

Insects: Good, Bad or Both?

Learn about a variety of insects while participating in a scavenger hunt in the school garden.

Gardening Connection:

Both beneficial and harmful insects exist in the school garden. Control methods will be found in this activity to suit the needs of the garden.

Time Required:

2 – 50 min
class periods

Grade Level:

Grades 3-12

EDUCATOR NOTE:

Be aware of any students with insect allergies.

OBJECTIVES

Students will be able to:

1. Identify beneficial garden insects
2. Analyze effects of conventional and sustainable pest controls
3. Attract beneficial insects to the school garden

BACKGROUND

Insects are an integral part of every garden. In vegetable gardens, beneficial insects (bees, ladybugs, etc.) benefit the garden by pollinating plants and eating insect pests. Harmful insects (squash bugs, aphids, etc.) may cause damage to crops if left unchecked. As in any balanced ecosystem, beneficial insects can assist in pest management and keep harmful insects in check.

On a larger scale, the department of entomology at NC State University estimates insects consume or destroy around 10% of gross national product in industrialized nations and up to 25% in some developing countries. On the other hand, over 6,000 insect species have been tested and released as biological control agents to fight insects and weeds that we regard as pests. Insects also play essential roles as pollinators and produce beneficial products like honey, silk, and shellac.

This lesson will help to determine the difference between those insects that are deemed harmful and beneficial and ways to encourage beneficial insects and control pests.

MATERIALS

- Laminated insect scavenger hunt sheet for each small group of students (print 2-sided with beneficial insects on one side and pest insects on the other)
- Clip boards (or corrugated cardboard sheet with binder clip and paper)
- Dry erase markers (for writing on laminated sheets) for each group of students
- Journals or paper and pencils for recording observations
- Insect net
- Medium sized glass jars covered with holes in lid and/or mesh fabric
- Small pieces of sponge soaked in water (if keeping insects overnight)

Subjects

Science
Art
Reading

Vocabulary

Biological Control - The control of a pest by the introduction of a natural enemy or predator

Habitat – The natural home or environment of a living organism; consists of food, water, shelter, space

Project Connections

WILD – Improving Wildlife Habitat in the Community
World Travelers
Good Buddies

- Cubed white bread
- Organic Materials: cayenne pepper, vinegar, lemon juice, garlic, marigolds
- Organic insecticide such as insecticidal soap
- Field Guide to Insects such as Insects in Kansas www.entomology.ksu.edu/p.aspx?tabid=419
- Online Field Guide to Insects such as www.enature.com

PROCEDURES

Engage

Provide students with either print copies or access to online field guides to insects (for younger students, consider printing photographs for just a few common insects). Allow a few minutes for them to explore the field guides and become familiar with insects that interest them.

Ask the students to think about what insects you expect to see in the school garden and rank them in the order in which you expect to see the most. Share with a partner. *This can be a chance to define "insect" for younger levels – distinguishing against earthworms, spiders, pill bugs, etc.*

Explore

Divide students into small groups of 3-4. Hand out an insect scavenger hunt sheet, dry erase marker, and pencils for each group. Tell the students that they will be conducting a survey of the insects in the garden. Take students to the garden location for the insect scavenger hunt! For each insect a student sees, the group recorder will place a tally mark next to the picture of that insect. Remind students that there are insects on both sides of the sheet. Encourage the students to observe and take notes on each insect's behavior and sketch if time/interest allows. If a student sees an insect that is not listed on the insect scavenger hunt sheet, these notes and sketches can be used for later identification.

Explain

Ask students to analyze their findings. What observations can you make about the number and types of insects you found in your scavenger hunt? Which insects did we find most frequently? Why do you think this is? Which insects do you think are beneficial to the garden? Why? Which insects might be harmful to the garden? Why? What might this tell us about the health of our garden? What do you think we could do to improve the health of our garden?

Discuss ways we can encourage the beneficial insects to stay and live in our garden (providing habitat, planting nectar source flowers or larval food sources, water sources for puddling, etc.). *See Elaborate section for additional activity.*

In what ways can we decrease the number of harmful insects? What do you think the tradeoff might be for each of these strategies? There are a number of ways we can control the harmful insects in our garden. We need to discover the best way to meet our needs.

Elaborate

Analysis of pest control methods (using scientific method):

Provide as little information as possible in the beginning to make this a more inquiry-based lesson. Ask students if they have heard the term organic, related to fruits or vegetables. Ask students what they think makes a fruit or a vegetable organic. Guide students to understanding that organic fruits and vegetables are those raised without the use of human-made or synthetic processes, including synthetic fertilizers, pesticides, or genetically modified seed. In other words, they are raised only using natural fertilizers or pesticides. Ask students to think about what some of the challenges might be in raising organic fruits and vegetables. Explain to students that one of the biggest challenges is managing pests that consume or

destroy produce. Explain to students that today we're going to test some natural pesticides to see if they might be useful in controlling pests in our garden. Students will choose between a variety of materials, placing the test ingredient on a bread cube and sealing it in the jar full of insects.

Organize Your Materials:

- Gather pest control materials (as many as you would like for your students to be able to test)
 - organic insecticide (safe around your students)
 - cayenne pepper
 - vinegar
 - lemon juice
 - garlic
 - marigolds boiled in water
 - biological controls (lady bugs, lace wings, praying mantis, etc).
- Prepare clean glass jars (or ask students to bring them from home)
- Collect insect pests from the school garden (i.e. squash bugs can be collected by the teacher or by students depending on time available. NOTE: Students might collect those insects they identify as pests when they do their initial scavenger hunt.)
- Place insects (of the same species) in a glass jar & cover with mesh fabric or holed lid, provide one jar of insects for each group of 3-4 students.
- Add small sponge pieces soaked in water to the jars (if housing insects overnight)
- Cube several slices of white bread

Problem: Provide the problem – choose an actual pest problem from school garden. Describe the pest control methods available to the students for testing (lemon juice, cayenne, praying mantis, etc.).

