

Unit D: Controlling Pests and Diseases in the Orchard

Lesson 1: Managing and Controlling Pests of Fruit and Nut Crops

Student Learning Objectives: Instruction in this lesson should result in students achieving the following objectives:

1. Explain integrated pest management.
2. Explain best management practices.
3. Identify the basic elements of an integrated pest management program.

Recommended Teaching Time: 1 hour

Recommended Resources: The following resources may be useful in teaching this lesson:

- A PowerPoint has also been developed with use with this lesson plan

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint Slides
Transparency Masters
Copies of Student Worksheets
Jars or bags to hold insects (optional)

Terms: The following terms are presented in this lesson (shown in bold italics and on PowerPoint Slide #2):

Action threshold
Best management practices (BMPs)
Economic or aesthetic injury level
Integrated pest management (IPM)
Scouting

Interest Approach: Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Have the students form into small groups of 2-3 and ask them the question, “What are some ways we can control insects in the orchard?” Give them about 5 minutes to create their list. Once they are done have each group share their list with the class. Write the responses on the chalkboard or overhead projector.

**** Use this activity to lead into the content.**

Summary of Content and Teaching Strategies

Objective 1: Explain integrated pest management.

(PowerPoint Slide #3)

I. **Integrated pest management (IPM)** is a pest management strategy that uses a combination of best management practices (BMP) to reduce pest damage with the least disruption to the environment.

A. Studies have shown that no single control measure works consistently over a long period of time.

1. A reason for this is that pests can develop resistance to certain control measures.

(PowerPoint Slide #4)

B. The goal of IPM is to keep pest populations below the **economic** or **aesthetic injury level**, the point at which plant losses due to the pests are equal to the cost of control.

1. IPM provides protection against hazards to humans, domestic animals, plants and the environment.

2. This optimizes pest control within the constraints of economic, social, and environmental conditions.

(PowerPoint Slide #5)

C. IPM is an ecologically based pest control strategy that includes natural factors, such as natural enemies and weather, to assist in controlling pest populations.

1. Control strategies that disrupt these factors as little as possible are used in this strategy.

(PowerPoint Slide #6)

2. There are two basic phases of integrated pest management.

a. Phase One involves pest identification, monitoring, and action thresholds.

i. **Action threshold** is the predetermined level at which pest control is needed.

b. Phase Two is to evaluate all possible control measures.

i. If the action threshold is met, control options are evaluated and an option is selected and implemented. Possible control options may include:

1. Chemical
2. Biological
3. Mechanical

Use TM: D1-1 to review IPM and discuss its benefits to an orchard.

Objective 2: Explain best management practices.

(PowerPoint Slide #7)

II. **Best management practices (BMPs)** are those practices that combine scientific research with practical knowledge to optimize yields and increase crop quality while maintaining environmental integrity. Through the use of BMPs, pest management can coexist in harmony with a natural setting.

(PowerPoint Slide #8)

A. Best management practices can effectively eliminate the risk of unwanted materials reaching environmentally sensitive areas. The following is a list of some BMPs used in horticulture situations.

1. Management of surface and subsurface water runoff
 - a. Erosion control
 - i. Reducing erosion into nearby water sources will improve water quality for everybody.

(PowerPoint Slide #9)

- b. Cultural control of pests
 - i. Reducing the amount of pesticides used will reduce environmental issues.
- c. Soil testing
 - i. Testing the soil will reveal exactly how much of each fertilizer is needed thereby reducing excess usage.
 - ii. This will reduce water pollution and save money.

(PowerPoint Slide #10)

- d. Timing and placement of fertilizers
 - i. If fertilizers are placed on the crop just before a rainy season most of the fertilizer will wash off.
 - ii. Fertilizer placed on a slope will wash off easily.
- e. Controlled release fertilizers
 - i. These fertilizers release nutrients in small amounts over a longer period of time so the plants can absorb the nutrients without excess runoff.
- f. Irrigation management
 - i. Using water wisely will improve water quality and ensure everybody has water to use.

(PowerPoint Slide #11)

- g. Biological control of pests
 - i. Using natural enemies of pests will keep the ecosystem in balance and reduce pollution from chemicals
- h. Pesticide selection
 - i. Choosing the proper pesticide will be more effective and save money.
- i. Correct pesticide use
 - i. Improper pesticide use will have negative consequences on the environment and can even be deadly to the grower.

After discussing points (a.) through (i.) ask the class if they can think of any examples of these situations from around their homes, farms, or orchards. Discuss Best Management Practices that improve fruit and nut orchards.

Objective 3: Identify the basic elements of an integrated pest management program.

(PowerPoint Slide #12)

- III. Certain pests commonly cause major damage in any production system.
- A. It is very important to correctly identify the pest and understand its life cycle.
 - B. Individuals must monitor plants regularly to determine current levels of pest activity, know as **scouting**.
 - C. Scouts check to identify the presence of a pest, the stage of development, and the amount of damage done.

