INFLUENCE OF ROW SPACING AND TILLAGE UPON WESTERN FLOWER THRIPS AND TOBACCO THRIPS IN COTTON

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Abstract

Thrips are very detrimental to the growth of a cotton crop. The feeding damage caused by the two prevalent thrips species found in Georgia, Western Flower Thrips and Tobacco Thrips, causes severe economic loss to farmers because of damage incurred by cotton seedlings, and yield is negatively affected. During the 1998 growing season field experiments were performed in order to ascertain the differences in thrips populations under varying tillage systems and row spacing widths. Thrip adults and larvae were found in lower population densities in tillage systems utilizing a no-till system consisting of wheat residue and stubble. Ultra-narrow-row cotton production systems are theoretically more susceptible to thrips injury, as is make evident by the higher population levels found in UNRC as compared to cotton grown in rows thirty inches wide. This experiment helped to further solidify the fact that Temik does have an important role in suppression of thrips populations. Differences in thrips populations were not observed between Roundup Ready weed management scenarios utilizing a residual chemical weed control component and a stand alone Roundup Ready weed control system.

Introduction

Adequate suppression of Thrips populations is of vital importance for farmers wishing to maximize yield of Cotton Thrips are an annual early-season pest of Georgia cotton, and control is critical (Roberts and All, 171). Because of new herbicide technology and the wide-scale availability of herbicide-resistant cotton cultivars, broadcast applications of herbicides can be utilized to control weeds which otherwise would be prohibitive to ultra narrow row cotton production. Studies have shown, however, that thrips utilize small grains as an overwintering site, and move to seedling cotton as an alternate food source during the early portion of the growing season (Burris et al, 3).

One field experiment was conducted during 1998 to assess the population dynamics of thrips infesting cotton seedlings grown in both eight inch spaced and thirty inch spaced rows, which were grown under a conventional tillage system as well as a no-till production system. Furthermore, comparisons were made assessing differences in thrips populations in plots treated with Temik, and without Temik,. Lastly, thrips populations were assessed two weed management regimes. One regime consisted of Roundup Ultra being the sole means of weed control, and the other consisted of a pre-emergent application of residual grass and broadleaf herbicides, followed by one application of Roundup Ultra early post-emergence, followed by a topical application of Staple at the match-head square stage of development.

Materials and Methods

The experiment was established at the University of Georgia Plant Sciences Farm near Watkinsville, Georgia during 1998. The soil was a Cecil sandy loam (Typic Hapludult, clayey, koalinic, thermic) with a pH of 5.8 and organic matter of 1.0%. A randomized complete block design with a split-split-split plot arrangement with four replications was used. Tillage systems were the main plots, with row spacing , Temik application, and weed control systems being the sub-plots. Sub plots were five feet in width (two thirty inch rows, or seven eight-inch rows) by forty feet in length.

Paymaster BG/RR cotton seed was planted on June 3, 1998 with a John Deere vacuum planter or either a Tye No-Till grain drill. Desired plant density was 75,000 plants per acre with thirty inch rows, and 120,000 plants per acre with the eight inch rows (UNRC). The planter with a thirty inch row spacing was outfitted with granular insecticide hoppers calibrated to apply Temik 15G at the rate of 7.5 lb/A, and the UNRC planter was fitted with a small-seed hopper calibrated to apply 7.5 lb/A Temik. Both the thirty inch spaced row planter and the UNRC planter applied Temik in-furrow at planting. The same planters were used to plant the conventionally tilled and the no-till cotton.

Herbicides were applied to sub-plots with a sprayer calibrated to apply 20 GPA at 30 PSI using flat-fan nozzles. Roundup Ultra was applied utilizing two separate weed control regimes. One regime consisted of two broadcast applications of Roundup Ultra. One application at the rate of 1.5 pt/A was made at the two true leaf stage of cotton development followed by a broadcast application of 1.5 pt/ A at the four true leaf stage. The residual grass/ broadleaf weed control system consisted of a broadcast pre-emergent application of Prowl tank mixed with Cotoran at the rates of 1.5 pt/A and 2.0 pt/A, respectively. This was followed by an a topical application of Roundup Ultra at the rate of 1.5 pt/A at the four leaf stage, followed by an application of Staple at the rate of 1 oz./A at the match-head square stage of development.

