Interrelationship of Ants (Hymenoptera: Formicidae) and Southern Chinch Bugs (Hemiptera: Lygaeidae) in Florida Lawns[1]

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Abstract The southern chinch bug, *Blissus insularis* Barber, and ants were sampled at chinch bug infestations in southern Florida. Samples were obtained both by vacuuming and by flotation. The red imported fire ant, *Solenopsis invicta* Buren, was found more frequently and in greater abundance at the infestations than any other ant species. Data also show that the introduction of exotic ant species has resulted in a large reduction in the relative abundance of native ant species in the urban environment of southern Florida. Ants have been reported as predators of southern chinch bugs. However, my data show that ants show little response to southern chinch bugs at the population level and probably are not important in controlling chinch bug populations.

Key Words Southern chinch bugs, *Blissus insularis,* ants, Formicidae

St. Augustinegrass, *Stenotaphrum secundatum* (Walt.) Kuntze, lawns are grown throughout the southern United States because of their climatic adaptation and ability to tolerate full sun to moderate shade. The southern chinch bug, *Blissus insularis* Barber, is the most serious insect pest of St. Augustinegrass (Crocker 1993). As many as six insecticidal applications per year have been used in Florida to control southern chinch bugs (Reinert 1978). The importance of this insect is emphasized by its ability to develop resistance to insecticides (Reinert and Portier 1983) and to overcome host plant resistance (Busey and Center 1987, Cherry and Nagata 1997).

Currently, there are few data on how southern chinch bugs interact with other insect species. Wilson (1929) and Kerr (1966) noted various natural enemies observed in the field, but data were not provided on frequency, abundance, etc. Reinert (1972) reported that the southern chinch bug was a host for the parasitic wasp, *Eumicrosoma benefica* Gahan, and provided data on host-parasite interactions. Likewise, Reinert (1978) provided data on predators and pathogens of southern chinch bugs in Florida. In spite of these earlier studies, there are still major gaps in our understanding of how southern chinch bugs interact with other insects, especially at the population level, under field conditions.

The importance of ants in ecosystems is well recognized. In southern Florida lawns, ants are abundant and frequently observed at chinch bug infestations. Ant predation on southern chinch bugs has been observed by Wilson (1929), Kerr (1966), and Reinert (1978). However, no data have been published showing population in-

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teractions between southern chinch bugs and ants under field conditions. These data are now more interesting since the red imported fire ant, *Solenopsis invicta* Buren, has become established in southern Florida and is frequently seen at chinch bug infestations in Florida lawns. The objective of this study was to determine the interrelationship of ant and southern chinch bug populations in southern Florida lawns.

Materials and Methods

Twenty-four chinch bug infestations (2/month) were sampled by vacuuming during 1999 from urban lawns in Palm Beach Co., FL. These lawns and other lawns sampled in this study received insecticidal applications the previous year. These are typical lawns since an informal survey by the author of extension agents throughout Florida showed that a St. Augustinegrass lawn in Florida receives an average of five insecticidal applications per year. Infestations were found by looking for areas of yellow St. Augustinegrass and then visually examining the area for chinch bugs in the field. If chinch bugs were detected, a 1 × 1 m sample was taken at the infestation by vacuuming for 5 min using a modified Weed Eater Barracuda blower/vacuum (Poulan/ Weedeater, Shreveport, LA). The use of a vacuuming technique for sampling southern chinch bugs has been described by Crocker (1993). After collection, samples were frozen for later counting in a laboratory. Chinch bug adults and nymphs were counted by microscopic examination, and ants were removed and stored in alcohol for later taxonomic identification. Relative abundance of ants at the infestations was determined. Correlations between chinch bugs and the three most abundant ant species and all ants combined (Total ants) were derived with Pearson's correlation analysis (SAS 1996).

Flotation samples (Kerr 1966) also were taken to determine possible differences in ant number at chinch bug infestations vs healthy appearing grass 5 m from infestations. Previous samples had been taken by vacuuming infestations for chinch bugs and ants. However, infestations often had yellow-to-brown or dying grass which was thinner and less lush than green grass in surrounding areas. Hence, it appeared that vacuuming may be more efficient at collecting chinch bugs and ants at infestations than in surrounding grass and would not reflect population differences between these areas. Thus, flotation samples were taken because the efficiency of measuring chinch bug or ant populations using this method would not be affected by grass thickness. Twenty-four chinch bug infestations (2/month) were sampled during 1999 from urban lawns in Palm Beach Co., FL. Infestations were located as previously described and were new infestations from infestations sampled by vacuuming. Two samples were taken at each infestation. One sample was taken at the infestation where the chinch bugs had been observed in yellow-to-brown damaged grass. The second sample was taken 5 m from the infestation in green healthy-appearing grass. Each sample was a 25-cm diam grass sample dug down 15 cm into the soil. Each sample was then placed in a plastic bucket and covered with a fine mesh cloth to prevent the escape of insects. Samples were taken to a laboratory where water was slowly added to buckets for 2 h. Chinch bugs surfacing were counted and ants collected and stored in alcohol for later identification. T-tests comparing chinch bugs and ants at infestations vs 5 m from infestations were conducted (SAS 1996).

Results and Discussion

The frequency and abundance of ants in vacuum samples at chinch bug infestations are shown in Table 1. The red imported fire ant, *S. invicta,* was found more

Table 1. Frequency and abundance of ants in vacuum samples at southern chinch bug infestations

Species	Frequency*	Abundance**	
		Total	% Relative
Brachymyrmex obscurior	83.3	1336	23.6
Monomorium pharaonis	75.0	502	8.9
Pheidole moerens	66.7	381	6.7
Solenopsis invicta	100.0	1801	31.8
Tetramorium simillimum	33.3	1050	18.5
Wasmannia auropunctata	12.5	423	7.5
Other†	70.8	177	3.1

* Frequency = percentage of all infestations in which ants were found.

