Chapter 3

Feeding Preference of Chinch Bug (*Blissus leucopterus* Hemiptera:Lygaeidae) for Fine Fescue and Kentucky Bluegrass
INTRODUCTION

Feeding preferences of insects may be the primary separation force causing the evolutionary diversity in phytophagous species (Bush 1975; Dethier, 1958). The chinch bug, *Blissus leucopterus*, has two subspecies, *B. l. leucopterus* and *B. l. hirtus* (Leonard, 1966). The two races are separated in geographic range but even more so by host preference. *B. l. leucopterus* feeds mostly on wheat, sorghum, and corn, while *B. l. hirtus* feeds primarily on turfgrasses, such as Kentucky bluegrass, fine fescue, and the ryegrasses (Leonard, 1966). Chinch bug preferences for certain host plants have not been shown for *B. l. leucopterus* (Stuart et al., 1985; Wilde et al., 1986). Ratcliffe (1982) found that *B. l. hirtus*, the hairy chinch bug, has a preference for certain cultivars of Kentucky bluegrass. However, feeding preference among common home lawn grass species has not been addressed. In this investigation I sought to determine the feeding preference of the hairy chinch bug for two of the most common temperate region home lawn turfgrasses, Kentucky bluegrass (*Poa pratensis*) and fine fescue (*Festuca rubra*).

MATERIALS AND METHODS

Standard golf course cup-cutter plugs of "Fylking", "Adelphi", and "Kenblue" Kentucky bluegrass cultivars and "Biljart" and "Jamestown" fine fescue cultivars were taken from the Hancock Turfgrass Research Center on the Michigan State University (East Lansing, MI) campus. These were planted in clay pots in the greenhouse where they received uniform watering and clipping treatment. Because only two cultivars of fine fescue were
available at the Hancock Center, a third, "Wintergreen", was planted in the greenhouse one month before the beginning of the test.

Resting Habitat Preference

Resting habitat preferences for B. l. hirtus were tested on July 15 and 16, 1987. Standard cup-cutter plugs of each of the six cultivars were cut into quarters. One quarter of each of the six cultivars was placed on the soil in an 20 cm diameter clay pot, alternating Kentucky bluegrass quarters with fine fescue quarters. Six permutations of cultivar quarters arranged in this fashion were possible. Two replicates of each permutation were produced, for a total of 12 test arenas. The grass in each arena was surrounded by a clear plastic collar, 53 cm in circumference, and 17 cm tall, placed 2 cm into the soil. The area around the turfgrass and collar was covered by white silica sand. Twenty chinch bugs (5 adults, 12 fifth instars and 3 third or fourth instars) were introduced into the center of the arena, and the top of the collar was covered with a piece of parachute cloth secured with elastic banding. One-fifth of the chinch bugs used had been reared from eggs according to the method described by Baker et al. (1981). Because of a low success rate in chinch bug rearing, the rest of the bugs used in the experiment were collected as immatures and maintained on corn stalk sections through at least one moult. After 24 hrs., the arenas were dismantled and the cultivar quarters removed and visually searched for chinch bugs.

Feeding Preference Tests

Feeding preference test chambers were prepared using 90 mm plastic Petri dishes. Five 6mm diameter holes were drilled along the top edge of the Petri dish. The four outer holes were covered with mosquito netting and
served to ventilate the chamber. The center hole was fitted with a cork and provided an opening for introduction of the chinch bugs into the chamber. Twenty cc of white silica sand was placed into the bottom of the dish and was wetted with 6 ml of water. One plant of Kentucky bluegrass and one plant of fine fescue were placed in the sand. The lid of the dish was attached by a double layer of Parafilm and the whole chamber gently tapped on one edge to cause the sand to collect in the bottom of the chamber (Figure 9). Completed chambers were stabilized for 24 hrs before introduction of the chinch bugs. Five replicates of each of the nine permutations of cultivar combinations (three cultivars each of the two grass species) were set up, for a total of 45 chambers.

