INFLUENCE OF CANOLA, WHEAT, AND CLOVER AS COVER CROPS ON SOUTHERN CORN BILLBUG INFESTATIONS IN NO-TILLAGE AND PLOW-TILLAGE CORN

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ABSTRACT

Field tests were conducted for 3 years in the GeoMa Coastal Plains to determine the influence of cover crops and tillage practices on the initiation and intensity of southern corn billbug, *Sphenophorus callosus* (Oliver) (SCB), infestations in seedling corn. Infestations were lowest in areas where canola, *Brassica napus* L, was used as the winter cover crop compared with crimson clover, *Trifolium incarnatum* L., and wheat, *Triticum aestivum* L. Increased feeding damage to young seedlings occurred in all the winter cover areas when no-tillage practices were utilized as compared with plow-tillage.

INTRODUCTION

The SCB is a well-known insect pest of corn in Coastal Plains areas of Georgia, South Carolina, and North Carolina (Wright et al., 1982). Both adult and larval stages feed on corn, *Zea mays* L., but only adults produce damage, which is usually debilitating, hut on occasion may be lethal (Metcalf, 1917;DuRant, 1975). The SCB has one generation a year and, from the standpoint of pest hazard, can be considered a "sedentary"-type pest that tends to increase in severity each year in mono-crop corn systems. The SCB adults feed on various grasses, hut larvae can survive only on corn and yellow nutsedge, *Cyperus esculentus* L.

This study was prompted when it became apparent that certain sustainable agricultural practices, such as no-tillage, may increase hazard for SCB infestations in corn (All et al., 1984). Since SCB feeding habits are restricted to a few grasses and populations tend to be sedentary, it seemed possible that nongrass cover crops, such as canola or crimson clover, might negatively influence the development of infestations in corn as compared with wheat.

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MATERIALS AND METHODS

The tests were conducted from 1990 to 1992 at the University of Georgia Southeastern Branch Experiment Station, which is located in the Coastal Plains. The soil type was Marlborough sandy loam. A randomized complete block split-split plot experimental design was used in most years with winter cover areas as main plots, either no-tillage or plow-tillage as subplots, and poultry manure and/or soil insecticides as sub-subplots. This report will encompass only results from cover crop and tillage treatments. Winter cover areas, measuring 520 m^2, and tillage blocks were maintained in the same location each year. Planting of corn seed (DK689) was done with a John Deere Flex 71 no-tillage planter.

Three winter cover crops, wheat, crimson clover, and canola, and a fallow area, which had been planted in corn the previous growing season, served as winter cover areas. The cover crops were planted in the fall of 1989-1991 using standard agricultural practices. Prior to maturation of the cover crops, the areas were mowed and the land was prepared for planting of corn.

The winter cover areas were split into blocks of either no-tillage or plow-tillage. No-tillage blocks received no plowing prior to planting; whereas, plow-tillage areas included tillage operations with a moldboard plow and disk harrow until a smooth seedbed was prepared. Paraquat at 0.70 kgai/ha was used as a burndown herbicide, and atrazine at 224 kg ai/ha provided residual weed control.

The SCB feeding damage on corn was determined when plants reached Stage 1[four leaves fully emerged (Hanway, 1971)] because injury to young seedlings at this stage has maximum impact on yield. Damage was evaluated by making counts of damaged and undamaged plants in 7 m of two adjacent rows in each treatment replicate so that a percent damaged stand parameter could be calculated. Yield was determined by harvesting all ears of the two rows of each plot that were examined previously for damage. Grain moisture was determined, and all grain weights were standardized at 15.5% grain moisture content.

Results of SCB feeding damage and yield were analyzed with a computer-based statistical analysis program for a split-split plot design (SAS Institute, 1985). Treatment means were separated with Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Infestations by SCB, as indicated by feeding damage to Stage 1 corn seedlings, demonstrated that the different cover crops had a differential effect on the insects' population biology. In all years, corn following canola had significantly fewer ($P<0.05$) damaged plants as compared with the crop planted in the fallow areas. In general, lowest percent damaged stand of corn occurred in canola plots < crimson clover = wheat < corn fallow. Data for percent damage in 1990, 1991, and 1992 [means for the different cover crops followed by the same letter for a specific year were not significantly different ($P<0.05$)] were: canola treatments - 5.6a, 7.la, and 1.9ab; crimson clover - 10.0bc, 11.5b, and 1.0b; wheat - 8.2ab, 12.9b, and 3.1bc; and fallow - 14.3c,15.3c, and 5.3c.

Percentage of corn plants in Stage 1 of development exhibiting damage symptoms of SCB feeding was significantly less ($P<0.05$) in plow-tillage compared with no-tillage systems during all 3 years of tests. Data for percent damage in no-tillage plots in 1990, 1991, and 1992 were 11.9, 13.8, and 4 2 as compared with plow-tillage, which were 7.1, 9.5, and 1.5.

Grain yield was significantly reduced ($P<0.05$) in no-tillage compared with plow-tillage in all years except 1990, which was an abnormally dry year, and higher yields in no-tillage may be attributed to increased soil moisture in these areas. Yield (bu/A) for no-tillage plots in 1990,1991, and 1992 was 30.7, 40.7, and 73.4 as compared with plow-tillage, which was 18.7, 70.0, and 1292. No significant interactions between tillage practices and winter cover areas on yield were observed, indicating that the cover crops produced similar effects on SCB populations, irrespective of tillage practices.

In summary, these tests demonstrate that winter cover crops and tillage practices influence the potential of infestation (i.e., hazard) by SCB on corn. In most years, use of winter cover crops significantly reduced SCB damage compared with a fallow area that had been planted in corn the previous season. Canola, used as a winter cover crop, had the greatest negative influence on SCB infestations. The SCB infestations in the no-tillage plots were always higher than in plow-tillage, demonstrating increased SCB hazard in reduced-tillage systems.

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