Effects of Temperature on Rate of Development of Insects

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Grade levels targeted: Middle school

National Science Foundation requirements addressed by the experiment

This experiment will introduce and further educate students about;

- The life cycle of organisms (insects)
- The interaction between organisms and their environments
- The regulatory influences of the environment on insect life cycles
- Will introduce students to the concept of diversity and adaptation of organisms
- Will enhance students' ability to generate a particular scientific inquiry
- Teach students the ability to observe, analyze and discuss results from a scientific inquiry.

Entomology Literacy Element(s) and Supporting Concept(s) addressed by the experiment

This experiment will teach students the value of insects as research organisms, to answer a particular question; and the value of insects in demonstrating scientific concepts and methods via scientific inquiry.

Observations:

The rate of insect development from eggs to adults is usually related to the temperature of their environment, since they are cold blooded. Some insects develop faster than others in the same environment. Environmental temperatures contribute to the number of generations insects can have, and also influences whether non-native insects will survive in non-native environments. These are important questions for Entomologists.

Question: How does environmental temperature influence the time it takes for an insect to develop from egg to adult?

Hints to form the hypothesis:

Look for and identify insects, at school or at home, that live in various different places. For example, in rotting fruits, on flowers and plants, under rocks or in puddles, in sunlight or in shaded areas. Pay attention to the differences in temperature. Do you think it is warmer or colder than the surrounding? Are there more of the insects in warmer environments than those living in colder ones in your school yard, or backyard at home? Do the insects living in warmer environments seem more active than those in colder environments?

Hypothesis:

For the same type of insect at the same stage of development (egg, or larvae), a higher temperature will speed up development than a lower temperature.

Materials:

-Medium clear plastic cups
-Refrigerator
-Fruits
-Paper plate
-Mesh
-Notebook

The Experiment:

1. Put well ripened soft fruits (bananas, mangoes, plums, etc.,) on a paper plate outside either at home or in school to attract flies to lay eggs

2. Collect fly larvae from rotting fruit and determine what stage of development they are in. Use figure 1.

3. Group larvae together into developmental stages, i.e. group eggs together, group first instars together, second instars together, third instars together, or pupae together.

4. Depending on which stage of development you are assigned, divide the group equally into a treatment group and a control group. Look at figure 1 to decide which stage of development.

5. Put treatment insects into a clear plastic cup, with a piece of rotting fruit in it. Put this cup into a refrigerator with temperature range of 20-25˚C. This is slightly less optimal for normal development, and will not kill the insect.

6. Put control insects into another clear plastic cup, with a piece of rotting fruit in it, but leave the cup outside (either at home or in the backroom of the class).

7. Note the day the experiment started, and keep track of the development of the insects. Change fruit piece once a week till development is complete (by end of the second week).

Results:

Present your results in any preferred format, addressing the following questions;

1. Did all the insects become adults in the treatment group compared to the control group?
2. How long did it take the treatment group to become adults compared to the control group?
3. Is there any difference in size between control flies and treatment flies?
4. What other observations did you make?

Discussion:

Based on the finding and any interesting observations during the experiment, what do you think about the experiment? Does the experiment support or reject your hypothesis? How could the experiment have been better designed and executed to meet the objective of the hypothesis? What sort of experiments would you design to investigate this further?

References:

1. http://entnemdept.ufl.edu/creatures/urban/flies/house_fly.htm
2. http://animals.howstuffworks.com/insects/housefly4.htm

Estimated time for experiment:

Experimental time should be between 1-2weeks. A few days to set up fruits to collect flies and about 1-2 weeks, for complete development of insects.

Estimated cost of experiment: < $30

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Figure 1. Development cycle of houseflies