

## Pink Hibiscus Mealybug Biological Control in Imperial Valley, CA

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The pink hibiscus mealybug (PHM), *Maconellicoccus hirsutus* (Green), was first detected in Imperial Valley, CA during August 1999. Population densities of PHM on mulberry, carob, silk oak, hibiscus and natal plum were determined to be high in several urban communities in southern Imperial Valley. Two parasitoid species, *Anagyrus kamali* Moursi and *Gyranusoidea indica* Shafee, Alam & Agarwal, were released at ten sites in the fall of 1999. Subsequently, an insectary was established in El Centro for additional parasitoid production. The two species were then produced locally and released beginning in 2000. The culture of *A. kamali* that was propagated through 2001, originated from collections in China and Hawaii that were combined. *Gyranusoidea indica* was a combination of populations from Egypt, Pakistan and Australia. In 2002 a population of *Anagyrus kamali* (collector: D. Gonzalez, UC Riverside) from southern Egypt was reared and released.

We received permits for rearing an additional parasitoid, *Allotropa* sp. nr. *mecrida* (Hymenoptera: Platygasteridae), in November 2002. This population was collected in the very warm and dry climate of southern Egypt by Dr. Dan Gonzalez (UC Riverside) in 2000. We produced and released nearly 300,000 parasitoids in 2003 (Table 1). They were either; released in Imperial Valley or provided to Mexican authorities for release in the adjacent Mexicali Valley. Parasitoids were initially released at sites on the perimeter of the infested area. As the season progressed, releases were made at progressively interior locations. This approach avoided releases being made within several city blocks of long-term monitoring sites until fall of 2003.

Table 1. Destinations of pink hibiscus mealybug parasitoids, *Allotropa* sp. nr. *mecrida*, produced at the CDFFA insectary, El Centro, CA in 2003.

Month	Imperial Valley	No. of sites in Imperial Valley	Mexico	Monthly release totals
Jan	5,000	4		5,000
Feb	8,800	13		8,800
Mar	22,000	28		22,000
Apr	23,000	26		23,000
May	3,500	5		3,500
June	5,000	6	4,000	9,000
July	2,500	5	4,800	7,300
Aug	34,000	38	21,000	55,000
Sep	33,000	33	24,000	57,000
Oct	24,000	20	26,000	50,000
Nov	13,000	13	9,000	22,000
Dec	35,000	35		35,000
Total				
To Date	208,800	226 locations	88,800	297,600



its numbers are typically low during the year, particularly during the warmest months from June through September. In 2002, less than 10% of all parasitoids collected during the year were *G. indica*, however, *G. indica* represented 21% of the primary parasitoids collected in October. Similar results have been recorded at three study sites consisting of carob trees (Figure 2). PHM densities were high initially on carob trees, but with the onset of parasitism, population densities have been considerably lower. In 2003, PHM densities were the lowest of all years to date (Figures 1 & 2). *Anagyrus kamali* continues to be the dominant parasitoid. Due to very low PHM densities in 2003, it was not feasible at many sites to collect PHM specimens for assessing percent parasitism. Overall, percent parasitism for 2003 was considerably lower than in past years, presumably reflecting a density dependent relationship with PHM.

The impact of **native** (to Imperial Valley, CA) hyperparasitoid species on newly introduced primary parasitoid species is being monitored. A hyperparasitic species (*Marietta* sp.) was first collected in July 2000. At that time, its occurrence was quite rare. Dissected samples confirmed that the primary parasitoid, *A. kamali*, is under attack by *Marietta* sp. (Aphelinidae), and to a lesser extent by *Chartocerus* sp. (Signiphoridae). *Marietta* sp. was common through the remainder of 2000, as represented by the percent of PHM mummies from which hyperparasitoids emerged [(mean %, number of sample sites): late July **11%**, five sites; late Aug. **60%**, six sites; Sept. **16%**, six sites; Oct. **51%**, nine sites]. Hyperparasitoid attack of *A. kamali* declined after 2000 (Fig 3). In 2003, *Marietta* sp. was common during one sample date at two locations. Elsewhere, it was rarely found. From four samples taken during September of 2003, hyperparasitism was estimated to be 32%. *Chartocerus* sp. was not collected in 2003.

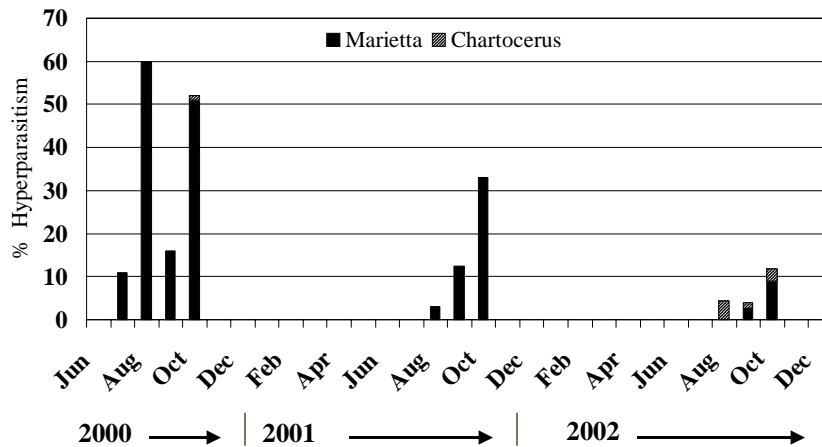


Figure 3. Hyperparasitism of pink hibiscus mealybug parasitoids in Imperial Valley, CA

A number of samples of two resident species of mealybug have been collected over several years to monitor for non-target impacts. Ten separate collections of the solenopsis

mealybug (*Phenacoccus solenopsis* Tinsley) and 13 collections of the striped mealybug, *Ferrisia virgata* (Cockerell) have been made in Imperial Valley. The former species is native, whereas the later is not a native species. To date, neither *A. kamali* nor *G. indica* have been recovered from either mealybug species, thereby demonstrating that they are either moderately or highly host specific. In summary, two biological control agents released against the PHM have become widely established throughout infested areas of Imperial Valley, and one species has had considerable impact to date. The third newly released species has shown strong signs of establishment to date. The average regional density of PHM has decreased markedly (>95% reduction) since 1999 and its distribution has been unchanged and continues to be restricted to urban locations within the southern half of Imperial Valley.

**2004 Season Status: Through August 2004**

*Allotropa* nr. *mecrida* is being reared for a second year and released in Imperial Valley, CA and neighboring Mexicali Valley, Mexico (Table 2). Similar to past years, five mulberry and three carob trees sites are once again being monitored within Imperial Valley. Pink hibiscus mealybug densities are comparable or less than 2003 densities.

Table 2. Destinations of pink hibiscus mealybug parasitoids, *Allotropa* sp. nr. *mecrida*, produced at the CDFFA insectary, El Centro, CA in 2004.

Month	Imperial Valley	Mexico	Monthly release totals
Jan	6,000		6,000
Feb	4,000		4,000
Mar	3,700		3,700
Apr			
May	300		300
June	18,250		18,250
July	19,000		19,000
Aug	60,000	23,000	83,000
Total			
To Date	111,250	23,000	134,250