Efficacy of Commercial Fly Traps vs. Homemade Fly Traps on *Musca domestica* (Diptera: Muscidae)

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Abstract: *Musca domestica* (Linnaeus) (Diptera: Muscidae), widely known as the house fly, is a vector for diseases and commonly invades spaces of agricultural production and human residence. There are many different variations of fly traps that have been created to catch these insects and minimize the spread of infectious diseases. The objective of this study was to test the effectiveness of commercial fly traps versus homemade fly traps on *M. domestica*. One commercial trap and three different homemade traps were constructed and analyzed every day over the course of a week. The traps were each examined for the number of *M. domestica* caught each day, their durability, and odor. This study maintained that the commercial trap was the most successful at catching the most house flies in comparison to the homemade traps.

Keywords: house fly, *Musca domestica*, commercial, homemade

Musca domestica (Linnaeus) (Diptera: Muscidae), or the common housefly, is a pest and a nuisance to many. Frequently found gathering near waste and inhabiting homes, they play the role of the annoying pest that lingers too long. However, these pests are dangerous to more than just one's peace and quiet. *M. domestica* are vectors for many diseases including Hepatitis A, typhoid, and polio (Phillips 2023). As a vector, *M. domestica* carries and spreads such infectious diseases by physically contacting food or water and thereby contaminating those substances that humans then intake (Phillips 2023). This is all the more reason to keep them away from homes and out of food storage. In the same manner, *M. domestica* contaminates food crops and negatively affects the health of harvests and the productivity of farms. This can lead to food scarcity and the vast spread of food-borne illnesses and parasites (Hung, Michailides, Milar, Wayadande, & Gerry 2015).

Research has shown that *M. domestica* demonstrates a significant attraction to poultry and livestock feces (O'riordan 1928). This foul odor is the same smell that draws house flies to rotten food and waste found around homes (Encyclopedia Britannica 2023). Solutions like pesticides and chemosterilants have been identified to combat pest invasion in rural areas where large-scale farming and livestock production are in place (Meifert, LaBrecque, & Rye 1969). However, these methods are constantly facing obstacles as many flies are able to adapt a resistance to insecticides

(Georghiou 1972). Additionally, solutions are needed on a smaller scale. Keeping *M. domestica* and other vectors away from homes and areas where food and water are commonly consumed is necessary to combat the spread of disease.

There are many different fly traps designed for at home use on the market. Plenty of online websites give directions on how to make homemade traps with ingredients that can normally be found around the house. However, traps can also be bought commercially. There are numerous ongoing debates over which type is the most effective at catching flies.

Research exists over the effectiveness of catching *Calliphora* sp.(Linnaeus) (Diptera: Calliphoridae), commonly known as the blowfly. An experiment shows that store bought traps were highly successful at catching large numbers of the insect (Dadour & Cook 2007). However, many researchers have varying results, and this particular analysis does not cover the effectiveness in regards to *M. domestica.* Differing from Dadour and Cook's findings, an experiment revealed that homemade traps made with pumpkin bait were more successful than commercial traps in catching females of a certain fly species (Gupta & Regmi 2022).

Therefore, the question still remains. In an effort to reduce the number of diseases spread by the habitation of *M. domestica* around homes, further comparison of homemade and commercial traps must be completed. In this study, homemade and commercial fly traps will be used to determine which style of trap is more effective at catching the common house fly, *M. domestica*.

Materials and Methods

Trap Locations. This experiment was conducted in the backyard of a home located in College Station, Texas. The traps were set up in each corner of the yard, approximately 32 feet away from one another. Each trap was maintained in this backyard for seven days as data collection took place every day. Each fly identified was naturally inhabiting or passing through this location.

Experimental Design. The first trap (Trap (A)) necessary for this experimental design was commercially manufactured and produced. The Reusable Fly Trap (Model: SWA ,Sewanta, New York, New York) was assembled by pouring water and bait powder into the base of the trap and thoroughly mixing. The top of the trap was closed and secured.

The second trap assembled was a homemade trap (Trap (B)). A mixture of three tablespoons of turbinado sugar (In the Raw, Brooklyn, New York) and one cup of water was poured into a 16-ounce wide mouth mason jar (5.3 in x 3.0 in) (Ball, Westminster, Colorado). A funnel was created using a 4-ounce Solo Bare Eco-Forward Cold Cup (KSS Enterprises, Kalamazoo, Michigan). A small hole, 1.5 cm in diameter, was cut from the point of the paper cone (KSS Enterprises). The cone was then placed upside down in the jar with the point facing down but not touching the liquid mixture.

