Cover-Crop Effects on Billbug Damage to Seedling Corn and Sorghum in Conservation Tillage Systems

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Research quantifying the effects of tillage on the incidence of crop pests has demonstrated that insect pest problems are generally higher in conservation tillage than in conventional tillage. For example, green cloverworms *(Plathypena scabra)* and seedcorn maggots *(Hylemya platura)* have caused more damage to conservation tillage than conventional tillage soybeans in the Midwest (Sloderbeck and Yeargan 1983, Funderburk et al. 1983). In South Carolina, Roach (1981) observed 4.4X more corn earworm *(Hellothis zea)* and tobacco budworm *(H. virescens)* moths emerging from no-till plots than from conventional till plots. The tillage operation itself apparently injures and kills many insects while increasing the exposure of others to natural predation. Crop residues, decaying organic matter, and weeds also attract insects, thereby, increasing pest infestations.

However, utilization of conservation tillage technology, especially in multiple-cropping systems, can reduce labor expenses, eliminate moisture loss associated with tillage at planting time, reduce soil erosion, and maximize land use. Predictions indicate that more than 65% of the acreage planted in the seven major grain crops will be under conservation tillage in the United States by the year 2000. The use of cool-season legumes in multiple-cropping conservation tillage production to restore crop productivity on eroded soils is a high priority and is increasing in popularity.

The suitability of selected legumes in these production systems depends at least partially on the relative susceptibility of the cover crop to pest damage and the influence of the cover crop on the incidence of pests in the following crop. In gathering descriptive data on the role of this latter factor in corn and grain sorghum production, we observed considerable damage by billbugs (Coleoptera: Curculionidae) to seedling corn and sorghum following Crimson clover.

Two separate tests spanning three cropping seasons examined the amount of damage to the grain crop caused by the southern corn billbug *(Sphenophorus callosus)* in response to clover crop residue management

practices and to the type of cover crop. Test 1 was conducted in 1979 and 1980 on the 8ledsoe Research Farm near Griffin, Georgia. Crimson clover served as the winter crop. After crop maturity, the clover was cut and removed from one-half of the plots, while the clover was killed and utilized as mulch in remaining plots. Grain sorghum was then planted by conservation tillage. Test 2 was conducted on the Southeast Georgia Station in Midville in 1983. Corn was planted into either Crimson clover, hairy vetch, or winter fallow after killing the previous cover.

In Test 1, billbug adults damaged approximately 16% of the sorghum seedlings in areas in which the clover residue remained as mulch. Only 2% of the stand was damaged in the areas from which the residue was removed. Billbug damage in this test was sublethal with a characteristic transverse pattern of holes in emerged leaves and some deformed plant parts on the damaged plants.

In Test 2, plant damage was often lethal with a greater percentage of the stand affected in corn following clover than in corn following vetch or winter fallow (Table 1).

Table 1. Effect of Winter Cover Crop on Billbug Damage to Conservation Tillage Corn. Midville. GA, 1983.

Winter Cover Crop	% Corn Plants Damaged	Cover Crop Residue (kg dry matter/ha).
Fallow	22.2	-
Clover	47.4	3846
Vetch	28.6	2346

Factors responsible for the increased damage by billbugs to seedling corn and sorghum in clover mulch have not been fully ascertained. Based upon biological information on billbugs, this response apparently is not due to a selective preference of clover as an overwintering or feeding site. Billbugs usually overwinter as adults at the edges of crop fields and seldom in crop stubble. In addition, their host range is extremely restricted (Wright et al. 1982). Although adults feed on a variety of host plants and females oviposit on at least six plant species, larvae are able to complete development on corn and yellow nutsedge only (Table 2). Feeding and oviposition do not occur on either soybeans or peanuts. Therefore, billbugs do not overwinter in the cover crop and, in general, do not feed OR legumes.

However, the increased billbug activity in the clover mulch could be correlated with crop residue on the soil surface when overwintered adults disperse into crop fields. (Dispersal is primarily accomplished by walking; adults seldom fly.) In Test 1, the damage was greater in mulched areas than in areas from which the residue had been removed. In Test 2, more residue was produced by the clover than the vetch (Table 2). Due to their sedentary nature, overwintered adult billbugs may be attracted to areas with crop residue and subsequently feed on susceptible host plants.

Table 2. Host Range of the Southern Corn Billbug

Plant	Adult Feeding	Oviposition	Larval Development
Field corn	+++	+++	+
Yellow nutsedge	+++	+++	+
Grain sorghum	++	+	-
Sudangrass	++	+	-
Sudax	++	+	-
Johnsongrass	++	+	-
Fall panicum	+	-	-
Giant foxtail	+	-	-
Kenaf	+	-	-
Giant cane	+	-	-
Pennsylv. smartweed	+	-	-
Peanut	-	-	-
Soybean	-	-	-

From Wright et al. (1982).

Due to its restricted host range and its sedentary nature, crop rotation between host and nonhost crops is recommended as a primary tactic in managing the billbug. Early planting and proper fertilization of susceptible crops are recommended to promote rapid seedling growth in order to reduce the period of overlap between plant stages that are susceptible to damage (i.e., seedlings) and the time of adult billbug activity. However, when the risk of billbug infestation is high (i.e., susceptible crop, late planting date, previous infestations in the same field, etc.), several insecticides labelled for use against the billbug are available for application at planting time.

References

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