of insecticides has "selected" those genes). The insecticide-resistant bugs reproduce, resulting in a higher percentage of resistant bugs than before. Therefore, the development of more synthetic insecticides would only have temporary effectiveness since the targeted pests would eventually develop a new resistance to them. Also, more synthetic insecticides would only enlarge the environmental footprint left behind by agricultural chemicals. In order to design better ways to manage insecticide-resistant bugs, more information concerning the genetic variation and distribution of *TPB* populations is required.

Five collection sites; bugs were collected from each site three times over a four-month period

One particular study (Perera et al., draft) conducted by USDA-ARS researchers compares the genetic characteristics of different L. lineolaris populations near Stoneville, MS and tracks their genetic variability at multiple times throughout the growing season. First, L. lineolaris adults were collected from five locations in a small geographic area surrounding Stoneville, MS in May, July, and September 2006. The insects were then preserved at -80°C until they were used for DNA extraction. Genomic DNA (gDNA) was extracted from ninety-six TPB specimens from each population. Then, the gDNA was genotyped using fourteen pre-designed microsatellite markers along with genotyping software. Software-performed statistical analysis was used to calculate informative genetic parameters from the resulting genotypes, such as allelic diversity, Garza-Williamson indices (M values), and linkage disequilibrium. Allelic diversity is a measure of genetic variation, M values serve as an indicator of population bottlenecks, and linkage disequilibrium may indicate that certain loci have been selected by outside factors (Perera et al., draft). Also, a descriptive technique called factorial correspondence analysis (FCA) was used to identify relations between different populations. These genetic parameters, among others, were calculated and interpreted in order to evaluate the genetic state of these local populations.



FCA results showing centroid values for (a) individuals and (b) populations

The resulting genetic parameters showed that there was considerable genetic differentiation between the *L. lineolaris populations*. Also, FCA calculations indicated that two "genetic clusters" existed among the fifteen groups. Almost all of the populations (four out of five) appeared in the first genetic cluster in early season (in May) and transferred to the other cluster in late season (in September). Furthermore, low M values and a decreasing allelic diversity throughout the season suggest that the populations experienced a "population bottleneck," meaning that a significant decrease in population size caused the genetic variation of the population to decrease. The significant linkage disequilibrium values support this finding, as they are an indication that several of the genetic loci have been subject to selection by some external factor. Given the indigenous environment of these populations, it is mostly likely that the selection exerted on these populations was caused by insecticide usage (Perera et al, draft). More studies will be required in order to pinpoint the genetic loci represented by the microsatellite markers used.

References:

Perera, O. P., J. Gore, G. L. Snodgrass, R. E. Jackson, K. C. Allen, C. A. Abel, and R. G. Luttrell. "Temporal and Spatial Genetic Variability of the Tarnished Plant Bug, *Lygus lineolaris* (Palisot de Beauvois), Populations in a Small Geographic Area." (Draft)

Perera, O. P., G. L. Snodgrass, B. E. Scheffler, J. Gore, and C. A. Abel. 2007. Characterization of eight polymorphic microsatellite markers in the tarnished plant bug, *Lygus lineolaris* (Palisot de Beauvois). Molecular Ecology Notes 7: 987-989.

Acknowledgements:

Thank you to Dr. O. P. Perera and Calvin A. Pierce III for teaching me new skills and knowledge and allowing me to gain hands-on experience in the lab.

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2013 Sweetpotato Variety Trials

Bailey Tubertini
USDA-ARS, Southern Insect Management Research Unit

Introduction

One study that has been a staple in out unit (SIMRU), is the sweet potato variety trials. For a number of years now our unit has conducted research on different varieties of sweetpotatoes from North Carolina, Louisiana, and Mississippi. The primary focus for this research is to discover if any variety produces a higher yield or shows a greated resistance to insects than the varieties currently used by commercial farmers.

Photographs show variety trials in Mound Bayou, MS.

Materials and Methods

The variety trial has many characteristics that differ from the rest of our sweetpotato studies. It is a much smaller and more precise study of each individual variety. We use two row skips and 25 foot plots to ensure we get accurate data specific to each type of sweet potato. We use the transplanting method to implement each variety and use a sweep net to gather our data on insect which falls in line with the rest of our sweetpotato research. Weed management is also universal throughout our studies due to sweetpotatoes' susceptibility to herbicides, which means any broad-leafed weed must be pulled by hand.

Summary

The results and findings are submitted to the National Sweetpotato Collaborators Group each year. This is a group of researchers located throughout the country that our results can be compared to. These groups compare the yield of each variety, types of fertilizer used, plot size, and amount of irrigation used in each study. I believe the variety study is one of our most important studies because if we can find a specific variety that shows a significant increase in yield in specific areas, we can suggest that particular variety be used by commercial farmers to increase their output and profits.

References

Calyor, A., D. Picha, K. Piecota. 2013. National Sweetpotato Collaborators Group Progress Report, 2012. www.sweetpotatoes.org

Acknowledgements

I would like to thank Larry Adams and Chris Johnson for assisting me with this project.

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Effect of *Beauveria bassiana* on Tarnished Plant Bug

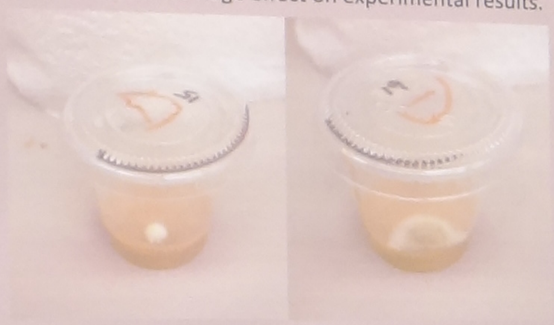
Cavishia Andrena' Roberson
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:

The tarnished plant bug, *Lygus lineolaris,* is one of the most serious pests of cotton in the Mississippi Delta. Scientists have been working for many years to solve the ongoing problem of this insect. Tarnished plant bugs have developed resistance to most insecticides used in cotton (Snodgrass etal. 2009). There is a growing interest in alternate control methods. *Beauveria bassiana,* specifically the NI8 strain isolated from bugs in the Mississippi Delta, has been studied and is currently being studied as a tool to make the tarnished plant bug more vulnerable to insecticide. My presentation summarizes an experiment with *B. bassiana* on cotton plants, and the effect it has on the tarnished plant bug. It also illustrates how contamination can have a huge effect on experimental results.

MATERIALS AND METHODS:

Artificial evaluation diet: Prepared in the NBCL.
Lygus Adults: Obtained from lab colonies of *L. lineolaris*.
Microscope cover slips
Ribbon
Sponges
B. bassiana: Isolate NI8 Tween 80

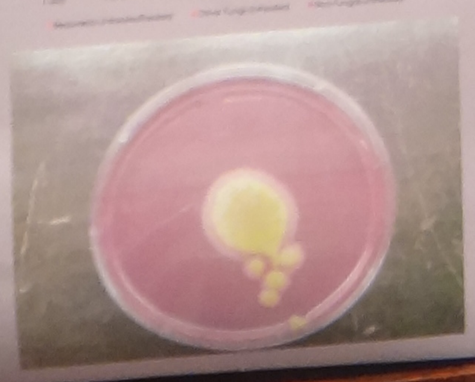


THE EXPERIMENT:

There were ten plots: M3A, M1A, M3B, M1B, M1C, M3C, M3D, M1D, M3E, and M1E. Plot numbers that contain "1" were control plots. Those that contain "3" were NI8 Tween 80 plus *B. bassiana*.

Cover slips were pinned to the upper leaves of the cotton plant. The cover slips were held in place with an insect pin inserted through the slide and leaf to a sponge backing. A ribbon was also attached for easy retrieval after the *B. bassiana* is sprayed.

A total of twenty-five leaf tissues were collected from each plot. One-day-old adults were placed on the leaf tissue for twenty-four hours before being transferred onto the artificial evaluation diet.



RESULTS AND DISCUSSION:

Observations were made daily to observe the survival and sporulation of the fungus.

