Decision Guide for Late Season Management of Tarnished Plant Bug (Lygus lineolaris) in Arkansas Cotton using the COTMAN™ Crop Monitoring System

Tina Gray Teague1, Diana M. Danforth2, Patricia F. O’Leary3 and Jennifer Lund4
1University of Arkansas Agricultural Experiment Station at Arkansas State University, Jonesboro; 2Department of Agricultural Economics and Agribusiness, University of Arkansas, Fayetteville; 3Cotton Incorporated, Agricultural Research, Cary, NC

Conclusions

Results from Arkansas small plot research indicate that the high yielding cotton remains susceptible to high densities of tarnished plant bugs up to physiological cutout, and then becomes increasingly resistant. The following integrated pest management (IPM) decision guide in COTMAN that has been in use for heliothine caterpillars and boll weevils (NAWF=5+350 DD60s) is very conservative and more than sufficient for effective end-of-season plant bug management.

Insecticide Termination

Monitor the crop to identify the last effective boll population (cutout). Physiological cutout is signaled when field average Nodes-Above-White-Flower equals five. Accumulate daily heat units (DD60’s) starting at cutout.

Small plots were infested one time at two different levels: 1 bug per plant (=3 bug/ft) and 3 bugs per plant (=9 bugs/ft). Yields from these treatments were compared to untreated and sprayed cotton. In this high yielding year, we saw no differences in mean lint yield between untreated and sprayed treatments (1723 and 1721 lb/acre, respectively); however, yields were significantly reduced in cotton infested with 1 b/a (15% reduction, 1496 lb/acre) and 9 b/a (23% reduction, 1391 lb/acre). Infestation timing was similar in a 2005 study, but plant bug infestation levels were reduced to 1 and 3 nymphs. An additional factor, irrigation, was added. Plant bug treatments were made in either furrow irrigated (season long) or non-irrigated cotton. Plot yields ranged from a low of 1428 lb/acre in the non-irrigated, 3 b/a treatment compared to 1742 lb/acre in irrigated, sprayed treatments. Mean yield of irrigation main plot treatments was 1700 lbs compared to 1500 for dryland yields. Yields were extremely variable across the experiment. Neither plant bug treatments nor irrigation effects resulted in statistically significant yield reductions, but mean yields tended to be lower in the non-irrigated 3 b/a treatment compared to untreated and sprayed treatments. These results indicate that the high yielding cotton remains susceptible to economic damage by tarnished plant bugs at the time of physiological cutout.

Timing final furrow irrigation and terminating insect control — This study was conducted at the UA Cotton Branch Experiment Station at Marianna, in the Central Delta region of the state. Natural plant bug population densities were above state recommended action thresholds in late season for both years of the study. The 2004 season was characterized by high population densities of plant bugs and dry conditions in late season. Mean yields ranged from 1012 to 1285 lb/acre. Tolerance of irrigation and insecticide prior to physiological cutout resulted in significant yield penalties compared to later termination dates (Teague and Danforth 2005). Extending insecticide sprays past 300 DD60 after physiological cutout for irrigation beyond 350 DD60s to 580 DD60s after NAWF=5 did not significantly improve yields. Late irrigations delayed boll opening. In the 2nd year, rains in late August confounded irrigation treatments, and there were no significant irrigation effects. Mean yields ranged from 1150 to 1450 lb/acre for all treatments. Plant bug numbers at physiological cutout + 1 wk were low, but mean yields tended to be lower in the non-irrigated 3 b/a treatment compared to untreated and sprayed treatments. Results from these Central Eastern Arkansas and previous other NE Arkansas trials (see Vories et al. 2006) indicate that timing of final irrigation in furrow systems appears to be similar to that for terminating insect control — NAWF=5+350 DD60s.

Arkansas Termination Research

Small Plot Studies Augmenting Plant Bug Infestations after Cutout — In a 2001 and 2002 trial in irrigated fields in commercial lands in northern Arkansas, we augmented natural plant bug infestations of TPB by releasing field collected or lab reared plant bug nymphs in small plots at different times after NAWF=5. Yield and quality from those treatments plots were compared to untreated cotton and cotton receiving protective insecticides. In the 2001 trial (2001-2002), 3 to 5 nymphs were released in plots starting at about 1 week after physiological cutout (NAWF=5 = 80 to 150 DD60s). Additional infestations were made in subsequent weeks such that plots were infested at cutout + 1, 2 and 3 wks, cutout + 2 and 3 wks and cutout + 3 wks. The final release date occurred after final boll was considered safe – cutout + 350 DD60s, the COTMAN guideline. Plant monitoring results indicated significant feeding injury to upper canopy bolls, but we found no significant yield penalty associated with plant bug infestations compared to untreated plots or plots protected or controlled in either year. Mean yields ranging from 1180 to 1250 lb/acre in 2001 and 1034 to 1150 lbs in 2002. Results of the 2001 study are summarized by Teague et al. (2002). In 2002, yield was 1074 lb/acre for the treatment with 3 bugs released after cutout compared to the untreated check yields of 1089. Yields did not differ significantly from sprayed plots despite a late season boll weevil infestation.