Samples for thrips were taken on June 18, 1998 (ten days after emergence) and June 28, 1998 using a plant washing technique. The plant washing technique consisted of ten randomly selected seedlings within each sub-plot being selected, removed from the soil, and placed into a six ounce cup filled with 70% ethyl alcohol. A lid was then placed

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onto the cup and it was vigorously shaken for a minimum of fifteen seconds in order to remove all thrips adults and larvae. The plants were then removed from the washing solution and discarded, and samples containing the alcohol and thrips were taken to the laboratory of Dr. John All at the University of Georgia for subsequent counting. Counting was accomplished by the washing solution's being poured into a counting dish and placed under a dissecting microscope. The individual numbers of tobacco thrips and western flower thrips adults were then tallied for each sample, as well as the larvae of the aforementioned thrips, collectively called larvae.

Plots were harvested during the first week of November 1998. A John Deere one-row spindle picker was used to pick one row of each sub- plot in the cotton spaced thirty inches apart, and sub-plots consisting of rows spaced eight inches apart were subjected to a randomly selected one-square-meter area being hand harvested. A randomly selected sample of seed cotton from all plots was taken and then ginned in order to determine percent-lint of the cotton harvested. The percent-lint data was used to convert the amount of seed cotton harvested per sub-plot into the equivalent lb lint per acre per sub-plot.

Data collected pertaining to tobacco thrips, western flower thrips, and thrips larvae, as well as yield data was subjected to statistical analysis of variance using general linear models procedure.

Results and Discussion

Larvae was the only factor significantly affected by tillage method. Both tobacco thrips and western flower thrips were not affected to the 0.05 level of significance when least squares means were analyzed. Conventional tillage resulted in thrips larvae being 200% of the larval population found in no-till plots. The opposite effect, however, was seen when observing population densities of thrips larvae and tobacco thrips and western flower thrips adults in 30"spaced rows compared to UNRC. Larval populations were not significantly altered because of varying row widths. However, tobacco thrips and western flower thrips adults were found in significantly higher levels in UNRC). Temik had a significant suppressive effect of thrips larvae and adults. Yield was significantly affected only by row spacing. The yield of UNRC was >200% that of cotton planted in thirty inch wide rows. Larval populations were very low on June 18, 1998. However, larval populations were significantly higher on June 28, 1998. The opposite trend, however, was observed for adult western flower thrips and adult tobacco thrips.

Tillage method has the interesting effect of suppressing thrips larvae population numbers. Cotton planted into wheat stubble had 50% fewer thrips larvae than cotton planted into soil prepared with a disk harrow. The same trend was also seen with western flower thrips and tobacco thrips adults, although not at the 5% level of significance. The significant difference in larval population between tillage systems is possibly attributable to the fact that averages were taken from two sampling dates. Thrips larvae numbers were found at very high levels on June 28, 1998. Larvae populations were not significantly altered in the row spacing comparisons, though. Population levels of western flower thrips and tobacco thrips adults were altered significantly in favor of thirty inch spaced rows. As would be expected, Temik significantly reduced population levels of both thrips larvae and adults.

Yield was affected significantly only by row spacing. This effect can be attributed to the higher plant population density of UNRC. Furthermore the tremendous yield difference can possibly be attributed to the fact that mechanically harvested cotton was compared to hand harvested cotton. In every circumstance in which such comparisons are made hand harvesting out-yields mechanical harvesting due to the greater efficiency of hand harvesting. A lower than desired plant density in the UNRC may have been another contributing factor in favor of UNRC. Although the desired final plant density was 120,000 plants per acre, the actual plant density was 90,000 plants per acre. Such low plant densities are detrimental to lint grades, although grades were not assessed in this experiment. Lower than adequate plant densities in UNRC cause an undesirable branching characteristic of individual cotton plants, thereby leading to excessive removal of "bark" by mechanical strippers. The excessive branching does lend itself to higher lint yields than cotton planted into wider (30" and above) rows.

This experiment will be continued through 1999, and results will likely be similar for thrips population levels. Yield differences will, no doubt, be significantly different than in 1998. Knowledge gained into the agronomic practices of ultra narrow row cotton production should result in differences in yield that are more similar to those seen in actual situations experienced by the commercial cotton grower. The summer was very hot and dry during 1998, and irrigation was less than ideal for this experiment. Because of extraordinary soil compaction as a result of the lack of rainfall and irrigation, stand establishment was very difficult. After an acceptable stand was finally established, lack of rainfall was still being experienced, thereby eliminating the need for growth regulators. Lastly, no supplemental nitrogen application was applied, resulting in no excessive growth being observed.

References

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