IMPACT OF WARM SEASON GRASS STRIPS ON ARTHROPOD POPULATIONS IN MISSOURI COTTON FIELDS

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Abstract

Soil erosion by wind is an important problem in Southeastern Missouri cotton fields. Grass strips can help to minimize wind erosion. However, little is known about the impact of grass strips on the entomofauna in this region. Research is being conducted to evaluate the influence of vegetation strips on the insect fauna and to determine the existence of gradients in insect numbers and diversity with distance from the strips. At closer distances from the vegetation strips: selected pests appear to occur at lower densities, some natural enemies appear to increase in numbers, and yield seems to be higher. Results at this time are preliminary and need to be validated since this is the initial year of a three year project.

Introduction

Soil erosion by wind is an important problem in Southeastern Missouri cotton fields, especially when fields are recently planted or plants are in seedling stage. This problem results in loss of soil fertility and significant crop injury by physical damage (sandblasting). Grass strips planted in the fields can help to minimize wind erosion. Moreover, vegetation strips may contribute to wildlife habitat and may have an effect on the arthropod populations found in cotton fields.

Some of the objectives of this study are to evaluate the influence of the vegetation strips on the insect fauna and to determine the existence of gradients in insect numbers and diversity with distance from the strips.

The study consists of five treatments: switchgrass strips, rye strips, switchgrass plus forbs, untreated conventional cotton, and insecticide treated conventional cotton. There are four replications or blocks per field in a split plot design. The main plots are the vegetation strip treatments. The subplots are the distances from the vegetation strip. This factorial arrangement has the following three factors: type of vegetation strip (five treatments), distance from the vegetation strip (1, 6, and 12 m), and position from the strip (north and south).

There are two test sites. One is located in Portageville at the Delta Center and the other is in Clarkton.

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Materials and Methods

All samples -except for plant stand densities and yield- were collected from rows numbers 1, 6, and 12 from both sides of the vegetation strips.

Thrips counts: Collecting dates were: 10, 20, and 30 days after planting (DAP). Cotton plants were collected in straight-side, wide-mouth, 250 ml Nalgene® jars. On average, samples were taken around 8:30 am, since thrips are more active and escape more readily at higher environmental temperatures. Each sample consisted of five plants randomly chosen from the rows.

Ant samples: 3X5" index cards baited with peanut butter were used to attract ant species. These cards were fixed to the ground using 3 1/2" nails. The traps were placed in the field at 9:00 am and checked two hours later. Sampling dates were 6-20-95, 7-18-95, and 8-15-95 for the Portageville field study; and 6-21-95, 7-19-95, and 8-16-95 for Clarkton. Ant numbers were estimated looking at both sides of the index cards.

Plant stand densities: A total of 6.10 m sampled per row were sampled. Observations were recorded on 6-20-95 in Portageville and 6-21-95 in Clarkton.

Pitfall traps: These traps consisted of two 16-ounce plastic cups placed in the ground with their mouth at the level of the soil surface on top of the rows. One ounce of a mixture of ethylene glycol and water at a 1:1 ratio was poured inside the traps as a killing and preservative agent. The pitfall traps were left in the field for five days.

Management practices: The field in Portageville was planted to cotton on 5-12-95. The field in Clarkton was planted to cotton on 5-16-95. Both experimental fields were planted with the variety DPL-50. In the Portageville field study, the vegetation strips were planted as following: switchgrass and switchgrass plus forbs on 3-13-95, Rye on 11-17-94. Switchgrass and switchgrass plus forbs were reseeded on 6-2-95. AAtrex® 4L (Atrazine) was used for weed control, pre-planting, at a rate of 0.66 lb AI/A on 4-19-95. The experimental fields (with the exception of the four center rows of each plot) were sprayed with DSMA (disodium methanearsonate) in combination with surfactant for the control of morninglory (*Ipomoea* spp.) and pepperweed (*Lepidium virginicum*) on 5-19-95. DSMA was used on the four center rows of the conventional cotton and conventional sprayed cotton treatments at a rate of 1.75 lb AI/A on 6-13-95. The alleys were disced on 5-26-95. Plots were cultivated on 6-9-95 for weed control.

In the Clarkton field study, switchgrass strips and switchgrass plus forbs were re-planted on 3-22-95. Rye strips were planted on 11-20-94. The herbicide AAtrex® 4L (Atrazine) at a rate of 0.66 lb AI/A was applied on 4-25-95 to the experimental plots. A mixture of 24 oz/A of

Roundup® (glyphosate), 1.5 pts/A of Prowl® (pendimethalin), and 1.5 pts/A of Cotoran® (fluometuron) was applied at crop pre-emergence on 5-19-95, for weed control, in the four center rows of the conventional cotton and conventional sprayed cotton treatments. The plots were cultivated on 5-26-95 and alleys were disced on 6-16-95.

Results and Discussion

Significant differences were found between conventional sprayed cotton and the rest of the treatments in all the sampling dates in the Portageville study. There were not significant differences among the other four treatments. The results obtained from the thrips samples validate the efficacy of Temik® (Aldicarb) as an excellent insecticide for the control of thrips when applied at planting.

This year, the high populations of thrips in Southeastern Missouri were unprecedented. This phenomenon was probably due to the relatively mild winter and/or to thrips migration on the strong southerly wind currents during the month of May.

