

Fruit and Vegetable Production

Lesson 4: Integrated Pest Management

Competency/Objective

Explain management practices for pest control.

Study Questions

1. What are the basic considerations of pest control?
2. What are biological pest management methods?
3. What are chemical pest management methods?
4. What are cultural pest management methods?
5. What are physical and mechanical pest management methods?
6. What is integrated pest management?

References and Materials

1. *Fruit and Vegetable Production Unit for Plant Science Core Curriculum* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2006.
2. Figures/Transparency Masters
 - Fig. 4.1 Pesticides for Specific Pests
 - Fig. 4.2 Steps of Integrated Pest Management
3. Activity Sheet
 - AS 4.1 Designing an IPM Strategy

Teaching Procedures

A. Review

Lesson three discussed evaluating a site. The same factors that make a site desirable for planting a crop—fertile soil, adequate moisture, and a hospitable climate—also make it susceptible to many pests and diseases. To have a profitable yield and a healthy crop, producers must have a system of preventing pest infestation and protecting crops. This lesson covers systems of pest management.

B. Motivation

Show students a plant that has been damaged by pests. Have students discuss possible pest problems the plant might have and ways to prevent and treat the problems. Keep the plant for section F. Other Activity and discuss it again after students have completed the lesson.

C. Assignment

D. Supervised Study

Lead students in collecting the information needed to answer and discuss the study questions. The instructor may choose to work on one study question at a time or have students consider all the study questions before the discussion. Another option is to have students work in a cooperative learning environment by forming groups and assigning different study questions to each group.

E. Discussion

Lead students in a discussion of the study questions. Supplement students' responses and information with additional materials when needed.

1. What are the basic considerations of pest control?

Introduce the topic of pest control and ask students to give examples of pest control strategies. Could a plant or insect be a pest in one situation and not in another?

- a. Pests are plants, animals, or other organisms that occur where they are not wanted or where they can cause damage.

- b. A pest control program should do the following:
 - i. Protect crops from pests
 - ii. Increase plant resistance to pests
 - iii. Reduce or eliminate pest populations
- c. There are four basic methods of pest control:
 - i. Biological
 - ii. Chemical
 - iii. Cultural
 - iv. Physical and mechanical

2. What are biological pest management methods?

- a. Biological pest management is the use of living organisms to control pests. Examples include the following:
 - i. Trap plants used to lure pests from crops
 - ii. Natural predators and parasites used to reduce pests
- b. Biological pest management is usually done in one or more of three ways:
 - i. Conserving or encouraging species in the area that control the pests
 - ii. Supplementing existing predator populations with additional members of the same species
 - iii. Introducing new species to the environment specifically to control pests
- c. Biological methods tend to take longer than other management methods and do not completely eliminate pests.

3. What are chemical pest management methods?

Refer to Figure 4.1 Pesticides for Specific Pests.

- a. Chemical pest management is the use of chemicals to protect and treat plants and to repel or destroy pests.
- b. Pesticides are the most common form of chemical pest management.
- c. Pesticides can be a very useful tool in managing pest populations, but they do pose potential risks.
 - i. Can present health risks to humans
 - ii. Can cause damage to the environment
- d. Pesticide use is monitored and regulated by various agencies, including the U. S. Environmental Protection Agency, which evaluates new pesticides and reviews old ones to determine that they can be used safely.
- e. Growers should follow all directions and regulations regarding the proper use, handling, and storage of any pesticides they use.
- f. Pests can develop resistance to chemicals over time, so using pesticides alone should not be the only method for treating pests.

- g. Pesticides should be used only when necessary and at the lowest rate of application that will effectively control the pests. This is done for the following reasons:
 - i. Reduce expense
 - ii. Help prevent pests from becoming resistant
 - iii. Lower health and environmental risks

4. What are cultural pest management methods?

- a. Cultural pest management is controlling pests through the use of proper planting and growing techniques.
- b. Cultural pest management works by optimizing conditions for crops while minimizing opportunities for pests.
- c. Cultural management strategies have the advantage that many of them can be implemented before pests appear.
- d. Examples of cultural pest management practices include the following:
 - i. Choosing crop varieties suited to the area
 - ii. Planting crops to optimize growing conditions and reduce plant stress
 - iii. Providing adequate water and nutrients so plants resist disease and pests and outgrow weeds
 - iv. Rotating crops
 - v. Disposing of plant residue
 - vi. Planting and harvesting to avoid coinciding with pests

5. What are physical and mechanical pest management methods?

- a. Physical and mechanical pest management strategies use physical barriers and labor to prevent or limit pest damage. Examples of barriers and techniques include the following:
 - i. Fencing
 - ii. Traps
 - iii. Row covers
 - iv. Trenches
 - v. Mowing
 - vi. Plowing
 - vii. Hand-picking insects off plants
 - viii. Holding produce in cold storage to kill pests or slow or stop their development
- b. Some physical and mechanical strategies, such as removing insects by hand, can require too much time and labor to be practical for larger operations.
- c. The size of the operation and the availability of a labor force should be considered before using physical and mechanical management strategies.

