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The Southern Insect Management Research Unit (SIMRU) concentrates on "improving the safety and efficiency of pest control for cotton, maize, soybean, sweetpotato and other row crops." Conducting research on insect pests of agricultural crops is important because without agricultural crops, our world would be without the nourishment of food. By conducting research on insect pests, we ensure the continuation of civilization. With an infinite number of insect pests in existence, research not only allows us to use chemical and biological controls to manage insect pests, but also makes us able to establish and discover host plants that offer resistance to certain species of insect pests. This summer I proudly worked for research entomologist Dr. Ryan Jackson. His research project involves improving "the understanding of how the changing cropping landscape impacts insecticide resistance development and management of various insect pest species in order to increase profitability and sustainability of mid-South row crops."

Our crew's specific objectives include: improving tarnished plant bug control and insecticide resistance management and determining the effect of bollworm ecology on pyrethroid insecticides. The collection of both plant bugs and bollworms from various locations in the Delta, as well as other states, is essential for our research. In this short essay I will discuss how we use stable carbon isotope research in hopes of better controlling plant bug population densities and assessing insecticide resistance. With this research, we also can begin to assess if Bt technology on both corn and cotton is worth the cost, providing farmers with both efficient and proficient procedures for better management of their crops.

Using the photosynthetic pathway utilized by plants, C_3 vs. C_4, we are able to determine the C_{13}/C_{12} ratio; insects feeding on this show this same isotope signature. This allows us to evaluate the impact of non-cotton crop hosts on Bt resistance management. In *Spatial and temporal variability in host use by Helicoverpa zea as measured by analyses of stable carbon isotope ratios and gossypol residues,* researchers found that more Bollworms were coming from non-cotton crop hosts than non-Bt cotton. This was significant because growers were initially planting non-Bt cotton in order to create a refuge to produce susceptible insects that would mate with resistant insects to dilute resistance genes. Unfortunately, this summer, despite Bt technology and proper pesticides, bollworms are being found in overwhelming numbers in cotton fields. As bollworms develop more resistance, our research is vital for the future control of these pests in crops.

Using carbon isotope research, we are also able to compare the plant bug population densities between cotton fields planted near cotton and cotton fields planted near corn. Through Dr. Jackson's previous research, he found that plant bug population densities in the Mid-Delta are higher in cotton fields planted near corn. Currently, we are testing the same population densities in the hills of Mississippi. The carbon isotope research allows us to determine the origin of the plant bugs. This is helpful because there is very little farmers can do to rid their crops of plant bugs. Plant bugs prefer to mate in corn but do not cause it any harm. By determining the origin of the plant bugs we can develop methods outside of the cotton fields in order to reduce the population densities of the plant bugs, and furthermore, reduce damage to the crops. Some of these methods include: increasing control of possible plant bug hosts (such as pigweed) and controlling

when we plant corn in order to decrease the risks of large populations affecting the cotton. Depending on low or high concentrations of plant bugs, the question of the effectiveness of Bt cotton and pesticides further arises. Some speculate if farmers need the technology in low populations of bollworms. Others hypothesize that farmers will still need to spray in high populations of bollworms because the current technology does not kill at least 50% of the pests.

This summer at SIMRU was not only a wonderful job opportunity but a great learning experience. I truly appreciate the hard work that is done in order to manage pests so that our world does not go hungry. Without research facilities like USDA in Stoneville, MS, and the hard work of farmers to produce a quality product, many would be without the nourishment of food. My experience has also made me delve into the science of entomology and gain a new appreciation for both pests and beneficial insects. I am proud to have been chosen for the experience and I want to thank all who made this learning opportunity possible. The knowledge I have gained is invaluable.