GREENHOUSE OPERATION AND MANAGEMENT Unit VI: Plant Health

Lesson 2: Pest Control

Competency/Objective:

Differentiate between various pest management methods.

Study Questions

- 1. How can greenhouse owners protect plants from pests?
- 2. What are biological pest management methods?
- 3. What are chemical pest management methods?
- 4. What are cultural pest management methods?
- 5. What are mechanical pest management methods?
- 6. What is an integrated pest management (IPM) system?

References/Supplies/Materials

- 1. *Greenhouse Operation and Management* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 2002.
- 2. Activity Sheets

AS 6.3 Applied Pest Management AS 6.4 Integrated Pest Management

- 3. "Pest Management and Identification." University of California-Davis. http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html
- 4. UC IPM Online. <http://www.ipm.ucdavis.edu/>

TEACHING PROCEDURES

A. Review

In the previous lesson, students identified common pests and diseases in the greenhouse setting. This lesson introduces five pest management programs: biological, chemical, cultural, mechanical, and

integrated. Pest control programs aim to protect plants from pests and to promote plants' resistance to pests.

B. Motivation

Have students relate how they control pests that attack their gardens or crops. Are some methods better than others? What are unique features of various pest control techniques? The greenhouse owner has options in managing or removing pests and diseases that directly relate to the financial well-being of the operation.

- C. Assignment of Study Questions
- 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 answer all the study questions before the discussion. Another option is to have students work in a cooperative learning environment and have groups work on different study question.

E. Discussion

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

1. How can greenhouse owners protect plants from pests?

As the class reviews the principles of basic pest control, ask students to consider which of the four control measures are proactive. If someone wants to grow organic greenhouse crops, what are the best methods?

- A. Basic pest control principles
 - 1. Preventing pest introduction
 - 2. Reducing or eliminating pest population
 - 3. Protecting plant from pests already present
 - 4. Increasing plant resistance to pests
- B. Basic methods of control
 - 1. Biological
 - 2. Chemical
 - 3. Cultural
 - 4. Mechanical

2. What are biological pest management methods?

Predators, parasites, and pathogens can naturally control pests in a greenhouse. This process of management is environmentally sound but has its drawbacks. Biological control is best used when the pest population is small.

A. Controlling pests by introducing living organisms that are predators of pests

B. Examples:

- 1. Releasing ladybugs to control certain insect pests
- 2. Introducing the bacterium Bacillus thuringinensis to kill certain worms
- 3. Planting trap plants to lure pests away from cultivated plants

3. What are chemical pest management methods?

Chemicals are a quick and cost-effective way to eradicate pests. But pesticides can be hazardous to humans when they apply the chemicals, to greenhouse workers after application, and to the environment during disposal. In addition, some pests build up tolerance and become resistant to the product.

- A. Chemicals are used for various reasons.
 - 1. Protect plants from pests
 - 2. Treat plants affected by pests
 - 3. Destroy pests
- B. Pesticides are the most commonly used pest management chemicals.
 - 1. Pesticides that kill unwanted plants herbicides
 - 2. Pesticides that kill unwanted, nonplant pests
 - a. Acaricide (spiders and ticks)
 - b. Aviacides (birds)
 - c. Bactericide (bacteria)
 - d. Fungicides (fungi)
 - e. Insecticides (insects)
 - f. Miticides (mites, ticks)
 - g. Molluscides (snails, slugs)
 - h. Nematicides (nematodes)
- C. Chemicals used to control pests can be deadly and must be used with extreme caution.

4. What are cultural pest management methods?

Cultural pest management refers to controlling pests through cultivation.

- A. Using various greenhouse management techniques to control pests
- B. Examples:
 - 1. Mulching and pruning plants
 - 2. Pasteurizing growing media
 - 3. Purchasing quality seeds
 - 4. Using disease-resistant varieties of seeds

5. What are mechanical pest management methods?

Time-consuming and labor intensive, mechanical pest management is not practical for large operations. But a significant advantage is that it has a minimal impact on the environment because no chemicals are used. Have students complete AS 6.3.

- A. Using physical means of preventing, removing, or destroying pests
- B. Examples:
 - 1. Weeding and mulching
 - 2. Handpicking large bugs from plants
 - 3. Hanging flytraps
 - 4. Maintaining sanitation

6. What is an integrated pest management (IPM) system?

Ask students to infer what "integrated" pest management entails. Lead students to the discovery that IPM is a complex system that requires planning, monitoring, acting, and evaluating. Ask students to complete AS 6.4.

