# ANASA TRISTIS (HETEROPTERA: COREIDAE) DEVELOPMENT, SURVIVAL AND EGG DISTRIBUTION ON BEIT ALPHA CUCUMBER AND AS PREY FOR COLEOMEGILLA MACULATA (COLEOPTERA: COCCINELLIDAE) AND GEOCORIS PUNCTIPES (HETEROPTERA: LYGAEIDAE)

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# *ANASA TRISTIS* (HETEROPTERA: COREIDAE) DEVELOPMENT, SURVIVAL AND EGG DISTRIBUTION ON BEIT ALPHA CUCUMBER AND AS PREY FOR *COLEOMEGILLA MACULATA* (COLEOPTERA: COCCINELLIDAE) AND *GEOCORIS PUNCTIPES* (HETEROPTERA: LYGAEIDAE)

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The Beit alpha cucumber, *Cucumis sativus* L., a crop grown under protective structures in the Middle East, is a new greenhouse commodity in Florida that will compete in the marketplace with the traditional Dutch-type cucumber (Shaw et al. 2000). While it produces a seedless fruit with a thin smooth skin like the Dutch cultivars, productivity can be much higher than other cucumbers. The Beit alpha cucumber can be grown successfully year-round in greenhouses but pests must be controlled for optimal production. The Protected Agriculture Project of the Horticultural Sciences Department at the University of Florida (www.hos.ufl.edu/ProtectedAg/) is seeking to implement biological control and reduce insecticide use as part of an integrated pest management program for this crop. Some of the common cucumber pests encountered by the project are aphids, spider mites, thrips, and whiteflies.

During the spring of 2002, a sporadic pest, the squash bug, *Anasa tristis* DeGeer (Heteroptera: Coreidae), infested the Beit alpha cucumber crop in the project's greenhouse three weeks before harvest and caused considerable damage. The squash bug is considered an important pest of cucurbits in open fields in the U.S. (Beard 1940; Nechols 1987; Cook & Neal 1999). Host preference includes squash, pumpkin, cucumber, and melon (Nechols 1987; Bonjour & Fargo 1989). Important natural enemies of the squash bug are the tachinids, *Trichopoda pennipes* (Fab.), and sceleonids, *Eumicrosoma* spp. (Metcalf & Metcalf 1993; Van Driesch & Bellows 1996). We evaluated 3rd instar larvae and adults of the two predators, *Coleomegilla maculata* DeGeer, and *Geocoris punctipes* (Say), as candidates to control the squash bug. These predators were selected because they are being used extensively to control other pests in the project's greenhouses. We also observed the location and number of eggs deposited by adults in the crop, and the development and survival of squash bug nymphs on Beit alpha cucumber.

The spatial distribution of egg masses in the greenhouse indicated the presence of female squash bugs and subsequent nymphs. Squash bug egg mass distribution on Beit alpha cucumber was determined by randomly selecting 20 cucumber leaves in each of the lower, middle, and upper levels of cucumber plants. Counts were made every other day for three weeks. Beit alpha plants were 3.7 m tall and each level was approximately 1.2 m wide. For each plant level and day, the number of egg masses and eggs per mass were counted (n = 20). Plants in the outside row proximal to the east wall screen were used because the pest appeared there first.

Squash bug adults (n = 20) were collected from the Beit alpha cucumber crop and taken to the laboratory (28 April). The colony was maintained at 21°C and 65% RH with a 16:8 (L:D) photoperiod. The squash bugs and cucumber plant material were kept in 3.8-liter Mason jars and egg masses were collected daily. Five egg masses from a single day were transferred to individual 7-cm plastic cups and kept moist with wet cotton balls. After the eggs hatched, about 20 nymphs were removed from each mass (n = 100) and isolated in individual 10 cm diameter plastic cups. Daily observations were made until individuals died. Each nymph was fed one-fourth of a Beit alpha cucumber leaf and a section of cucumber fruit. Food was replaced every two days. The developmental period was recorded for eggs and first and second instar nymphs.

To test squash bugs as prey, an experimental unit was used consisting of a section of Beit alpha cucumber leaf, a predator, and five first instars of the squash bug in an 8.2 cm diameter petri dish (Fisherbrand, Suwanee, GA) sealed with parafilm. Third instar and adult predators were used based on the results of a pilot experiment. Predators were not fed 8 h prior to the experiments. The control consisted of five prey without a predator. The mean number of prey consumed per day by each kind of predator was recorded and LSD was used to determine significant differences among treatment means (SAS Institute 2002).

