



Soy Worms

Sally Schempp
Vermillion Middle School
Vermillion, SD

Research Host:

Douglas Martin, Ph.D.
University of South Dakota School of Medicine

1998

Grade Level:

Middle School

Soy Worms

Purpose:

Before a new medicine or food additive is approved for human use we must be sure that it is safe. To do this, scientists experiment with the new product using animals and humans. This research will lead to an understanding of how the product affects the body and if it works as predicted.

Using their knowledge of insects and the scientific method, middle school life science students will determine how a diet that includes soybean products affects the Tenebrio beetle larvae (mealworm). Students will develop skills in observation, experimental design, data analysis, and communication.

Objectives:

Students will be able to:

- develop a question to explore the effects of diet on insects.
- perform an experiment.
- analyze and communicate findings.

Materials: (Students will work in groups of three or four.)

The following materials will be provided by the teacher:

- mealworms – six per group
- aquarium or bucket for mealworms
- magnifiers – one per group
- petri dishes - 9 cm.
- plastic shoe boxes with lids– one per group
- metric rulers– one per group
- soybeans, meal, and flakes
- oatmeal
- bran flakes
- apple or potato pieces

Preparation:

This lab should be preceded by an insect study, preferably of mealworms, Tenebrio beetle larvae. To engage students in their exploration of the effects of a soy diet on mealworms, serve them muffins made with soy flour as an added ingredient and muffins made without soy flour. Do not let on to the students that there is anything different about the muffins.

Ask students to list the possible ingredients, and characteristics of the muffins. Taste, texture, moistness, sweetness could be included in the list. Compare and contrast the muffins' characteristics. Now you can reveal your secret. Describe some of the current research being done on the effects of soy diet on humans, particularly the effects on blood pressure.

Time frame for experiment:

The length of time that this activity will take is determined by the question being explored. The mealworms should be on the new diet for a few days. The behavior can be observed over any length of time. If time is limited, I suggest observing behavior changes during one class period. This way students can observe the control and variable groups at the same time. If change in life cycle is being explored this activity will last for several weeks.

Procedure:

Students will apply what they know about mealworms and the scientific method to design an experiment to explore the effects of a soy diet on their behavior, life cycle, or growth. Only one of these factors should be chosen for the experiment.

The teacher should group students to ensure that the use of stereotypes is avoided. There are several strategies from which to choose what role each student has in the group. . I suggest assigning recorder to the youngest, reporter to the oldest in the group, and so on. Let the students begin their group activity by discovering the birth dates of each member.

Provide students with a variety of foods appropriate for a mealworm diet. A small potato or apple piece is needed for the worms source of water. Provide one Petri dish to house up to three mealworms of the same size. Students should include the food chosen for each group and a small piece of apple or potato.

Each experimental design must be approved by the teacher before carrying out the experiment. The teacher should monitor the groups to ensure proper care and handling of the animals being used. Any misuse or abuse should be stopped and corrected before proceeding.

Safety:

Students should handle the mealworms with care so as not to harm them. Make sure the experimental designs have been approved by the teacher.

Questions to Ask:

1. What other experiments can you suggest?
2. How would the design differ from the one you chose?
3. Would you choose mealworms again?
4. Soybeans?

Where to Go from Here:

Students can experiment with their own soy muffin recipes, choose the best, and share with the class.

References:

1. Kneidel, Sally Stenhouse. (1993). *Creepy Crawlies and the Scientific Method*. Golden, CO: Fulcrum Publishing.
2. McGlathery, Glenn. (1989). *Mealworms in the Classroom, Science and Children*, pp. 29- 31.

3. Matyas, M.L. (July, 1998). *Save the Bran*. Bethesda, MD: American Physiological Society.
4. Williams, Jack, University of South Dakota School of Medicine, Vermillion, SD 57069.
5. American Heart Association: www.amhrt.org
6. United States Soyfoods Directory: www@in.net/soy
7. Carolina Biological Supply, PO Box 6010, Burlington, NC 27216-6010
8. Nasco Science, 901 Janesville Ave., Fort Atkinson, WI 53538
9. South Dakota Soybean Research and Promotion Council, 3801 S. Western Ave., Suite 105, Sioux Falls, SD 57105.

Suggestions for Assessment:

When each group has completed its experiment, the members will prepare a poster report of their experimental procedure. The report must include the question, hypothesis, and description of the procedure. The observations, a chart of the data, and a graph of the results must also be displayed. An in-class poster session will allow the reports to be shared with others in a realistic manner.

A rubric will be used to evaluate the poster and the presentation. Self and peer assessment can be used to evaluate group process.

Soy Worms

Student Activity Sheet

Purpose:

Using your knowledge of insects and the scientific method you will determine how a diet that includes soybeans affects their growth, behavior, or life cycle.

Procedure:

In your group you will design and carry out an experiment to explore the effects of a soy diet on mealworms.

1. Determine the roles of the members in your group following directions from your teacher. Record their names and roles on the worksheet.
2. With others in your group, answer and discuss the following questions: How can you measure changes in a mealworm?
3. How many worms will you need?
4. What will be your control for your experiment?
5. How long will you observe and record data?
6. What kind of graph should you make?
7. How will you decide on a variable?
8. How much food does a mealworm eat?
9. List several hypotheses you might explore. Select one consensus hypothesis and record it on the worksheet.
10. Describe your procedure.
11. List the materials you will need.
12. Obtain teacher approval to proceed. Teacher initials must be visible on worksheet.
13. Your experimental design must include a control and one variable.
14. Once your experiment is approved your group may “do” the experiment.
15. Prepare a poster report of your experiment. Your poster must include the following elements:
 1. Question - clearly stated
 2. Hypothesis - directly related the question
 3. Observations - including drawings, photographs
 4. Data - accurately displayed
 5. Graph - correctly constructed
 6. Conclusion - related to hypothesis
16. What other experiments can you suggest? How would your design differ from the one you chose?

Soy Worms

Group _____
Class _____

Group Worksheet

Name	Role
	Recorder
	Materials Manager
	Reporter
	Monitor

Possible hypotheses:

1. _____
2. _____
3. _____
4. _____

Consensus hypothesis:

Procedure:

Materials:

_____ teacher approval

Soy Worms

Class _____

Group members _____

Soy Worms Poster Rubric

element included in poster	2	1	0
question	clearly stated	unclear	none stated
teacher approval	prior approval	late approval	no approval
hypothesis	related to question	not related	none stated
materials	accurate description	unclear/incomplete	not listed
procedure	clear/complete/logical	incomplete/illogical	not done
observations	descriptions and drawings/photos	descriptions or drawings/photos	none recorded
data	accurate	not accurate	none recorded
graph	correctly constructed	poorly constructed	none present
conclusion	related to hypothesis	not related	none stated
control/variable	valid control	invalid	none
		Total Points:	/20
	Grade	%	