Hypothesis: Divide students into groups, assign each group an organic pest control method and challenge them to write a hypothesis on their own, using “If, Then, Because” statement about how the control method might work and why.

Method: Have students test their hypothesis. Instruct students to write out their methodology. This should include all the materials necessary to conduct their experiment, a control (such as a plain cube of bread).and specific step by step procedures that could be followed by someone else.

Analysis: Record results, students should produce at least one type of chart – students should state how they determine how they know if a result is successful (# of insects on the bread, insect death, avoidance, etc).

Conclusion: What did students learn about pest control?

Application: Have students look at all of the results. Ask students which method they think might work best on a larger scale in the garden? Ask students to identify their rationale for their recommendation. Apply chosen control method to the garden and monitor the results. Complete the scavenger hunt again. Have the tally marks changed?

Example

Problem: Squash Bugs on the School Garden zucchini

Hypothesis: If I use lemon juice, then the squash bugs will avoid the plant, because they do not like the acidity of the juice.

Method: Collect 10 squash bugs. Place the 10 squash bugs in a large plastic bag or container. Soak a zucchini stem (or cube of bread) in lemon juice for two minutes. Have one untreated zucchini stem (or bread cube) as the control. Place the treated and untreated zucchini stem (or bread cubes) as far apart in the bag or plastic container as possible. Observe the squash bugs for 10 minutes, recording observations.

Analysis: Using recorded data, develop a chart or graph of observation results.

Conclusion: Squash bugs are difficult to control organically, however, lemon juice can be used as a temporary avoidance of the pest, but it will not kill the insect.

Evaluate

Cut the insect scavenger hunt sheet into individual insect photograph cards. Ask students to identify as many of the insects as they can, then sort the cards into “beneficial” and “harmful/pest” insects.

Have students repeat the experiments using another group’s hypothesis and method. As a class, discuss the components of sound scientific methods and procedure. Were all groups able to repeat the same experiment using another group’s instructions? Why or why not?

Have students conduct online research to discover a wide variety of pest control methods and create a pro/con list between using traditional chemical pesticides and organic sustainable methods.

Extension Ideas

- Research products produced with aid of insects (honey, silk, shellac, cochineal bugs: food dyes)
- Create separate garden plots – one using commercial pesticides, one using organic methods – evaluate and chart the differences.

Gardening to Attract Beneficial Insects Activity: Students will research methods to attract certain insects like lady bugs to the school garden and then create the necessary habitat. A PowerPoint created by Missouri Extension showcases several native plants, when the plants bloom, and what insects it benefits

(<http://extension.missouri.edu/sare/resources/nativepollinators/nativeplants.pdf>).

Separate students into partners. To showcase the information learned – students will create a habitat for an assigned insect on construction paper. The design should showcase food, water, shelter and space needs for the insect. Designs will be presented to the class. Choose one or two designs to actually implement in the school garden space to attract beneficial insects.

Related Readings:

Insects in Kansas

Published by Kansas Department of Agriculture by Stephan C. White and Glenn A. Salsbury (can be ordered for \$25 by emailing orderpub@lists.oznet.ksu.edu)

Resources:

Top 10 Beneficial Garden Insects

<http://insects.about.com/od/insectpests/tp/top10beneficialinsects.htm>








Insects: A Class of Distinction







<http://www.cals.ncsu.edu/course/ent425/text01/impact1.html>

Alternatives in Pest Control

<http://www.gardenkansas.org/p.aspx?tabid=26>

Insect Scavenger Hunt

Predators	Picture	Tally
<p>Green Lacewing</p> <ul style="list-style-type: none"> - Larva can eat up to 100 aphids and other harmful mites in a week 		
<p>Lady Beetle</p> <ul style="list-style-type: none"> - Feed on aphids and scale insects 		
<p>Assassin Bugs</p> <ul style="list-style-type: none"> - Feed on everything from beetles to caterpillars 		
<p>Praying Mantis</p> <ul style="list-style-type: none"> - Very hungry predators, but won't hesitate to eat good insects too 		
<p>Dragonfly</p> <ul style="list-style-type: none"> - Eat mosquitoes and other small insects like flies, bees, and ants 		
Pollinators	Picture	Tally
<p>Bees</p>		
<p>Butterflies</p>		

Garden Pests	Picture	Tally
<p>White Fly</p> <ul style="list-style-type: none"> - Inject a toxic saliva into the phloem of a plant 		
<p>Aphids</p> <ul style="list-style-type: none"> - Feed on sap in shoots, leaves, buds, flowers 		
<p>Colorado Potato Beetle</p> <ul style="list-style-type: none"> - Feed on potato, tomato, eggplants, strip foliage down to leaf veins 		
<p>Corn Earworm</p> <ul style="list-style-type: none"> - Larva feed on silks of corn, interfering with pollination – also feed on ears and tomatoes 		
<p>Squash Bugs</p> <ul style="list-style-type: none"> - Attack pumpkins and squash family plants – pierce and suck from plant foliage, feed on fruit late in season 		
<p>Scale</p> <ul style="list-style-type: none"> - Suck sap from plants, remove essential nutrients – create a waxy coating for defense 		
<p>Other Insects</p>	<p>Draw Picture</p>	<p>Tally</p>