Mortality in the treated plots were 8%, 25%, 37% 80%, 83%, 90%, and 95% on days 1, 2, 3,6, 7, 8, and 9 post- treated respectively. Untreated plots were 5%, 8%, 23%, 38%, 11%, 14% and 15% over the same time period. Mortality due to *B. bassiana* infection reached 40% at nine days post-treated. In untreated, there was 10% due to *B. bassiana* infection. Infection from other fungi was 52- 80% in the study, indicating the importance of correct identification of fungi associated with dead tarnished plant bug.

This conclusion of possible contamination was determined after the recognition of the fungus. We used a medium of MDRB to test for *aspergillus flavus*. The petri dish was placed in an environmental growth chamber at 25° and grown for 5-7 days. After observing the mortality rate of the contaminated fungus, *aspergillus* may be another alternate for tarnished plant bug management.

REFERENCES:

Snodgrass, G. L., J. Gore, C. A. Abel, and R. Jackson. 2009. Acephate Resistance in Populations of the Tarnished Plant Bug (Heteroptera: Miridae) From the Mississippi River Delta. Journal of Economic Entomology 102: 699-707.

ACKNOWLEDGEMENTS:

I would like to thank Dr. Randall Luttrell and Kenya Dixon for helping me with my presentation.

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Helicoverpa Zea and *Heliothis Virescens* Moth Traps

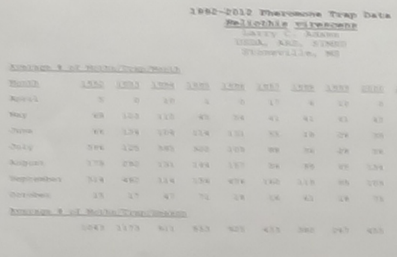
Chris Morris
USDA-ARS, Southern Insect Management Research Unit

Introduction

Helicoverpa Zea, or corn earworm is a major pest in corn and BT cotton in the southern United States. Corn is predominately the food of choice for H. Zea but it will also need on BT cotton for it has a nigh resistance to BT. Heliothis Virescens is also a pest of corn and BT cotton but the low resistance to BT makes it an easy kill for the virus. Keeping count of the population of these worms is essential to the survival and yield of the crops. One way to keep account of the presence of H. Zea and H. Vir worms is by counting their adult form moths.

Materials and Methods

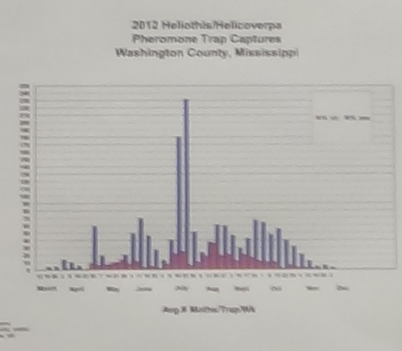
Our Division in SIMRU has been monitoring the H. Zea and H. Vir presence in and around the Stoneville area since 1992. We have five sets of traps in five different locations that attracts both H. Zea and H. Vir by their respective pheromones. The traps are checked and counted weekly with pheromones being replaced every other week.


1992-2012 Pheromone Trap Data
Heliothis virescens
USDA, ARS, SIMRU
Stoneville, MS

Results and Discussion

The past twenty years of data collected sheds light on the effectiveness of transgenic crops as well as the different generations of the moths. After the introduction of BT cotton and corn there is a notable decline in both H. Zea and H. Vir with H. Vir having the most significant drop in population. BT has not eradicated either species so insecticide regimens are still needed to control the population

Helicoverpa zea adult. Photo ©Mark Dreiling, Bugwood.org



References

Luttrell, R. G., Jackson, R. E. 2012. *Helicoverpa zea* and *Bt* cotton in the United states. GM Crops Food. 3(3): 213-227

Acknowledgements

Thank you Larry Adams and Chris Johnson for the opportunity to aid in research for SIMRU.

Sweetpotato D

Thom
USDA-ARS, Southern Ins

Introduction:

During the 2012 growing season USDA, A
attempted to answer an important question
incorporated insecticide to control soil inse
method chosen to answer this question wa
to exemplify the value in taking soil sample
locations were selected: Alcorn State Univ
Farm, Mound Bayou, MS; and Livingston F
transplanted in mid May, and treatments w
which included: Lorsban, K-Pam, Lorsban
managed field treatment. Soil samples wer
verify nematode populations at different tim
damage, quality, and yield were recorded.

Materials and Methods:

Beauregard 14 sweetpotato slips were tran
4, 2012. Plots were eight rows by two hund
between each slip. The two Mound Bayou
treated before transplanting with recomme
irrigated as needed throughout the season
September 5 and September 26. Soil pull
ground insect sampling was performed by
25. Insects were recorded.

Mid-season soil sample

Summary:

All locations in the study showed a total in
Lorsban and Lorsban. US#1 yield in the K-
untreated control at the Stoneville and San
different from the Grower managed treatm
locations appeared to be a factor that may
SIMRU demonstration test plots are curre

References:

Calyor, A., D. Picha, K. Pecota. 2013. Na
2012. www.sweetpotatoes.org

Acknowledgements:

A big thank you goes out to my bosses M

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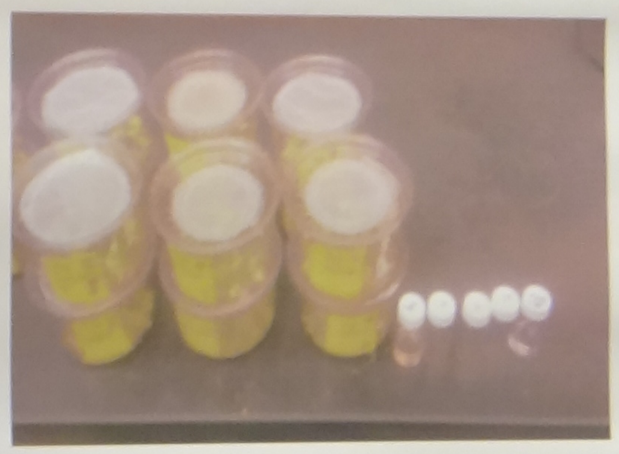
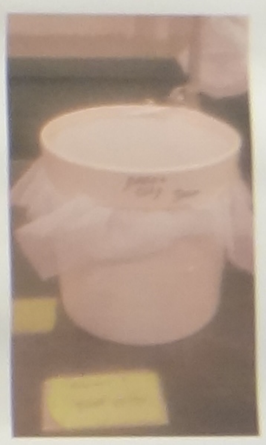
Insecticide Resistance of Tarnished Plant Bugs

D'Anice Dishmon
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:
I worked in the laboratory for Dr. Gordon Snodgrass and Mr. Arnell Patterson during the summer of 2013. The research project that I worked on was designed to monitor insecticide resistance in the tarnished plant bug (TPB) to thiamethoxam (Centric). Centric is an insecticide that is widely used in the mid-South to control TPB in cotton. Over the past 25 years TPB have become resistant to insecticide found in the carbamate, organophosphate, and pyrethroid classes. Centric is a newer class of insecticide (neonicotinoid) extensively used for TPB control and is a very important insecticide in cotton.

MATERIALS AND METHODS:
Resistance to Centric was monitored using a glass-vial bioassay. In the bioassay, adult TPB were fed different amounts of Centric (doses) by dissolving it in honey-water and pipetting it onto a piece of floral foam inside a 20-ml glass vial. The floral foam held the solution without leaking and TPB will feed on the foam and obtain the insecticide. One adult was used per vial and for most populations a check and four other different doses were tested. For the check and each dose, thirty adults (1 pr vial) were tested. Mortality was determined after 24 hours and results were used to calculate an LC_{50} for each test population. The LC_{50} is the dose that will kill 50% of the adults in a population. They allow us to compare different population in the current year and from previous years to see how resistance is changing. Adults from 23 populations found in the mid-South will be tested.





RESULTS AND DISCUSSION:
Tests with adults from the different locations are still being conducted. Results from the completed tests show that resistance to Centric is low and has changed little from previous years.

REFERENCES:
Snodgrass, G.L., C. A. Abel, R.E. Jackson, and J. Gore. 2008. A bioassay for determining resistance levels in tarnished plant bug populations to neonicotinoid insecticides. Southwest. Entomol. 33: 176-180.