6. What is integrated pest management?

Refer to Figure 4.2 Steps of Integrated Pest Management.

- a. Integrated pest management (IPM) combines biological, chemical, cultural, and physical and mechanical strategies into a comprehensive system of pest control.
- b. Integrated pest management programs have the following goals:
 - i. Limit pests to acceptable levels
 - ii. Promote healthy crops and good land management
 - iii. Reduce reliance on pesticides
 - iv. Promote long-term management strategies
 - v. Improve health and safety for farm workers and consumers
 - vi. Limit damage to the environment
- c. Integrated pest management plans don't try to eliminate all pests—small pest populations are left to support predators and parasites utilized for biological control.
- d. The key to IPM is knowing the action threshold (also called the economic threshold)—the point at which the cost of damage is greater than the cost of controlling the pests.
- e. There are a number of factors that should be considered when determining the action threshold:
 - i. Level of damage and infestation
 - ii. Market price
 - iii. Stage of crop growth
 - iv. Cost of pesticides
- f. A successful IPM strategy requires a thorough understanding of the following factors:
 - i. Crops to be grown
 - ii. Potential pests and their enemies
 - iii. Surrounding environment
 - iv. How these elements interact
- g. Monitoring the site for pest activity is critical for the IPM strategy to succeed.
- h. By utilizing a variety of control methods, IPM reduces the likelihood that pests will adapt to one particular strategy.

F. Other Activities

Revisit the motivation activity in which students examined a plant damaged by pests. Have students separate into small groups and discuss ways to prevent or treat the problem using an integrated pest management strategy. Have the groups present their strategies to the class.

Fruit and Vegetable Production

G. Conclusion

Protecting crops from pest damage is an essential part of raising a healthy, productive crop. The four types of pest management are biological, chemical, cultural, and physical and mechanical. Integrated pest management incorporates techniques from all four strategies into a comprehensive system of pest control.

H. Answers to Activity Sheet

AS 4.1 Designing an IPM Strategy

Answers will vary.

I. Answers to Assessment

1. Biological pest management is the use of living organisms to control pests.
2. Students should list four of the following answers.
 - A. Fencing
 - B. Traps
 - C. Row covers
 - D. Trenches
 - E. Mowing
 - F. Plowing
 - G. Hand-picking insects off plants
 - H. Holding produce in cold storage to kill pests or slow or stop their development
3. Integrated pest management (IPM) combines biological, chemical, cultural, and physical and mechanical strategies into a comprehensive system of pest control.
4. Students should list three of the following answers.
 - A. Limit pests to acceptable levels
 - B. Promote healthy crops and good land management
 - C. Reduce reliance on pesticides
 - D. Promote long-term management strategies
 - E. Improve health and safety for farm workers and consumers
 - F. Limit damage to the environment
5. Students should list three of the following answers.
 - A. Level of damage and infestation
 - B. Market price
 - C. Stage of crop growth
 - D. Cost of pesticides

Fruit and Vegetable Production

5. Identify three factors to consider when determining the action threshold in an integrated pest management strategy.

A.

B.

C.

Figure 4.1

Pesticides for Specific Pests

Type of Pesticide	Pests Treated
Bactericide	Bacteria
Fungicide	Fungi
Herbicide	Plants
Insecticide	Insects
Miticide	Mites, ticks
Molluscide	Snails, slugs
Nematicide	Nematodes

Figure 4.2

Steps of Integrated Pest Management

Six Steps of IPM
1. Implement preventive strategies.
2. Scout plants for symptoms or presence of pests.
3. Identify pests and scope of damage.
4. Determine when action must be taken.
5. Implement management strategies.
6. Evaluate results.

Unit I: Fruit and Vegetable Production

AS 4.1

Lesson 4: Integrated Pest Management

Name: _____

Designing an IPM Strategy

Objective: Design an IPM strategy for a garden.

Directions: Work in small groups to create an integrated pest management strategy for a 10 ft x 10 ft tomato garden using all four methods of pest control: biological, chemical, cultural, and physical and mechanical. Use Table 4.2 Steps of Integrated Pest Management in lesson four to guide your plan. Choose one of the 10 pests below to help focus your plan.

- Birds
- Cutworms
- Flea beetles
- Hornworms
- Leaf miners
- Spider mites
- Stalk borers
- Stink bugs
- Tomato fruit worms
- Turtles