Most egg masses were laid in the upper level of the crop, since it was frequented by the adults, averaging 11 ± 1.6. The mean number of egg masses in the middle third was 6 ± 1.2 and in the lower third 3 ± 0.8 (LSD, 0.05 = 4.75). Combining data from all locations, the average number of eggs laid per mass was of 20 ± 3.3. Egg masses were roughly circular (Fig. 1). The squash bug nymphs reared on Beit alpha cucumber advanced through the 2nd instar only. Bonjour and Fargo (1989)

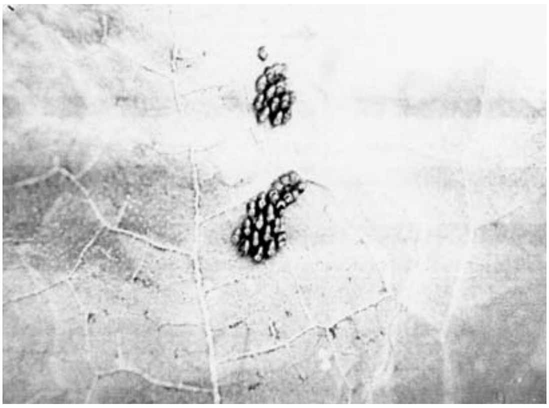

Fig. 1. Egg masses of *A. tristis* on the Beit alpha cucumber, *C. sativus* (12 mm length × 9.5 mm width). Photographed by Elio Jovicich.

Fig. 2. Damage caused by the squash bug on Beit alpha cucumber, *C. sativus* (insect length 90 mm). Photographed by Daniel J. Cantliffe.

obtained similar results when squash bugs were fed cucumbers; however, they did not specify if squash bugs were fed leaves or a combination of leaves and fruits. The nymphs were not able to molt and reach the 3rd instar. The mean developmental time for egg, 1st instar, and 2nd instar was 6.7 ± 1.8, 5.0 ± 1.2, and 3.2 ± 1.0 days, respectively.

The inability of the squash bugs to reach the adult stage under laboratory conditions does not eliminate the possibility of them causing severe damage in a greenhouse, especially if two related crops are being grown simultaneously and one is a true host plant. Our greenhouse contained the Beit alpha cucumber and the Galia muskmelon, *Cucumis melo* L. *reticulatus* group (Shaw et al. 2001). Egg masses, nymphs, and adults were observed only in the Beit alpha cucumber crop, causing wilting and eventually death of the plant. However, relocation of bugs from Beit alpha cucumber border rows toward the center of the cucumber crop and the melons was in progress. Adults, but not egg masses, were found in the melons. The melon crop was terminated 3 weeks after the cucumber crop.

Both nymphs and adults of *C. maculata* consumed more squash bug first instars than did either stage of *G. punctipes* (Table 1). Considering both species and stages, *C. maculata* adults consumed the most first instar squash bugs by the end of the 5-day trial (LSD = 1.61). Field observations indicated that neither predator could consume later instars of the squash bug.

Since no single pest management tactic (chemical, cultural, or biological control or host plant resistance) has been entirely effective in controlling squash bugs (Zavala 1991; Olson et al. 1996), their integration is necessary (Margolies et al. 1998). Early detection of squash bugs in the greenhouse is imperative because moderate infestations can cause plant wilt in cucumber (Fig. 2). *C. maculata* and *G. punctipes* can control early instars of the squash bug, thereby providing growers with a control tactic in addition to the use of chemicals and resistant varieties.

TABLE 1. CUMULATIVE MEAN NUMBER (±SEM) 1ST INSTAR SQUASH BUGS, *A. TRISTIS* DEGEER, CONSUMED BY TWO SPECIES OF PREDATORS (TREATMENTS REPEATED THREE TIMES, FIVE REPLICATES, N = 15).

