University of Kentucky Entomology

Insects in the Classroom Lesson Plan No. 101

Flour **Beetles**

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Activity Description

Hands-on Discovery Lab
Age Group: Can be adapted for elementary through high school.
Class Time: Initial discussion and preparation one class period (55 minutes).
Checking beetles every 3 to 4 weeks will take about 20 minutes.

Objectives

- Students will make observations of the behavior and life stages in flour beetles.
- Students will design and implement an investigation on food preference for flour beetles.
- Students will record data and graph results over a period of several months.
- Students will recognize elements in the experimental design to include a hypothesis, variable to be tested, control, and other variables.
- Students will write a summary report for the experiment where they have determined in which food source the flour beetles thrived best.

Academic Expectations

The above objectives fall under KERA's Science Academic Expectations or at least part in part.

- 2.1 Understand scientific ways of thinking and working and use of those methods to solve real-life problems.
- 2.2 Identify, analyze, and use patterns such as cycles and trend to understand past and present events and predicg possible future events.
- 2.3 Identify and analyze systems and the ways their components work together or affect each other.
- 2.4 Use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.
- 2.5 Understand that under certain conditions nature tend to remain the same or move towarda a balance.

⌘ 2.6 Understand how living and nonliving things change over time and the factors that influence the changes.

Flour Beetles

Background Information

Even though flour beetles are small insects they are one of the most important pests of stored products in the home and in grocery stores. They generally attack damaged grains, grain products, peas, shelled nuts, beans, spices, dried fruits, milk chocolate, drugs, snuff and cayenne pepper. They do have wings but apparently do not fly. The entire life cycle can be completed in about a month.

They are perfect for use in science class activities. They require nothing except flour. After about six months or so, when the population starts getting too high, you may separate them. They may be kept in quart sized jars, a gallon jar, or any other containers covered with a paper towel or cloth and a rubber band. They require no moisture as they may aquire water from the food they eat through respiration (This allows the chance to discuss respiration and the byproducts).

Scientific Inquiry

After students have completed the lab on the observation of the flour beetles (Student handout below), a discussion on the types of food they eat may take place. They may discuss if the beetles like to live in some kinds of food better than other kinds. Other questions which may be explored including the effects of light, temperature or type of beetle (red vs. black) on the growth rate of the beetles. Students may decide on the food choice as the tested variable against the possible control of flour. Suggestions for food types may be whole wheat flour, wheat germ, bulgar wheat, crushed breakfast ceareal, corn meal, or cake mix. Flour beetles cannot feed on undamaged grain or whole kernels so using dried beans may not be a practical food choice. Place a the same number of adult beetles (at least 10) in each jar (baby food jars work well) half filled with the food medium. Count and record the number of adult and immature beetles every four to five weeks. Student handout for this investigation is found below.

(Student handout for observation of Flour Beetles Lab)
Name _____

Flour Beetles

Background Information

Flour beetles are small, flat, oval bodied organisms, which belong to the Order Coleoptera (Class Insecta; Phylum Arthropoda). They are pests in mills, warehouses and can be a pest in the home in opened flour containers or other common grain products in the kitchen that have been left unattended. They may live in corn meal, beans, dried fruits, flour, cake mixes, and nuts.

The species commonly found is the black flour beetle called the confused flour beetle and the red flour beetle. They have complete metamorphosis where they pass through the stages of egg, larva, pupa and adult. The female lays 2 to 3 eggs a day but may live for 2 to 3 years. Eggs hatch in 5 to 12 days into brownish-white larvae. Depending on the temperature, they can go through a complete cycle, egg to egg, in 7 weeks.

Objective

To make observations about the flour beetle and its life style.

Materials

Flour beetles, dissecting microscope or magnifying glasses, petri dish, probe.

Procedures

Obtain equipment and flour beetles. Observe the life stages and answer the following questions.

1. What observations can be made of the flour beetles?

2. Measure the length of 5 flour beetles and determine an average. Use both metric and English systems. Which appears to be more accurate, why?

3. Make a drawing of the adult beetle. Make a detailed drawing of an antenna.

4. Make a drawing of the larval stage.

5. Make a drawing of the pupal stage.

6. If the stock jar of beetles is gently mixed with a teaspoon, how do the flour beetles respond?

Conclusion

1. Flour beetles exhibit cannibalistic behavior. The larvae and the adults will eat the eggs and larvae of the same species. How has this been an important adaptive behavior?

2. How would flour beetles come to be in your grocery store or school cafeteria if they do not appear to fly?

3. Flour beetles thrive in flour or cornmeal with nothing else, that is, no moisture? How is this possible

4. If an adult female can lay 2-3 eggs a day and lives for 2 to 3 years, what is the highest possible number of eggs she could lay?

(Student Handout for food preference investigation)

Name _____

FLOUR BEETLES FOOD PREFERENCE

Hypothesis

Tested Variable

Control

Other Variables

Procedures

DATA (Include dates, number of adult or immature beetles and pupae)

Key To Conclusion Questions

1. Flour beetles exhibit cannibalistic behavior. The larvae and the adults will eat the eggs and larvae of the same species. How has this been an important adaptive behavior?

They can maintain a lower population and have less competition

2. How would flour beetles come to be in your grocery store or school cafeteria if they do not appear to fly?

As eggs in the flour, corn meal, or other stored food products.

3. Flour beetles thrive in flour or cornmeal with nothing else, that is, no moisture? How is this possible?

They are able to get water through the process of respiration.

4. If an adult female can lay 2-3 eggs a day and lives for 2 to 3 years, what is the highest possible number of eggs she could lay?

3 X 365 = 1095 1095 X 3 =3285

References and Resources

Klein, William J. 1993. **Learning For All Seasons** MB Learning Systems, Sioux City, Iowa 51102

Carolina Biological Supply Company
2700 York Rd.
Burlington, NC 27215-3398
Telephone for Orders: 1-800-334-5551
Fax: 1-800-222-7112
Technical Support: 1-800-227-1150

Wards Natural Science Establishment, Inc.
P.O. Box 92912
Rochester, New York 14692-9012
Customer Service and Ordering Telephone:
1-800-962-2660
Fax Ordering: 1-800-635-8439
Catalog Request Only: 1-800-892-3583

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