Southern Chinch Bug (Hemiptera: Lygaeidae) Survival on St. Augustinegrass Selections[1]

Ron Cherry[2] and Russell Nagata

University of Florida/IFAS, Everglades Research and Education Center, 3200 E. Palm Beach Road, Belle Glade, FL 33430 USA

J. Entomol. Sci. 39(4): 579-583 (October 2004)

Abstract The survival of female vs male adults of southern chinch bugs (*Blissus insularis* Barber) was determined on five selections of St. Augustinegrass (*Stenotaphrum secundatum* (Walt.) Kuntze) of which three (Floratam, 1997-6, Floratine) are susceptible to southern chinch bugs and two (FX-10, NUF-76) are resistant. Survival of different chinch bug life stages (small nymphs, large nymphs, adults) on the five selections also was determined. Survival of female adults, male adults, and other life stages was higher on the three susceptible selections than on the two resistant selections. These data show that survivorship of all stages of southern chinch bugs (small nymphs, large nymphs, adults of both sexes) tested responded similarly to the five St. Augustinegrass selections.

Key Words *Blissus insularis, Stenotaphrum secundatum,* chinch bugs, St. Augustinegrass, host plant resistance

St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze, is used for lawns throughout the southern United States due to its wide adaptation to varying environmental conditions. The southern chinch bug, *Blissus insularis* Barber, is the plant's most damaging insect pest (Crocker 1993). Prior to the release of resistant "Floratam" St. Augustinegrass in 1973 (Horn et al. 1973), control of southern chinch bug was primarily through insecticidal applications. Host plant resistance in Floratam lasted until 1985 when southern chinch bug damage on Floratam was reported (Busey and Center 1987) in Florida and later confirmed by Cherry and Nagata (1997). Reinert et al. (1986) and Busey (1990) identified several new lines of St. Augustinegrass of African origins resistant to southern chinch bugs. This led to the development of FX-10 St. Augustinegrass (Busey 1993), which exhibited resistance to southern chinch bugs. However, FX-10 was never extensively grown due to several overriding negative characteristics including a very coarse appearance and tough texture (Busey 1993). Most recently, Nagata and Cherry (2003) reported the discovery of southern chinch bug resistance in a diploid line of St. Augustinegrass; all previously reported resistant lines were polyploid.

Host plant resistance of St. Augustinegrass to southern chinch bugs has been and will continue to be an area of research interest. Although numerous host plant resistance studies have been conducted, the survival of different sexes and life stages of

[1]Received 24 December 2003; accepted for publication 23 May 2004.
[2]To whom all inquiries are to be addressed (pinesnpets@AOL.com).

southern chinch bugs on resistant St. Augustinegrass selections is largely unknown. The sex and age of an insect are variables that may affect the expression of host plant resistance to the insect (Smith 1989). This information is important in determining how to evaluate for host plant resistance and to better understand the biology of the insect-host plant interaction. The objective of our research was to compare the survival of different sexes and life stages of southern chinch bugs on resistant and non-resistant selections of St. Augustinegrass.

Materials and Methods

Adult tests. Five tests were conducted from April to May 2002. The response of southern chinch bugs to host plant resistance in St. Augustinegrass has been shown to vary among different populations of the insect (Busey and Center 1987). Hence, chinch bug adults were collected from five locations in Palm Beach Co., FL, in order to obtain an average response of the insects to the host plants. Collections were made by vacuuming lawns and then sorting through debris for adults in a laboratory.

Survival of female vs male adults was determined on five selections of St. Augustinegrass. Three selections (Floratam, Floratine, 1997-6) are susceptible to southern chinch bugs, and two selections (FX-10, NUF-76) are resistant (Busey 1993, Nagata and Cherry 2003). Evaluations were conducted using potted St. Augustinegrass plants grown in 11-cm diam azalea pots filled with a 1:1 mixture by volume of sand and Fafard #2 potting mix (Conrad Fafard, Agawam, MA). Test plants were 8 to 12 wks old and were initiated from a single node cutting. A 30 to 40 cm long stolon runner still attached to the potted plant was placed into a 28 × 16 × 11 cm high assay arena to determine chinch bug survival (see Nagata and Cherry (2003) for construction of arena). Chinch bug adults from each location were put into 10 arenas with each arena holding 10 females or 10 males and one stolon of one of the five selections. All evaluations were conducted within an insectary room maintained at 31°C on a 14 L/10 D photoperiod. Plants were watered as needed. After 14 d arenas were opened, stolons were dissected, and live chinch bugs counted. Data from the five locations were pooled. Differences in chinch bug survival for each sex among the five selections were determined using a Least Significant Difference (LSD) test (SAS 1996).