| | Mean number of prey consumed (n = 5) | | | | | |
|---|---|---|---|---|---|---|
| | Days of observations | | | | | Not consumed in 5 days |
| Predator | 1 | 2 | 3 | 4 | 5 | |
| *Coleomegilla maculata* (3rd instar) | 0.75 ± 0.48 | 2.25 ± 0.85 | 3.00 ± 1.08 | 3.25 ± 1.18 | 3.25 ± 1.18 | 1.75 |
| *Coleomegilla maculata* (adult) | 3.00 ± 1.08 | 3.00 ± 1.08 | 3.75 ± 0.63 | 4.00 ± 0.71 | 4.25 ± 0.48 | 0.25 |
| *Geocoris punctipes* (3rd instar) | 0.25 ± 0.25 | 1.00 ± 0.41 | 2.00 ± 0.82 | 3.00 ± 0.41 | 3.00 ± 0.41 | 2.75 |
| *Geocoris punctipes* (adult) | 0.75 ± 0.48 | 0.75 ± 0.48 | 1.75 ± 0.85 | 1.75 ± 0.85 | 1.75 ± 0.85 | 3.25 |
| Control | 0.00 ± 0.00 | 0.00 ± 0.00 | 0.00 ± 0.00 | 0.00 ± 0.00 | 0.00 ± 0.00 | 5.00 |
| LSD, 0.05 | 1.64 | 1.61 | 2.17 | 2.01 | 2.00 | 1.61 |

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## Summary

During the spring 2002 growing season, the squash bug, *Anasa tristis* (De Geer) (Heteroptera: Coreidae), appeared for the first time in damaging numbers on the Beit alpha cucumber, *Cucumis sativus* L., a new greenhouse commodity in Florida. Adult squash bugs distributed egg masses mostly in the upper areas of the cucumber plants. However, the nymphs did not develop beyond 2nd instar when fed solely on cucumber leaves and fruits. Although squash bugs may not be the preferred prey for *Coleomegilla maculata* DeGeer or *Geocoris punctipes* (Say), 1st instar squash bugs were consumed by 3rd instars and adults of these predators. *C. maculata* adults consumed more prey than did the nymphs or either stage of *G. punctipes*. Early detection of the squash bug and immediate releases of these predators would be required to affect a significant level of control.

## References Cited

BEARD, R. L. 1940. The biology of *Anasa tristis* (De Geer). Conn. Agric. Exp. Stn. Bull. New Haven 440: 597-679.

BONJOUR, E. L., AND W. S. FARGO. 1989. Host effects on the survival and development of *Anasa tristis* (Heteroptera: Coreidae). Environ. Entomol. 18: 1083-1085.

Cook, C. A., and J. J. Neal. 1999. Feeding behavior of larvae of Anasa tristis (Heteroptera: Coreidae) on pumpkin and cucumber. Environ. Entomol. 28: 173-177.

MARGOLIES, D. C., J. R. NECHOLS, AND E. A. VOGT. 1998. Rapid adaptation of squash bug, *Anasa tristis*, populations to a resistant cucurbit cultivar. Entomol. Exp. Appl. 89: 65-70.

METCALF, R. L., AND R. A. METCALF. 1993. Destructive and Useful Insects: Their Habits and Control, 5th ed. McGraw Hill, NY.

NECHOLS, J. R. 1987. Voltinism, seasonal reproduction, and diapause in the squash bug (Heteroptera: Coreidae). Kansas Environ. Entomol. 16: 269-273.

OLSON, D. L., J. R. NECHOLS, AND B. W. SCHURLE. 1996. Comparative evaluation of population effect and economic potential of biological suppression tactics versus chemical control for squash bugs (Heteroptera: Coreidae) management on pumpkins. J. Econ. Entomol. 89: 631-639.

SAS INSTITUTE, 2002. The GLM Procedure. SAS/STAT User's Guide Version 6, SAS Inst. Cary, NC.

SHAW, N. L., D. J. CANTLIFFE, AND S. B.TAYLOR. 2001. Hydroponically produced "Galia" muskmelon: what's the secret? Proc. Fla. State Hort. Soc. 114: 288-293.

SHAW, N. L., D. J. CANTLIFFE, J. C. RODRIGUEZ, S. TAYLOR, AND D. M. SPENCER. 2000. Beit alpha cucumber: an exciting new greenhouse crop. Proc. Fla. State Hort. Soc. 113: 247-253.

VAN DRIESCHE, R. G., AND T. S. BELLOWS, JR. 1996. Biology and arthropod parasitoids and predators, pp. 309-335. *In* R. G. Van Driesche and T. S. Bellows, Jr. (eds.), Biological Control. Chapman and Hall, NY.

ZAVALA, M. S. 1991. Relative toxicity of selected pesticides to the squash bug, *Anasa tristis* DeGeer (Hemiptera: Coreidae) and its egg parasitoid, *Gryon pennsylvanicum* (Hymenoptera: Scelionidae). M.S. Thesis, Kansas State University, Manhattan.