(PowerPoint Slide #13)

- D. Basic elements of an integrated pest management (IPM) program include:
- 1. People—system devisers and pest managers
 - 2. Knowledge and information needed to devise the system and make sound decisions
 - 3. Program for monitoring the ecosystem elements
 - 4. Pest densities at which control methods are put into action
 - 5. Techniques used to manipulate pest populations
 - 6. Agents and materials

Have students complete worksheet WS: D1-1 “IPM Scenarios”. This worksheet can be completed individually or in small groups. After the students have completed the worksheet, discuss it as a class and review any topics the students do not understand.

Review/Summary: Use the student learning objectives to summarize the lesson. Have the students explain the response to the anticipated problem of each objective. Student responses can be used to determine which objectives need to be reviewed. Questions on **PowerPoint Slide #14** can be used as review.

Application: Have students go outside and search for insects around the school. Have them note where they found the insects (under a rock, on a specific plant, time of day, etc). Provide them with jars or bags to keep the insects in for the next lesson which will focus on common fruit and nut insect pests. Alternately, if you do not want the students to hold the insects in jars or bags, they can draw the insects in detail and color them.

Evaluation: Evaluation should focus on student achievement of this lesson’s objectives. A sample written test is attached.

Answers to Sample Test:

Matching

1. e
2. c
3. d
4. b
5. a

Short Answer

1. Chemical- pesticides
Mechanical- hoeing or cultivating
Biological- natural predatory pests

Sample Test

Name _____

Test

Unit D Lesson 1: Managing and Controlling Pests of Fruit and Nut Crops

Part One: Matching

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|---------------------------------------|-------------------------------------|
| a. Integrated pest management (IPM) | d. Best management practices (BMPs) |
| b. Economic or aesthetic injury level | e. Scouting |
| c. Action threshold | |

- _____ 1. Regularly checking plants to determine current levels of pest activity.
- _____ 2. Predetermined level at which pest control is needed.
- _____ 3. Practices that combine scientific research with practical knowledge to optimize yields and increase crop quality while maintaining environmental integrity.
- _____ 4. Point at which plant losses due to pests are equal to the cost of control
- _____ 5. Pest management strategy that uses a combination of best management practices to reduce pest damage with the least disruption to the environment.

Part Two: Short Answer

Instructions. Provide information to answer the following questions.

1. Provide an example for each of the control methods of IPM.

Chemical

Biological

Mechanical

IPM Scenarios

Instructions: Read the following scenarios and provide a short answer to the question.

1. A local fruit grower is establishing a new orchard. The land he chose is moderately sloped with sandy soil and is somewhat unfertile. Close to the chosen location is some flatter land with gentle slopes. The grower conducted a soil test and learned he needs to add a large quantity of fertilizer. He did not take the time to weigh the fertilizer being applied and put on too much. When he planted the trees, they were planted in a straight line up the hill and he did not plant a groundcover.
 - A. Did this grower choose the best land? Why or why not?
 - B. What should he have done when applying the fertilizer?
 - C. What is going to happen to the soil on the hill in a heavy rain? What can he do to prevent this?

2. A grower is scouting his orchard and notices some damage to the fruits and leaves in a small section of the orchard. On closer inspection he discovers a number of insects feeding on the trees. He purchased two different insecticides and sprayed both of them throughout the entire orchard. Close to the orchard is a stream that flows to a nearby village.
 - A. What should the grower have done differently when applying the fertilizers to his orchard?
 - B. Will the nearby stream be affected if the grower applied too much insecticide?

WS: D1-1: Answer Key

1. A local fruit grower is establishing a new orchard. The land he chose is moderately sloped with sandy soil and is somewhat unfertile. Close to the chosen location is some flatter land with gentle slopes. The grower conducted a soil test and learned he needs to add a large quantity of fertilizer. He did not take the time to weigh the fertilizer being applied and put on too much. When he planted the trees, they were planted in a straight line up the hill and he did not plant a groundcover.

A. Did this grower choose the best land? Why or why not?

No. He should have chose the land that was flatter. Choosing land on the slope will cause more runoff of chemicals used and also erosion.

B. What should he have done when applying the fertilizer?

He should have weighed the fertilizer and used the correct type. Because the orchard is on a slope, the excess fertilizer will runoff before the plants are able to use it. This fertilizer will then seep into the groundwater.

C. What is going to happen to the soil on the hill in a heavy rain? What can he do to prevent this?

When a heavy rain comes, the soil will erode. He can prevent this by staggering the tree plantings instead of planting them in straight lines. He can also plant a groundcover like grass to hold the soil in place.

2. A grower is scouting his orchard and notices some damage to the fruits and leaves in a small section of the orchard. On closer inspection he discovers a number of insects feeding on the trees. He purchased two different insecticides and sprayed both of them throughout the entire orchard. Close to the orchard is a stream that flows to a nearby village.

A. What should the grower have done differently when applying the insecticides to his orchard?

Firstly, he probably didn't need both insecticides. If he did he should have consulted the directions on the container to see if they two were compatible. Secondly, he should have checked the rate at which he was spraying the insecticide. Applying too much insecticide will only cause the excess to run off the plant.

B. Will the nearby stream be affected if the grower applied to much insecticide?

Depending on the type and amount of insecticide applied, there could be possible negative consequences to the stream. Since the stream flows to a village the insecticide will end up in the water used by the village and cause sickness.

Optimal IPM