The highest value for plant stand density was obtained in the conventional sprayed cotton treatment for both Portageville and Clarkton studies. However, these differences were not highly significant. The experimental plots in Portageville are more uniform in topography and soil composition than the ones from Clarkton. Thus, the possibility exists that, in Clarkton, the cause of differences in plant stand densities may not be inferred solely on the basis of treatment since very sandy plots have low plant numbers. In Portageville, there was a definite tendency of lower plant numbers at closer distances from the vegetation strips. A possible explanation for this might be that higher numbers of cutworms are found in or near the vegetation strips.

There were not significant differences in numbers of ants (*Pheidole* sp. and *Monomorium pharaonis* L.) among treatments for both Clarkton and Portageville studies. However, in both localities, the numbers of ants decreased at longer distances from the vegetation strips. Results obtained from the ant samples indicate a possible preference of ant colonies for the vegetation strips.

Increasing numbers of ground beetles (specially *Harpalus* sp. and *Geopinus incrassatus*) and tiger beetles (*Megacephala carolina, M. virginica virginica, Cicindela punctulata,* and *C. formosa generosa*) were found near the vegetation strips (Figures 1 and 2).

No significant differences were found in the numbers of lady beetles (*Hippodamia convergens, Coleomegilla maculata,* and *Coccinella septempunctata*) at different distances from the vegetation strips.

Cotton pests such as boll weevils, *Anthonomus grandis grandis*, and Aphids (*Aphis gossypii* Glover) were significantly less numerous near the vegetation strips than at 12 m away from the strips (Figure 3).

The yield in the Portageville study was significantly higher near the vegetation strips than at longer distances. The treatment with the highest yield in Portageville was switchgrass plus forbs. However, no significant differences in yield were found in Clarkton (Figure 4).

Trends and differences in arthropod numbers and their effect on the crop, should become much more clear in the following years. The vegetation strips will be better established and their effect more evident. Data obtained from this first year of study should be considered preliminary and will be used as a tool for making and implementing future changes for the improvement of this study.

Acknowledgements

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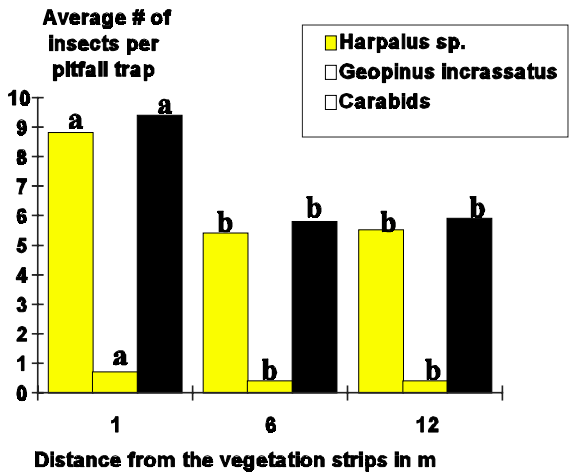

Figure 1. Densities of selected ground beetles at three distances from the vegetation strips.

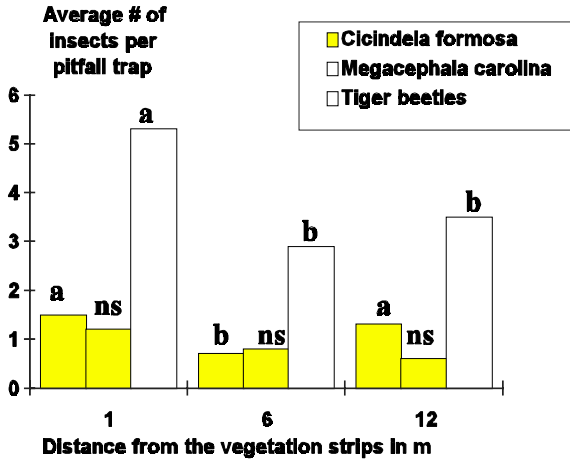

Figure 2. Densities of selected tiger beetles at three distances from the vegetation strips.

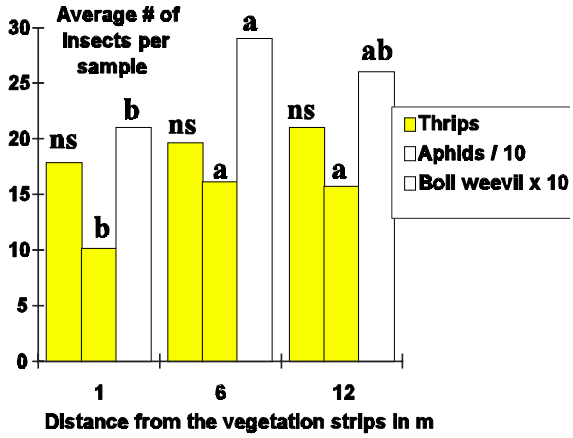

Figure 3. Densities of selected cotton pests at three distances from the vegetation strips

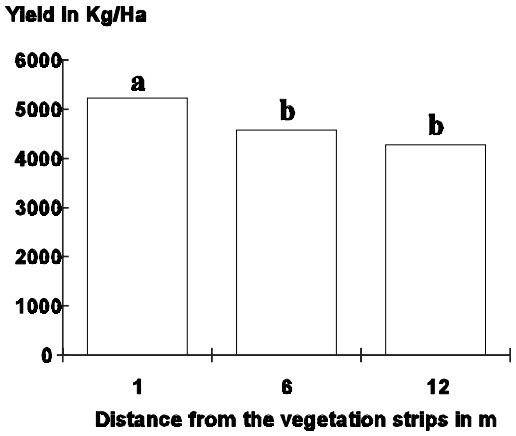

Figure 4. Cotton yield at three distances from the vegetation strips.