ACKNOWLEDGEMENTS:
I would like to thank Dr. Snodgrass for his devoted enthusiasm for helping me with my presentation. I would also like to thank Mr. Arnell Patterson.

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Odorant Binding Proteins in *Lygus Lineolaris*

Darshanisha Warren
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:

Tarnished plant bug, *Lygus Lineolaris* is a polyphagous crop pest that feed on several crops in the United States and Canada. Among many agronomic crops affected by this pest are soybeans, strawberries, alfalfa, and cotton. OBPs are small soluble proteins in the sensory organs of animal species and they detect odorants that are hydrophobic. OBPs stimulate neurons housed within the sensilla which triggers a signal cascade that culminates in a behavioral response. Insects use odorant binding proteins (OBPs) and chemosensory proteins to detect signals from various sources that trigger behavioral responses such as host detection, mating, oviposition, aggregation, and avoidance. Identification of OBPs and characterization of their expression in *Lygus* sensory appendages help in improving our understanding of olfaction in *Lygus* species.

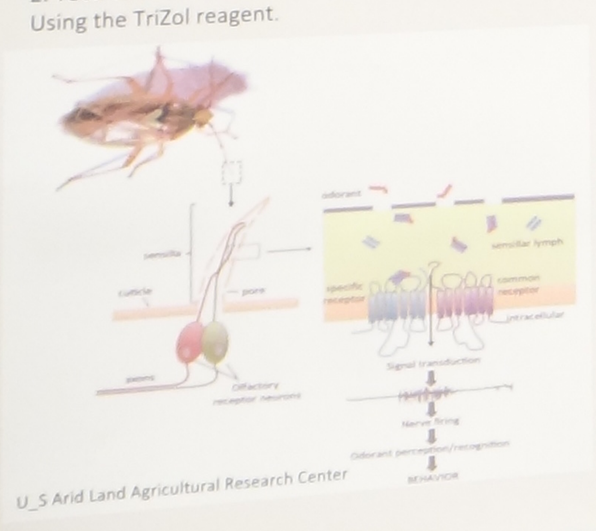
Gene expression was analyzed in *L. lineolaris* through real time PCR of cDNA synthesized from RNA extracted from various tissues. Real time polymerase chain reactions is a laboratory technique based on the polymerase chain reaction, which is used to amplify and simultaneously quantify a targeted DNA molecule. For one or more specific sequences in a DNA sample, real time-PCR enables both detection and quantification. The quantity can be either an absolute number of copies or a relative amount when normalized to DNA input or additional normalizing genes.

MATERIALS AND METHODS:

1. Insect rearing

Lygus Lineolaris were obtained from a laboratory colony maintained at 25°C under 20% humidity. Insects were reared on green beans and an artificial diet mix. Some of the artificial were reared on bio-assay trays whenever we wanted to screen a certain toxin.

2. Total RNA was extracted from the (legs, antennae, and proboscis) of the *L. Lineolaris* Using the TriZol reagent.



U_S Arid Land Agricultural Research Center

RESULTS AND DISCUSSION:

An initial step in elucidating the molecular basis of olfaction in *L. Lineolaris*, the transcriptomic approach was used to identify genes encoding proteins exhibiting OBP- like features. Expression profiling revealed that transcripts for a number of the putative "Plus-C" OBPs were enriched in the antennae. A total of 33 OBPs, including previously identified LAP, were identified from *L. lineolaris*. Twenty of the 33 OBPs were classified as classic OBPs. They were also similar putative OBP sequences identified from other hemipteran species such as green plant bug *Apolygus lucorum* and lucerne plant bug *Adelphocoris* lineolatus.

REFERENCES:

Hull, JJ., OP Perera, and G. L. Snodgrass.____. Transcriptome analysis and expression profile of odorant binding proteins in the tarnished plant bug, *Lygus Lineolaris*. Insect Molecular Biology. Submitted 2013.

Steinbrecht R (1998). Odorant binding proteins: Expression and function. *Ann N Y Acad Sci* 855: 323-332.

ACKNOWLEDGEMENTS:

I would like to acknowledge Dr. OP Perera for his help with this presentation and giving me the opportunity to work with him and learn and gain knowledge in his field of expertise. I would also like to acknowledge Dr. Randy Luttrell for his enthusiasm and support that he gives to all of the SIMRU summer employees. I would also like to thank Calvin Pierce for his continued dedication in assisting with my presentation.

13

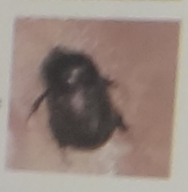
Beneficial Use of Light Traps

Dquan Wilson
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:
What are light traps? Light traps take advantage of the fact that nocturnal insects are attracted to UV light. An insect flies to the UV light emitted by the trap, and falls into a 36" cubed screened cage. Light traps are designed to attract insects of all types, and their use is constantly increasing around the world. Light traps play an important role in some pest management strategies. They have proven to be effective as a non pesticide tool for reducing and suppressing moth pests, such as adults of tomato pinworm and cabbage loopers.

Black light traps have been shown to be effective at trapping many pests which attack the fruits of agricultural crops. They can also be used in determining the flight habits of moths that are not attracted to baits, such as the peach twig borer and navel orangeworm. The black light traps gives a farmer an accurate means of determining when to scout and spray for moths.

MATERIALS AND METHODS:
There are five main parts to the light trap: 1) the power regulator, 2) the photocell, 3) the 36" cubed screen, Cage, 4) a UV bulb, 5) and a 12volt DC marine battery. The light trap is what the bulb is attached to by the current supports. The trap has metal plates resembling a plus sign, with the light bulb in the center. The regulator is a small rectangular box that converts the power into a form that the light can accept. A photocell is what detects sunlight and darkness. It controls the light so that when its dark it activates power and when its daytime it deactivates power. The 36" cube screen provides a one-way entry inside the trap to prohibit the insects from exiting out of it. Last but not least, the 12volt battery. This is indeed the heart of the simply because without it power isn't possible.



RESULTS AND DISCUSSION:
Traps are checked for moths and sugarcane beetles twice a week. When the contents from the light traps are analyzed, a variety of different insects are tallied according to what is captured. Majority of the insects that are caught in the light traps are *Helicoverpa zea*, *Heliothis virescen*, or sugarcane beetles. They range anywhere from 10 to 20 per trap including dead moths. These moths are collected and brought back to the laboratory for use in experiments.

REFERENCES:
Albert W. Hartstack, Jr., J.P. Hollingsworth, D.A. Lingquist. Agricultural Research Service, USDA, College Station, Texas.

ACKNOWLEDGEMENTS:
I would like to thank Dr. Luttrell for his enthusiasm and dedication throughout the year, and Cavishia Roberson for assisting me with my presentation.

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Dose Morality Vial Test with Tarnished Plant Bugs and Adult Bollworms

Jana' Slay
USDA-ARS, Southern Insect Research Management Unit

By conducting research on insect pests, we ensure the continuation of civilization. The research we conduct in the Southern Insect Research Management Unit allows us to use chemical and biological controls to manage insect pests. Some scientists specifically focus on improving the tarnished plant bug population and determining the effect of bollworm ecology on pyrethroid insecticides. With the studies conducted scientists can see how effective Bt corn and cotton plants are as well as see if they are worth the cost.

In the article *Acephate Resistance in Populations of the Tarnished Plant Bug (Heteroptera: Miridae) From the Mississippi Delta* it is stated, "that the tarnished plant bug populations highly resistant to pyrethoid insecticides were still susceptible to organophosphates, especially acephate. This is no longer true for tarnished plant bugs in the delta."

The Dose morality Vial Test with plant bugs can establish baseline measurements of susceptibility for an insecticide. Various insecticide are used. A common insecticide used was Diamond. Because of these tests ran today, years later it can be referred back to so population resistance can be determined.

Assorted chemicals are tested to judge effectiveness on killing the plant bugs. Plant bugs are caught from various regions throughout Mississippi. We "rear" the bugs to make colonies so multiple tests can be conducted. We start the test by soaking the vials in the different chemicals. We also use different dosages of the chemicals. After allowing the vials to air dry, we then place the plant bugs in the vials. After a set amount of time (roughly 3-24 hours) the plant bug is then removed from the vial and individually placed into plastic cups with food suitable for survival. The test is then rated by observing the bugs for death as well as switching out the food for those who managed to survive. After rating the test a certain amount of times, data are then collected, reviewed, and stored.