The next homemade trap (Trap (C)) was built by placing a cup of water and one jumbo raw shrimp (Good and Gather, Minneapolis, Minnesota) in another 16-ounce wide mouth mason jar (5.3 in x 3.0 in) (Ball, Westminster,

Colorado). Then, a cone shape was created out of a standard size (9 in x 12 in) sheet construction paper, leaving a hole with a 1.5 diameter open at the pointed end. This funnel was placed in the mason jar without touching the point to the water.

Lastly, the final homemade trap (Trap (D)) was assembled by cutting a two-liter sprite soda bottle (Coca-Cola Company, Atlanta, Georgia) where its body met its tapered neck. An overripe, discolored Navel orange (Good and Gather, Minneapolis, Minnesota) was placed inside the larger piece of the bottle. Finally, the top piece of the bottle was placed upside down in the larger piece to create a funnel.

The traps were placed on the ground approximately 32 feet away from each other. The traps were analyzed every day for seven days at approximately 10 a.m. The number of *M. domestica* caught in each trap was recorded daily. The durability and odor of each trap was also observed over the course of the experiment.

Results

Quantitative. An analysis of commercial and homemade traps exhibits a large difference in the overall effectiveness of catching a high number of *M. domestica*. (See Figure 1).

After allowing the traps to sit out for one day, Trap (A) caught 13 *M. domestica* while Trap (B), (C), and (D) caught zero. The second day of data analysis revealed that Trap (A) caught 11 *M. domestica* and Trap (C) caught two. Trap (B) and (D) both caught zero. On day 3, Trap (A) caught 10 *M. domestica* and Trap (B), (C), and (D) caught one. On the fourth day it was recorded that Trap (A) caught 16 *M. domestica*, Trap (B) caught 0, and Trap (C) and (D) caught one. Day 5 revealed that Trap (A) caught 14 *M. domestica*, and Trap (B), (C), and (D) caught zero. On day 6, Trap (A) caught 16 *M. domestica*, Trap (C) caught two, and Trap (B) and (D) caught zero. On the seventh and final day, Trap (A) caught 11 *M. domestica*, Trap (C) caught zero, and Trap (B) and (D) caught one. Trap (A) caught a total of 91 *M. domestica* throughout the span of seven days, significantly more than any

