



Effects of Group Living on Pupation in a Lady Beetle

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Abstract

To further understand the lives and development habits of insects, we must know how they influence each other through pupation periods. This will ultimately help us understand how interactive insects are throughout their life. To answer this question, we tested the pupation rates of *Hippodamia convergens* in groups and alone. This will help us delineate the advantages or disadvantages of the organism in groups versus singular pupation. We hypothesized that the Lady Beetles reared alone will develop faster and have a higher growth rate than those reared in groups. During the experiment, the subjects engaged in cannibalism which could have affected our results. Cannibalism occurs when food in the environment is scarce, and although the Lady Beetles were fed, the amounts that were given may not have been proper for their size nor consistent with each group member. At the end of this experiment we saw that the specimens reared in groups pupated more consistently than those reared alone. We assume that the reason Lady Beetles in groups pupated more consistently is because of the stressors in their environment, while the ones alone did not have any stressors. These conclusions may be important because it will help us determine the factors that influence pupation before and during the process in relation to other species of insects.

Purpose

The purpose of this research is to study the pupation rates of *Hippodamia convergens* in groups compared to those that are reared alone and observe the effects that group living has on development.

Questions, Hypotheses, and Predictions

Question: Does the length of the pupation period differ between Lady Beetles that are reared in groups or alone?

Hypothesis: Lady Beetles reared alone will develop faster and have a higher growth rate compared to those reared in groups.

Study System

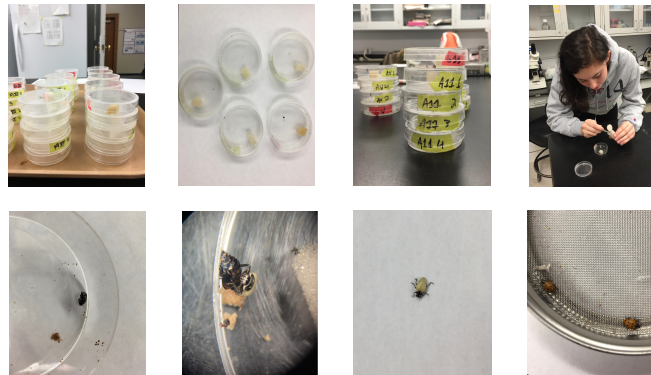
The most common lady beetle species throughout North America, is *Hippodamia convergens*, or commonly known as the convergent lady beetle. These beetles are rounded and elongate-oval, whom are bright orange or red and also have twelve black spots. They are a natural enemy of aphids, scales, thrips, a few of many soft-bodied insects, and are helpful in gardens as a natural control agent for pests. Adult Lady beetles can eat honeydew, nectar, and pollen, but females have to consume live prey like aphids to be able to reproduce. Larger larvae can consume up to thirty to fifty aphids a day. Once Convergent lady beetle larvae hatch, they are active predators who use visual, chemical, and olfactory cues along with pheromones and honeydew secreted by aphids to locate their prey. When food is scarce they can become cannibalistic.



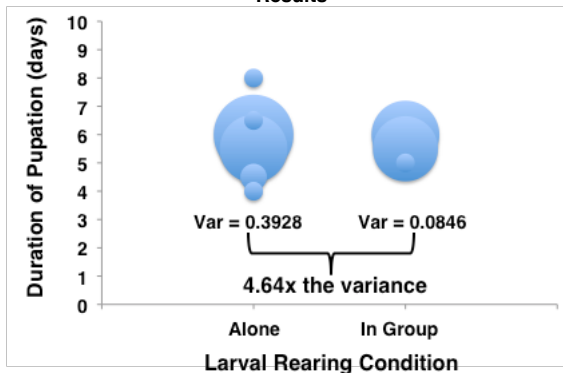
Methods and Experimental Design

We received the beetles as eggs and they were placed in the incubator until they were hatched. Once they were hatched they were counted and transferred into 9 cm diameter plastic Petri dishes in colonies for the research project. These colonies consist of four individual (one beetle per each), along with one group of four beetles with different labels on each Petri dish and colony to identify the groups. They were fed *E. kuehniella* eggs every two days along with a small sponge cubed soaked with water, and checked once a day to check food and water and given more food or water accordingly. Once a week the beetles were all transferred to clean Petri dishes, and this cycle continued until pupation started to occur.

Once pupation began, the beetles were checked twice a day, once in morning and once in evening and were fed and watered once a day until all beetles started pupation. The beetles continued to be observed twice a day, everyday day, until all beetles were hatched. The hatched beetles were then placed together in one of two jars that stayed in the incubator while not being used.



Results



Conclusions

The pupation rates within the groups occurred within a half a day of each other compared to the ones that were alone which were more variable. This is likely due to the threat of cannibalism that the groups faced, although more testing is needed to confirm this hypothesis.

Future Directions

For the next trial, I would make the *H. convergens* my control group and I would try this experiment with a different family of Lady beetles to see if there were a difference in pupation and hatching rates and try to understand, if there were differences, why that would be. To continue this experiment, I would make the variables throughout this experiment more consistent such as making watering and feeding at the same times each day and the same amount of food for each Petri dish.

Another thing I would do different would be to write data for each group once a day to have a full set of data to have a thorough report and data for a more accurate graph. With more than one person conducting this experiment and having our own ideas of what enough food would be leaving some groups with more food and some with less, I believe that if this were changed the cannibalism rates would be far less and our results would be less affected by it making a more accurate graph.

References

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