Adult bollworms also have a Dose Morality Vial Test. Pyrethoids are used to test the bollworms. Moths are placed in vials covered with insecticides. They are placed in vials for a set amount of time (roughly 3-24 hours.) If the survivors are able to fly afterwards they are reported as resistant. The deceased bollworms are listed as susceptible. This test can also be used to monitor resistance over period s of time.

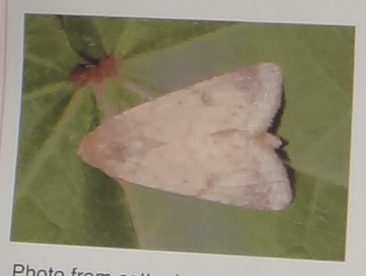


Photo from cottoninsectcorner.org

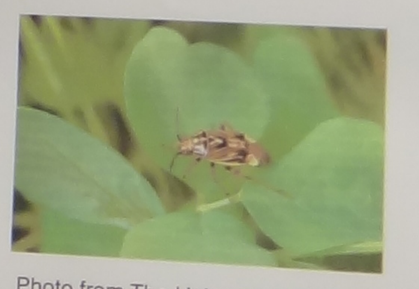


Photo from The University of Florida

References: Snodgrass, G.L., Gore, J., Abel, C.A., Jackson, R.E. 2008. Resistance to Acephate in Tarnished Plant Bug (Heteroptera: Miridae) Populations in the Mississippi River Delta. Journal of Economic Entomology.102:699-707

Acknowledgments: Thank you Dr. Luttrell and Michelle Mullen for all your help and encouragement through these years.

15

Biodiversity of insects in cotton and soybean fields

Jesse King
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:
Pitfall traps are mainly used for ecology studies and ecologic pest control. A pitfall is a trap for insects that travel on the ground. Flight intercept traps catch insects that are moving through the air. Insects that enter a pitfall trap are unable to escape, and may either be killed by the trap or remain trapped, but unharmed.

Biodiversity in some areas shows a significant correlation to various groups of insects (Duelli and Obrist 1998). The purpose of the study was to test species numbers or diversity measures of several faunistic groups and of flowering plants for their correlation with the total number of animal and plant species found at a given site. Various methods of trapping collect different groups of insects based on their behavior.

MATERIALS AND METHODS:
12 pitfall traps
1 Flight Intercept Trap
Study sites in cotton and soybeans across the Mississippi Delta

RESULTS AND DISCUSSION:
Pitfall and flight intercept traps are used to find the level of biodiversity in the fields of cotton and soybean and to see what insects will be attracted. The traps are all checked once a week. Some of the insects that were caught were beetles, spiders, and crickets. After retrieving the contents of the traps, they are taken back to the laboratory, labeled, and transferred into whirl pack bags to be analyzed later.

Flight intercept trap in a soybean field.

Cotton flower, copyright bugwood.org

REFERENCES:
Duelli, P., & M. Obrist. 1998. In search of the best correlates for the local organismal biodiversity in cultivated areas. Biodiversity and Conservation. 7(3): 297-309

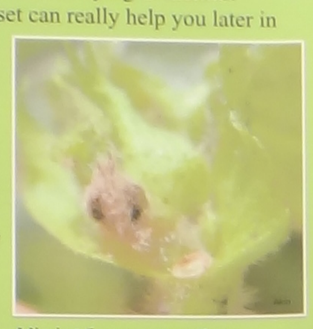
ACKNOWLEDGEMENTS:
I would like to thank Dr. Parys and Cavishia Roberson for their assistance with my presentation.

4

Fruiting in Cotton as Affected by Square Set

By: John-Austin Coleman
USDA-ARS, SOUTHERN INSECT MANAGEMENT RESEARCH UNIT

Determining your cottons health and current stage is a very important aspect of growing and maintaining a good cotton crop. Square set in early season is a must for many farmers and researchers. Square set retention counts are easy and extremely helpful when trying to monitor tarnished plant bug activity in the field. Managing your early square set can really help you later in the season. The way you calculate square set is by using a clicker and counting the top ten square sites of the plant. Start by counting the top ten square sites on the plant. You count from the terminal down, and you do not count over ten sites per plant before moving to the next plant. The goal is to count a total of 100 squaring sites and keep up with the number of damaged, missing, blasted, or flared squares. For example, if you counted a total of 100 squaring sites and you found eleven missing squares, then you would have a square set of 78% (Catchot,A.). By using a clicker and finding your square set, you can determine where your cotton is and what to expect in the future days to come. By knowing what kind of damage is in your fields, you can better determine what you should treat your cotton with and in a timely manner.



Missing Square on cotton. Photo © Bugwood

There are many reasons for low square set. These causes range tremendously, from weather to insect pressure. This is why early square set count is a vital tool to track your cottons progress and helps to keep an eye on insect activity. Along with sweeping and other methods, square set is a productive way to maintain your fruiting nodes on your cotton. There are many ways to lose squares, but the most common way is tarnished plant bug feeding. The tarnished plant bug, (lygus lineolaris) is a common insect that targets cotton and other flowering crops and weeds. Without treating and targeting the plant bug, it can destroy and flare squares. This is the major way to hurt your square set and slow down your cotton (Catchot, A.). Other significant causes of square set lose is: weather, drought, and planting date. According to Maurney and Henneberry, "All squares showing visual evidence of the onset of abscission but still on the branches and those on the soil below were collected and dissected under a stereoscopic microscope... When excessive square abscission occurs it may be difficult to assign reasons for the abscission and thus develop strategies to correct it."

Using a handheld counter in the field. Photo © A. Catchot

The benefit of early square set in cotton is that it produces a timely mature crop. "Removing fruiting form early in the season can result in increased productivity later with a high percentage of fruiting forms developing into mature bolls. Early season defruiting caused cotton plants to set bolls during the normal cut out period in the Imperial Valley of California." (Patterson, Buxton, and Briggs) "It was then suspected that the delay in fruit-set caused by square removal produced a larger plant framework consisting of more reproductive branches which were simultaneously at productive stages of development." (Kennedy, Smith Jr., and Jones) So the results are, by maintaining a healthy square set early in the cottons fruiting cycle, the cotton will have a better boll count, and will set the cotton up for a better chance at a higher yield than otherwise.

You want to maintain a square set of 80% early in the cottons life. This will ensure that your cotton is going to develop the right way and load up the way one would want it to. Plus 80% gives the farmer or researcher room to make economical decisions for insects, watering, fertilizing, among other things. To sum square set up, it is a maintaining tool that helps to keep your cotton loaded and successful. This is a great tactic to keep your cotton on track for early square production.

References:
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4. C.W. Kennedy, W.C. Smith Jr., J.E. Jones. Effect of Early Season Square Removal on Three Leaf Types of Cotton.

Acknowledgement: Thanks Mr. Donny Adams.

6

2013 Sugarcane Beetle Study

Julian Beamon
USDA-ARS, Southern Insect Management Research Unit

Introduction

USDA-ARS, SIMRU is in the second year of a sugarcane beetle cage study to evaluate the efficacy of various insecticides for the control of soil insects in sweetpotato. The cages are infested each year with 40 sugarcane beetles per treatment rep to determine how effective the pre-plant insecticides used by commercial growers are in the control of the sugarcane beetle.

Material and Methods

This study was done in a 1/8 acre screen cage with one plant per foot in plots of four rows. We conducted weekly checks of 100 total sweeps in four different locations. Weed management is necessary to ensure a productive yield however our primary focus is the insects and damage from the infestation of sugarcane beetles. A two row low drift boom sprayer calibrated to deliver 12gpa was used to deliver all insecticide applications. The black light trap set up at random locations was used in the collection of the sugarcane beetles.

Result and Discussion

According to the Arthropod Management Test 2012, Volume 37, Section E65, the majority of root damage in the current trial was attributed to sugarcane beetles. Sugarcane beetle damage ranged from 1.0 - 33.0 percent. We found that using Lorsban and Admire Pro can significantly reduce the damage. Using these two pesticides we recorded damage from 2.0 – 18.0% which is about half of the damage seen without the use of pesticides.

