Lesson A5–7

Identifying and Managing Plant Pests in the Greenhouse

Unit A. Horticultural Science

Problem Area 5. Integrated Pest Management

Lesson 7. Identifying and Managing Plant Pests in the Greenhouse

New Mexico Content Standard:

Pathway Strand: Plant Systems

Standard: **I:** Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and natural environment.

Benchmark: **I-D:** Develop and use a plan for integrated pest management.

Performance Standard: **1.** Identify plant pests (e.g., insects, diseases, weeds, rodents). **2.** Determine pest management safety practices. **3.** Determine pest management methods. **4.** Develop pest management plans based on pest life cycles.

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

1. Identify the major categories of pests found in the greenhouse.
2. Discuss pest control techniques used in a greenhouse.
3. Describe the different practices of integrated pest management used in the greenhouse.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Reiley, H. Edward and Carroll L. Shry, Jr. *Introductory Horticulture,* Sixth Edition. Albany, New York: Delmar Publishers, 2002.

Schroeder, Charles B., et al. *Introduction to Horticulture*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2000.

Other Resources. The following resources will be useful to students and teachers:

Biondo, Ronald J. and Dianne A. Noland. *Floriculture: From Greenhouse Production to Floral Design.* Danville, Illinois: Interstate Publishers, Inc., 2000.

VAS U4085, *Glossary of Pesticide Terms*. Urbana, Illinois: Vocational Agriculture Service.

Biondo, Ronald J. and Jasper S. Lee. *Introduction to Plant and Soil Science and Technology,* Second Edition. Danville, Illinois: Interstate Publishers, Inc., 2003.

Osborne, Edward W. *Biological Science Applications in Agriculture*. Danville, Illinois: Interstate Publishers, Inc., 1994.

List of Equipment, Tools, Supplies and Facilities

Writing surface
Overhead projector
Transparencies from attached masters

Terms. The following terms are presented in this lesson (shown in bold italics):

Abiotic diseases
Biological pest control
Biotechnology
Biotic diseases
Chemical pest control
Cultural pest control
Genetic pest control
Insect
Mechanical pest control
Nematodes
Pathogens
Pest
Pesticide
Plant diseases

Resistance
Weeds

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.

Bring one or more plants that are suffering from disease or insect problems into the classroom. Also bring in one healthy plant. Ask the students to explain why the infected plants could cause a problem. Ask them if you should put the infected plants into the greenhouse with the healthy plants. Ask them to explain their answer.

Summary of Content and Teaching Strategies

Objective 1: Identify the major categories of pests found in the greenhouse.

Anticipated Problem: What are the major categories of pest found in the greenhouse?

I. A ***pest*** is anything that causes injury or loss to a plant. Most pests are living organisms. They damage plants by making them less productive, by affecting reproduction, or by destroying them. Pests can be put into five major categories as follows:

   A. ***Insects*** are animals with three distinct body parts (head, thorax, and abdomen), three pairs of legs, and either two, one, or no pairs of wings. Any deviation from this definition is an insect-related pest.

   B. ***Nematodes*** are appendageless, nonsegmented, worm-like invertebrates. They have a body cavity and complete digestive tract, including mouth, alimentary canal, and anus. They do not have a specialized respiratory or circulatory system, but have a well-developed nervous system, an excretory system, and a set of longitudinal muscles.

   C. ***Weeds*** are plants growing out of place or unwanted plants. They may be classed as grassy (monocots), broadleaf (dicots), or other. Weeds impact desired plants by offering direct competition for water, light, space, and nutrients.

   D. ***Plant diseases*** are abnormal conditions in plants that interfere with their normal appearance, growth, structure, or function. Disease is expressed by characteristic symptoms or signs. Some diseases attack the entire plant, while others attack only certain parts of the plant. There are two principal groups of diseases. They are:

      1. ***Abiotic diseases*** are noninfectious or disorders.

      2. ***Biotic diseases*** are caused by parasites or ***pathogens*** that are infectious and transmissible.

