

# Oviposition Behavior of Indianmeal Moths With and Without Synthetic Pheromone

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## Abstract

*Plodia interpunctella*, commonly known as the Indianmeal moth, is a pyralid moth that is a pest of stored food products (Mohandass, 2007). While there are many known factors that influence oviposition, like food odor and type of food available (Mohandass, 2007), the effect of extra sex pheromones is not known. We tested progeny output to see if female *P. interpunctella* will produce less progeny when there is a large dose of synthetic pheromone in the environment. Our research did not show any significant difference between the females exposed to the pheromone and those that were not exposed, in both the total number of progeny produced and weight of the progeny. This experiment is important due to the quantity of pheromone-baited traps that are a major part of pest management for *P. interpunctella* (Mullen, 1998). This suggests that the widespread use of this pheromone to attract and trap male *P. interpunctella* does not also have an additional effect on females, which would have been a hidden benefit of this method of trapping and pest control.

## Purpose

The purpose of this research is to determine if synthetic pheromone influences the oviposition of female Indianmeal moths.

## Questions, Hypotheses, and Predictions

**Question:** Does extra female sex pheromone in the environment have an influence on oviposition?

**Hypothesis:** Female *P. interpenctella* will produce less progeny when there are more sex pheromones in the environment.

**Prediction:** The Indianmeal moths in the jars with increased sex pheromone will produce less progeny than the control jars.

## Study System

*Plodia interpunctella*, commonly known as the Indianmeal moth, is a common pest that infests many different food products in many places like warehouses and food mills (Figure 1). The commercial pheromone traps, (Z,E)-9,12-tetradecadienyl acetate or commonly known as ZETA, are used to help trap males that reside in warehouses and facilities or help monitor population trends (Arthur, 2013). Oviposition can be increased by food odor and oil. Other sources of influence include type of food available, amount of water supplied, temperature and the current condition of the female. Unlike many other pyralid moth species, *P. interpunctella*'s oviposition is not under the influence of circadian rhythms (Mohandass, 2013).



**Figure 1.** (Left) Adult Indianmeal Moth. (Right) Indianmeal Moth larvae  
 Source: Whitney Cranshaw, Colorado State University, Bugwood.org  
 Source: Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org

## Methods and Experimental Design

Two blocks, that were composed of two different treatments, were ran. The first block consisted of four control and three pheromone jars, and the second block consisted of six control and six pheromone jars. Thirty-eight Indianmeal moths were sexed and placed accordingly into a bedding of cracked wheat and honey (Figure 2) and with a corrugated paper spool, which acted as a pupation site for larvae (Huang, 2003). Both blocks were then moved to an incubator kept at 30° C, and remained there until the progeny were counted. Block one remained in the incubator from 10/22 to 11/20, while block two remained there from 10/26 to 11/27. We retained eight to ten moths from block 2 that represented the populous of each jar to be weighed for any weight deviation between treatments. Data was analyzed using a paired t-test in R Statistical Software to analyze differences in the mean of the progeny count and weight, and create the box plots.



