

# The Effects of Different Wavelengths of Light on *Tribolium castaneum*

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## Abstract

Insects are known to be able to see different wavelengths of lights than humans can see. Because of this, there has been a lot of research done into using light to prevent damage caused by stored-product pests. Common pests that research has been performed on are psocids (Diaz-Montano et al., 2015) and fruit flies (Saranwong et al., 2011). One of the biggest pests of stored-products is the red flour beetle *Tribolium castaneum*. Research on the attraction of different wavelengths of light has already been done on these beetles and published (Duehl et al., 2011), and my project mirrors that research. My hypothesis was that the shorter wavelengths of light would attract red flour beetles while the longer wavelengths of light would have no effect. My results show that, compared to a white light, the shorter wavelength light attracted more beetles. Compared to no light, there wasn't a definite trend in wavelength of lights and attractiveness. The attractiveness of short-wavelength lights could be used to make traps for red flour beetles more effective and prevent damage to stored-grains.

## Purpose

The purpose of this research is to determine if lights, specifically different wavelengths of lights, can be used as attractants or repellants for the red flour beetle. This could be used to make traps for the red flour beetle more effective.

## Questions, Hypotheses, and Predictions

**Question:** Will different wavelengths of light attract or repel red flour beetles?

**Hypothesis:** The lights at longer wavelengths (i.e. red and yellow) will have little to no effect on the beetles, while the lights with shorter wavelengths (i.e. violet and ultraviolet) will attract the beetles.

## Study System

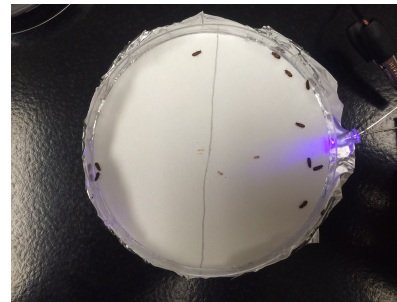
The red flour beetle (RFB) *Tribolium castaneum* (Order: Coleoptera, Family: Tenebrionidae) is a major pest to stored grain products. The beetles are small (2.3-4.4mm) and reddish-brown in color. They have a very diverse diet ranging from beans to nuts, but its favorite food is dried grains and cereals.



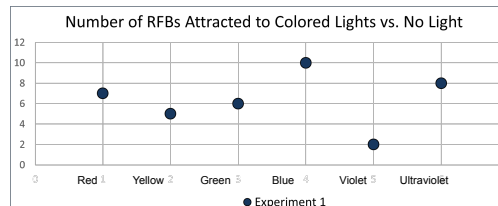
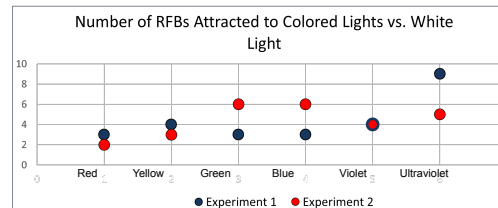
## Methods and Experimental Design

Two different variations of the same experiment were run. The first tested the effect of different wavelengths of light against a broad-spectrum white light. For this experiment, a petri dish with a filter paper bottom was used as an arena. The arena was divided in half by a pencil line in the middle. The sides and top of the arena were covered in aluminum foil, to keep light out, with openings on either side for the lights to shine through. Ten red flour beetles were put in the arena without the lights on and left alone for one minute to calm down. The light was then introduced, the white light on one side and the colored light on the other, and the beetles were left for five minutes. After the five minutes were up, the beetles were counted on either side of the arena. This variation of the experiment was run twice.

The second variation to this experiment tested the effect of different wavelengths of light against no light. The only difference with this experiment was that the arena was completely covered in aluminum foil except for a hole on one of the sides for the colored light to shine through. The number of beetles used and times that the beetles were allowed to rest and react to the lights were the same as the first experiment. This variation of the experiment was only run once.



## Results



## Conclusions

In the first variation of the experiment where the colored lights were tested against the white light, a general trend of attractiveness of the light as the wavelength gets shorter can be seen in both times the experiment was performed. The second variation where the colored lights were tested against no light showed a different outcome. There doesn't seem to be a definitive trend in the attractiveness of the different wavelengths of light.

## Future Directions

If I were to do this research again, there are several things that could be changed to make the results more accurate. The biggest change I would make would be using a different arena. I think that an arena with pitfall traps by the lights would provide a more accurate number of beetles attracted to each light. The other change I would make is to run the experiment more times to provide a bigger poll of data to pull from which would make the data more credible.

## References

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