SPATIAL DISTRIBUTION OF SOUTHERN CHINCH BUGS (HEMIPTERA: LYGAEIDAE) IN ST. AUGUSTINEGRASS

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St. Augustinegrass (*Stenotaphrum secundatum* (Walt.) Kuntze) lawns are utilized throughout the southern United States for their climactic adaptation and their ability to tolerate full sun to moderate shade. The southern chinch bug, *Blissus insularis* Barber is the plant's most damaging insect pest (Crocker 1993). The importance of this insect pest is shown by its ability to develop resistance to insecticides (Reinert & Portier 1983) and overcome host plant resistance (Busey & Center 1987; Cherry & Nagata 1997).

Numerous studies have given anecdotal information on the spatial distribution of southern chinch bugs (SCB) in St. Augustinegrass. Watson (1925) described the grass of an infested lawn as turning brown in patches which might die out completely. He found that around the dead brown spot there was a circular marginal area in which the SCB were feeding turning the grass yellow. Wilson (1929) reported that damage is first noticed in small spots which increase in size if uncontrolled. He also reported that few SCB were in the dead brown grass with most SCB being found in a one to 1.5 m wide strip at the margin of the infestation. Likewise, Reinert (1978) reported taking samples along the periphery of grass damaged by SCB where the population would be the highest. Kerr (1966) reported that SCB occur aggregated in scattered patches rather than being evenly distributed in a lawn. The later studies of Reinert and Kerr (1973) and Crocker and Simpson (1981) also reported that SCB occurred in aggregations in St. Augustinegrass.

Previous studies clearly show that there has been a consensus among SCB researchers that the spatial distribution of SCB in St. Augustinegrass is aggregated. However, a thorough analysis of the spatial distribution of the insect determining if the populations are aggregated and if so, how aggregated, has not been reported. The objective of this study is to report the spatial distribution of SCB in St. Augustinegrass. This information will be useful in understanding the basic biology of the insect and developing sound strategies to sample and control SCB.

The spatial distribution of light infestations of SCB was examined during 1998. A light infestation is defined here as an area of St. Augustinegrass which is less than 1 m^2 containing SCB and damaged yellow grass and the infestation is surrounded by green, healthy appearing grass. Ten light infestations were sampled from May to September, 1998 from urban lawns in Palm Beach County, Florida. Infestations were found by looking for small areas of yellow appearing St. Augustinegrass and then visually examining the area for SCB in the field. If SCB was detected, a 1×1 m sample was taken at the infestation and at 5 m and 10 m from the infestation in the healthy appearing green St. Augustinegrass. Each of the three samples was taken by vacuuming the 1 m^2 for nymphs and adults for 5 minutes using a modified Weed Eater® Barracuda blower/vacuum (Poulan/Weedeater, Shreveport, LA). The use of a vacuuming technique for sampling SCB has been described by Crocker (1993). Each infestation was sampled once with the three samples being taken at the same time (i.e., within minutes of each other). Also, all three samples were taken from the same property to ensure that type of grass, fertilizer, insecticidal spraying, etc. were the same between the three samples. After collection, samples were frozen for later counting in a laboratory. Samples were passed through a U.S.A. Standard Testing Sieve #10 (2 mm opening) to remove large debris. Adults and nymphs were counted by microscopic examination. Data from the 10 infestations were pooled and difference in numbers of nymphs, adults, and total SCB between the three sample areas were determined using Tukey's test (SAS 1996).

The spatial distribution of moderate infestations of SCB was examined during 1999 at different infestations than sampled in 1998. A moderate infestation is defined here as an area of St. Augustinegrass which is greater than 4 m^2 containing SCB and damaged yellow to brown dead grass and the infestation is surrounded by healthy appearing green grass. Ten moderate infestations were sampled from May to September, 1999 from urban lawns in Palm Beach County, Florida. Infestations were located as previously described. Three 1×1 m samples were taken at each infestation. One sample was taken in the interior area of brown, dead St. Augustinegrass. A second sample was taken at the infestation edge which was yellow grass bordering the interior area. The third sample was the exterior being 5 m from the edge into green, healthy-appearing grass surrounding the infestation. The 10 infestations were sampled by vacuuming as previously described. Each infestation was sampled once with the three samples being taken at the same time (i.e., within minutes of each other). All three samples were taken on the same property to again ensure insecticidal spraying, etc. was the same between samples. After collection, samples were processed as previously described. Statistical analysis was performed as previously described.