   E. Rodents and other animals are the fifth category of pests. Animal pests eat the leaves, stems, fruit, and roots of the plant.

A variety of techniques may be used to assist students in mastering this objective. Students should use text materials to help identify the major categories of pests. Introduction to Horticulture is recommended. Use TM: A5–7A and TM: A5–7B to assist in discussion on this topic.

Objective 2: Discuss pest control techniques used in a greenhouse.

Anticipated Problem: What pest control techniques may be used in a greenhouse?

II. Many pest problems can be prevented. Good management practices will help reduce the problems caused by pests. When pest infestation does occur, they must be controlled. The method selected must be right for the plant and the pest. Pests may be controlled using the following techniques:

A. ***Cultural pest control*** uses management techniques to control pests. Cultural control includes proper maintenance programs, sanitation, and resistant varieties. Some examples of cultural pest management strategies include:

1. Improve the soil or media
2. Select pest-resistant plants
3. Purchase quality seeds and healthy plants
4. Use sterile growing media when potting
5. Plant at recommended times
6. Mulch plants
7. Remove dead and diseased plant foliage
8. Water at proper time
9. Use insect traps
10. Use proper pruning techniques
11. Set up physical barriers

B. ***Biological pest control*** uses living organisms that are predators to control pests. Many insects are beneficial in controlling other insects. Pests have natural enemies in the environment. Lady beetles would be an example. They are notorious for their roles in controlling many different types of insect pests. Insecticides should not be used in combination with this technique as the chemical will kill the beneficial insects.

C. ***Mechanical pest control*** includes using tools or equipment for control. The most common example of mechanical pest control used in a greenhouse is the removal of unwanted plants by hand.

D. ***Chemical pest control*** includes using pesticides, such as herbicides on weeds, insecticides on insects, nematocides on nematodes, and fungicides on fungi. A ***pesticide*** is a chemical used to control pests. Most of these chemicals are deadly. They are designed to kill the pest. All chemicals that are used to control pest populations must be tested and approved for use by the Environmental Protection Agency.

E. ***Genetic pest control*** utilizes biotechnology by gene transfer or genetic manipulation to make plants resistant to specific pests. ***Resistance*** means that the plants have some trait

that repels the pest. ***Biotechnology*** is the management of biological systems for the benefit of humanity. Gene mapping is used to identify genes and their locations along the chromosomes that make up the species. Once genes have been mapped, they can be isolated and transferred from one organism to another.

A variety of techniques may be used to assist students in mastering this objective. Students should use text materials to help identify pest control techniques. Introduction to Horticulture is recommended. Use TM: A5–7C and TM: A5–7D to assist in discussion on this topic.

Objective 3: Describe the different practices of integrated pest management used in the greenhouse.

Anticipated Problem: What are the different practices of integrated pest management used in the greenhouse?

III. The greenhouse environment is very favorable for the development of all types of pests. Whether they are weeds, insects, or diseases, they can be detrimental to the crop if not controlled. To help prevent pests in the greenhouse, a number of practices are often used. They are:

A. Pest entry prevention—All plants that enter the greenhouse should be carefully inspected for insects and diseases. Any signs of pests on incoming plants should be isolated and treated.

B. Weed control—Weeds can compete with crops for moisture and nutrients, but most importantly, they can harbor insects and diseases. Weeds should be eradicated from inside, as well as outside, the greenhouse.

C. Sanitation practices—Many preventive measures can be taken before the crop is planted to reduce the chances of pests. Growing media should be pasteurized. Containers, tools and benches should be disinfected. Dead leaves, flowers, and stems should be removed from the greenhouse.

D. Crop inspection—Crops need to be inspected regularly. Plants especially need to be checked closely in the buds and under the leaves.

E. Environmental manipulation—If favorable environmental conditions for pest development are known, then sometimes the environment may be slightly adjusted to prevent their development. For example, black root rot disease can be prevented by slightly lowering the growing medium pH to between 4.5 and 5.0.

