

## **Using bean beetles to teach experimental design and experimental variables**

### **Objectives**

- 1) To formulate a hypothesis and design an experiment to test your hypothesis
- 2) Communicate hypothesis and experimental design to your peers

### **Bean Beetle Experiment**

**Goal:** To formulate a hypothesis and design an experiment to test your hypothesis.

Today, each lab group will choose one of the following observations and questions to pursue further. Next week, you will perform an experiment designed by you to test the question that you have chosen to investigate. Prior to beginning the experiment, each group will give a 5 minute presentation on their question, hypothesis and the experiment that was designed by the group.

#### **OBSERVATIONS AND QUESTIONS ABOUT BEAN BEETLES**

**Males are driven to find females and mate with them. Typically, males find females and begin mating in 15 minutes in small containers. Male beetles have been observed attempting to mate with other male beetles.**

- 1) What senses do males use to find their mates?
- 2) Does mating decrease or increase a beetle's lifespan?
- 3) Does the presence of females reduce or increase the attempts of male-to-male mating attempts?
- 4) Does the presence of extra male beetles increase or decrease the time it takes to successfully mate with a female beetle?

**It is claimed that adult bean beetles do not need to eat or drink.**

- 5) Would beetle lifespan increase in the presence of food?
- 6) Do beetles survive longer in the presence of light or in the presence of dark?

**Females prefer to lay eggs on their natal bean (the bean from which they emerge).**

- 7) Are female beetles picky about the size of natal bean?
- 8) Are female beetles picky about whether an egg has already been laid on a natal bean?
- 9) Will females lay eggs on beans without a seed coat?
- 10) What makes the natal bean attractive to the female – its color or shape?

### **Supplies Available**

Virgin Male and Female Beetles

This experiment was written by Allison D'Costa and Mark Schlueter, Georgia Gwinnett College ([www.beanbeetles.org](http://www.beanbeetles.org)).

Non-virgin Male and Female Beetles

Mung Beans (natal bean) with seed coat, Mung bean without seed coat, Mung Beans with eggs

Others Bean Types (Adzuki beans, Black-eye peas, Chick-peas, Black Beans)

Water, Yeast, Fruit Fly media

Petri Dishes, Scissors, Microscopes, Electronic Balances

Beetle “storage” areas include: (a) cool area (b) warm area (c) dark area (d) light area

### **EXPERIMENTAL DESIGN**

**You need to answer each of these questions in your experiment design paper. This paper is due at the beginning of lab. Each group will give a five minute presentation on their question and the experiment they will perform to answer that question.**

1. State your question (or reword the question).
2. State your purpose.
3. State your hypothesis.
4. List your variables.
  - a. What is your independent variable?
  - b. What is your dependent variable(s)?
  - c. What is your controlled variable (s)?
5. Design your experiment.
  - a. What materials or organisms will you need? How many?
  - b. Write out a step by step procedure.
  - \* Consult your “Available Supply List”
  - \* Remember to include a control group
  - \* Remember to include replicates in your experimental design
  - \* Statistics might be useful (e.g. t-test, ANOVA)

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