INSECT PEST MANAGEMENT ISSUES IN STRIP-TILL PEANUT PRODUCTION

Jay W. Chapin and James S. Thomas, Clemson University, Edisto REC, Blackville, SC 29817
jchapin@clemson.edu

ABSTRACT

A series of studies were conducted on the effects of tillage, soil insecticide treatment and cover crop on peanut arthropod pests. In an initial 2-year experiment, populations of corn earworn, granulate cutworm, and velevetbean caterpillar were lower in strip-tillage systems. Chlorpyrifos applications suppressed fire ants, thus triggering corn earworm and granulate cutworm outbreaks in all tillage systems, but these applications were more disruptive in strip-tillage.

Pod damage from lesser cornstalk borer and wireworms was lower in strip-tillage systems. Tomato spotted wilt virus incidence was also reduced by strip-tillage. However, threecornered alfalfa hopper damage to peanut was greater in the wheat residue strip-tillage system. Burrower bug injury to peanut kernels was also greater in strip-tillage systems. Under drought conditions, losses of $ 249/ha and $ 388/ha were attributed to burrower bug injury in untreated corn and wheat residue strip-tillage systems, respectively.

In a subsequent 2-year experiment, peanuts strip-tilled into corn or wheat residue had greater burrower bug injury than in rye residue or conventional tillage. However, when winter tillage was used to establish cover crops, burrower bug injury was reduced.

Another study evaluated the association of burrower bug kernel feeding in strip-tillage peanut with aflatoxin contamination. Across all grade categories, 98% of all aflatoxin contamination was associated with burrower bug feeding.

In summary, strip-tillage production systems were found to generally result in reduced injury levels for most insect pests. However, burrower bugs are capable of causing major economic injury to peanut, at least in some conservation tillage systems under drought stress.

SUMMARY

A series of studies were conducted on the effects of tillage, soil insecticide (chlorpyrifos) treatment and cover crop on peanut arthropod pests. In an initial 2-year experiment, main plot treatments consisted of three tillage systems: conventional moldboard plow, strip-tillage into a killed wheat cover crop, and strip-tillage into corn stubble residue. Subplot insecticide treatments were granular chlorpyrifos applied at early pegging (growth stage R2) and untreated. Populations of corn earworn, *Helicoverpa zea* (Boddie), granulate cutworm, *Agrotis subterranea* (F), and velevetbean caterpillar, *Anticarsia gemmatalis* Hübner, were lower in strip-tillage systems. Chlorpyrifos applications suppressed imported fire ant, *Solenopsis invicta* Buren, populations, thus triggering corn earworm and granulate cutworm outbreaks in all tillage systems, but these applications were more disruptive in strip-tillage. Chlorpyrifos treatment also increased populations of fall armyworm, *Spodoptera frugiperda* (J. E. Smith), but had no measurable effect on velvetbean caterpillar populations. Pod damage from lesser cornstalk borer, *Elasmopalpus lignosellus* (Zeller) and wireworms (Elateridae) was lower in strip-tillage systems, and chlorpyrifos suppressed pod damage in all systems. Threecornered alfalfa hopper, *Spissistilus festinus* (Say), damage to peanut was greater in the wheat residue strip-tillage system. Chlorpyrifos treatment reduced threecornered alfalfa hopper damage in all systems. Spider mite injury was not affected by tillage, but chlorpyrifos caused mite outbreaks in all tillage systems.

Incidence of tomato spotted wilt virus was reduced by strip-tillage. Burrower bug, *Pangaeus bilineatus* Say, injury to peanut kernels was greater in the strip-tillage systems and this injury was suppressed in the strip-tillage systems by chlorpyrifos treatment. There was a significant interaction effect for burrower bug injury between tillage and insecticide treatment.

Use of an effective fungicide program and a 3-yr crop rotation out of peanut production probably obscured any potential tillage effects on fungal diseases (southern stem rot, Rhizoctonia limb rot, and leaf spot). However, chlorpyrifos treatment increased Rhizoctonia limb rot incidence. Weed populations were generally greater in strip-tillage systems, but postemergence herbicides effectively eliminated any potential confounding effect on yield and grade.

Yield was not affected by tillage; however, chlorpyrifos increased yield and grade in both strip-tillage systems during a drought year due to suppression of burrower bug injury. Grade was also highest in conventional tillage where burrower bug injury was less prevalent. Under drought conditions, crop value losses of $ 249/ha and $ 388/ha were attributed to burrower bug injury in untreated corn and wheat residue strip-tillage systems, respectively. These observations prompted additional investigations of burrower bug in conservation tillage systems.

A subsequent 2-year experiment was conducted on the effects of cover crop, tillage timing and insecticide treatment on burrower bug injury. Peanuts strip-tilled into corn or wheat residue developed greater burrower bug populations and kernel-feeding injury levels than in rye residue or no-residue, conventional tillage systems. When the wheat cover crop was planted with conventional tillage rather than being drilled directly into corn residue, subsequent burrower bug populations and peanut kernel feeding were reduced, indicating that winter tillage disrupted diapaused adults. At-pegging granular chlorpyrifos treatments were most effective in suppressing kernel feeding. Kernels with burrower bug feeding sites were 10.3 ± 1.8 % lighter than kernels which were not fed-on. Burrower bug feeding reduced peanut grade primarily by reducing individual kernel weight and increasing the percentage of damaged kernels. Each 10 % increase in kernels fed on by *P. bilineatus* was associated with a 1.7 % decrease in total sound mature kernels, and kernel feeding levels above 30% increased the risk of damaged kernel grade penalties.

Another study evaluated the association of burrower bug kernel feeding in strip-tillage peanut with aflatoxin contamination. Across all grade categories, aflatoxin levels were 65x higher in kernels with observable burrower bug feeding, and 98% of all aflatoxin contamination was associated with burrower bug feeding. The DK grade category had the highest concentration of aflatoxin and accounted for 45% of total contamination. Burrower bug-induced aflatoxin contamination of the TSMK grade category is particularly interesting because this source would be most difficult to remove from the food supply.

In summary, strip-tillage production systems were found to generally result in reduced injury levels for most insect pests. However, burrower bugs are capable of causing major economic injury to peanut, at least in some conservation tillage systems. It appears that this injury is likely to be significant only under drought stress, although the efficacy of irrigation in suppressing burrower bug injury has not been experimentally demonstrated.