Comparative Analysis of Fragrances and Commercially Available Attractants to Insects

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Abstract: The attractiveness of different chemicals to insects is needed for developing effective baits for commercial traps. In addition, the use of personal fragrance could inadvertently increase attractiveness to biting insects. Our objective was to evaluate the attractiveness of three different personal fragrances and one commercial attractant for different insect orders in College Station, Texas. Traps captured a total of 1228 individual insects from eight different orders. The most consistent treatment in attractiveness was jasmine and the most commonly attracted insect order was Thysanoptera. We found that the mean abundance of most insect orders did not differ from the un-baited control group, indicating that the different baits did not significantly differ in their attractiveness. This study helps identify baits for insect traps to increase effectiveness.

Keywords: fragrance, attractants, thrips, pests, jasmine

Commercial insect traps have many home uses among the general population, including eradication of crop pests and prevention of contact with potentially disease-carrying vectors. In addition to traps, people have also utilized nets, screens, and repellent sprays to deter insects. The general goal of these methods is to keep insects away or to attract them to a more appealing bait.

For traps, the idea of using perfumes of certain scents to better attract insects has been introduced in the past. Further studies have been conducted to identify natural repellents, and several found eucalyptus oil deters mosquitoes and other insects (Maia and Moore 2011). Of the many scents mentioned, the most claimed attractants were floral and fruity scents (Dobson 2017). With this in mind, there should be different methods taken while trying to attract insects to a bait versus deterring them.

Some common pests that are seen in the fall temperature include Thrips (Thysanoptera). These are abundant in fields similar to the intended test sites of our trials, and therefore should be abundant (Chamberlin et al. 1992). The other intended pest to attract are mosquitoes (Diptera: Culicidae). With the perfume-like attractants, we expect the number of collected mosquitoes to be significant.

In this study, floral and fruity scents will be used to explore the suggested ways to improve common household fly traps to see the comparative attractiveness of different treatments.

Materials and Methods

A Gold Stick Fly Trap (AP&G Bayonne, NJ) was used as a base to collect insects. There were five treatments tested: control group with no bait, the granular bait provided with the trap, and granular Jasmine, Peach, and Eucalyptus sachets (MYARO, China). These granules were added to the trap to attract insects.

The first two trials were conducted at Bee Creek Park in College Station, Texas. For the subsequent two trials, the experiment was moved to Leach Teaching Gardens at Texas A&M University in College Station, Texas. Since the experiment took place in October, the average temperature was 70.8 °F, ranging from 62.6 °F to 81 °F. The average humidity in the area was 61%. It is reported that the month of October in College Station typically receives approximately 4.1 inches of rainfall.

After the experiment the traps were retrieved, and the insects collected were counted and identified. For analysis, insects were organized by order, but some were identified further to family or species level. Microsoft Excel was used to visualize the data and one-way ANOVA tests were used to analyze these results.

Results

Eight orders of insects were detected on the traps: Hemiptera, Diptera, Neuroptera, Thysanoptera, Hymenoptera, Lepidoptera, Blattodea, and Coleoptera. The most common insect order found was Thysanoptera (thrips). It was observed that the number of thrips trapped for each trial in each treatment was much higher when compared to the other arthropod species (Figure 1). For this reason, the mean abundance across all four trials for thrips was calculated separately and another ANOVA was run to compare the difference of bait attractiveness to them (Figure 2).

