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STAGE SPECIFIC SUITABILITY OF TWO MIRID PESTS OF COTTON FOR PREDATION BY THE CURSORIAL SPIDER HIBANA FUTILIS (ARACHNIDA: ANYPHAENIDAE) UNDER LABORATORY CONDITIONS

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Abstract

The ability of 2nd and 4th instars and adult females of the cursorial spider *Hibana futilis* (Banks) to prey on different stages of two mirid pests of cotton was examined. Small nymphs, large nymphs and adults of the cotton fleahopper, *Pseudomatoscelis seriatus* (Reuter) and *Creontiades signatus* (Distant) (Hemiptera: Miridae) were exposed to individual *H. futilis* for 24 h to determine their suitability as prey. Both, the cotton fleahopper and *C. signatus* were consumed by *H. futilis*. Second instar *H. futilis* attacked and consumed only small cotton fleahopper nymphs, however, 4th instars consumed all stages that were presented to them. Second instar *H. futilis* did not consume any *C. signatus*. The larger 4th instar *H. futilis* attacked small and large nymphs of *C. signatus* but in relatively small numbers. Adult female *H. futilis* readily consumed all stages of *C. signatus* tested thus far (adults have not been evaluated yet). Juvenile *H. futilis* were able to attack and consume more cotton fleahoppers than the larger *C. signatus*. This study suggests that *H. futilis* has the potential to be an important predator of the cotton fleahopper and should be evaluated under more realistic settings.

Introduction

Mirids are an important secondary pest of cotton and in locations where boll weevil has been eradicated may be primary pests (Turnipseed et al. 2004). Currently the boll weevil eradication program (BWEP) is underway in the Lower Rio Grande Valley of Texas (LRGV). Research is ongoing to develop techniques to mitigate future damage by the two most important mirid pests of cotton in the LRGV, the cotton fleahopper, *Pseudomatoscelis seriatus* (Reuter), and *Creontiades signatus* (Distant) (both Hemiptera: Miridae). Both mirids are annual pests of cotton in the south Texas (Norman and Sparks 2002, Fromme 2006, Parker 2006). Feeding damage can result in abscission of squares and in the case of *C. signatus*, small bolls. Treatment thresholds have yet to be experimentally determined for *C. signatus*; however recommendations concerning action levels and insecticide choices generally follow guidelines developed for *Lygus* spp. (Norman and Sparks 2002). When treatments are applied for these pests, it is typically early in the season, a time when pesticide applications may result in destruction of beneficials and induce secondary pest outbreaks of lepidopteran pests (Stewart et al. 1996, Summy et al. 1996). Improving biological control of these early season pests would reduce pesticide inputs and the likelihood of outbreaks of other pests.

One of the dominant predators in LRGV cotton is the cursorial spider *Hibana futilis* (Banks) (Araneae: Anyphaenidae) (Pfannenstiel 2004, 2005). On several occasions, *H. futilis* have been collected in the field with green abdomens, suggesting that they may have fed on these mirids. To determine if these mirids are attacked and fed upon by *H. futilis* we evaluated predation under laboratory conditions. These mirids vary considerably in size and it was hypothesized that prey susceptibility would be size dependant. Therefore we evaluated the susceptibility of small and large nymphs as well as adults of both mirids to predation by 2nd and 4th instars and adult female *H. futilis*.

Materials and Methods

For study, *P. seriatus* nymphs were obtained using the methods of Breene et al. (1989). A colony of *C. signatus* was maintained at BIRU and nymphs were reared on green bean pods and corn ears in 5 Qt. plastic containers. Small or large nymphs and adults were removed from this colony as needed. *H. futilis* were reared individually in 150 × 9 mm Petri dishes on a diet of frozen *H. zea* eggs with a moistened dental wick as a water source. Spiders were observed daily and molts tracked until individuals molted to the appropriate instar for testing. *H. zea* eggs for prey were obtained from a laboratory colony reared by modified methods of Ignoffo (1965).

To determine basic suitability of different size classes of the two mirids for predation by 2nd and 4th instars and adult female *H. futilis* a Petri dish assay was performed. For each assay a Petri dish with a cotton leaf was set up and 5 of either *P. seriatus* or the larger *C. signatus* were introduced. Fully expanded leaves were cut from greenhouse grown cotton plants (cv. Deltapine 54-14 RR) and the petiole immediately surrounded by cotton batting and moistened to maintain leaf quality. To the dish a single individual of the appropriate instar *H. futilis* was added. Upon molting to the appropriate instar, spiders were provided with water and no prey and used within 2 to 4 days. Adult spiders tested consisted only of females. Assays were run for 24 hours and controls were performed simultaneously with the prey mirids and no spiders. Trials with 2nd instar spiders were conducted first, 4th instars next, and adults last. If a juvenile instar of the spider caused significant mortality to adults of either mirid, then trials with the larger spider stage were suspended as irrelevant. The goal was to have 10 replicates of each predator×prey size combination. Trials with *C. signatus* have not been completed and these results should be considered preliminary. T-tests were used to determined differences in prey mortality between spider treatments and appropriate controls.

