



UNIT 5: FOOD SAFETY

Controlling Pests and Disease

Grade level: Upper elementary

Student Learning Objectives

By the end of this lesson, students will be able to:

1. Define *pesticide* and *herbicide* (crop protection chemicals).
2. Define *integrated pest management* and give examples.
3. Discuss how farmers balance risks and benefits in using herbicides and pesticides.

Time: 50 minutes

Tools, Equipment, and Supplies: Copies of Activity Sheet 17:1

Key Term(s): Pesticide
Herbicide
Integrated pest management (IPM)

Background Information

Since the beginning of agriculture, farmers have known they needed to enrich the soil and kill various insect pests. Since prehistoric times, wood ash and manure were used as fertilizers. Materials including arsenic, pyrethrum and other natural poisons were used to kill insects for centuries.

The dramatic increase in food grown per acre is a result of farmers' ability to control pests and diseases. But there are risks associated with the use of crop-protection chemicals, including damage to beneficial insects and wildlife.

Without **pesticides**, 25 to 30 percent of all crops and livestock would be lost and the cost of food would raise 50 to 70 percent. Eliminating all agricultural chemicals would mean a 40-percent decrease in the world food supply.

In the United States, crop-protection chemicals are carefully regulated. The average crop protection chemical is researched and tested nine years before it can be marketed. The Environmental Protection Agency (EPA) determines the greatest amount of residue that can be consumed safely and then sets a limit 100 to 1,000 times less than this amount. Since crop-protection chemicals are expensive and potent, farmers don't use any more than necessary.



NOTES

Many farmers today apply *integrated pest management*, which is a combination of techniques. It can include the use of natural predators. For example, scientists have learned that a species of harmless ladybug will eat aphids that destroy potato crops and can also make changes in field conditions. Farmers also use biological controls to prevent insects from reproducing. Scientists are always at work developing pest-resistant crop varieties. For example, rotating the crops can reduce or prevent a long-term buildup of certain pests.

Farmers who use *integrated pest management* closely monitor pest levels in their fields. They use chemical *pesticides* only when necessary. In this way, they can reduce the potential for harmful effects of *pesticides*.

Interest Approach

Food is the topic for today! Here is an easy question for you. Who grows food?

Answer: Farmers, producers, etc.

Good! Here is a question that might not be as easy. When farmers grow food, what is usually one of the biggest problems they run into?

Solicit answers from several class members. Answers could include many things (rain, no rain, pests, deer, etc.). Comment positively on each.

Our answers to our second question were correct, but today let's discuss one of those major food production problems you mentioned. It is a problem that we can actually do something about. The major problem we will discuss is controlling pests and diseases. Let's find out what the problem is, what can be done to help and how it relates to food safety.

OBJECTIVE 1: Define pesticide and herbicide (crop protection chemicals).

Just as we discussed, growing food is not easy. Sometimes rain doesn't come and the crops die. Sometimes too much rain comes and the seeds wash away. Hail can destroy a crop. So can drought. What stories do you remember from books or television (*for example, the Little House on the Prairie books*) or stories from your own families about crops that were destroyed by insects or other natural disasters?

Call on some students if they wish to share. Be prepared with some stories of your own in case they can't think of any.

Some of the biggest threats to crops are insects, plant diseases and weeds. Farmers have been fighting them forever. Since people began to plant food as crops, producers have known they needed to enrich the soil and kill various insect pests. Even in prehistoric times, wood ash and manure were used as fertilizers. Materials including arsenic, pyrethrum and other natural poisons



NOTES

were used to kill insects for centuries. Does your family have a garden?

Have insects ever eaten what they were growing in the garden? Have weeds ever choked out a crop they had planted and hoped to eat?

Provide time for students to respond to each question. Comment positively on their responses.

In the 1950s, scientists developed chemicals to fight these problems.

***Herbicides** were created to control weeds.*

***Pesticides** control insects/bugs that eat crops.*

The use of these chemicals, along with fertilizers, dramatically increased the amount of food produced by farmers. It dramatically decreased the amount of crops lost to disease and pests. However, excessive use of chemicals has proven to be dangerous for the environment and foods we consume.

Use a Go with the Flow e-Moment® to show the reasons and need for herbicides and pesticides. Be sure to show a sample flowchart and explain each shape's meaning prior to the moment.