Preliminary observations suggested that female adults were living longer than male adults on all St. Augustinegrass selections, both susceptible and resistant. Hence, we hypothesized if all other factors are the same, females live longer than males. To test this hypothesis, we conducted starvation tests with the adults. During April through May 2003 chinch bugs were collected as previously described. After collection, last-instar nymphs (fifth instars) were placed into plastic vials (20 nymphs/vial) and held at 28°C. Vials measured 3-cm diam by 10-cm length and contained a moist sponge to maintain high relative humidity and a sprig of St. Augustinegrass (Floratam) for food. Water was lightly sprayed into vials to provide free water as droplets on the side of the vial. New sprigs and water were added each 3 to 4 d. Vials were checked daily for new adults. New adults were placed into the same type of vials (1 adult/vial), except these vials did not contain St. Augustinegrass. Vials containing adults were checked daily for adult survival and lightly sprayed with water to provide a continuous supply of free water as droplets on the vial side. At death, the sex and wing form (brachypterous vs macropterous) of the adult was recorded. An LSD test (SAS 1996) was used to compare mean survival of the four adult types (2 sexes × 2 wing types).

Life stage tests. The objective of these tests was to compare the survival of different life stages of chinch bugs on the five St. Augustinegrass selections. Five tests were conducted from June to August 2002. Testing procedures were the same as previously described for the tests with adults on St. Augustinegrass selections except that rather than using sexed adults, 20 small nymphs (first to third instar), 20 large nymphs (fourth and fifth instar), or 20 unsexed adults were placed into each arena. Data from the five locations were again pooled. Differences in chinch bug survival for each life stage among the five selections were determined using a LSD test (SAS 1996).

Results and Discussion

Adult tests. Adult survival was higher on the three susceptible St. Augustinegrass selections (Floratam, Floratine, 1997-6) than the two resistant selections (FX-10, NUF-76) for females and males (Table 1). These data show that adults of both sexes were responding similarly via survivorship to the five St. Augustinegrass selections. In females, statistically significant separations in mean survivorship was observed between resistant selections vs susceptible selections. However, in males, mean survivorship on FX-10 was significantly different from the susceptible selections, but NUF-76 was not. This lack of statistical separation of NUF-76 from the susceptible selections may be partially explained by the fact that male survival was lower than that of females within each of the five selections. This lower male survival resulted in the range of means in males being less (37.6%) than the range of mean survival of females (76.2%) making statistical separation more difficult in males. This lower survival of males than females on all five host plants is explained by data from our starvation tests (Table 2). These data show that wing type had no significant effect on survival within each sex. However, females of both wing types had significantly greater survival than males of both wing types. Quite simply, females live longer than males all other factors being the same. The overall mean survival in days for all females was 10.7 ± 2.6 (SD) versus 7.3 ± 2.9 (SD) for all males.

Life stage tests. The age of an insect has been shown to affect the expression of plant resistance (Smith 1989). Earlier studies (Reinert and Dudeck 1974, Reinert

Table 1. Percent survival of female and male adult chinch bugs on different St. Augustinegrass selections

	Percent survival*	
Selection	Females	Males
Floratam	77.8 ± 16.3a	37.6 ± 14.3a
Floratine	57.6 ± 26.8a	40.0 ± 25.5a
1997-6	57.6 ± 26.8a	40.2 ± 34.5a
FX-10	1.6 ± 3.6b	0.0 ± 0b
NUF-76	20.4 ± 16.4b	14.0 ± 5.7ab

* Mean ± SD % survival after 14 days at 31°C. Means within a column followed by the same letter are not significantly different (alpha = 0.05) as determined with an LSD test (SAS 1996).

Table 2. Days of survival of adult chinch bugs held without food

Adult type	N	Days		
		Mean*	SD	Range
Female-Macropterous	10	11.3a	3.2	8-19
Female-Brachypterous	22	10.4a	3.3	4-16
Male-Macropterous	23	7.9b	3.6	2-16
Male-Brachypterous	28	6.8b	3.3	1-13

* Mean survival of starved adults at 28°C. Means followed by the same letter are not significantly different (alpha = 0.05) as determined with an LSD test (SAS 1996).