Immature chinch bugs were collected from three heavily infested lawns of varying grass composition in the Lansing, MI area June 30 and July 27, 1988. Bugs were maintained in the lab on corn stalk sections for at least a week before being used in any experiment. On August 5, 1988, a single fifth instar chinch bug was introduced into each chamber. The chambers were kept up-right in a rack and the bugs were observed every fifteen minutes beginning at 8 AM and continuing until 3 PM for a total of 29 observations on each bug. Feeding was recorded as positive when the bug was observed to have its proboscis inserted into the plant. Observations took place under a combination of fluorescent and incandescent light in a lab at 25°C and 80% relative humidity. The experiment was repeated on August 11, 1988 using a new set of test bugs. The difference between the number of feeding observations on Kentucky bluegrass and fine fescue for each chinch bug was determined and used to calculate a t value for comparison in a paired t-test.
Figure 9. Choice chamber used in feeding preference test. The chamber consisted of a modified 90 mm plastic Petri dish. One fine fescue and one Kentucky bluegrass plant were held upright in moist white silica sand.
RESULTS

Two hundred and one of the 240 chinch bugs introduced into the resting habitat preference arenas were recovered. Of these, 113 were found in Kentucky bluegrass plug quarters and 88 were found in fine fescue plug quarters. Given an expected ratio of 50% of the bugs in each of the two turf types, a log likelihood ratio test value of 3.12 (0.05<P<0.10) was found. Although the value was not significant at the .05 level, there was some indication that the chinch bugs were preferentially resting in the Kentucky bluegrass sections.

Of the 90 chinch bugs observed in the feeding preference experiments, 54 fed only on Kentucky bluegrass, 7 fed only on fine fescue, 22 fed on both, and 7 did not feed. Subtracting the number of observations of feeding on fine fescue from the number of observations of feeding on Kentucky bluegrass for each bug yielded differences (D's) for the two replicates of the experiment of 5.98 and 9.05, with variances of 101.87 and 105.2, respectively. These translate into paired t-test values of 3.79 and 3.54 (df=41), which are both significant at P<0.001. Chinch bugs fed significantly more on Kentucky bluegrass than on fine fescue plants.

DISCUSSION

This study indicates that Blissus leucopterus hirtus prefer to feed on Kentucky bluegrass over fine fescue. Several limitations of this experiment that could affect the results should be pointed out. First, stress to grass plants during set-up of the choice chambers may have affected plant palatability (Risch, 1985). The chinch bugs may feed as early instars on the
fine blades of fine fescue. Second, field collected chinch bugs could have had food plant preferences imprinted during the early instars that affected their choice in these experiments even after being held on corn plants for at least seven days prior to the experiment. In a previous study Davis and Smitley (in prep.) found that chinch bugs are most typically found in lawns with a moderate percentage of fine fescue and a significantly lower percentage of Kentucky bluegrass as compared to lawns without chinch bugs. Yet, our feeding preference study suggests they prefer to feed on Kentucky bluegrass. At least three hypotheses could explain this apparent discrepancy between feeding preference and observed habitat. Chinch bugs could be causing higher mortality to the Kentucky bluegrass in mixed Kentucky bluegrass/fine fescue lawns, reducing the proportion of Kentucky bluegrass present. The presence of fine fescue may favor chinch bug survival, even though it is not a preferred food plant. Given that some chinch bug infested lawns were composed entirely of fine fescue, this plant had served as a food plant. Third, something in the laboratory experiment was different enough from natural conditions such that the bugs behaved atypically. Although host preferences are not always correlated with host suitability, discrimination between host plants is expected to evolve toward a maximization of encounter rate, oviposition probability, and host suitability (Rausher, 1983). Studies on the development and oviposition of the chinch bug on these host plants under laboratory and field conditions are necessary to more completely understand the importance of these two grasses in hairy chinch bug ecology.
LITERATURE CITED