F. Pest eradication—The pest needs to be positively identified before eradication can begin. Biological control measures and pesticides are forms of pest eradication.

A variety of techniques may be used to assist students in mastering this objective. Students should use text materials to help identify pest control techniques. Introduction to Horticulture is recommended.

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the end of each chapter in the recommended textbooks may also be used in the review/summary.

Application. Complete the "Insect Populations" exercise in the *Introduction to Plant and Soil Science and Technology Activity Manual*.

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activity. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1=b; 2=f; 3=h; 4=d; 5=a; 6=c; 7=i, 8=g; 9=e

Part Two: Completion

10. pasteurized, disinfected
11. insects, disease
12. Resistance

Part Three: Short Answer

13. a) Pest entry prevention
    b) Weed Control
    c) Sanitation practices
    d) Crop inspection
    e) Environmental manipulation
    f) Pest eradication

Sample Test Name_____

Test

Lesson A5–7: Identifying and Managing Plant Pests in the Greenhouse

Part One: Matching

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

a. cultural pest control	b. pesticide	c. plant disease
d. nematodes	e. pest	f. weeds
g. mechanical pest control	h. biotechnology	i. insects

_____ 1. A chemical used to control pests.

_____ 2. Plants growing out of place or unwanted plants.

_____ 3. The management of biological systems for the benefit of humanity.

_____ 4. Appendageless, nonsegmented, worm-like invertebrates.

_____ 5. Uses management techniques to control pests.

_____ 6. Abnormal conditions in plants that interfere with their normal appearance, growth, structure, or function.

_____ 7. Animals with three distinct body parts (head, thorax, and abdomen), three pairs of legs, and either two, one, or no pairs of wings.

_____ 8. Includes using tools or equipment for pest control.

_____ 9. Anything that causes injury or loss to a plant.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

10. Growing medium should be _____ and containers, tools and benches should be _____.

11. All plants that enter the greenhouse should be carefully inspected for _____ and _____.

12. _____ means that the plants have some trait that repels the pest

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

13. Identify six practices that are used to help prevent pests in the greenhouse.

    a)

    b)

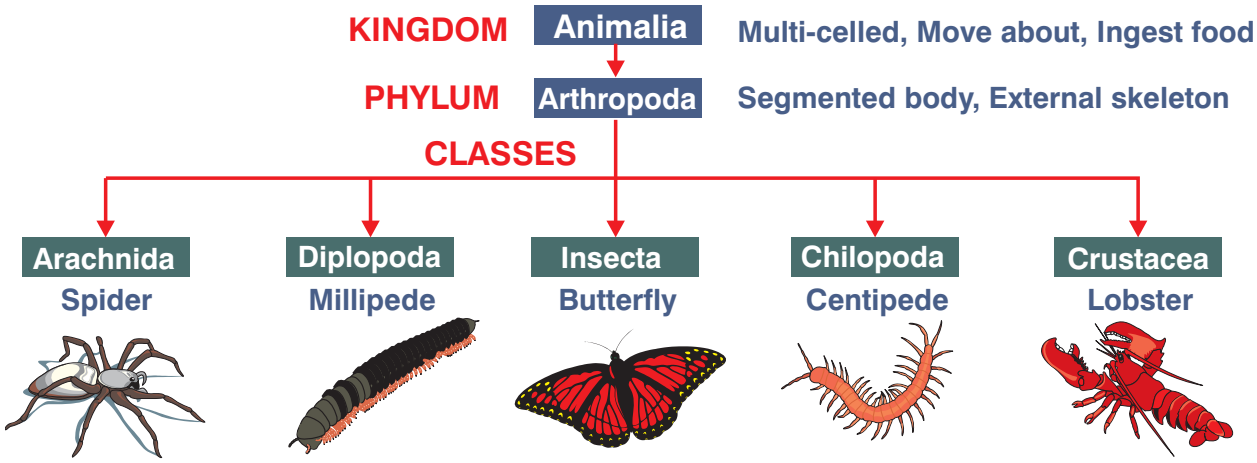
    c)

    d)

    e)

    f)

