NOTE

Red Imported Fire Ants (Hymenoptera: Formicidae) Fail to Reduce Predator Abundance in Peanuts[1]

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An experiment was conducted to determine effects of the red imported fire ant, *Solenopsis invicta* Buren, on abundance of other arthropods in a peanut agroecosystem. Effects of *S. invicta* on arthropod abundance and peanut quality are poorly understood. Previous work suggests that *S. invicta* prey on approximately 7 times more pests than beneficial arthropods in peanuts (Vogt et al. 2001, Environ. Entomol. 30: 123-128). Our study was undertaken to examine the effects of low and high *S. invicta* population densities on predator and herbivore populations in peanut fields.

The study site was a large (>80 ha) peanut field located in Bryan Co., OK. Prior to this experiment, *S. invicta* mound densities along the field edge were estimated to be >1 per 2.5 linear m of irrigation ditch, with scattered colonies occurring within the field. Ten plots (30.5 m × 30.5 m) were established along the edge of the field near the irrigation ditch. Prior to planting, *S. invicta* populations were reduced in every other plot using Amdro® (0.73% hydramethylnon) (American Cyanamid Co., Wayne, NJ) outside the plots and Extinguish® (0.5% methoprene) (Wellmark International, Schaumburg, IL) within the plots,[3] resulting in a randomized complete block design (blocked by location) replicated 5 times. Arthropods were sampled in the plots using pitfall traps (8 plot^{-1}, 24 h sample) and sweep samples (25 swings plot^{-1}) approximately every 2 wks. Ants were specifically sampled at one point in the study by placing 8 hotdog-baited vials in each plot for 30 min, then quickly sealing and collecting them. Arthropod abundance data were $\log_{10}$-transformed for analysis and subjected to repeated measures analysis of variance (Proc MIXED) (Littell et al. 1996, SAS System for Mixed Models, SAS Institute, Cary, NC) to test for fixed effects of time (date) and treatment, and random effects of block, block * treatment, and block * time (treatment).

Bait treatments dramatically reduced *S. invicta* population density in treated plots compared to untreated plots, as measured using pitfall trap data (Proc MIXED, $F = 118.5$; df = 1, 4; $P = 0.0004$) (Fig. 1A). Treatment accounted for 82% of the

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[3]Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by Oklahoma State University or the U.S. Department of Agriculture.

