EGG AGE PREFERENCE AND "WINDOW OF SUSCEPTIBILITY" OF *HOMALODISCA COAGULATA* EGGS TO ATTACK BY *GONATOCERUS ASHMEADI* AND *G. TRIGUTTATUS*

Project Leaders:
Nic Irvin
Department of Entomology
University of California
Riverside, CA 92521

Mark Hoddle
Department of Entomology
University of California
Riverside, CA 92521

INTRODUCTION

Understanding the reproductive biology of natural enemies is essential if observed outcomes in the field are to be explained accurately. *Gonatocerus ashmeadi* Girault and *G. triguttatus* Girault both attack glassy-winged sharpshooter (GWSS), *Homalodisca coagulata* [Say] eggs, however it is not known whether they compete for host eggs of the same age, what egg ages are most preferred by females of each species, and which species would be most beneficial for GWSS control. *G. triguttatus* is associated with GWSS in Mexico and Texas and is now being released in limited numbers in Riverside County and elsewhere in California to combat GWSS. *G. ashmeadi* is native to California. Determining the egg age preference of this species will also be valuable in maximizing production for parasitoid releases. Therefore, the following experiments were conducted to determine GWSS egg age preference and the 'window of susceptibility' of eggs to attack by *G. ashmeadi* and *G. triguttatus*. Results presented here are for *G. ashmeadi* and are for egg age categories 1, 5 and 10 days of age. Replicates for 2, 3, 4, 6, 7, 8 and 9 days of age have been set up for both species, however, data is still being collected and analyzed. This will be completed and presented at the December 2001 Pierce's Disease Control Program Symposium.

OBJECTIVES

1. To determine the "window of susceptibility" or vulnerability in days of GWSS eggs to attack by *G. ashmeadi* and *G. triguttatus*.
2. To determine *G. ashmeadi* preference for young, medium and old GWSS eggs.

MATERIALS AND METHODS

For Objective 1, five leaves with 15 GWSS eggs of known age laid on Eureka lemon leaves were placed into a 3 inch ventilated vial cage and exposed to one mated female *G. ashmeadi* (~ 24 hrs of age) for two hours at 25°C. This experiment was replicated ten times for GWSS eggs 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 days of age and repeated for *G. triguttatus*. The number of parasitoids that emerged from GWSS egg masses of each age and the sex ratio of emerged progeny was recorded.

Three egg ages (1, 3 and 5 days of age) were selected for Objective 2 to represent young, medium and old GWSS eggs. Ten eggs of each age category were presented simultaneously to each of one female *G. ashmeadi* for one hour. At this time the egg age that the parasitoid was found on was recorded, the parasitoid was removed, and the vials were kept at 25°C. The number of parasitoids that emerged from eggs in each age category was recorded after three weeks.

RESULTS AND CONCLUSIONS

Preliminary results showed that approximately 73% of one-day-old GWSS eggs and 26% of 5-day-old eggs were successfully parasitized by *G. ashmeadi*. Lower parasitism rates of 5 day old eggs may have resulted because GWSS embryos in eggs of this age had developed beyond a stage that most *G. ashmeadi* larvae were able to use after hatching, or higher rates of encapsulation were experienced post-oviposition, or venom injected at time of oviposition was not sufficient to halt GWSS embryo development and facilitate wasp development. Furthermore, Eidmann (1934) suggested that success in parasitizing host eggs that are close to terminal development depends on whether the parasitoid egg is oviposited directly into the

embryo, thereby killing it. If Eidmann (1934) is correct, then 26% of ovipositions by *G. ashmeadi* into GWSS eggs 5 days of age may have killed the embryo allowing the parasitoid to develop successfully.

G. ashmeadi successfully parasitised five day old GWSS eggs which indicates that this species has a wide host age preference. This is favorable for GWSS control because the period of vulnerability to attack by this parasitoid is long, therefore increasing the probability that an egg will be parasitised before it hatches.

Exposure of GWSS eggs 10 days of age to *G. ashmeadi* resulted in 0% parasitism as nymphs were emerging from egg masses of this age at 25ºC. Data for the entire 'window of susceptibility' for *G. ashmeadi* and *G. triguttatus* are still being collected. Once this has been completed the results will be analyzed to determine if different egg age preferences exist between these two species.

Results also showed that regardless of egg age and of how many of the 15 eggs were parasitized, female *G. ashmeadi* generally allocated two males to an egg mass and the remaining progeny were female. This is consistent with Stern and Bowen (1963) fixed sex allocation findings.

Results from Objective 2 showed that parasitism was slightly lower for eggs of 5 days of age compared with 3 days of age (Table 1), thereby supporting the results from Objective 1. However, the number of times the parasitoid was found on each treatment did not significantly differ between the three egg ages (Table 1). Also, parasitism did not significantly differ between eggs of 1 and 5 days of age (Table 1). This may suggest that this parasitoid species does not directly select between host age when all the age categories are able to be parasitised. However, other egg parasitoids, such as *Trichogramma* sp. have been found to distinguish between favorable and unfavorable eggs for parasitism and tend to prefer younger eggs (Pak, 1986; Hintz and Andow, 1990; Godin and Boivin, 1994). Therefore, this choice experiment will be repeated next season using the three egg age categories 1, 4 and 8 days of age to determine whether *G. ashmeadi* can differentiate between favorable and unfavorable eggs for parasitism.

Table 1. Percentage parasitism of 1, 3 and 5 days of age GWSS eggs by G. ashmeadi.

Egg age treatment	*Parasitism*	*Number of times the parasitoid was found on each treatment after one hour*
1	22.7%	5
3	27.9%	6
5	20.2%	5

REFERENCES

Eidmann, H. 1934. Zur Kenntnis der Eiparasiten der Forleule insbesondere uber die Etwachis lung und Okologie von *Trichogramma minutum* Ril. *Mitt. Forstw. u. Forstwiss* 5, 56-77.

Godin, C. and G. Boivin. 1994. Comparison of strains of trichogrammatids for selection as a function of host age. *Resume des Recherches* 23: 34-35.

Hintz, J. L. and D. A. Andow. 1990. Host age and host selection by *Trichogramma nubilale*. *Entomophaga* 35: 141-150.

Pak, G. A. 1986. Behavioral variations among strains of *Trichogramma* spp. – a review of the literature on host-age selection. *Journal of Applied Entomology* 101: 55-64.

Stern, V. M. and W. Bowen. 1963. Ecological studies of *Trichogramma semifumatum*, with notes on *Apanteles medicaginis* and their suppression of *Colias eurytherme* in southern California. *Annals of the Entomological Society of America* 56: 358-372.