



Effects of group living on pupation in a Lady Beetle

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Abstract

Lady beetles, sometimes also called ladybugs, are a species of insect with brightly-colored wing covers that are often a shade of red or orange with black spots (Michaud and Qureshi 2006). Lady beetles are generally a beneficial insect, as most of them are carnivorous and predators of aphids, scales and other juice-sucking plant parasites. In fact, one lady beetle can eat as many as 5,000 aphids over the course of its lifetime! Lady beetles are also widely studied in behavior, as they exhibit a range of social and antisocial behaviors (i.e., cannibalism). Here, we tested if lady beetle larvae reared in groups would exhibit different pupation development times relative to beetles reared alone. We found that group living resulted in greater synchronization of pupation development, likely due to an increase in the possibility of cannibalism. Further research is needed to test this hypothesis.

Purpose

The purpose of this research is to study the pupation rates between groups to individual *Hippodamia convergens* and observing the effects that it has.

Questions, Hypotheses, and Predictions

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

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

Study System

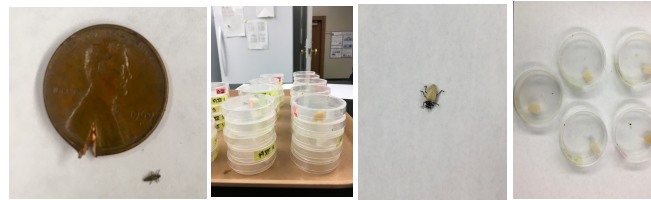
The most common lady beetle species throughout North America, is *Hippodamia convergens*, or commonly known as the convergent lady beetle. These beetles are rounded and elongate-oval, whom are bright orange or red and also have twelve black spots. They are a natural enemy of aphids, scales, thrips, a 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.



Larval Cannibalism in Lady Beetles



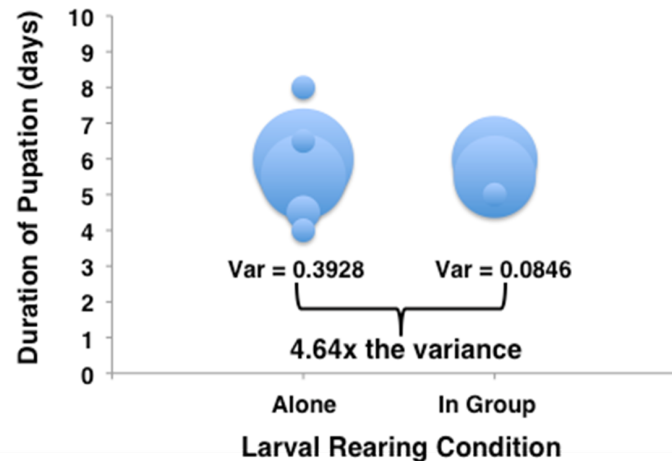
Conclusions

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

If I were to do this ladybug project again, I would have the ladybugs grow a lot slower and try to prevent them from eating each other. So, each ladybug would have its own petri dish to begin with. You can watch them a lot more than in a group setting and not have them escape. Additionally, I would adjust food levels throughout the experiment to reduce the probability of cannibalism – as low food availability is the primary cause of cannibalism in this system.

Results



References

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Acknowledgements

Thank you to Dr. Jeremy Marshall, Shara Arnold, Miranda Huston, and Dr. JP Michaud.