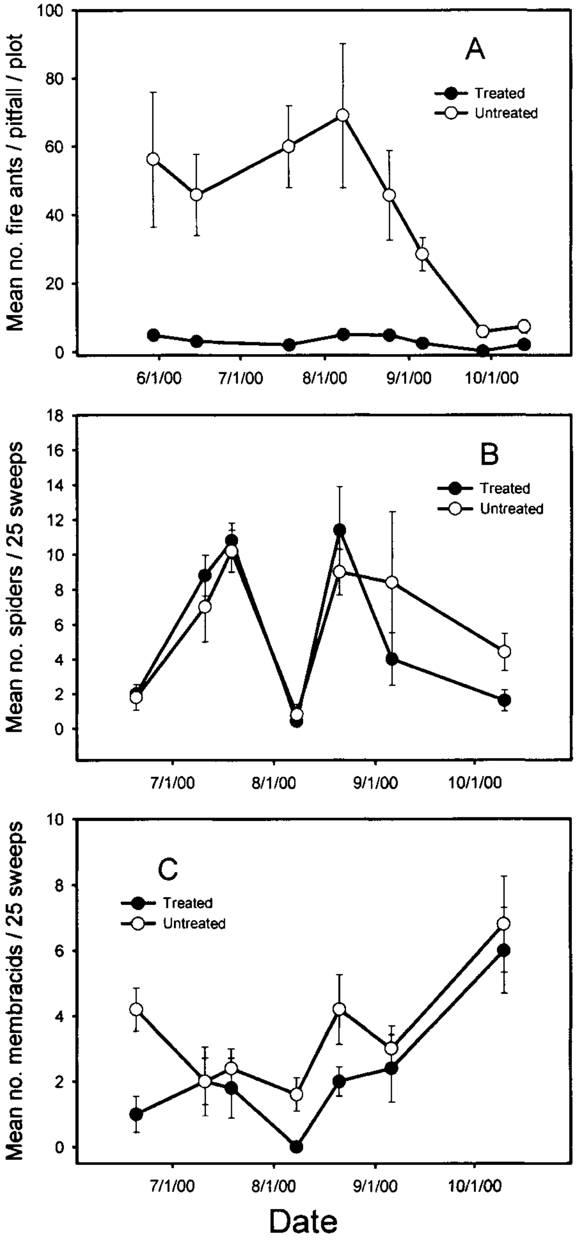

Fig. 1. Relative abundance of *S. invicta* (A), spiders (various species) (B), and three-cornered alfalfa hoppers (C) in high *S. invicta* density (untreated) and low *S. invicta* density (treated) peanut plots.

variability in the fixed effects model $\log_{10}$ *S. invicta* = treatment + time + treatment * time; time accounted for 15%, and the interaction term accounted for 3%. Aside from Collembola (14,864 total) and *S. invicta* (13,070 total), spiders (Araneae) (various species) (1,641 total) were the most abundant arthropods present in pitfalls, followed by Coleoptera adults (1,431, of which 634 were carabids). Spiders were most abundant in sweep samples (403 total), followed by threecornered alfalfa hopper, *Spissistilus festinus* (Say) (Membracidae) (197 total) and various acridids (126 total). Spiders were not affected by abundance of *S. invicta* as measured by pitfall traps (Proc MIXED, P = 0.17) or sweep samples (Proc MIXED, P = 0.78) (sweep data illustrated in Fig. 1B). Adult carabids were not reduced in untreated plots as measured by pitfall traps (Proc MIXED, P = 0.24); only 3 carabid adults were captured by sweep net during the study. Other predators [e.g., tiger beetles (Cicindelidae) and ladybird beetles (Coccinellidae)] were captured in relatively low numbers in sweeps and pitfalls in both treated and untreated plots. The only other ant species collected during this study was *Conomyrma insana* (Buckley); it comprised only 0.27% of ants collected in baited vials within the plots (total ants = 5,485). Forty-two of 49 *C. insana* collected in pitfall traps were collected in treated plots, but low numbers made statistical analysis impracticable. Interestingly, more threecornered alfalfa hoppers (adults) were captured by sweep net in high *S. invicta* density plots than in low density plots (F = 13.0; df = 1, 27; P = 0.0018) (Fig. 1C). This relationship merits further investigation. While we are unaware of specific records of *S. invicta* tending this insect, other ant species tend threecornered alfalfa hopper nymphs (e.g., Nickerson et al. 1997, Florida Entomol. 60: 193-199; Spurgeon and Mueller, 1992, J. Entomol. Sci. 27: 325-336).

Solenopsis invicta do not appear to lower predator abundance in peanuts. In fact, many spiders, the most abundant predators other than ants in our study, are known to capture and feed on *S. invicta* (Nyffeler and Sterling 1994, Environ. Entomol. 23: 1294-1303). Some predators in this study [e.g., rove beetles (Staphylinidae) and big-eyed bugs (Lygaeidae)] were not collected in sufficient numbers for analysis. In collections of material foraged by *S. invicta* workers in an Oklahoma peanut field, "pest" insects outnumbered "beneficial" insects by approximately 87% (Vogt et al. 2001, Environ. Entomol. 30: 123-128). Researchers have concluded that predators in some other cropping systems are not negatively affected by presence of *S. invicta* [e.g., cotton (Reilly and Sterling 1983, Environ. Entomol. 12: 541-545)]; in pecan orchards, however, *S. invicta* prey on the eggs of at least one important predator, the green lacewing *Chrysoperla rufilabris* (Burmeister) (Tedders et al. 1990, Environ. Entomol. 19: 44-53). Additionally, Eubanks (2001, Biol. Control 21: 35-43) demonstrated that *S. invicta* abundance was negatively correlated with 22 of 24 natural enemy taxa in cotton, and 14 of 16 natural enemy taxa in soybean, suggesting that it may be an important intraguild predator in these systems. Additional work will be needed to fully understand possibly subtle interactions between *S. invicta,* predators, and pests in the peanut agroecosystem.

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