



Another Look at Pheromonal or Related Attractants for Leaf-footed Bugs Infesting California Nut Crops

Jocelyn Millar – Entomology, University of California, Riverside

Kent Daane – Environmental Science, Policy, and Management, University of California, Berkeley

Jeff Aldrich, Entomology, University of California, Davis



Introduction:

Leaf-footed (LFB) bugs are a chronic problem in California nut crops, and there are currently no cost-effective methods of monitoring these species, especially early in the season. The problem is exacerbated by the tendency for large numbers of bugs to move into a crop rapidly, so that infestations can go from negligible to large within a few days. Previous research has shown that these bugs use pheromones in a number of contexts, from alarm to aggregation and mating. We propose to have another detailed look at two species, *Leptoglossus zonatus* and *L. clypealis*, under both summer and fall conditions, to see whether we can sort out the chemical or other signals that the bugs might be using to create the rapid crop infestations in summer, and the overwintering aggregations in the fall. It is likely that the chemical signals used in these two different contexts will be different. Overall, if we can gain a better understanding of their behaviors during these different periods of the year, and the signals controlling those behaviors, we may be able to exploit those signals to develop pheromone-based methods of monitoring these species.

Summary of previous work (Wang and Millar 2000):

- Both sexes of LFB produce defensive compounds from metathoracic glands. These include short-chain aldehydes and esters.
- Males appear to attract females from a distance, then actively court females.
- Adults take ~2 weeks to become sexually mature, and then mate multiple times.
- Adult males have sex-specific ventral abdominal glands, which produce benzaldehyde and benzyl alcohol. These compounds act as short-range aphrodisiacs, and not attractants.

Current Objectives:

- Field test attraction of adults (*L. clypealis* and *L. zonatus*) of both sexes to caged males and caged females, under both summer and fall conditions.
- Identify/verify the metathoracic gland contents of both sexes (the likely alarm and defense compounds), and the contents of the male-specific ventral abdominal glands, some of which might be involved in attraction.
- Analyze volatiles emitted by sexually immature adults, and sexually mature adults, both virgin and mated, under long-day summer conditions when adults would typically be feeding and mating, and under short-day fall conditions, when adults would typically be forming overwintering aggregations.
- Analyze the cuticular lipids of adults of both sexes, which may help to keep overwintering aggregations together.

Progress to date:

- Colonies of *L. zonatus* established at Berkeley, Riverside, and Santa Cruz. It was not possible to establish colonies of *L. clypealis* because they were in low abundance this year.
- Analyzed defensive secretions of adult *L. zonatus* of both sexes, as baseline data, nothing new found.
- Analyzed cuticular lipids of summer-form adult *L. zonatus* for comparison with winter forms, to look for compounds that might help hold aggregations together.
- Conducted first analyses of odors from actively aggregating bugs (Fig. 1).



Rearing leaf-footed bugs in the laboratory

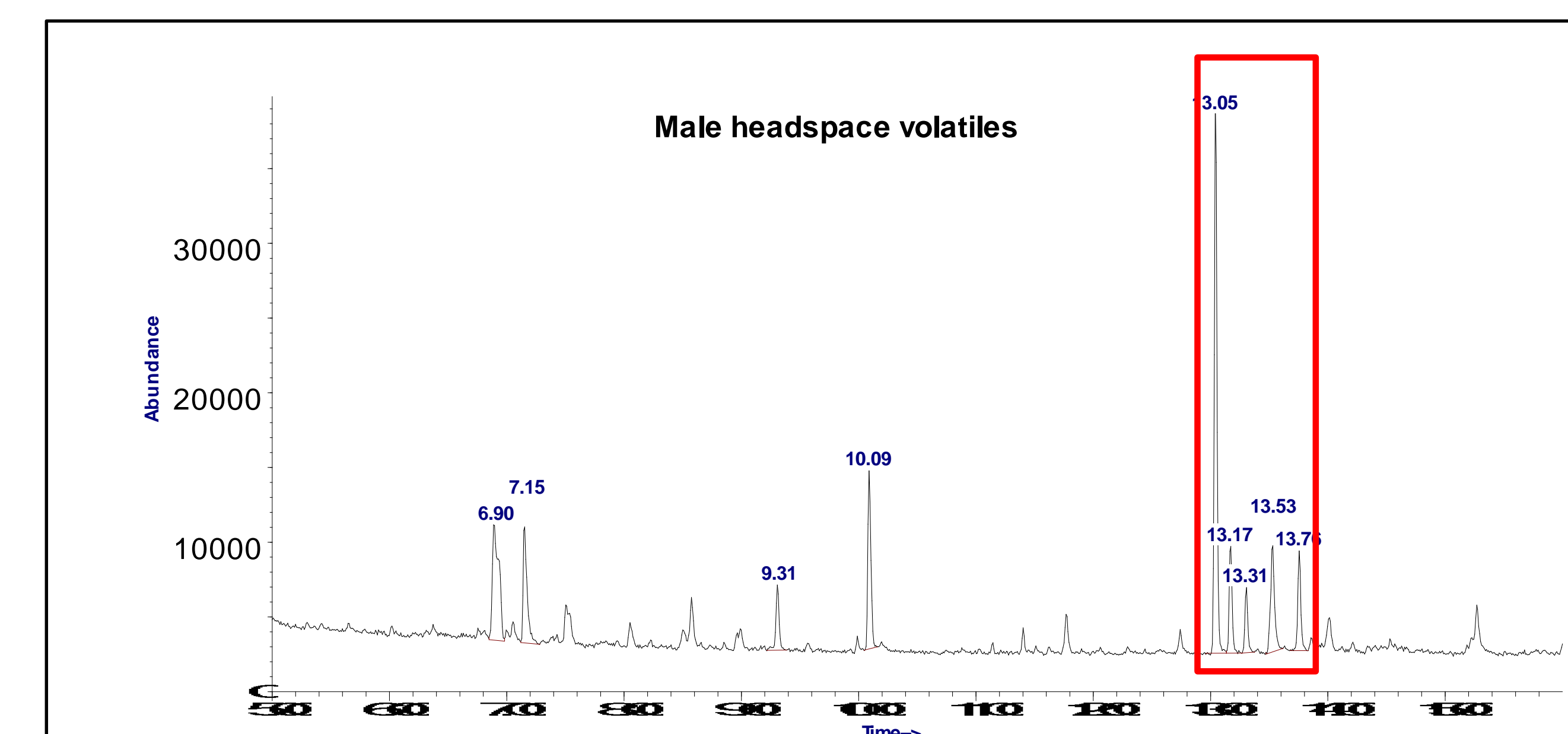


Figure 1: Gas chromatography analysis of odors produced by sexually mature male *L. zonatus*. A group of male-specific compounds are highlighted; these are likely involved in the formation of aggregations.

References:

Q. Wang and J.G. Millar. 2000. Mating behavior and evidence for a male-produced sex pheromones in *Leptoglossus clypealis* (Heteroptera: Coreidae). *Ann. Entomol. Soc. Am.* 93: 972-976.

Acknowledgments:

We gratefully acknowledge funding from the Almond Board and the Administrative Committee for Pistachios for financial support of this work.



Leaf-footed bug damage to almonds and pistachios



Leaf-footed bugs in olives



Collecting odors from live adult bugs