CLASSIFICATION OF PESTS



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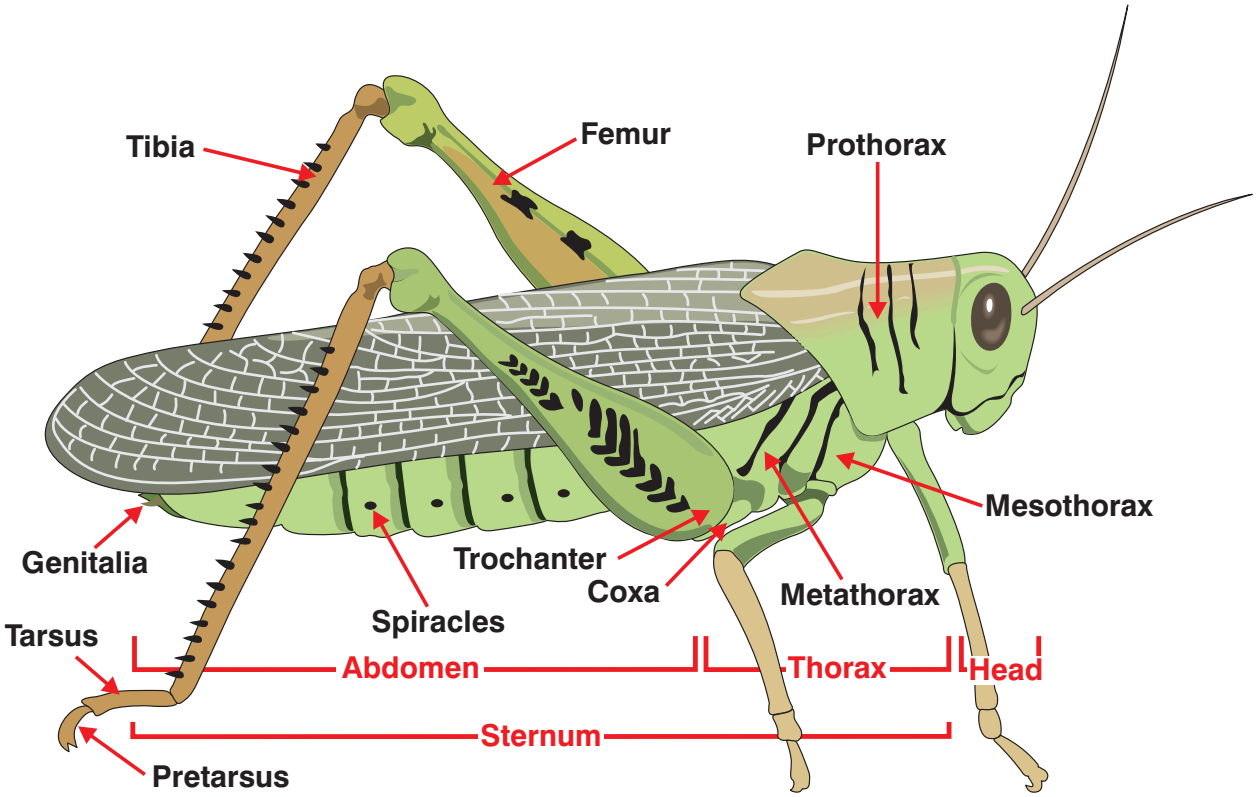
TM: A5–7B

