



Grouping of Red Flour Beetles using two Different Strains

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Abstract

In this research project I studied how the Red Flour Beetle grouped over a 10 day time period with two different strains of the Beetle. One strain was the Canadian Red Flour Beetle and the other was the Manhattan, KS Red Flour Beetle. The grouping of the beetles is a behavior that is being tested in this experiment and can be greatly effected by both environment and genetics (Breed & Sanchez, 2010). Thus for this experiment I ask if different strains of the Red Flour Beetle aggregate differently and hypothesize that they will end up aggregating differently. After testing this question and hypothesis I found that The different strains do aggregate differently and this could be due to the different climates at which they are normally found. The Canadian lives in an overall lower temperature year round unlike the Kansas beetle (Baldwin & Fasulo, 2014). With this knowledge grain facilities will be able to better prevent infestations of this particular beetle (Gerken, Scully, & Campbell, 2018).

Purpose

The purpose of this research is to better understand how and why the Red Four Beetle groups.

Questions, Hypotheses, and Predictions

Question: Do different strains of the Red Flour Beetle aggregate differently?

Hypothesis: Different strains aggregate differently.

Study System

The organism used in this research was the Red Flour Beetle. The red flour beetle is a pest found in grain facilities and are commonly taken care of with traps that contain pheromone and kairomone lures (Gerken, Scully, & Campbell, 2018). The beetles are normally found in cool climates and they inhabit grain with high moisture content (Baldwin & Fasulo, 2014). They group according to genetics and their environment meaning that they will group with another that shares genes with them or they will group with another that has been living in the same environment as them for a period of time. This was the basis of how the red flour beetle was studied in this research. They were exposed to another strain of the same beetle and were then observed on how they grouped over a 10 day period. The two strain used in this experiment was a Canadian strain (NDG-2, Argyle, MB) and a Manhattan, KS strain (Shellenberger).



Source: https://keys.luicidcentral.org/keys/v0/indofredflourize_poeckikeymaize_psest?MediaItem/
 Tribolium, castaneum, @Insect_119791, Red_Flour_Beetle.htm

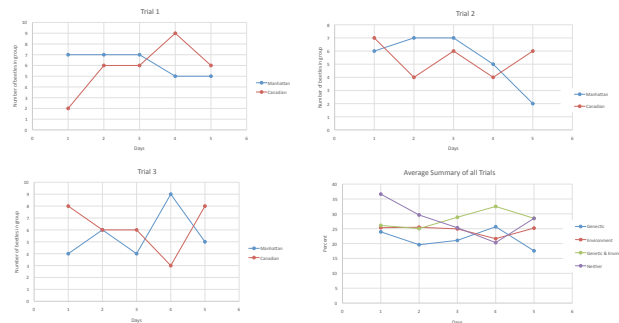
Methods and Experimental Design

This experiment began with painting the beetles with nail polish. I painted 20 of my Canadian beetles with white nail polish and another 20 with green nail polish and separated them into different jars; all white beetle in one jar and all green beetles in the other. Next, I painted 20 of my Kansas beetles with orange nail polish and put them in the jar with the white Canadian beetles, and I painted another 20 Kansas beetles with blue nail polish and put them in the jar with the green Canadian beetles. Once this was done, I let the beetles comingle in the jars with a bed of grain for 10 days. When I can back, I separated all the beetles out based on color. I did this using a small sucking tool to move them out of the jar and into a petri dish. I then counted how many of each color of beetle was alive and viable for the next step of the experiment. I was then able to place 5 of each color into my 3 trials, that had a light layer of grain on the bottom of the dish. I then made 3 petri dishes with 5 of each color of beetles. Once this was done, I came in every other day for 10 days and recorded how the beetles grouped using a microscope. To do this, I had to not move the beetles around a lot before observing them or they would no longer be in their groupings from the previous day and night before. I finally wrote down the color and each one that was in each group, and I also kept tract of which beetles were alone.



Results

On day one there was some grouping with more smaller groups (less than 5 beetles/group) than large ones. There were also more of the same color grouped together and some grouping of beetles coming from the same environment (e.g. white and orange in the same group). On day two larger groups appeared, but the green (Manhattan, KS) beetle was not grouping as much as the other colors. The green beetle not grouping became a common occurrence during the middle days of the experiment. On day four, the grouping became larger and then on day five there was the largest group yet with 10 beetles in one group.



Conclusions

Based on the results of this research, I can conclude that when the observation of the grouping of the beetles began that the environment and genetics did not play a large role in how the beetles grouped. As the experiment continued both the environment and genetics played a large role of the grouping beetles. Also the results showed that the Canadian strain of beetles were most effected by this. By day five in all three trials more of the Canadian strain was grouping rather unlike the Kansas strain.

Future Directions

If this research was to continue the first thing I would do would be to test how the Red Flour Beetle groups within a high moisture grain. The beetle is attracted to places with high moisture and with this test the beetles could group more and in a quicker time period with this test (Baldwin & Fasulo, 2014). The second possible experiment to test for the future would be to use the same grain as used in this experiment, but add some moisture to a section of the grain. Once that is done you would be able to measure where the beetles are grouping in the section with added moisture or not. The third possible experiment I would try would be to regulate the temperature of the room where the experiment in being held. The Red Flour Beetle thrives in cooler temperatures, so regulating the temperature would be able to show how well the beetle will group in higher and cooler temperatures (Baldwin & Fasulo, 2014). The fourth future experiment would be testing the grouping of the beetle with numbers similar to the numbers in a colony of beetles. This will be able to show where the majority of the beetles group within the grain. Lastly the final possible experiment would be to find a better way to mark the beetles for observation. Possible solutions to marking the beetles could be non-toxic pain or spray paint to test to see if it will last longer on the beetles than the nail polish used for this experiment.

References

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