

*Project Concluding: Summary Report*

**Reducing the Negative Impact of Bacterial Infections in *Aphytis melinus***

*Project Leaders:*

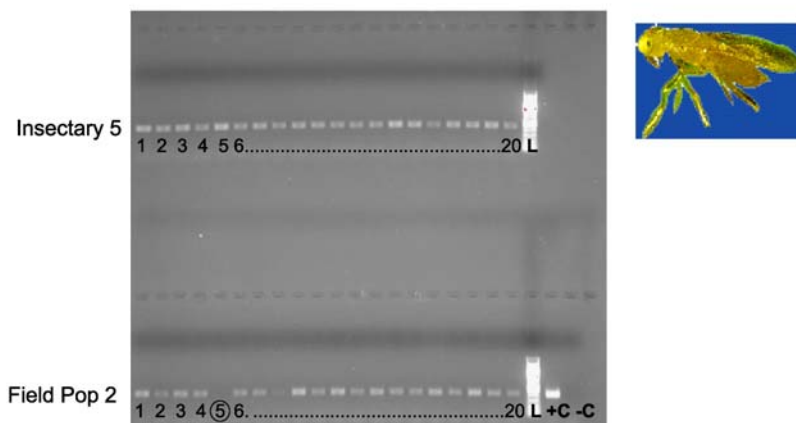
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About 70% of all insect species are infected with *Wolbachia*, a bacterium. *Aphytis* is no exception. Some *Wolbachia* infections can be beneficial such as those causing their hosts to produce female offspring exclusively, while others can be negative such as those that affect the efficacy of biological control.

We discovered a *Wolbachia* infection that causes mating incompatibility in *Aphytis melinus*. This mating incompatibility results in the death of female offspring when an infected male mates with an uninfected female. This process is comparable to the sterile insect techniques used for the control of fruit flies. *Wolbachia* is of concern because *Aphytis melinus* is reared and released in large numbers for biological control of California red scale, but it can be managed. This project seeks to develop management techniques to avoid the potential negative impact of *Wolbachia* on biocontrol.

Our primary goal is to study the infection status of both insectary-reared and field-established *Aphytis*. Once we identify and understand the pattern and infection of these different populations, we then can release either infected or uninfected mass reared wasps into field populations, thus avoiding the sterile insect problems that otherwise may occur.

With this project we have developed an efficient method of detecting *Wolbachia*'s presence in *Aphytis* using DNA techniques (Figure 1). Our main emphasis this year was to routinely test *Aphytis* samples from all five insectaries and increase our database of field samples. Thus far, all commercial insectaries continue to produce *Wolbachia* infected *Aphytis* (Figure 2).



*Figure 1. Gel showing the presence or absence of Wolbachia DNA (=infection) in insectary-reared and field-collected Aphytis (all Aphytis showing a bar above its number are infected.)*

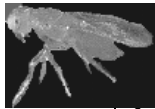
Our field samples indicate that Kern County field sites have the highest proportion of infected *Aphytis* (94%), followed by Riverside County at 78% and lastly Tulare County at 67%. When we compared

infection status with *Aphytis* releases, non release field sites had a lower infection (75%) as compared to release sites (95%). In general, there were more field sites in Tulare County that did not make *Aphytis* releases in 2003 and 2004 than the other two counties. An additional 25 new field sample locations, some of which are from two new counties -- Ventura and Stanislaus -- have been collected but not analyzed (project terminated). On one such field sample there was only male *Aphytis* emerging from the field fruit, an indication that there could be some inter-mating between non-infected and *Wolbachia* infected *Aphytis*.

Exposure of infected wasps to high temperatures for several generations (> 32° C) can cure *Wolbachia* infections. Our data show that indeed the wasps that are the offspring of females reared at high temperatures have a lower, but still substantial, *Wolbachia* titer. Exposure for several generations to elevated rearing temperatures may result in field curing.

In conclusion, our work has shown that in a number of field populations the *Wolbachia* infection frequency was lower than 100%, which may somewhat hamper the reproductive potential of the wasps in these field populations. As far as we know now, it appears that we do not need to change our rearing cultures to start releasing “cured” wasps.

## Commercial Insectaries



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep*	Oct	Nov	Dec
<b>1</b>		100			95	100		100		X	X	
<b>2</b>	90	100		100		100		100	X			
<b>3*</b>				100	100	100			X			
<b>4</b>	90	100				100		100	X		X	
<b>5*</b>			100	100	100	100		100	X			

Figure 2. Percent of *Aphytis* with *Wolbachia* infection. X denotes samples collected but not analyzed (project terminated).