OBJECTIVE 2: Define integrated pest management and give examples.

Excellent job of representing the reasons and need for **herbicides** and **pesticides** with our diagrams. Our "Go with the Flow" diagrams indicate that **herbicides** and **pesticides** were an excellent solutions to farmers' crop production problems. And they were, but agriculturalists still wanted to improve. Let's see how.

Scientists and farmers soon realized that there could be problems with using too many crop-protection chemicals. Sometimes, these chemicals can run off the fields into streams and lakes. Now, farmers balance the risks and benefits of using crop-protection chemicals.

Scientists have now developed many new ways of controlling pests and disease. One new way is called **integrated pest management (IPM)**. IPM, as it is called, is a combination of techniques. It can include the use of natural predators. For example, scientists have learned that a species of harmless ladybugs will eat aphids that destroy potato crops. Farmers also use biological controls, preventing insects from reproducing. Scientists are always at work developing pest-resistant crop varieties. Farmers can also make changes in field conditions. For example, rotating the crops can reduce or prevent a long-term buildup of certain pests.



NOTES

Farmers who use **integrated pest management** closely monitor pest levels in their fields. They use chemical **pesticides** only when necessary. In this way, they can reduce the potential for harmful effects of crop-protection chemicals.

Today, some farmers are farming organically. They are not using chemicals, and their fertilizers consist only of materials that come from animals (manure) and vegetables (compost).

Expand upon the "Go with the Flow" diagrams by incorporating IPM into the diagram.

OBJECTIVE 3: Discuss how farmers balance risks and benefits in using herbicides and pesticides.

Now that we have a handle on **pesticides**, **herbicides**, and even integrated pest management, let's examine the risks and benefits associated with each of these new agricultural techniques.

Hand out the Activity Sheet 17:1, "Risks vs. Benefits." Ask students to define risks and benefits.

Every action we take has both risks and benefits. Take a look at Activity Sheet 17:1 titled Risk vs. Benefits and decide if each statement is a risk or a benefit. When I say GO, read each statement slowly and provide an answer. Okay. 3...2...1...GO!

Have the students complete the Activity Sheet to decide if each statement is a risk or a benefit. Key to Activity Sheet:

1. benefit
2. risk
3. benefit
4. benefit
5. benefit
6. risk
7. benefit
8. benefit
9. risk

Let's discuss our answers.

Discuss the overall risks and benefits of agricultural chemical use. Discuss the overall risks and benefits of other actions, like riding in a car, riding in a car without a safety belt, skateboarding, smoking, eating a diet that is high in fat.



NOTES

SUMMARY/REVIEW

We did such an awesome job! Great job today! Remember that there are always two sides of the story. Many times people are scared by the thought of **pesticides** and **herbicides**, but the benefits far outweigh the risk. Share what we learned today with at least two other people when you leave class today and be prepared for a brief quiz on what we learned the next time we meet.

REFLECTIVE REVIEW QUESTIONS:

- How might the use of pesticides and herbicides relate to food safety?
- Describe integrated pest management in your own words.
- What are some natural materials that were originally used for fertilizing plants?

APPLICATION

APPLICATION 1: Have students develop a list of foods that are available organically, or grown without the use of any herbicide or pesticide. Then have students compare the organic foods to the foods grown with the help of pesticides and herbicides. Share your findings.



ACTIVITY SHEET 17:1

Name: _____

NOTES

Risk vs. Benefits

The use of agricultural crop-protection chemicals has both risks and benefits. Determine whether each statement represents a risk or a benefit. Write your answer on the line.

- _____ 1. More food can be produced using agricultural crop-protection chemicals.
- _____ 2. Farmers may become ill if they apply agricultural chemicals improperly.
- _____ 3. Agricultural chemicals destroy disease-carrying insects.
- _____ 4. Federal, state and local governments strictly regulate the use of crop-protection chemicals.
- _____ 5. Excessive use of agricultural chemicals may cause runoff into rivers, ponds and lakes, harming fish and other wildlife.
- _____ 6. If the wind blows agricultural chemicals onto other kinds of plants, those plants may be harmed.
- _____ 7. Crop-protection chemicals might lower crop-production costs for farmers.
- _____ 8. Crop-protection chemicals help the United States have the most abundant supply of safe food in the world.
- _____ 9. Excessive use of chemicals can leave residue on fresh fruits and vegetables.