Results & Discussion

Both mirids were readily consumed by *H. futilis*. However, the suitability of any individual mirid did depend on its size relative to the spider. Small 2nd instar *H. futilis* did attack all stages of the cotton fleahopper but could consume only relatively few large nymphs or adults (Fig. 1). Fourth instar *H. futilis* consumed nearly all of the five individuals presented for all stages of the cotton fleahopper (Fig. 2). Because of the high level of consumption of adult fleahoppers by 4th instar *H. futilis*, adult spiders were not tested against them.

H. futilis also readily attacked *C. signatus*. However, because of the larger size of *C. signatus*, the smaller spiders did not cause significant mortality. Second instar *H. futilis* did not appear to attack any *C. signatus* (Fig. 3). Fourth instar *H. futilis* attacked and consumed on average 1 small nymph each possibly a very small number of spiders were able to attack large *C. signatus* nymphs. No adult *C. signatus* were attacked by 4th instar *H. futilis* (Fig. 4). Adult female *H. futilis* consumed most of the small *C. signatus* nymphs in the arena and about 2 of the large nymphs each. No trials with adult spiders and adult *C. signatus* have been conducted as yet.

H. futilis attacked and consumed mirids of several size classes and for 4th instars and adults, could feed on most size classes of pest mirids. Individual spiders of the 4th and adult stages could consume many *P. seriatus* in a 24 hour period. Consumption of *C. signatus* was more modest due to their large size, only adult *H. futilis* could be considered of any importance attacking this species.

It is likely that *H. futilis* could have a significant impact on cotton fleahopper populations when present in moderate numbers. Further testing under more realistic conditions are necessary to confirm and delineate this possibility. However, due to the larger size of *C. signatus* and the correlated reduction in suitability of many stages as prey, it is much less likely that *H. futilis* could have much impact on these populations. Studies are planned to evaluate *H. futilis* fourth instars as predators of the cotton fleahopper in both cage and field studies.

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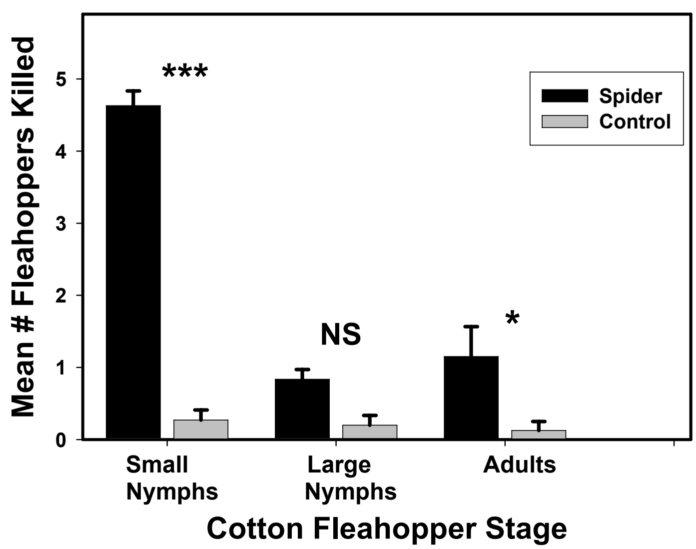

Figure 1. Predation on different stages of the cotton fleahopper, by 2nd instar *H. futilis*. Levels of significance are by t-test; * $0.05 < P \leq 0.10$, ** $0.01 < P \leq 0.05$, *** ≤ 0.01, NS = Not Significant

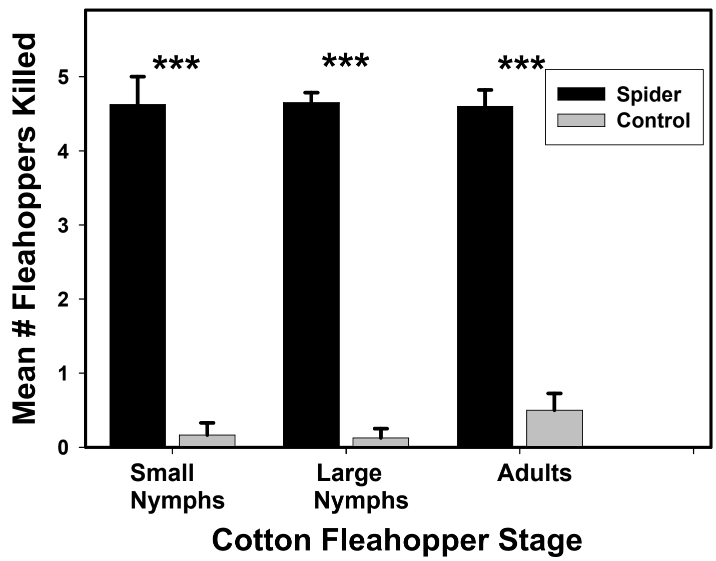

Figure 2. Predation on different stages of the cotton fleahopper, by 4th instar *H. futilis*. Levels of significance are by t-test; * 0.05< $P \leq 0.10$, ** 0.01 < $P \leq 0.05$, *** ≤ 0.01, NS = Not significant.