Field Trials with Western Plant Bug: Ellsworth and Barkley (2003) reported crop tolerance to tarnished plant bug infestations after cutout in irrigated cotton in Aroostook county, ME. Mean yields from these trials were 1735 lbs/acre for untreated plots compared to 1932 lbs/acre in plots treated with insecticides applied before physiological cutout resulting in 9% yield increase. The authors proposed a conservative recommendation of establishing 300 DD60s after cutout as the terminal point. In 2004, plant bug infestations were made 1, 2 and 3 weeks after cutout provided no yield benefit. Maximum yields and maximum profits were gained where insecticide applications for tarnished plant bug were continued up to 1 week prior to cutout.

Arkansas Termination Research

Small Plot Studies Augmenting Plant Bug Infestations after Cutout — In open field under furrow irrigation at irrigated commercial farms in western and southwestern Arkansas, we augmented natural plant bug infestations of TPB by releasing field collected or lab reared plant bug nymphs in small plots at different times after NAWF=5. Yield and quality from those treatments plots were compared to untreated cotton and cotton receiving protective insecticides. In the 2002 trial, 3 to 5 nymphs were released in plots starting at about 1 week after physiological cutout (NAWF=5 = 80 to 150 DD60s). Additional infestations were made in subsequent weeks such that plots were infested at cutout + 1, 2 and 3 wks, cutout + 2 and 3 wks and cutout + 3 wks. The final release date occurred after final bolls were considered safe – cutout + 350 DD60s, the COTMAN guideline. Plant monitoring results indicated significant feeding injury to upper canopy bolls, but we found no significant yield penalty associated with plant bug infestations compared to untreated plots or plots protected or controlled in either year. Mean yields ranging from 1180 to 1250 lb/acre in 2001 and 1034 to 1150 lbs in 2002. Results of the 2001 study are summarized by Teague et al. (2002). In 2002, yield was 1074 lb/acre for the treatment with 3 bugs released after cutout compared to the untreated check yields of 1089. Yields did not differ significantly from sprayed plots despite a late season boll weevil infestation.

Insecticide Termination

Monitor the crop to identify the last effective boll population (cutout). Physiological cutout is signaled when field average Nodes-Above-White-Flower equals five. Accumulate daily heat units (DD60’s) starting at cutout.

Small plot studies reveal that the high yielding cotton remains susceptible to high densities of tarnished plant bugs up to physiological cutout, and then becomes increasingly resistant. The following integrated pest management (IPM) decision guide in COTMAN that has been in use for heliothine caterpillars and boll weevils (NAWF=5+350 DD60s) is very conservative and more than sufficient for effective end-of-season plant bug management.

Literature Cited


Rogers, P. H. M. Hutchinson, and L. G. Hinpy, 1986. Estimating the conservative reevaluation point of establishing 300 DD60s after cutout as the point to terminate insecticides (i.e. insecticides to control future infestations of plant bugs would be unnecessary). In similar no-choice cage studies in Louisiana, Russell et al. (1999) evaluated retention of boll after 72 hrs exposure to 2 TPI adults. They found that TPI did not sufficiently penetrate the boll wall to result in boll abscission if the boll had accumulated 350 DD60s.

Review of Previous Research

Objective

The COTMAN insecticide termination rule for fruit-feeding insects was developed and validated in the Mid-South for the heliothine caterpillars (Heliocoverpa zea) and cotton boll weevil (Anthonomus grandis) (NAWF=5 +350 DD60s) to determine if it is conservative or too stringent. The objectives of this study was to compile results from insecticide termination trials in Arkansas conducted with tarnished plant bug (Lygus lineolaris). The COTMAN insecticide termination rule for fruit-feeding insects was developed and validated in the Mid-South for the heliothine caterpillars (Heliocoverpa zea) and cotton boll weevil (Anthonomus grandis) (NAWF=5 +350 DD60s) to determine if it is conservative or too stringent. The objective of this study was to compile results from insecticide termination trials in Arkansas conducted with tarnished plant bug (Lygus lineolaris).

Results from Arkansas small plot research indicate that the high yielding cotton remains susceptible to high densities of tarnished plant bugs up to physiological cutout, and then becomes increasingly resistant. The following integrated pest management (IPM) decision guide in COTMAN that has been in use for heliothine caterpillars and boll weevils (NAWF=5+350 DD60s) is very conservative and more than sufficient for effective end-of-season plant bug management.

Small plot studies reveal that the high yielding cotton remains susceptible to high densities of tarnished plant bugs up to physiological cutout, and then becomes increasingly resistant. The following integrated pest management (IPM) decision guide in COTMAN that has been in use for heliothine caterpillars and boll weevils (NAWF=5+350 DD60s) is very conservative and more than sufficient for effective end-of-season plant bug management.