Comparative susceptibility to hyperparasitism of two primary aphid parasitoids, *Binodoxys communis* and *Aphidius colemani* (Hymenoptera: Aphidiidae)

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Introduction

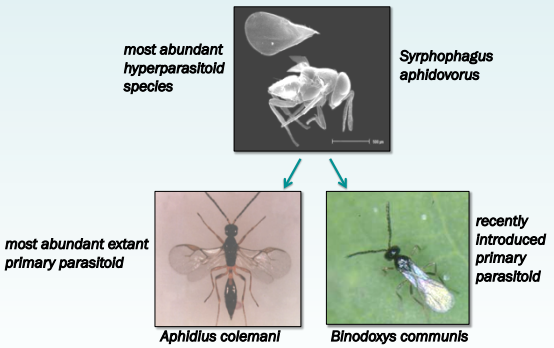
In Hawaii, the melon aphid, *Aphis gossypii* (Glover) is one of the pests attacking agriculturally important crops including taro, *Colocasia esculenta* (L. Schott) and cucumber, *Cucumis sativus* (Linnaeus). To control this particular aphid pest, several aphidiids were introduced and have established including *Lysiphlebus testaceipes* (Cresson) and *Aphidius colemani* (Viereck) (Messing and Klungness, 2001). To help improve the aphid biological control, a new parasitoid, *Binodoxys communis* (Braconidae) was recently released in the field.

Field surveys of aphid populations after the release of *B. communis* showed that even though *B. communis* reproduced successfully in the field, it did not reach high population levels throughout a 5 to 7 month post-release sampling period (Acebes, 2011). Populations of the extant primary parasitoid species remained considerably higher than *B. communis*, and levels of hyperparasitism were consistently high (~50%).

Prompted by these results, the involvement of hyperparasitoids as a factor in the low abundance of *B. communis* in comparison to the existing primary parasitoid species was investigated under laboratory conditions. *Aphidius colemani*, the most abundant primary parasitoid in the field and *Syrphophagus aphidovorus*, the most abundant primary parasitoid were used for this study.

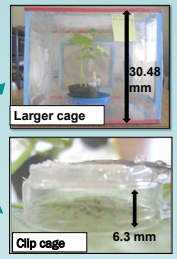
Objective

To assess the susceptibility of *B. communis* (in comparison with the extant primary parasitoid species, *A. colemani*) to attack by a hyperparasitoid species under laboratory conditions



Methods

Mummies parasitized by *A. colemani* and *B. communis* were exposed to mated female *S. aphidovorus* in no-choice and choice tests.



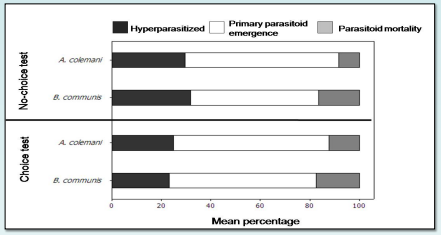
To test if *S. aphidovorus* females can locate and attack mummies of both primary parasitoid species on plants

To test for suitability

Results

◆ Was *B. communis* attacked more by *S. aphidovorus* females on the plant than *A. colemani*?

No, they were equally found and attacked.

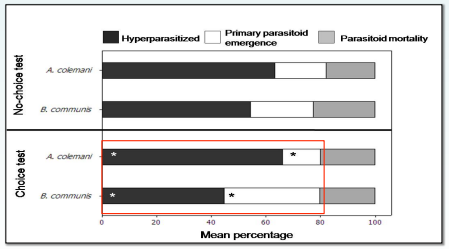


Percentage of *A. colemani* and *B. communis* mummies that were hyperparasitized ; not hyperparasitized, or unemerged (parasitoid mortality) in

Larger cage

◆ Was *B. communis* more suitable for hyperparasitoid development than *A. colemani*?

No, in fact to some degree *A. colemani* was more suitable in the choice tests.



Percentage of *A. colemani* and *B. communis* mummies that were hyperparasitized ; not hyperparasitized, or unemerged (parasitoid mortality) in

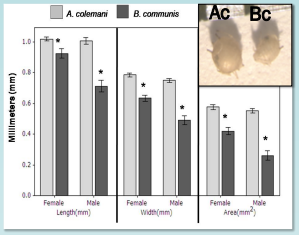
Clip cage

Asterisks denote significant differences between the two primary parasitoid species within the same test type at a < 0.05 (One-way ANOVA).

Results

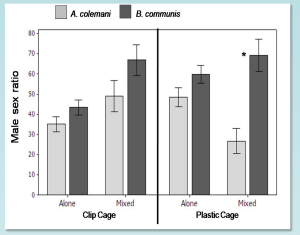
◆ Other evidence for the higher suitability of *A. colemani* …

A. colemani have bigger mummies than *B. communis.*



Host suitability = host quality = host size

Higher percentage of female hypers emerged from *A. colemani* mummies.



Host suitability = host quality = more female production

Conclusion and Implication

- Relative to *A. colemani*, *B. communis* may not be as susceptible to hyperparasitism under laboratory conditions implying that:
  - *Bc* may be less likely to be attacked by hyperparasitoids in the field.
  - *Bc*'s abundance may increase in the long run.
- The greater numbers of *A. colemani* in the field despite its higher susceptibility to hyperparasitism may be attributed to its dispersal to a much wider area, more alternative hosts and bigger size (= higher fitness).
- As there are other hyperparasitoid species present in the field besides *S. aphidovorus* (Acebes, 2011) and field conditions greatly vary from our laboratory set-up, additional tests would help verify these initial results.

References and Acknowledgment

Acebes, A., Introduction and preliminary evaluation of a new aphid parasitoid, Binodoxys communis (Hymenoptera: Aphidiinae) in Hawaii. Plant and Environmental Protection Sciences, Vol. Master's Thesis. University of Hawaii at Manoa, 2011, pp. 171.

Messing, R., Klungness, L., 2001. A two-year survey of the melon aphid, Aphis gossypii Glover, on crop plants in Hawaii. Proceedings of the Hawaiian Entomological Society. 35, 91-101.

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