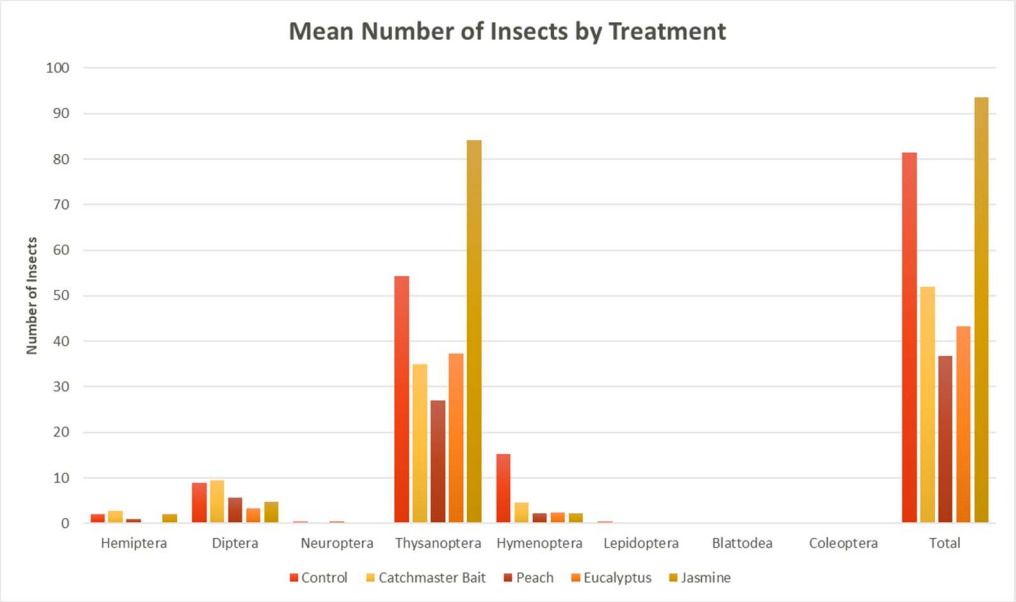

Figure 1. Mean abundance of insects in taxonomic orders for each bait used. Total insects collected for each bait is also included.

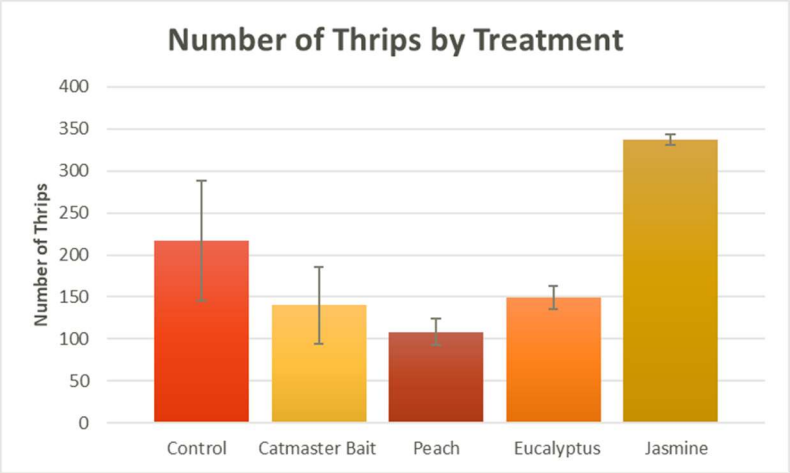

Figure 2. Mean abundance of thrips for all treatments with error bars.

The control group attracted a mean value of 81.5 specimens; the Catchmaster bait attracted a mean value of 52 specimens; the Peach treatment attracted a mean value of 36.75 specimens; the Eucalyptus treatment attracted a mean value of 43.25 specimens; and the Jasmine treatment attracted a mean value of 93.5 specimens. For each of these the majority of specimens collected were thrips. The control group attracted a mean value of 54.25 thrips; the Catchmaster bait attracted a mean value of 35 thrips; the Peach treatment attracted a mean value of 27 thrips; the Eucalyptus treatment attracted a mean value of 37.25 thrips; and the Jasmine treatment attracted a mean value of 84.25 thrips.

The Jasmine treatment is shown to have the highest mean abundance of thrips when compared to the other treatment groups. In addition, when looking at the overall number of specimens collected in each trial, the Jasmine treatment had the most consistent attractivity (Figure 3).