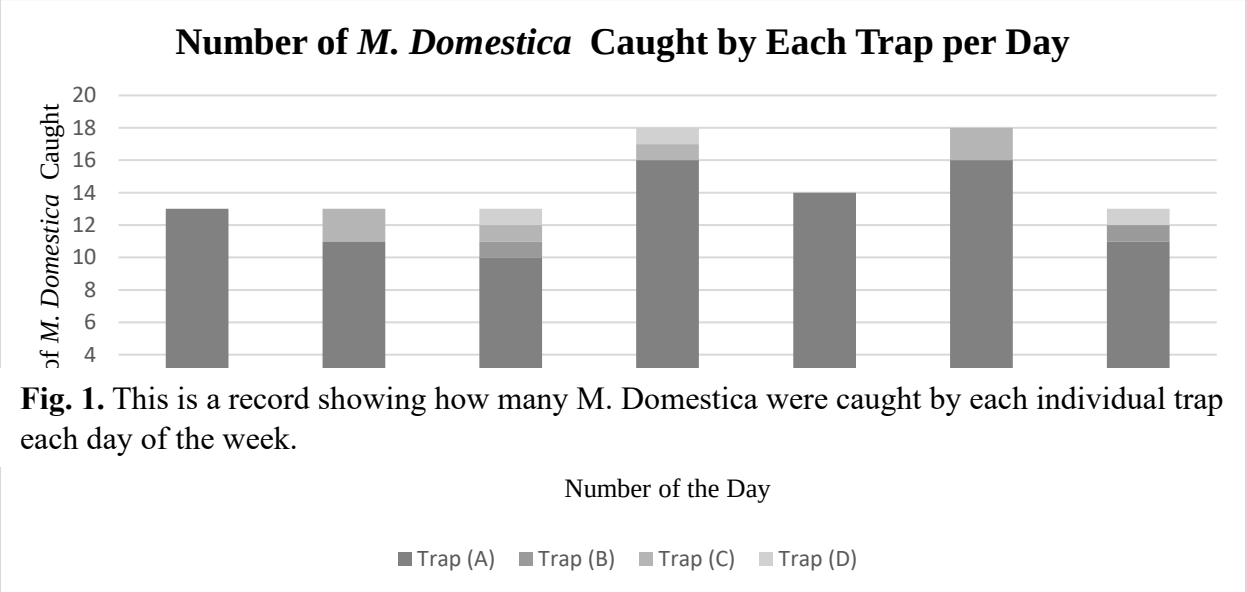

Fig. 1. This is a record showing how many M. Domestica were caught by each individual trap each day of the week.

other trap. Trap (B) caught two *M. domestica* and Trap (C) caught six *M. domestica* in total. Lastly, Trap (D) caught a total of three *M. domestica.*

Durability. Trap (A) was extremely durable. It was never blown over by the wind or damaged in any way throughout the seven days. Trap (B) and (C) were much more vulnerable. Throughout the span of one week, both of the mason jars were blown over once by the wind. Additionally, the funnel cones were damaged by rain throughout the week. This damage was so severe that the funnels each had to be replaced once. Trap (C) was blown over three times by the wind, but other than that it was not damaged in any way.

Odor. Trap (A) produced an extremely potent and foul smell that was noticeable to the human nose from up to seven feet away from the trap. The mixture of sugar and water in Trap (B) produced a slight sweet smell. It was detectable from about half a foot away from the trap. In Trap (C), the raw shrimp and water produced a mildly strong and unpleasant odor. This smell was comparable to raw seafood and was detectable from about three feet away from the trap. Finally, the overripe orange in Trap (D) produced a slightly vinegary smell which was detectable from about a foot and a half away from the trap.

Discussion

M. domestica is referred to as the common house fly for a significant reason. Throughout the span of just seven days, a total of 102 *M. domestica* were caught in the backyard of the house at this experiment site. Large populations of these insects found around households can be highly dangerous. More than just a pesky annoyance, *M. domestica* serves as a vector for transmissible diseases such as typhoid, cholera, and small-pox (O'riordan 1928). House flies are attracted to the odor of human and animal feces (O'riordan 1928). The odors produced by rotten food and waste found in garbage outside of homes are comparable to this stench (Encyclopedia Britannica 2023). Therefore, *M. domestica* is heavily drawn to homes and bakyards. As *M. domestica* inhabits living spaces, exposed food and water become vulnerable to contamination (Phillips 2023). By simply contacting food or water items with their legs or mouth, house flies can potentially spread disease to an entire household (Phillips 2023). This risk has led researchers to become more cautious of the species and conduct experiments to attempt successful eradications of these pests (Dadour & Cook 1992, et al. Gupta & Regmi 2022). Various fly traps have been invented to catch and eliminate *M. domestica.* While there are many variations of these traps on the market and on the internet today, the effectiveness of commercial versus homemade traps is in need of further research.

This experimental design and results upheld that commercial fly traps are more effective at catching a larger number of *M. domestica* than homemade traps. Throughout the course of a week, 85.85% of the total house flies recorded were caught by Trap (A). The ability to produce such a potent and rotten smell comparable to that of feces and detectable from at least seven feet away made the commercial trap stronger and more attractive to *M. domestica.* Although its numbers were

significantly lower, Trap (C) had the second highest performance, catching 5.88% of all house flies trapped. It produced a rotten smell similar to that of Trap (A) but on a much smaller scale. Its second-best performance indicates that the strong rotten odor is superior in attracting *M. domestica*. Traps (B) and (D) performed the worst by catching only 1.96% and 2.94% of the total house flies trapped respectively. They produced the faintest odors that differed the most from the rotten smell of Trap (A). Their sweet odor might have performed better indoors rather than outdoors where their fragrance could diffuse into a closed space and be detected more easily.

The commercial trap was the most successful at producing a strong and detectable odor that is attractive to *M. domestica*, and therefore was most effective overall. In order to most effectively combat the spread of infectious diseases by *M. domestica* in and around households, a commercial trap will a potent odor should be utilized. This study maintains that the commercial fly trap was more effective than the homemade fly traps at catching the highest number of *M. domestica*, the common house fly.

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