References:

Evaluation of Various Insecticide Regimes for Control of Sugarcane Beetle and Wireworms in Sweetpotato, 2011. Larry Adams, Southern Insect Management Research Unit. Arthropod Management Test 2012, Volume 37 Section E65

Acknowledgements:

I would like to thank Larry Adams and Chris Johnson for their help in organizing this report.

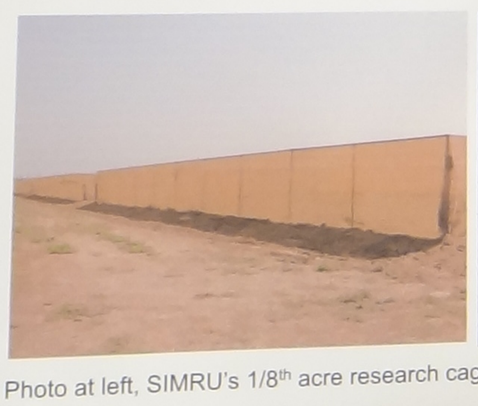

Photo at left, SIMRU's 1/8th acre research cages. Photo at right, sugarcane beetle.

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Diseases and Insects in Forest

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7

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Introduction

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Materials and Methods

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12

The Importance of GPS for Pest Management

Julian L. Henry I

USDA –ARS, Southern Insect Management Research Unit

One of the more serious pests of cotton in the Mississippi Delta is the tarnished plant bug, *Lygus lineolaris*. A Better understanding of how *Lygus* moves will lead to greater population controls. The effects of agroecosystem heterogeneity on insect population dynamics, dispersal, and habitat selection have important implications for pest management. Thus, area wide manipulation of placement, phenology, or suitability of vegetation patches has been considered for pest management (Lamp & Zhao 1993).

Aerial imagery from one field location, with the red lines showing the focal study field.

In the Southwest, management of alfalfa for reducing damage to cotton by *Lygus* is a classical example of an area wide pest management problem. In the spring and Early summer, alfalfa is more suitable to *Lygus* and preferred over cotton (Stern 1969). Large populations of *Lygus* can develop and once harvested the adults will move to cotton which at this time is highly vulnerable to *Lygus* attacks because of cotton's primary fruiting cycles which extends from June to August. One cultural practice that was investigated to reduce *Lygus* movement into cotton was to partially harvest alfalfa on given dates leaving flowering portions (Carriére etal. 2005). This method would retain the adult *Lygus*, therefore; leaving minimal numbers to move into cotton. However, this method has been proven to be time consuming and less profitable than chemical control, and weeds near cotton fields have also been considered an important source of *Lygus* for cotton in the spring (Snodgrass 2003).

The global positioning system (GPS) and geographic information system (GIS) are useful for gaining an actual view of fields in a given radius. I personally took aerial imagery of areas around our research test plots. Each snapshot covered about a two to five mile radius. I had to physically go out and record which crops were planted inside this radius. Having the snapshots made it possible for me to find each field with ease and actually see and report back to my supervisor what was planted with great confidence. It also kept me from getting lost in unfamiliar areas.

With the understanding of what crops now surround our cotton test plots, we will be able to take samples and build a model to understand the *Lygus* numbers we should be collecting which was zero because it was early in the season. CropScape, which is a web based software program that uses GIS, makes it possible to view crops in various fields from two and even seven years ago to get a better understanding of a field's history.

References:

Carriére, Y., P. Ellsworth, P. Dutilleul, C. Ellers-Kirk, V. Barkley, & L. Antilla. 2006. A GIS-based approach for areawide pest management: the scales of of Lygus hesperus movements to cotton from alfalfa, weeds, and cotton. *Entomologia Experimentalis et Applicata*. 118: 203-210

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siana Project Summer 2013

olar radiation on the effectiveness of *B.*
L. lineolaris using two surfactants.

Maria Benavides
Insect Management Research Unit

or that affect entomopathogenic fungi. Conidial germination
of insects by most entomogenous fungi (Luz and Fargues,
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olled through the use of chemical pesticides. Research to
s for TPB has increased. Laboratory tests have identified
that perform better that the commercial strain. This study
the effect of solar radiation on the effectiveness of *B.*
wo surfactants.

MATERIALS AND METHODS:

Two isolates of *Beauveria bassiana* (Balsamo) Vueillemin including the commercial strain GHA and the Mississippi Delta native NI8 strain were evaluated in the field for pathogenicity and infectivity against tarnished plant bug (TPB). Branches of cotton plants were cut after spray and placed in cages with 30 2-d old TPB adults from a laboratory colony. A total of 150 cage were used in 50 plots per each day (o day, 1 day and 2 days after spray). Plots were sprayed with four treatments: NI8+Bio-plastic, NI8+Tween-80, GHA + Bio-plastic, GHA +Tween-80 and a control (5 plots / treatment, 3 branches / plot / day). The sprayed concentrations (spores / acre) was $4.0x10^{12}$ for both strains. Released insects were collected from the cages and placed individually on Lygus solid diet and observed for ten days under laboratory conditions. Mortality and sporulation from Lygus collected from the cages of the plants were recorded daily.

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artiel Portilla and Tabatha Nelson

Beauveria bassiana Project Summer 2013

Pathogenicity and infectivity against *L. lineolaris* of two isolates *bassiana* NI8 native strain and GHA commercial strain using tw surfactants comparing morning and night applications.

June Jones
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:

The tarnished plant bug (TPB), *Lygus lineolaris* (Palisot de Beauvois), attacks a wid var economically important herbaceous plants, vegetable crops, commercial flower plants, and nursery stock. Half of the cultivated plant species grown in the United States are listed as ho plants for tarnished plant bugs. Effective management of TPB in cotton is complicated due to its mobility. Its control has been solely based on insecticides, and insecticide-resistant populations of tarnish plant bug have been reported in the Delta region (McGuire, 2006). Utilization of the entomopathogenic fungal, *Beauveria bassiana* to control TPB in cotton is being study. This stu was conducted in order to estimate the pathogenicity and infectivity against *L. lineolaris* isolates of *B. bassiana* NI8 native strain and GHA commercial strain n the effecti *bassiana* infection in *L. lineolaris* using two different surfactants Tween-80 and

MATERIALS AN

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RESULTS:

Differences of mortality and sporulation on day 3, 5 and 10 were found among concentrations for both isolates and surfactants. However, no differences were found between night and morning application.

REFERENCES:

McGuire, M.; Leland, J; Dara, S.; Parl, Y.; Ulloa, M. 2 bassiana on field population of Lygus hesperus. Bio Co

ACKNOWLEDMENTS:

I would like to give special thanks to Dr. Portilla and Tabatha while in school. SIMRU has changed my life forever opening and the control of pest found in crops. Thanks to the support year. Again I say thank you.

22

Lygus lineolaris: "Tarnished Plant Bug"

By Kristen J. DeAngelo
USDA-ARS, Southern Insect Management Research Unit

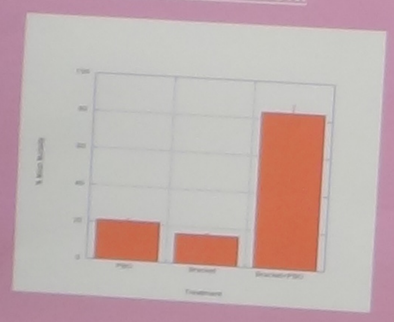
INTRODUCTION:

The tarnished plant bug (TPB), *Lygus lineolaris*, has emerged as an economically significant pest on cotton in the Mid-South area. Currently, management of this pest relies almost exclusively on chemical control (organophosphates, carbamates and neonicoinoids). Over the years, this pest has become increasingly resistant to several chemical insecticides. One insecticide that has commonly been used in the Delta to control TPB on crops is acephate (Bracket). Field surveys have shown that some populations of the TPB have become significantly less susceptible to many insecticides and insecticide classes. One of the potential mechanisms is that resistant insects may detoxify insecticide faster through over-expression of P450 genes. This study is to test whether piperonyl butoxide (PBO), a P40 inhibitor, could synergize acephate toxicity against tarnished plant bugs.

