Effects of Natural Food Sources on Attraction of Apple Maggot Flies to Baited Traps

Juan Rull, Alan Reynolds, Michelle Bakis, Holly Gagne, and Ronald Prokopy
Department of Entomology, University of Massachusetts

The effectiveness of visually attractive red sticky spheres can be increased by the addition of odor lures. In recent study in commercial orchards by Reynolds and Prokopy (1996), it was shown that red sphere traps baited with butyl hexanoate (an odor emitted by ripening apples) realized a four-fold increase in captures of apple maggot flies (AMF) when compared to unbaited spheres. However, the addition of ammonium carbonate (an odor emitted by sources of food) to red sphere traps did not enhance capture of flies on baited traps. The above study involved trapping wild flies entering commercial orchards. Their physiological state was unknown.

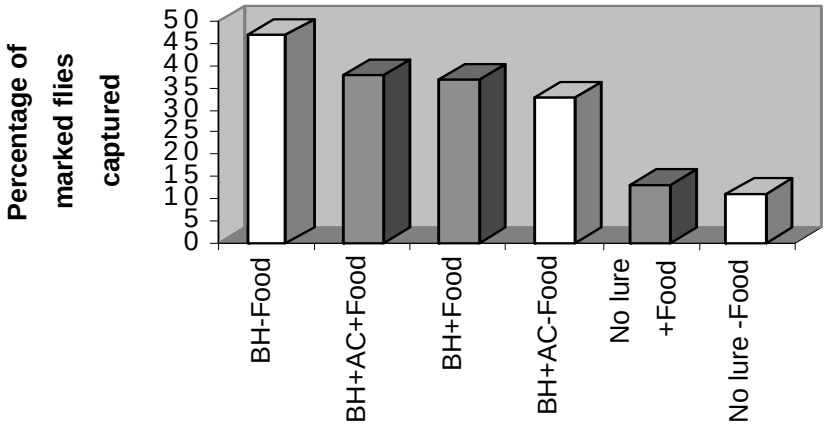
While the nature of fly attraction to butyl hexanoate was clear, the cause underlying lack of attractiveness of ammonium carbonate was uncertain. In order to reach a better understanding of AMF response to both lure types, we decided to perform an experiment in which flies of known physiological and nutritional state (mature protein fed or immature protein starved) would be released in blocks where different combinations of lures would be displayed. Further, all treatments would be replicated in blocks where natural food sources were added or suppressed. In this way, we could assess which synthetic lures are attractive to flies of different physiological states and whether or not the presence of natural food in orchards interferes with attraction to lures.

Materials & Methods

Four sets of six square blocks of 49 apple trees each were selected in four commercial orchards, with one set of blocks per orchard. In every block, red sticky spheres were positioned on every perimeter tree. In two of the blocks, sources of butyl hexanoate and ammonium carbonate were placed 15 cm away from every sphere. In two other blocks, only butyl hexanoate was added to spheres. Spheres in the remaining two blocks were not lured. One block of each lure-type treatment was treated with Provado™ to prevent buildup of aphid and leafhopper honeydew (natural food sources). The other block of each lure-type treatment received a large amount of bird droppings (also a natural food source) that was distributed by hand (in slurry form) onto the foliage of each tree. Thus, half of the blocks of each treatment type had a paucity of natural fly food; whereas, the remaining blocks had abundant natural fly food.

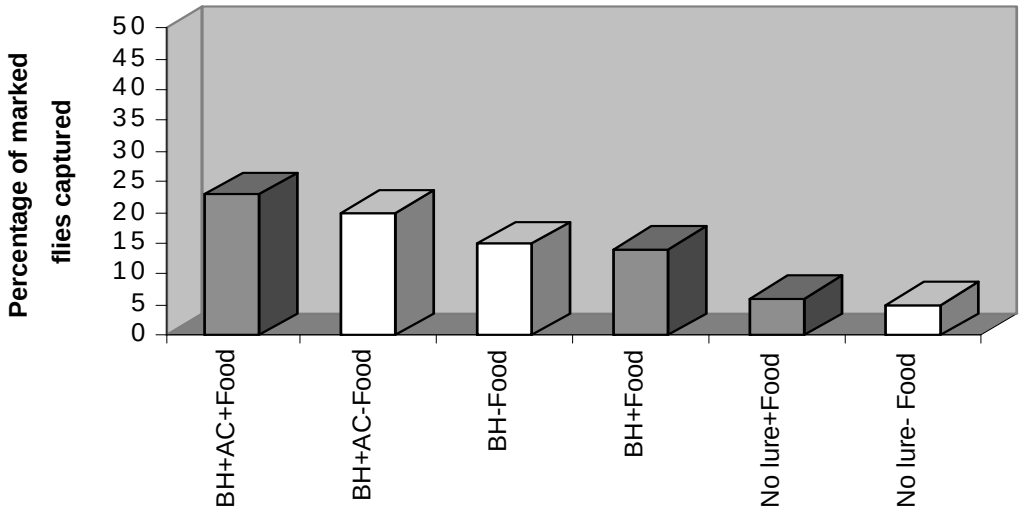
Apple maggot flies of known physiological state were released into the central tree of each block. The flies emerged in our laboratory and were subjected either to a diet including protein and sugar for 14 days (mature flies) or a diet limited to sugar for four days (immature flies). When ready to be released, flies were marked on the back of the thorax with a small dot of paint. Approximately 50 mature flies and 50 immature flies were released in each block. Flies of each physiological state released in each block bore a distinct color (12 different colors used across all blocks in an orchard). Flies captured by the traps in each block were counted after four days. The percentage of flies recaptured was used to compare response to treatments. Wild flies captured in the different blocks were also counted and their numbers compared.