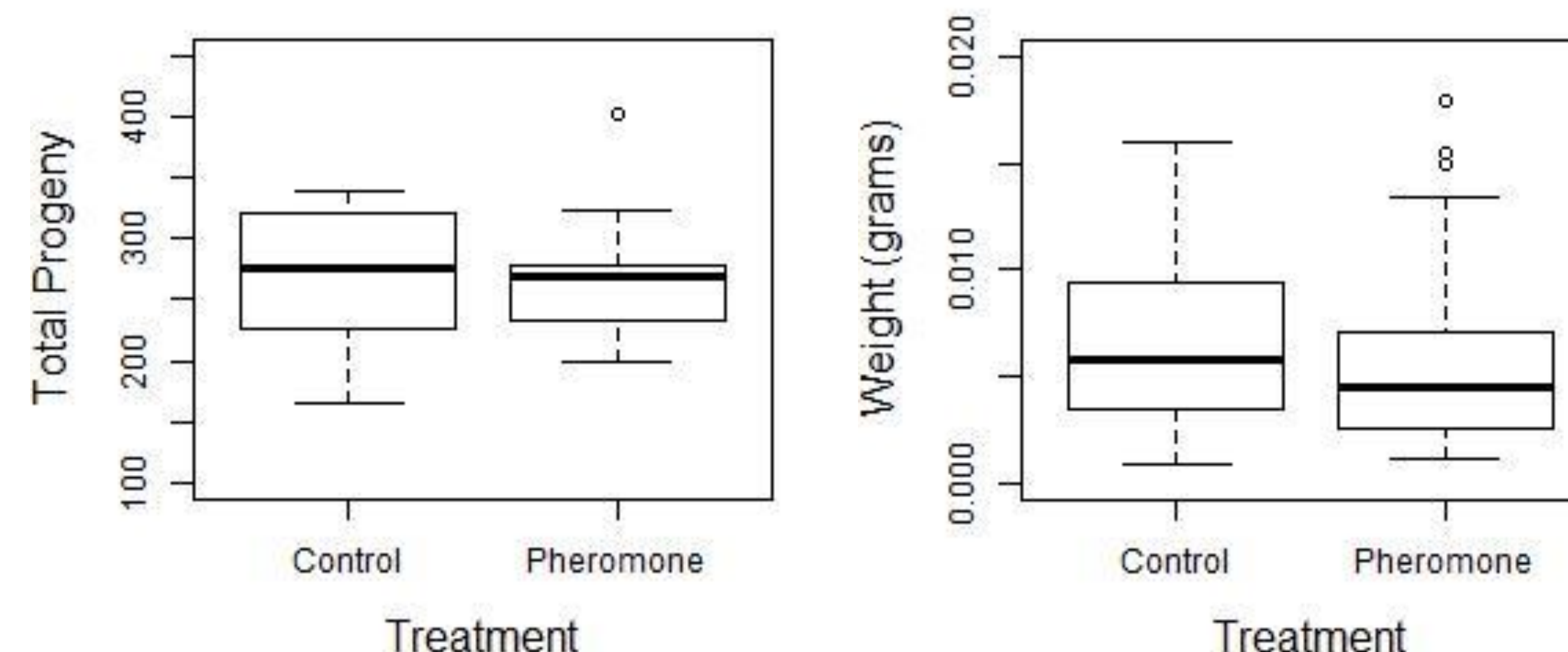
**Figure 2.** (top) A control jar before the progeny hatched. (bottom) A pheromone jar before the progeny hatched.

## Results

The average progeny count for the control treatment was 266.10, versus the pheromone treatment at 271.11 (Table 1; Figure 3). After noticing a large deviation of body size in block one, eight to ten moths were selected to be weighed to determine if an excess of pheromone had an impact on overall body size. The averages in weight were 0.0067 grams and 0.0054, respectfully (Table 1; Figure 3). Paired t-tests were calculated for both weight deviation and difference in progeny. The P-value resulted in 0.6435 for progeny and 0.1303 for weight deviation (Table 1), which were both greater than the 95% level of significance.

Measure	t-value	Df	p-value	Control Mean	Pheromone Mean
Progeny Count	-0.18	16.67	0.85	266.10	271.22
Weight	1.52	89.92	0.13	0.0067	0.0054

**Table 1.** Paired t-test results of progeny count and progeny weight for each treatment.



**Figure 3.** (left) Box plot of the total progeny that emerged from control and pheromone treatments. (right) Box plot of progeny weight for control and pheromone treated Indianmeal moths.

## Conclusions

We could not infer any significant differences between the control groups and the pheromone groups. These insects still successfully mate in each treatment and lay a large number of eggs. Since there was no choice of where to lay eggs, the importance of laying eggs may outweigh waiting to find a better location. Despite no difference between treatments, this study provides insight on what may or may not influence the oviposition of *P. interpunctella*, especially with the widespread use of pheromone that is commonly used to trap and monitor (Arthur, 2013).

## Future Directions

Future research could include assessing female *P. interpunctella* behavior to synthetic pheromone when given a choice on oviposition. One possible next step could include a male and female kept in a larger enclosure with access to two nearly identical jars, but one with synthetic pheromone and the other without. This can help further test the female's reaction to synthetic pheromone when given a choice on oviposition. This can also provide more insight on whether or not the synthetic sex pheromone would make the female more competitive to mate than she would be without excess pheromone. Before both treatments were counted, the pheromone treatment appeared to have more mating pairs than the control treatment, but more research is needed to verify if there is any significant difference.

## References

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