MATERIALS AND METHODS:

A laboratory colony (originally provided by Mississippi State University) was used as a standard susceptible strain which had not been exposed to insecticides for eight years. To develop a resistant colony, 45,000 bugs were collected from various cotton fields and selected with insecticides for resistance. These TPB were then divided into three groups, one to be treated with PBO, one to be treated with acephate (Brackel) at 80 mg/L, and one to be treated with both PBO and acephate. The mortality rates of the bugs were then recorded.

RESULTS AND DISCUSSION:



After spraying the lab resistant colony with a combination of PBO and acephate, it is obvious that they act synergistically on TPB mortality. PBO killed twenty-one percent of the bugs tested while Bracket killed approximately sixteen percent. When adding these two chemicals together, it would be expected that at least thirty-seven percent of the population of bugs are killed. This experiment proved this to be true by killing over eighty percent of the population. Results indicated that PBO could synergize acephate toxicity, and P450 genes might be associated with resistance development to acephate and other insecticides in TPB.

REFERENCES:

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Yu Cheng Zhu, Randall Luttrell. May 2012. Pesticide Biochemistry and Physiology: Variation of acephate susceptibility an correlation with esterase and glutathione S- transferase activities in field populations of the tarnished plant bug, Lygus lineolaris. Elsevier.

Yu Cheng Zhu, Randall Luttrell. January 2013. Elevated Metabolic Detoxification Associated With Multiple/Cross Resistance to Different Insecticide Classes in Tarnished Plant Bug.

ACKNOWLEDGEMENTS:

Thank you to Yu Cheng Zhu, Sandy West, and Ashley McIntire for helping me with this project.

11

Maintaining Insect Colonies

Laura Sipes
USDA-ARS, Southern Insect Management Research Unit

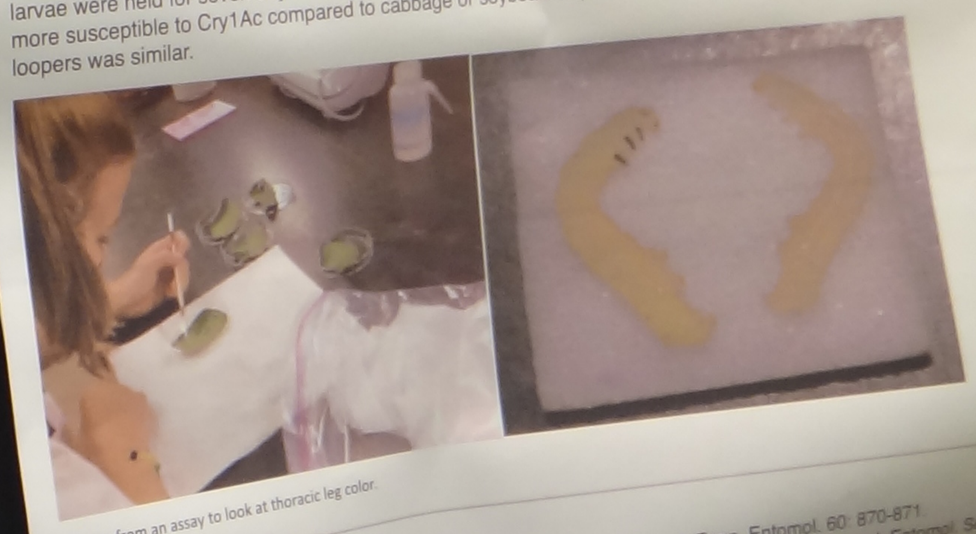
The main colonies reared in Lab 420 include the soybean looper, cabbage looper, and mint looper. Although these larvae are difficult to differentiate on the basis of their external appearance, one characteristic they share is that they can all be found in soybeans (Beach & Todd 1986). The colonies are maintained year round for scientists to run various tests and also for easy access during the off season.

The rearing room

Every Monday, Wednesday, and Friday we feed moths of these colonies with 20 percent sugar water, and we also change their egg sheets with cheese cloth. The egg sheets are then placed in Ziploc bags in an incubator to induce hatching at 29.9 degrees Celsius. Once the eggs have hatched, the larvae are placed on diet, a specifically formulated substance which includes linseed oil and a mixture of propionic and phosphoric acid. The larvae remain on this diet as they progress through each instar stage until they become pupae. This process takes about two weeks. The pupae are then transferred to buckets where they emerge as moths. Once they reach adulthood they begin to reproduce. The cycle is then repeated and the generations continue.

The maintaining of these colonies is extremely important because entomologists use them to run many different kinds of tests throughout the year. A study in Auburn, Alabama once said that the coloration of thoracic legs has been used to determine different looper species, such as soybean or cabbage loopers (Canerday & Arant 1967). Specifically that soybean loopers possess black thoracic legs. Although, we noticed in our soybean looper colonies that many of the larvae havegreen thoracic legs. One test we performed this summer examined the environmental influences on these thoracic legs of the soybean loopers. We did this by placing soybean leaves in 100 petri dishes with agar and a range of 1-15 loopers on each leaf. The test terminated after about two weeks when the larvae reached pupation. Their legs began to turn black after the first week. By running this test we learned that densities are a factor in the coloration of thoracic legs. The more the soybean loopers reared together, the greater the percentage of loopers with black legs.

We also performed a bioassay to examine the response of the various looper species to Cry1Ac, which is an insecticidal toxin found in some Bt plants, such as Bt cotton. We filled cells of trays containing 128 wells with 1.5ml of the artificial diet we use in rearing the colonies. We then pipetted 50µl of various concentrations of Cry1Ac diluted in water in the wells after the diet had dried. Once the buffer had penetrated the diet, a single larva from a particular colony was placed in each well. The wells were then covered with a plastic sheet. The larvae were held for seven days on the trays, and mortality was recorded. We found that mint loopers were more susceptible to Cry1Ac compared to cabbage or soybean loopers. The survival of soybean and cabbage loopers was similar.



Photos from an assay to look at thoracic leg color.

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Beach, R.M., J. W. Todd. 1987. Species composition of Plusiine larvae in south Georgia soybean. J. Entomol. Sci. 22(2): 106-107.

Acknowledgments:
Thank you to Clint Allen for helping me with this project.

veria bassiana Project Summer 2013

he effect of solar radiation on the effectiveness of *B.*
a infection in *L. lineolaris* using two surfactants.

By Maria Benavides
DA-ARS, Southern Insect Management Research Unit

TION:

rature is one of the principle factor that affect entomopathogenic fungi. Conidial germination first step in establishing infection of insects by most entomogenous fungi (Luz and Fargues, Tarnished Plant Bug, TPB, *Lygus lineolaris* (Palisot de Beauvois), across the word impart economic damage to a wide range of crops including cotton, seed alfalfa, strawberries, his pest is controlled through the use of chemical pesticides. Research to ive controls for TPB has increased. Laboratory tests have identified *ssiana* that perform better that the commercial strain. This study ine the effect of solar radiation on the effectiveness of *B.* two surfactants.

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INTRODUCTION:

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ACKNOWLEDMENTS:

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14

Analysis of Carbon and Nitrogen for Natal Host Determination of Lygus Lineolaris

Nakeshia Kenyatta Anderson
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:

Tarnished plant bug *Lygus lineolaris* is the most damaging insect pest of cotton in the mid south. Economic damage is typically caused by direct feeding on developing flower buds, flowers, or immature bolls (Bariola 1969). The primary control tactic for tarnished plant bug in cotton is use of foliar applications of synthetic insecticides. Tarnished plant bug control ranged from $18-57 per acre, in part because of their abundance and widespread development of resistance to various classes of insecticides. Chemical control had become more difficult for this pest and management efforts became focused on plant bug populations that were developing on non-cotton host. These efforts required knowledge of the primary host plants of tarnished plant bug as well as plant distribution across the landscape. Estimating the most important plant host of this insect pest was challenging because of difficulty associated with sampling inability to compare sample data from one plant host to another, and the time and energy required to collect data.

MATERIALS AND METHODS:

1. Nymphs
2. Mustard Blooms
3. Seed pods
4. Incubator

We collected late instar nymphs from mustard plots growing on the SIMRU research farm (4^{th}/5^{th}) and the nymphs were then placed on mustard blooms and seed pods brought back to the lab. The nymphs were reared on the mustard plant material until the nymphs reached the adult stage. They were removed from the mustard and frozen at -80 degrees Celsius for carbon nitrogen analysis later.