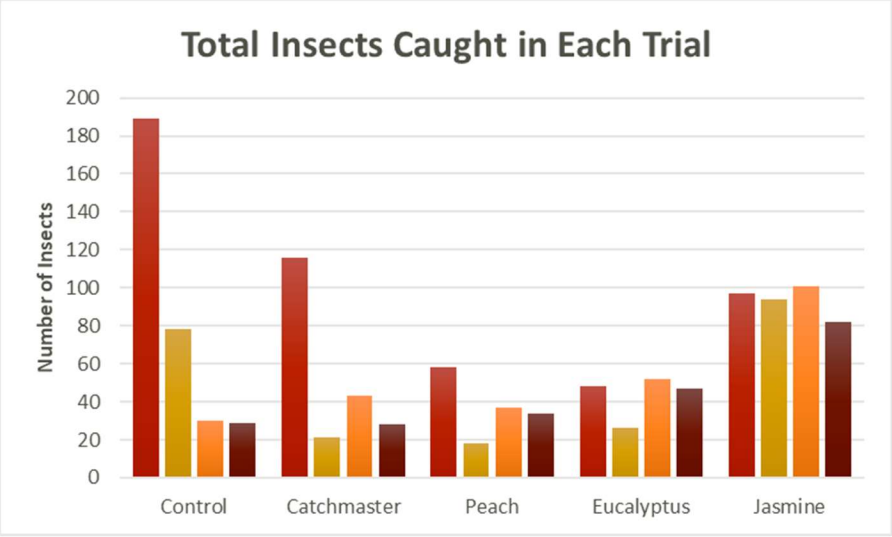

Figure 3. Total number of insects collected in each trial for each Treatment.

The data obtained from each trial was averaged and incorporated into the test. The F-statistic was 1.47 and the corresponding p-value determined was 0.2605. Since the p-value is greater than 0.05, the number of thrips obtained in each treatment are not statistically significant from each other, although it was expected that the Jasmine treatment would yield otherwise due to displaying the highest number of thrips and the least standard deviation.

Discussion

In this experiment, the attractiveness of mosquitoes, flies, and other common pests to fragrances used in perfumes was tested to support or refute claims made by popular press articles to improve household trapping methods. One unexpected result was that there were no mosquitoes collected during the experiment in either location. Some reasons this might be the case are the lack of a living host and weather. Living hosts are important to attracting mosquitoes because of their carbon dioxide output (McMeniman et al. 2014, Coutinho-Abreu et al. 2022). This is not accounted for in our treatments. Mosquitoes are also more abundant in the summer than in the fall, which is when this experiment took place (Su et al. 2003).

Two families of flies were commonly caught during this experiment. The most common family caught was *Dolichopodidae*, or the long-legged flies. These insects are predacious and feed on many smaller arthropods, such as aphids (Hemiptera: Aphididae) and thrips, both of which were also collected during this experiment (Cicero et al. 2017). Several species of these flies engage in foraging behavior, in which they feed on organisms that have been immobilized in some way, rather than actively hunting and capturing them (Gardiner et al. 2014). Given the large number of thrips collected during the experiment, it can be inferred that the long-legged flies were attracted to those organisms rather than the bait used on the traps. The second family of flies caught in this experiment were of the family *Sarcophagidae*, commonly called flesh flies. These organisms feed on decaying organic matter, this suggests that the flies were attracted to the organisms already caught and not the baits (Ren et al. 2018).

The most common specimens collected were the thrips. Thrips are very common outdoor pests and feed on a variety of different food sources (Morse and Hoddle 2006). They cause damage to plants due to their unique mouthparts that cut holes in the leaves and excrement left on the surface. Thrips are also vectors of several plant viruses that are especially harmful to vegetable crops. One virus, the tomato spotted wilt virus (TSWV), can infect almost 1,000 distinct species of vegetables, and can cause dark spots and discoloration on the crop (Gupta et al. 2018). Another significant virus to crops, such as potatoes, lettuces, and spinach, grown in greenhouses in the United States is the impatiens necrotic spot virus (INSV) (Moorman 2011).

The positive aspect of these plant diseases is that they can only be spread by thrips; they cannot survive in the soil or be transmitted by fomites. Thus, by controlling the thrip populations around crops, the diseases can be easily prevented. Although no plants were used in this experiment, the attraction to the thrips may be explained by multiple studies finding that thrips are attracted to the colors blue, yellow, and white (Gillespie and Vernon 1990, Mao et al. 2018, Pobozniak et

al. 2020). The Catchmaster traps used for this experiment were all golden in color which could have contributed to their abundance despite the different fragrances used.

In conclusion, the results of this experiment suggest that the various insects that were attracted were possibly due to the presence of other insects already present on the traps. Additionally, even though the highest number of thrips were found on the Jasmine treatment, the one-way ANOVA test determined that there was no statistically significant difference between the treatments. The overall high abundance of thrips can however be possibly attributed to the yellow color of the traps. This is essential to improve the trapping methods for thrips specifically to prevent the spread of plant disease and damage to vegetable crops.

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