- A. IPM is a comprehensive approach, using a combination of methods.
 - 1. Biological
 - 2. Chemical
 - 3. Cultural
 - 4. Mechanical
- B. IPM is an integrated system whose goals are to reduce the following:
 - 1. Number and impact of pests (not necessarily to eradicate all of them)
 - 2. Economic loss due to pests
 - 3. Reliance on pesticides
 - 4. Safety hazards to humans, animals, plants, and the environment
- C. IPM requires decision making and planning.
 - 1. Knowledge of pests' life cycle, mouth types, and other characteristics
 - 2. Identification of pests that damage plants and the plants' symptoms
 - 3. Establish level of damage that is unacceptable
 - 4. Implementation of IPM strategies
 - 5. Early detection
 - 6. Safe eradication measures
 - 7. Monitoring
 - 8. Evaluation
- D. IPM incorporates best management practices (BMPs).
 - 1. Combine scientific methods and practical knowledge
 - 2. Maintain cost-efficient operation and crop quality while protecting environment
 - 3. BMP practices that control pests
 - a. Test growing media
 - b. Determine correct time and application of fertilizers
 - c. Ensure proper drainage
 - d. Manage irrigation systems

- e. Use controlled-release fertilizers
- f. Use natural (biological) pest controls
- g. Use cultural pest controls

F. Other Activities and Strategies

- 1. Show the class the following videos, which are available from CATER (Career & Technical Education Resources), 2 London Hall, University of Missouri-Columbia: *Integrated Pest Management* (AG V109) and *Integrated Pest Management in Greenhouses* (AG V111).
- 2. Invite a representative from the local university Extension office to discuss IPM.
- G. Conclusion

There are numerous pests and diseases in greenhouses. Environmental factors make the greenhouse susceptible to the pests. Different methods of managing pests are available to the greenhouse owner.

H. Answers to Activity Sheets

AS 6.3 Applied Pest Management

Instructor's discretion

AS 6.4 Integrated Pest Management

Instructor's discretion

- I. Answers to Assessment
 - 1. C
 - 2. D
 - 3. A
 - 4. B
 - 5. A. Prevent pest introduction
 - B. Reduce pest population
 - C. Protect plants from pests
 - D. Increase plant resistance to pests
 - 6. A. Reduce pests
 - B. Reduce economic loss
 - C. Reduce reliance on pesticides
 - D. Reduce safety hazards
 - 7. Any four of the following:
 - A. Knowledge of pest biology
 - B. Identification of plant symptoms
 - C. Establishing level of damage that is not acceptable
 - D. Implementation of IPM strategies begins

- E. Early detection F. Safe eradication
- G. Monitoring H. Evaluation

UNIT VI: PLANT HEALTH

Lesson 2: Pest Control

Name	
Date	

ASSESSMENT

Match the pesticide management method on the left with its definition on the right. Write the letter in the space provided.

1. Chemical	A. Physical elimination of pests	
2. Cultural	B. Use living organisms to eliminate pests	
3. Mechanical	C. Use organic and inorganic compounds to eliminate pests	
4. Biological	D. Use greenhouse cultivation techniques to eliminate pests	

Short-Answer Questions: Write the answers in the space provided.

What are the four principles of pest control?
A.
В.
C.
D.
What are the four goals of integrated pest management (IPM)?
A.
В.
C.
D.

- 7. What are four examples of decision making and planning that are necessary for a good IPM plan?
 - A.
 - B.
 - C.
 - D.

UNIT VI: PLANT HEALTH

AS 6.3

Lesson 2: Pest Control

Name_____

Applied Pest Management

Objective: Design a pest management system.

Directions: Choose <u>one</u> of the following pest management systems - biological, chemical, cultural, or mechanical - and <u>one</u> type of greenhouse crop - floriculture, olericulture, ornamental, or organic. Create a method of controlling greenhouse pests. Be as specific as possible. Work in small groups and present results to the class. Note: Chemical management of an organic greenhouse is not a valid choice.

Pest Management System		Сгор
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1. How does this pest management system effectively treat the selected crop?

- 2. Why did you select this management system?
- 3. Are there any disadvantages to using this system?
- 4. What steps are advocated in implementing this pest management system?
- 5. What types of pests threaten your selected crop most frequently?

UNIT VI: PLANT HEALTH

Lesson 2: Pest Control

Name_____

AS 6.4

Integrated Pest Management

Objective: Devise an integrated pest management system for a greenhouse crop.

Directions: Building on information from AS 6.3, create an integrated method for controlling greenhouse pests. Work in small groups. Be as specific as possible about the steps to follow to produce this plan. If you are interested in an integrated management system in an organic setting, apply best management practices to the problem. Present your findings to the class.

Crop _____

- 1. Where should the integrated pest management system be used: in a regular commercial greenhouse setting or an organic environment? Why?
- 2. Outline the plan in detail. Justify your choices.
- 3. What advantages does IPM offer that other methods do not?
- 4. Why is your crop suited to an IPM system to eliminate pests?