Testing the Efficacy of Different Common Household as Baits on *Diptera* Using Baited Flytraps

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Abstract: There are many diseases and pathogens that can be transmitted by dipteran species. There is ample opportunity for fly pest species to do so because they can contaminate food and water sources. Scientist aim to reduce the and prevent the contact pest species have with places humans inhabit, however are not sure what the main attract is because pest flies can be found in a variety of environments. One of the most prevalent environments pest species are found are in homes. In this experiment, we investigated whether pest flies were more attracted to feces, fruit or meat. These three things can be found in the typical American home and distinguishing which one has more of an attract to pest flies can help deduce more ways to reduce their presence or even prevent it. There is no difference in efficacy between the three different baits that were tested most likely because each bait can provide nutrition and a breeding site for dipteran species.

Keyword *Diptera, Disease, Trap*

Online there are an immense number of do it yourself remedies to combat different household pests such as flies and cockroaches. Flies are not only annoying but pose health risk due to their ability to carry diseases such as typhus, especially the species *Musca domestica*. Flies can transmit pathogens and disease through mechanical means or chemical means (Howard 1911). Because of this, ways to repel and remove fly pest from areas that humans inhabit has been a major priority. There have been many different methods of sampling of fly population (Geden 2005). These methods include the use of baited traps. A pheromone or other suitable insect attractant such as a bait can be used the inside a bait container (Wilson 2000). In this experiment three different baits were tested: fruit, meat and feces. Fruit and meat were chosen as baits because pest flies such as *Musca domestica* and *drosophila sp*. are commonly found in the kitchen area in homes due to the fact it is a warm area that contains different cooking odors (Howard 1911). Feces was the third choice of a bait because it is a breeding site and food source for many fly species (Greenburg 2019). Many homes deal with pest flies, however the component that contributes to the main reason why flies are attracted to home is still unclear. This experiment investigates the efficacy of different types of common things found in the home to attract fly pest.

Materials and Methods

Making the Fly Trap

A plastic one-liter bottle was cut at the widest part then the top half of the bottle was inverted and inserted into the bottom half of the bottle. Scotch tape was placed around the edges where both the plastic meets to hold the two halves of the bottle in place.

Preparing the Fly Trap

The fly trap was filled with 500 mL of water and seven mL of dish soap. After the trap was

filled with dish soap, two ounces each bait was weighed out. Once weighed, the bait being tested was inserted into the trap by scooping the bait up with a plastic spoon and dropping the bait into the hole in the fly trap. Once the fly trap had the bait inside of it, it was placed outside for 48 hours. Each bait fly trap was placed outside on different days. The 3 different baits that were used were dog feces, bananas and beef tips. Once the 48 hours were over, the fly trap was observed tsee how many flies were in the trap.

Counting the Flies

The fly trap was drained of all the liquid using a strainer. After the liquid was removed, the insects in the trap were identified down to order and family using *Borror and DeLong's Introduction to the Study of Insects* dichotomous keys then sorted counted. Non-Dipteran insects were discarded

Analyzing Data

To analyze the efficacy of the three different baits, a T-test was used to analyze the mean of the number of flies in each group.

Results

Different baits were used to test their efficacy in attracting dipteran insects and it was found that there was no difference in efficacy. The average number of *Dipteran* found in the beef bait fly trap was 24. For the first trial, there were 20 dipterans found in the beef bait fly. In the second trial of the beef bait, there were 31 Dipteran species found in the beef bait trap. In the third trail, there were 21 dipterans found in the trap. On the first and third trial of the beef bait there was rain. As seen in table 1, the average number of *Diptera* found in the banana bait was 20 and the average number of *Diptera* found in the feces bait was 31. In the first trial of the banana bait fly trap 11 dipterans were found in the trap. On the second trial, 17 *Diptera* were found and on the third day, 32 *Diptera* were found. In the first and second trial there was rain during the duration of the banana trial. In the feces trials the first trial had 34 dipterans, the second trial had 33 dipteran and the third trial had 26 dipterans. The was rain during the duration of the third trial. A one-way ANOVA test was used to determine there was no significance in the efficacy of the three different baits (p=.96711).

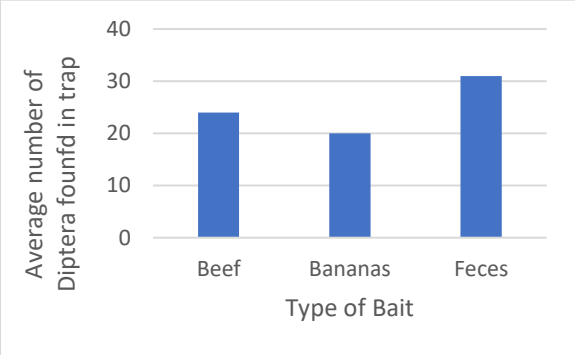

Figure 1 The average number of *Diptera* found in each bait trap.

Trial	Beef	Banana	Feces
1	*20	*11	34
2	31	*17	33
3	*21	32	*26

Table 1 shows the three trails for each bait. The * indicates that there was rain during the experiment.

Discussion

There was no difference in the efficacy of using feces, bananas or beef to attract

Diptera. Depending on the types of receptors used by the different families in the order Diptera, there may have been a different level of attraction to the baits. There are three types of sensory cells used to detect a food source: a sugar cell, a water cell and a salt cell (Hansen, Seebauer , Schnuch 1998). Depending on the food source, nectar blood, etc., a different sensory cell is needed. Looking at the order was too broad in a sense because all true flies were group together and not separated by food source.

The order *Diptera* has many flies that are vector of diseases including the family *Calliphoridae, Culicidae,* and *Muscidae*. These families of flies have been known to transmit pathogens that cause disease . Methods to control the *Diptera* order include pesticides and electrocution. Both methods have a downside in that they can harm nontarget insects. By studying what preferences specific insects have, we may be able to determine the mechanisms used to make an insect attracted to certain conditions and environments and create an environmentally friendly control method. By doing this experiment, it can be seen that as a whole, the order *Diptera* does not have a preference of meat, fruit or feces. This is most likely because they all provide some source of nutritional value to Dipterans as well a potential breeding site. However, if the different families were looked at most likely a different preference of attracts would be seen.

Jug and bait experiments have many benefits however, this experiment was impeded by the inconsistent weather and temperature. Like in many jug accounted for (Lysyk and Axtell 1985). The days where it rained correlated with the days there was a lower number of *Diptera* found in the flytraps. When it rains heavily, insects tend to seek shelter to prevent their wings from being damaged by the heavy rains which explains the very low numbers of *Diptera* found in the traps on the days it rain. The traps also became flooded when it rained meaning there was a possibility that the *Diptera* that were caught in the trap may have been washed out. Another limitation the experimental design faced was that there was no way to exclusively attract *Diptera*. There were many insects and arthropods that were in the trap and some were able to mess with the integrity of the trap which interfered with the experiment.

For further studies, the sensitivity of flies to rotten food versus fresh food should be explored as well as the sensitivity to different smells. This would be useful information in developing a repellant for *Diptera* because one can focus on which element most attracts a fly to an area. In addition, scientist should explore the difference in effectiveness in using a still bait versus a moving bait. In a previous study, it was found that a certain family of flies were attracted to still bait as well as moving bait, instead of focusing on a family of flies, the order should be explored (Vale 1974). This information would give scientist more knowledge to use when implementing pest control plans and educating the public on preventative measures to reduce fly pest. Some families of the order *Diptera* are pest that can vector disease and contaminate food, anything that can contribute to the prevention or reduction of *Diptera* pest near human inhabitants can prove to be beneficial.

Acknowledgement

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