INSECT PHYSIOLOGY

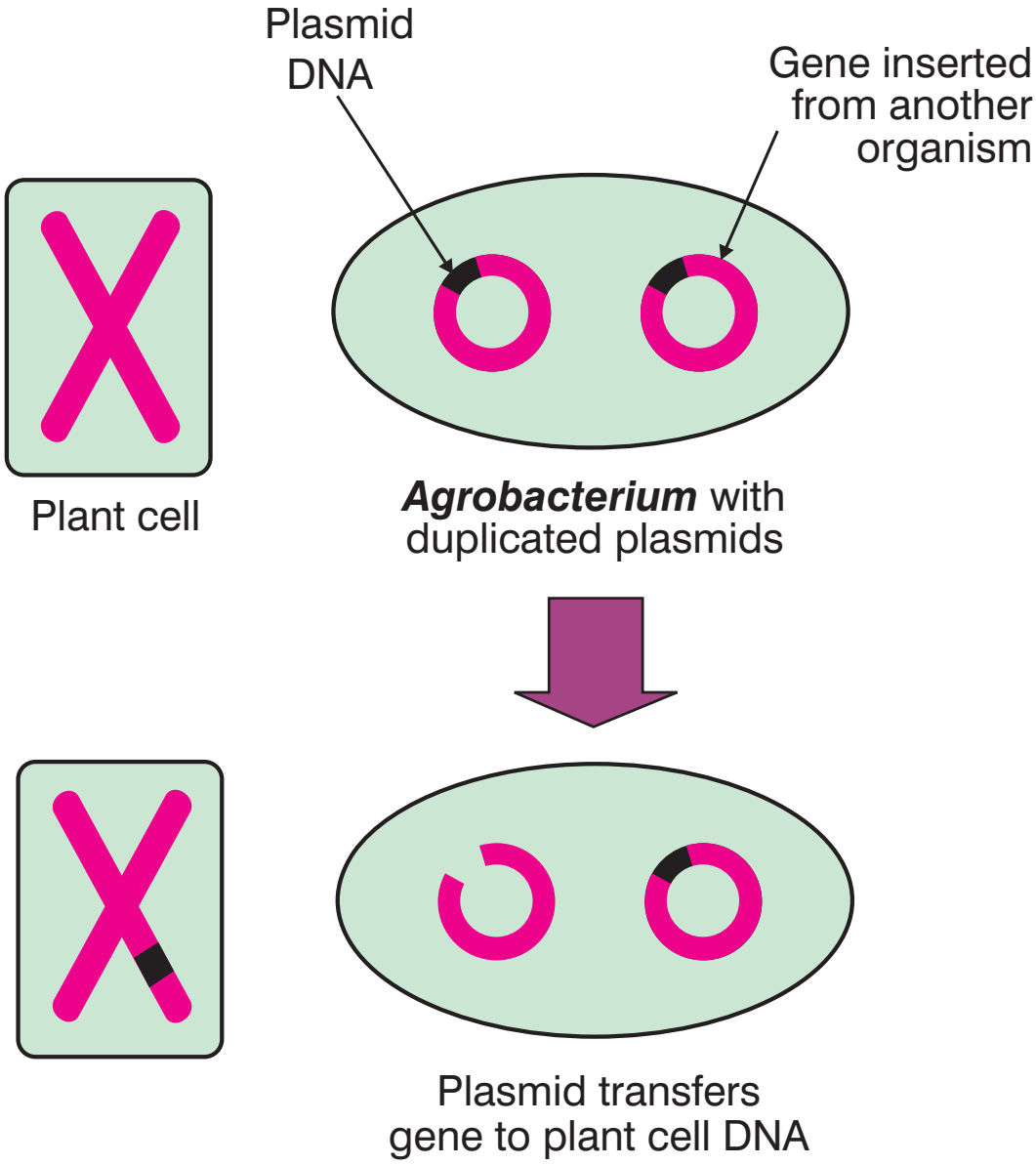


(Courtesy, Interstate Publishers, Inc.)

TM: A5–7C

PESTICIDE	PEST CONTROLLED
Insecticide	Insects
Miticide	Mites
Acaricide	Ticks and Spiders
Molluscicide	Snails and Slugs
Fungicide	Fungi
Avicide	Birds
Rodenticide	Rodents
Nematicide	Nematodes
Bactericide	Bacteria
Herbicide	Weeds
Piscicide	Fishes
Predacide	Predatory Animals

BIOTECHNOLOGY IN GENETIC PEST CONTROL



Moving a tiny part of one chromosome to another

(Courtesy, Interstate Publishers, Inc.)