Previous samples had been taken by vacuuming different areas for chinch bugs. However, interior and edge areas of moderate infestations often had yellow to brown or dying grass which was thinner and less lush than green grass in exterior areas. Hence, it appeared that vacuuming for chinch bugs may have been more efficient in interior and edge areas and not reflecting true population differences between those areas and the green exterior areas. Thus, flotation samples (Kerr 1966) were also taken since the efficiency of measuring chinch bug populations using this method would not be affected by differences in grass thickness. From June to October, 1999, 25 moderate infestations were sampled in St. Augustinegrass in urban lawns in Palm Beach County, Florida. Infestations were located as previously described and were new infestations from previously sampled infestations. Three samples were taken at each infestation. One sample was taken in the interior, edge, and exterior of each infestation, these areas having been defined previously. Each sample was a 25 cm diameter grass sample dug down 15 cm. Each sample was placed in a plastic bucket and covered with a fine mesh cloth to prevent escape of insects. Samples were taken to a laboratory where water was slowly added to buckets over a two hour period. Chinch bugs surfacing were aspirated and nymphs and adults counted. Statistical analysis was performed as previously described.

Significantly more nymphs, adults, and total SCB were found in suction samples at the light infestation (0 m) than at 5 m or 10 m from the infestation (Table 1). There was no significant difference in numbers of nymphs, adults, or total SCB in suction samples between 5 m and 10 m from the light infestation.

Significantly more nymphs, adults, and total SCB were found in suction samples at the infestation edge than the interior or exterior of moderate infestations (Table 1). Significantly more total SCB were found in suction samples in the interior of moderate infestations than the exterior. As in suction samples, significantly more nymphs, adults, and total SCB were found in flotation samples at the infestation edge than the interior or exterior of moderate infestations (Table 1). Also as in suction samples, significantly more total SCB were found in flotation samples in the interior of the moderate infestation than the exterior.

Both suction samples and flotation samples show that SCB are extremely aggregated in yellow damaged grass in light and moderate infestations with much fewer SCB in the green grass 5 m or more away from an infestation. However, the efficacy of SCB control using spot treatments of an insecticide only at SCB infestations versus complete lawn coverage with an insecticide is not known. To compare these two treatments, possible SCB resurgence, control of other lawn pests, and predator mortality also need to considered and there are no data currently available comparing the two methods. Future research is needed to determine the overall effect on all lawn arthro-

TABLE 1. SCB IN DIFFERENT AREAS OF ST. AUGUSTINEGRASS INFESTATIONS.

	Meters from light infestation[1]		
	0	5	10
nymphs	1780.8 ± 269.1 A	11.0 ± 3.1 B	12.0 ± 4.6 B
adults	115.9 ± 28.7 A	2.6 ± 1.5 B	0.8 ± 1.1 B
total	1896.7 ± 333.2 A	13.6 ± 4.5 B	12.8 ± 6.1 B
	Moderate infestation[1]		
	Interior	Edge	Exterior
nymphs	62.3 ± 20.4 B	1462.9 ± 359.5 A	1.9 ± 1.0 C
adults	1.9 ± 1.1 B	94.9 ± 23.4 A	0.9 ± 0.3 B
total	64.2 ± 21.5 B	1557.8 ± 365.8 A	2.8 ± 0.8 C
	Moderate infestation[2]		
	Interior	Edge	Exterior
nymphs	7.3 ± 1.1 B	73.8 ± 15.3 A	1.8 ± 0.7 C
adults	4.8 ± 0.9 B	49.5 ± 12.3 A	0.7 ± 0.3 C
total	12.1 ± 2.0 B	123.3 ± 20.1 A	2.5 ± 0.9 C

[1]Means ± 1 SE SCB in 1 m2 suction samples. Means in a row followed by the same letter are not significantly different (alpha = 0.05) using Tukey's test (SAS 1996).

[2]Means ± 1 SE SCB in 25 cm diameter flotation samples. Means in a row followed by the same letter are not significantly different (alpha = 0.05) using Tukey's test (SAS 1996).

pods, pests and beneficials, to determine if spot treatment or broad coverage of insecticides should be used for SCB control. Lastly, it should be noted that heavy SCB infestations do occur, although much less frequently than the light to moderate infestations described in this paper. In heavy SCB infestations, areas of SCB damage spread and merge so that SCB may be found throughout a lawn. In heavy SCB infestations, little St. Augustinegrass is remaining and resodding of the lawn may be necessary.

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Summary

The spatial distribution of southern chinch bugs, *Blissus insularis* Barber, in St. Augustinegrass was examined. In light to moderate infestations southern chinch bugs are extremely aggregated in small areas of lawns surrounded by large areas of green grass which contain few chinch bugs.

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