Tarnished plant bug nymph. Copyright Bugwood.org

Mustard Crop. Photo copyright Howard F. Schwartz, Colorado State University, Bugwood.org

RESULTS AND DISCUSSION:

Due to the fact that the tarnished plant bug is the major pest of cotton, analytical techniques useful to identify the origin of adults that move into cotton fields are important in a effort to utilize control tactics outside of cotton. Bugs collected this summer will be analyzed for carbon/ nitrogen analysis during the upcoming fall.

REFERENCES:

Jackson,R.E.,Snodgrass,G.L.,Allen, K.C.,Perera,O.P.,Price,L. 2012. Analysis of Carbon and Nitrogen Isotopes for Natal Determination of Tarnished Plant Bug(Hemiptera:Miridae)Adults. Southwestern Entomologist. 37 02: 123,124,127

ACKNOWLEDGEMENTS:

I would like to thank Dr. Katherine Parys for helping me with this project and also allowing me to work under her leadership. I would also like to thank Dr. Randall Luttrell for allowing to become a part of the Southern Insect Management Research Unit it has been an great experience.

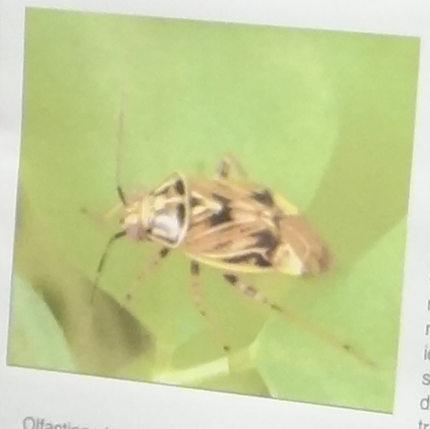
16

Controlling *Lygus lineolaris* pest population

Priya Chatakondi
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:
Lygus lineolaris is a common pest affecting agricultural crops in North America. Chemical treatments to manage this pest have not been effective, and there is a need to develop molecular based strategies based on the insect's biology, physiology, genetics and ecology. Antennae are the primary organ of olfaction used by Lygus to perceive and interact with its environment. This sensory organ allows the insect to detect and differentiate odors for the purpose of foraging and reproduction. This organ also houses the olfactory co-receptor (Orco). The interaction between Orco and an odorant specific receptor results in the formation of an ion channel in response to odorant binding. To understand the molecular basis of this system in the western tarnished plant bug, *L. hesperus* (LhOrco) was cloned and characterized. LhOrco has many functional properties and is expressed in antennae, proboscis, and legs. Hence, strategies that target disruption of this gene product at the transcript or protein level may facilitate an effective means for controlling Lygus pest populations.

MATERIALS AND METHODS:
Lygus lineolaris were obtained from USDA ARS Southern Insect Management Research Unit, Stoneville, MS. RNA was extracted from legs, antennae, and proboscis. Tissues from 10 insects were pooled in one extraction, and two extractions were performed for each tissue. Messenger RNA was purified from the total RNA using a Poly A(+) tract mRNA isolation system (Promega, Madison, WI). cDNA synthesis and labeled aRNA production was carried out using Agilent's aRNA production kit. Cy3 and Cy5 fluorescent dyes were used for labeling samples. Nanodrop instrument was used to obtain absorbance values for nucleic acids. The cDNA was then amplified using polymerase chain reaction. The amplified cDNA was run through an agarose gel and extracted and purified. The purified cDNA was then placed in TA cloning vectors to be used for sequencing. GeneSpring v9.3 software (Agilent) was used for data analyses. The bioinformatic analysis was done by BLASTIX to identify contig sequences related to other OBP sequences. Cloning and re-sequencing of OBPs were carried out with Invitrogen first-strand cDNA synthesis kit. Real time quantitative PCR analysis was done on total RNA extracted from various tissues harvested from 2-day old adult male and female *L. lineolaris*. Plasmid DNAs were sequence verified and linearized DNA was gel purified to determine DNA concentration.



RESULTS AND DISCUSSION:
Odorant binding proteins (OBP's) of insects are a family of 150 amino acid, water soluble protein characterized by six conserved Cys residues. Based on OBP classification and bioinformatics analyses, 33 OBP-like transcripts were identified to understand the biological functionality. Transcriptome approaches to identify the genes encoding proteins exhibiting OBP-like features conferred the molecular basis of olfaction in *L. lineolaris*. OBP-like transcripts in *L. lineolaris* were identified from multiple short sequence reads derived from a non-normalized whole body *L.* lineolaris. A few of
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Olfaction plays a critical role in governing a number of essential behaviors to sugges
essential gene product either at the transcript or protein level to control Lygus pest

REFERENCES:
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binding proteins in the tarnished plant bug *Lygus lineolaris*. Insect Mol Biol (sub

Chinta S, Dickens J, Aldrich J (1994). Olfactory reception of potential pherom
tarnished plant bug, *Lygus lineolaris (Hemiptera: Miridae). J Chem Ecol* **20**:

ACKNOWLEDGEMENTS:
We thank Charles Lanford (USDA-ARS SIMRU) for assistance with insect r
(USDA-ARS SIMRU) for RNA extractions and cDNA synthesis.

sects in cotton and soybean fields
Jesse King
n Insect Management Research Unit

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Flight intercept trap in a soybean field.

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Cotton flower, copyright bugwood.org

10

Row Crop Sampling and Pheromone Trap Study

Russell E. Godbold
USDA-ARS, Southern Insect Management Research Unit

INTRODUCTION:

The United States Department of Agriculture has played a key role in the lives of farmers and many other agricultural industries. It has helped to increase yields through genetics and preventatives such as herbicides, insecticides, and fungicides. The USDA also conducts studies to examine the variability of pest populations on crops and their resistance to insecticides. There are several ways of studying populations of insect pests in a field and the general area. Sampling with sweep nets along with individual traps such as pheromone traps used for tobacco budworms (*Heliothis virescens*) and bollworms (*Heliocoverpa zea*) are a major part in the study on insect management.

MATERIALS AND METHODS:

The materials used for sampling consist primarily of sweep nets. There are many major insect pests that we sample for that can cause damage to the crop. On average there are 250 sweeps done within a field with the exception of fields with USDA test plots. There are 12 plots on average within a test area for Karate, Prevathon, and untreated portions of the plot that require 25 sweeps per plot for accurate study and comparison of these chemicals as opposed to untreated crops. The pheromone traps consist of a wired funnel that feeds into a removable, cylindrical top. The moths are attracted to the pheromone that is located at the bottom of the funnel. They proceed to fly or crawl up to the top of the funnel and into the removable piece where the are then trapped until their removal for study. The three types of moths that are captured and studied are bollworms, budworms, and several variations of loopers. The moths are counted and recorded on a data sheet.

moth trap canister replacement

Kudzu bug on soybean leaf

RESULTS AND DISCUSSION:

The numbers of insect pests that were observed in samples were not substantially high considering the given threshold of each type of pest. The moth numbers varied from area to area. Some places had very low numbers of moths compared to other areas that had higher populations. Though there have been lower numbers of moths since the introduction of Bt cotton as reported by Adamczyk and Hubbard (2006), overall numbers of tobacco budworm moths have been greater this year than numbers reported in 2006. There were a number of Kudzu bugs (*Megacopta cribraria)* found in the fields that were sampled in the Vicksburg area that raised interest due to their effects on soybean crops. Kudzu bugs have caused substantial damage to soybean crops in areas with a large population. The kudzu bugs along with the kudzu bug nymphs feed on the stems and leaves and may potentially cause defoliation if large amounts are allowed to thrive within the soybean crop(Zhang et al., 2012).