** Total abundance = Ants found in all samples. % Relative abundance = (total number of ants divided by total number of ants of all species) × 100.

† Other = 23 *Hyponera opaciceps* (Mayr), 50 *Strumigenys louisianae* Roger, and 104 unidentified.

frequently and in greater abundance than any other ant species. This important ant species is not native to Florida and was first reported in Palm Beach Co., FL in 1973 (Adams et al. 1981). Its widespread occurrence and abundance at chinch bug infestations is consistent with the ant's legendary invasive capabilities in new areas. It is also interesting to note that five [*Monomorium pharaonis* (Linn.), *Pheidole moerens* Wheeler, *S. invicta, Tetramorium simillimum* Smith, and *Wasmannia auropunctata* (Roger)] of the six most abundant ant species in Table 1 are exotic and the sixth, *Brachymyrmex obscurior* Forel, is of unclear origin (Mark Deyrup, pers. commun.). These data show that the introduction of exotic ant species has resulted in a large reduction in the relative abundance of native ant species in the urban environment of southern Florida.

Pearson correlation coefficients between southern chinch bugs and ants in vacuum samples were 0.49 for *B. obscurior,* 0.18 for *S. invicta,* –0.11 for *T. simillimum,* and 0.26 for total ants. The only significant correlation (alpha = 0.05) was between chinch bugs and *B. obscurior.* However, even this correlation coefficient was only 0.49 or $R^2 = 0.24$ indicating a statistically significant, but low correlation.

The four most abundant ant species in flotation samples at chinch bug infestations vs 5 m from infestations are shown in Table 2. There were significantly more (*t*-test, alpha = 0.05) chinch bugs at the infestations ($\bar{x} = 123.3$, SD = 103.4) than 5 m from the infestations ($\bar{x} = 2.7$, SD = 4.5). The highly aggregated nature of chinch bugs at infestations vs in surrounding green grass has been most recently reported by Cherry (2001). However, there was no significant difference in mean ant number in any of the four ant species or all ants combined (Total ants) at infestation sites vs 5 m away in areas of lower chinch bug density.

Ants have been reported to be predators of southern chinch bugs (Wilson 1929, Kerr 1966, Reinert 1978). However, these same studies also have indicated that ants are not important for controlling southern chinch bug populations. Wilson (1929)

Table 2. Ants in flotation samples at southern chinch bug infestations vs 5 m from infestations

Ants	Mean ± SD*	
	Infestation	5 m from infestation
Hyponera opaciceps	4.6 ± 18.3A	4.7 ± 16.5A
Pheidole moerens	25.6 ± 53.0A	10.8 ± 37.6A
Solenopsis invicta	12.2 ± 15.5A	13.2 ± 26.0A
Tetramorium simillimum	10.2 ± 34.0A	0.1 ± 0.2A
Total**	54.1 ± 55.1A	29.0 ± 43.1A

* T-tests performed. Means in a row followed by same letter are not significantly different (alpha = 0.05).
** Total = Above 4 species + *Brachymyrmex obscurior, Monomorium pharaonis, Strumigenys louisianae, Wasmannia auropunctata,* and unidentified.

stated that natural enemies of chinch bugs such as insects, reptiles, and birds had little effect in controlling outbreaks of the pest. Kerr (1966) also stated that predators did not appear to suppress chinch bug numbers. Reinert (1978) did not place ants in his list of biotic control agents that regulated chinch bug populations in Florida. My data show that there was little correlation of chinch bugs with ants at chinch bug infestations. Also, ant numbers were not significantly different at infestations vs 5 m away where few chinch bugs were found. Although ants may be occasional predators of southern chinch bugs, my data show that ants exhibit little response to southern chinch bugs at the population level and probably are not important in controlling southern chinch bug populations.

Finally, it should be noted that ants have been shown to be important predators in numerous ecosystems including turfgrass (Lopez and Potter 2000). Hence, it is interesting to speculate on reasons why ants were not important predators in this study. One possible reason is that a Florida lawn is a highly disrupted ecosystem due to frequent insecticidal sprayings as noted earlier. Southern chinch bugs have been reported to be resistant to some insecticides (Reinert and Portier 1983), especially the egg stage (Nagata and Cherry 1999). Therefore, the chinch bugs may be more resistant to insecticidal treatments than ants thus preventing ant populations from building up between insecticidal treatments. Also, ants may be interfering with other ants or biological control agents which reduce chinch bug populations. Experimental work suggests that interactions of biological control agents with their own natural enemies can disrupt the effective control of herbivore populations (Rosenheim 1998). For example, the red imported fire ant was abundant at chinch bug infestations in this study and the replacement of other ants by *S. invicta* has been observed on several occasions (Camilo and Philips 1990). Another possible reason that ant populations did not respond to chinch bugs may be due to chemical defenses of southern chinch bugs. Southern chinch bugs in large numbers have an odor which a person can smell. Wilson (1929) has suggested that probably because of the repugnant odor of the chinch bug, the number and effectiveness of its natural enemies are not so great as with many insect pests. Future studies are necessary to clarify why ants and other predators often do not control populations of southern chinch bugs thus allowing the insect to be the most important insect pest of St. Augustinegrass.

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