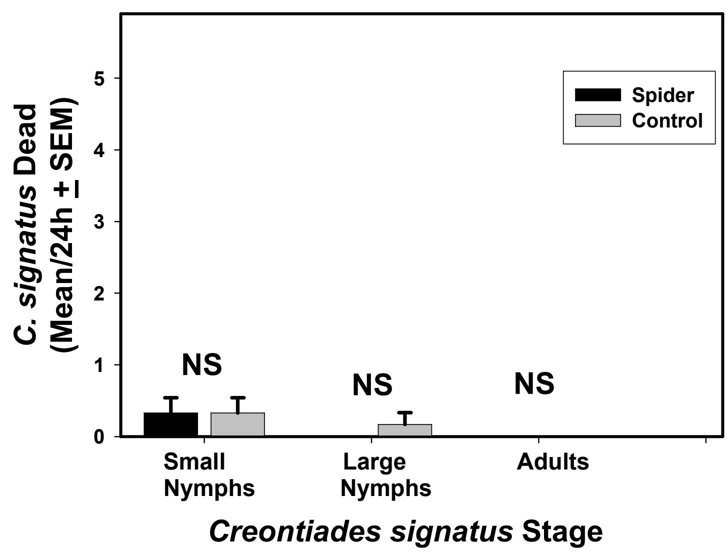

Figure 3. Predation on different stages of *C. signatus* by 2nd instar *H. futilis*. Levels of significance are by t-test; * 0.05< $P \leq 0.10$, ** 0.01 < $P \leq 0.05$, *** ≤ 0.01, NS = Not significant.

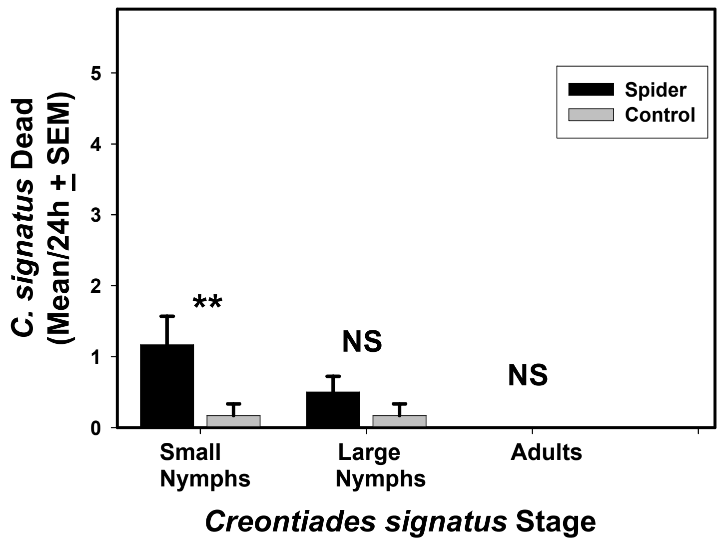

Figure 4. Predation on different stages of *C. signatus* by 4th instar *H. futilis*. Levels of significance are by t-test; * $0.05 < P \leq 0.10$, ** $0.01 < P \leq 0.05$, *** ≤ 0.01, NS = Not significant.

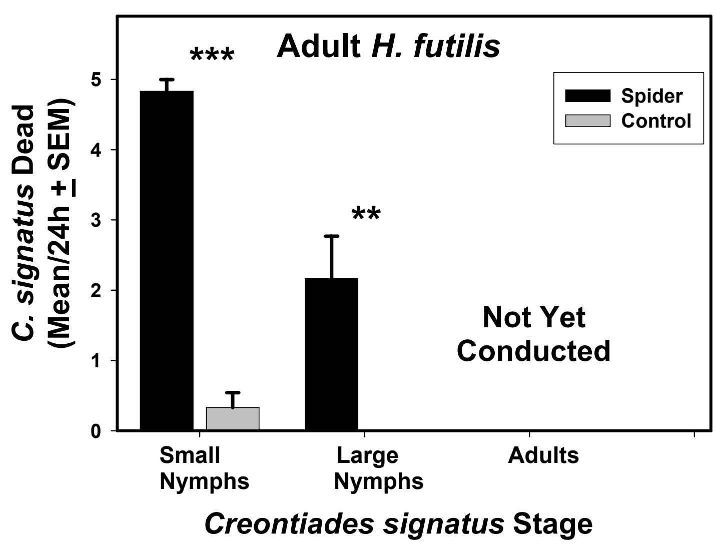

Figure 5. Predation on different stages of *C. signatus* by adult female *H. futilis*. Levels of significance are by t-test; * $0.05 < P \leq 0.10$, ** $0.01 < P \leq 0.05$, *** ≤ 0.01, NS = Not significant.