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5

Plant Bugs in the Mid-South

By: Severino Signa

USDA-ARS, Southern Insect Management Research Unit

The tarnished plant bug, *Lygus lineolaris,* has become a dominant pest in cotton throughout the South. It attacks a wide range of several herbaceous plants; crops; and fruit trees. With that being said, the plant bug has reevaluated existing thresholds in production of cotton practices and economics. The plant bug made up ninety-four percent of sampled bugs during the flowering period across the region in 2007 (Musser et al. 2007). Before 1995, bollworms and budworms tore cotton to pieces and plant bugs were controlled by substances used to eliminate the bud and boll worms so therefore plant bugs were uncommon at this time. When Bt cotton expressing *Bacillus thuringienesis* was introduced in 1995, the bud and boll worms were reduced in populations also the boll weevil had been eradicated. Since then, the plant bug has become a primary target in today's research (Williams 2008).

A tarnished plant bug adult. Photo © Bugwood

Plant bugs start to feed and lay eggs on the pulvinus base of a leaf, terminal, vain of a leaf, and on the stem of plants in early spring. The eggs are small, slightly curved and are about 1mm long. The top of the egg where it meets the surface of the plant tissue is flattened and has an opening, which is where the nymph emerges in eight days. The immature nymph is yellowish green and also about 1mm long. As it develops into an older nymph it turns yellowish green to green, wingless, and as it matures it develops yellow, green, or blacks spots. A full- grown nymph has wing pads and is about 4 to 4.5 mm. The full-grown nymph then develops into an adult. The adult male is 4.90 to 5.95mm, while the adult female is 5.25 to 5.95 mm long. Their heads are yellowish-brown with black sub-median lines. Their abdomen section is yellowish to reddish brown (Capinera 2001).

The plant bug is one of the most damaging bugs known to transmit diseases into plants. Both the adult and immature nymphs feed on cotton during the flowering period, which is squares, flowers, and bolls. It occurs on the reproductive structure they insert their mouthparts into plant tissues, introduce toxic saliva at the feeding site, and extract juices from the plant. The terminal growth tends to turn yellow and reduce plant growth. Plant bugs preferably tend to feed on squares (Tugwell etal. 1976). When the square is pinhead square, it often leads to abscission in a few days. Feeding on larger squares may not result in abscission, but damage will definitely occur and tend to stain the square yellow and have brown or black anthers in the flower. On bolls, it causes a dark, sunken lesion on the outside of the boll and a pin-point sized black spot inside the boll (Pack and Tugwell). Feeding on bolls it can result in undeveloped locules, stained lint, or damaged seed within the boll.

Cotton is most susceptible to damage by plant bugs during the period from first square through the first few weeks of bloom. So therefore fields should be scouted carefully every three to four days during this period. Economic Threshold at pre-squaring is one or more plant bugs/ per ten feet; first two weeks of squaring-Drop cloth, one plant bug/ 6 feet; Visual, five bugs/ hundred terminals; Sweep net, eight bugs/ hundred sweeps; third week of squaring through bloom- Drop cloth, three bugs/ 6 feet; Visual, ten bugs/ hundred terminals; Sweep net, fifteen bugs/ hundred sweeps. Plants should retain eighty percent or more of first and second position fruiting sites on the upper five fruiting branches.

Tarnished plant bugs have become difficult to manage in recent years, and very few insecticides have provided an adequate control of this outburst. We must use strategies such as appropriate scouting methods, sound action thresholds, and insecticides to properly manage pest populations.

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Acknowledgements: Thanks to Mr. Donny Adams and Dr. Snodg

2013 Sugarcane Bee

Julian Beamon

USDA-ARS, Southern Insect Manag

Introduction

USDA-ARS, SIMRU is in the second year of a sugarcan efficacy of various insecticides for the control of soil inse infested each year with 40 sugarcane beetles per treatm the pre-plant insecticides used by commercial growers a beetle.

Material and Methods

This study was done in a 1/8 acre screen cage with one We conducted weekly checks of 100 total sweeps in fo management is necessary to ensure a productive yield insects and damage from the infestation of sugarcane sprayer calibrated to deliver 12gpa was used to deliver black light trap set up at random locations was used in beetles.

Result and Discussion

According to the Arthropod Management Test 2012, V of root damage in the current trial was attributed to su damage ranged from 1.0 - 33.0 percent. We found tha significantly reduce the damage. Using these two pes – 18.0% which is about half of the damage seen with

References:

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Acknowledgements:

I would like to thank Larry Adams and Chris Johnso

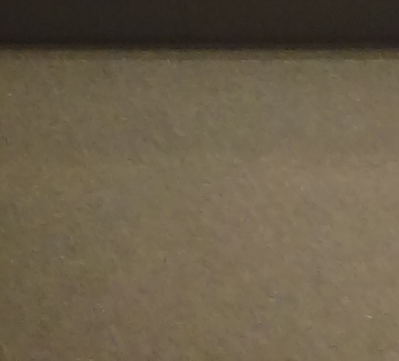

Photo at left, SIMRU's 1/8th acre research cages.

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Sweetpotato Demonstration Study

Thomas Sherman
USDA-ARS, Southern Insect Management Research Unit

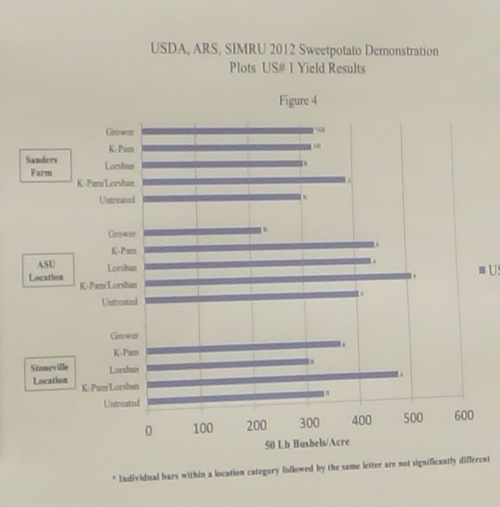
Introduction:

During the 2012 growing season USDA, ARS, Southern Insect Management Research Unit attempted to answer an important question. Do sweetpotato farmers need to apply a preplant incorporated insecticide to control soil insects attacking the developing sweetpotato roots? The method chosen to answer this question was to use transplanted sweetpotato demonstration plots to exemplify the value in taking soil samples for nematode populations. Three Mississippi Delta locations were selected: Alcorn State University Research Farm, Mound Bayou, MS; Sanders Farm, Mound Bayou, MS; and Livingston Farm, Elizabeth, MS. Beauregard 14 slips were transplanted in mid May, and treatments were applied roughly two weeks prior to transplanting which included: Lorsban, K-Pam, Lorsban and K-Pam, an untreated control, and a grower managed field treatment. Soil samples were extracted before plant, mid season, and preharvest to verify nematode populations at different times. All locations were harvested near 115 days. Insect damage, quality, and yield were recorded.

Materials and Methods:

Beauregard 14 sweetpotato slips were transplanted between the dates of May 17, 2012 and June 4, 2012. Plots were eight rows by two hundred feet. Row width was forty inches with a foot between each slip. The two Mound Bayou locations and the farm on Stoneville's campus were treated before transplanting with recommended herbicides and nematicide treatment. All plots were irrigated as needed throughout the season. Every test plot was harvested between the days of September 5 and September 26. Soil pulls were taken on May 5, June 27, and August 17. Above ground insect sampling was performed by the sweep net technique with 100 sweeps at intervals of 25. Insects were recorded.

Mid-season soil sample



Summary:

All locations in the study showed a total insect damage response to the SIMRU managed K-Pam/Lorsban and Lorsban. US#1 yield in the K-Pam/Lorsban treatment was significantly different from the untreated control at the Stoneville and Sanders Farm locations and all treatments were significantly different from the Grower managed treatment at the ASU location. Weed control at the three test locations appeared to be a factor that may have influenced insect populations and yield. USDA, ARS, SIMRU demonstration test plots are currently being evaluated in the summer of 2013.

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Acknowledgements:

A big thank you goes out to my bosses Mr. Larry Adams and Mr. Chris Johnson

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Introduction

One study that has be
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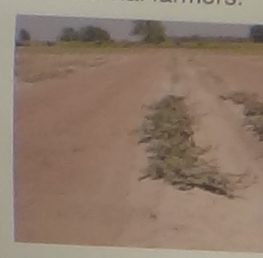

Photographs show variety t

Materials and Meth

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Summary

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References

Calyor, A., D. Picha,
Progress Report, 201

Acknowledgeme

I would like to thank L
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