Table 3. Percent survival of different life stages of chinch bugs on different St. Augustinegrass selections

Selection	Percent survival*		
	Small nymphs	Large nymphs	Adults
Floratam	88.6 ± 7.1a	65.6 ± 25.2a	58.2 ± 27.7a
Floratine	59.6 ± 33.2ab	53.4 ± 16.7a	43.2 ± 22.5ab
1997-6	58.6 ± 31.8b	50.2 ± 27.0a	30.8 ± 25.2bc
FX-10	1.0 ± 2.2c	3.0 ± 4.5b	2.2 ± 3.0d
NUF-76	8.4 ± 16.2c	10.0 ± 10.4b	9.0 ± 12.4cd

* Mean ± SD % survival after 14 days at 31°C. Means within a column followed by the same letter are not significantly different (alpha = 0.05) as determined with an LSD test (SAS 1996).

1978, Busey and Center 1987) measured survival of different stages of southern chinch bugs on different selections of St. Augustinegrass. However, in these studies, different insect stages were often examined in different tests and on different selections making it difficult to directly compare all chinch bug life stages at the same time on the same selections. In all three life stages (small nymphs, large nymphs, adults), survival within each stage was lower on the two resistant selections, FX-10 and NUF-76, than on the three susceptible selections, Floratam, Floratine, and 1997-6 (Table 3). These data show that small nymphs, large nymphs, and adults were responding similarly to the five St. Augustinegrass selections. The high survival of all stages on the once resistant Floratam corroborates earlier studies (Busey and Center 1987, Cherry and Nagata 1997, Nagata and Cherry 2003). Lastly, the low survival of all stages of chinch bugs on the resistant selections NUF-76 and FX-10 corroborates the study of Nagata and Cherry (2003) which showed the resistance of these two selections using only adult chinch bugs.

Acknowledgments

We thank Elsa Garcia, Vivian Johnson, and Alvin Wilson for technical support. This article was approved for publication as Florida Agricultural Experiment Station Journal Series No. R-10279.

References Cited

Busey, P. 1990. Polyploid *Stenotaphrum* germplasm: Resistance to the polyploid damaging population southern chinch bug. Crop. Sci. 30: 588-593.

1993. Registration of FX-10 St. Augustinegrass. Crop Sci. 33: 214-215.

Busey, P. and B. Center. 1987. Southern chinch bug (Hemiptera: Heteroptera: Lygaeidae) overcomes resistance in St. Augustinegrass. J. Econ. Entomol. 80: 608-611.

Cherry, R. and R. Nagata. 1997. Ovipositional preference and survival of southern chinch bugs (*Blissus insularis* Barber) on different grasses. Intern. Turfgrass Soc. Res. J. 8: 981-986.

Crocker, R. L. 1993. Chemical control of southern chinch bug in St. Augustinegrass. Intern. Turfgrass Soc. Res. J. 7: 358-365.

Horn, G. C., A. E. Dudeck and R. W. Toler. 1973. "Floratam" St. Augustinegrass: A fast growing new variety for ornamental turf resistant to St. Augustinegrass decline and chinch bugs. Circ. Florida Agric. Exp. Stn. S-224.

Nagata, R. and R. Cherry. 2003. New source of southern chinch bug resistance in a diploid selection of St. Augustinegrass. J. Entomol. Sci. 38: 654-659.

Reinert, J. 1978. Antibiosis to the southern chinch bug by St. Augustinegrass accessions. J. Econ. Entomol. 71: 21-24.

Reinert, J. and A. Dudeck. 1974. Southern chinch bug resistance in St. Augustinegrass. J. Econ. Entomol. 67: 275-277.

Reinert, J., P. Busey and F. Bilz. 1986. Old World St. Augustinegrass resistant to the southern chinch bug (Heteroptera: Lygaeidae). J. Econ. Entomol. 79: 1073-1075.

SAS Institute. 1996. SAS Systems for Windows. Version 6.12. SAS Institute. Cary, NC.

Smith, C. 1989. Plant resistance to insects. John Wiley and Sons, Inc. New York.