Figure 1: Response of marked released mature flies



BH= Butyl hexanoate, AC =Ammonium carbonate, Food = Presence or absence of natural sources of food on trees.

Figure 2: Response of marked released immature flies

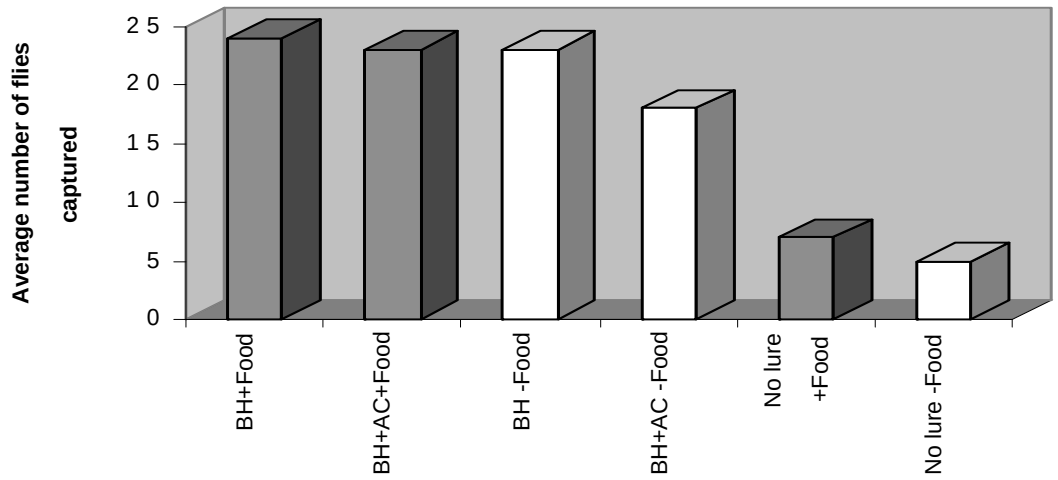


BH = Butyl hexanoate, AC = Ammonium carbonate, Food = Presence or absence of natural sources of food on trees

Results

Similar to the earlier findings of Reynolds and Prokopy (*Fruit Notes* 61(4):1-2, 1996) on response of wild flies, we found that the addition of butyl hexanoate resulted in nearly a four-fold increase in capture of released mature flies on spheres. Presence of ammonium carbonate did not add to the attractiveness of traps to mature flies, even in the

Figure 3: Response of unmarked wild flies



absence of food on the apple trees (Figure 1). Response of immature flies to lures and traps was much lower than that of mature flies. Although the combination of butyl hexanoate and ammonium carbonate in the presence as well as the absence of food was the trap treatment that caught the most immature flies (Figure 2), captures were well below those of mature flies on traps with lures. Responses of wild flies were similar to those of released mature flies (Figure 3). Again, captures on traps having butyl hexanoate alone were nearly four-fold greater than captures on unbaited traps. Again, addition of ammonium carbonate did not enhance trap capture.

Conclusions

Our results support the combined use of sticky red spheres and butyl hexanoate lures as an alternative to insecticides to control AMF. Addition of ammonium carbonate lures did not enhance captures of released mature flies or wild flies, and its slight enhancement of trap captures of immature flies was not great enough to justify its use. Presence or absence of natural food in orchard blocks had little detectable effect on response patterns of either released mature, released immature, or wild flies. Response patterns of wild flies seem to indicate that their populations consisted mainly of mature flies.

Our findings support use of a behavioral control strategy based on the employment of visually attractive red spheres together with butyl hexanoate as an odor lure.

Acknowledgments

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