

Course	Agricultural Science II
Unit	Entomology
Lesson	Chemical Control Methods
Estimated Time	50 minutes

Student Outcome

Describe the factors in the selection and application of insecticides.

Learning Objectives

1. Define pesticides.
2. Distinguish when an insect is considered a pest.
3. Identify the different types of pesticides.
4. Describe the mode of action for different types of insecticides.
5. Identify the methods of insecticide application.
6. Identify the different formulations of insecticides.
7. Describe how insecticides are applied.
8. Distinguish why it is important to calibrate a sprayer accurately.

Grade Level Expectations

SC/EC/1/B/09-11/a	SC/EC/1/B/09-11/b	SC/EC/1/C/09-11/b
SC/EC/1/D/09-11/b	SC/EC/3/C/09-11/b	SC/ST/1/B/09-11/a
SC/ST/1/C/09-11/a	SC/ST/3/B/09-11/a	SC/ST/3/B/09-11/b
SC/ST/3/B/09-11/c	SC/ST/3/D/09-11/a	

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slide
☐ PPt 1 – Nozzle Types
2. Handout
☐ HO 1 – Calibrating Sprayers
3. *Entomology* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991.
4. *Entomology Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- ☐ Several containers of common household chemicals
- ☐ Different types of sprayers, if possible

Supplemental Information

1. Internet Sites

- ❑ Calibrating Field Sprayers. University of Missouri Extension. Accessed June 10, 2008, from <http://extension.missouri.edu/xplor/agguides/agengin/g01270.htm>.
 - ❑ National Pesticide Information Center. Accessed January 24, 2008, from <http://npic.orst.edu/>.
 - ❑ Pesticide Education Center. Accessed January 24, 2008, from <http://www.pesticides.org/>.
 - ❑ Types of Pesticides. U.S. Environmental Protection Agency. Accessed January 24, 2008, from <http://www.epa.gov/pesticides/about/types.htm>.
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Interest Approach

Have several containers of common household chemicals on display. The containers could be from home, a drugstore, a grocery, or a gardening supply store. Compare the information (e.g., ingredients, mode of action, safety precautions) on the labels.

Communicate the Learning Objectives

1. Define pesticides.
2. Distinguish when an insect is considered a pest.
3. Identify the different types of pesticides.
4. Describe the mode of action for different types of insecticides.
5. Identify the methods of insecticide application.
6. Identify the different formulations of insecticides.
7. Describe how insecticides are applied.
8. Distinguish why it is important to calibrate a sprayer accurately.

Instructor Directions	Content Outline
Objective 1 <i>Pesticides are an important part of any insect control plan. Point out that insecticides are pesticides that are specifically made for controlling insects.</i>	Define pesticides. The term pesticide is a general term used for any chemical used to kill any pest.
Objective 2 <i>Discuss with students when an insect is considered a pest and when it is considered a beneficial insect.</i>	Distinguish when an insect is considered a pest. Insects are considered pests when they compete with humans for food and fiber or attack people directly.
Objective 3 <i>Pesticides are classified by the types of pests they are designed to control. The pest for which a pesticide is intended is called the target pest. The target pests are listed after the type of pesticide. Chemical control methods are often used to control harmful insects because they are very effective, easy to apply, quick acting, usually economical, target specific, and practical for commercial use.</i>	Identify the different types of pesticides. <ol style="list-style-type: none">1. Acaricide – mites and ticks2. Avicide – birds3. Bactericide – bacteria4. Fungicide – fungi5. Herbicide – weeds6. Insecticide – insects7. Miticide – mites8. Molluscicide – snails and slugs9. Nematicide – nematodes10. Piscicide – fish11. Rodenticide – rodents (rats and mice)

Instructor Directions	Content Outline
<p>Objective 4</p> <p><i>How an insecticide works is called the mode of action. Encourage students to discuss in what insect control situations would the different modes of action be the most effective.</i></p>	<p>Describe the mode of action for different types of insecticides.</p> <ol style="list-style-type: none"> 1. Contacts 2. Systemics 3. Fumigants 4. Protectants 5. Sterilants 6. Selective insecticides 7. Nonselective insecticides 8. Growth regulators 9. Biologicals
<p>Objective 5</p> <p><i>Discuss the importance of applying an insecticide using the proper method. Point out that some insecticides may not work if applied by the wrong method.</i></p>	<p>Identify the methods of insecticide application.</p> <ol style="list-style-type: none"> 1. Pre-emergence 2. Preplant 3. Band 4. Broadcast 5. Dip 6. Directed 7. Drench 8. Foliar 9. In-furrow 10. Over-the-top 11. Pour-on 12. Sidedress 13. Soil incorporation 14. Spot treatment
<p>Objective 6</p> <p><i>An insecticide formulation refers to the specific way the product is made. Students can be asked for examples of each of these formulations. Insecticides are made and applied as a liquid, gas, or solid. Most formulations have a letter abbreviation.</i></p>	<p>Identify the different formulations of insecticides.</p> <ol style="list-style-type: none"> 1. Liquid formulations <ol style="list-style-type: none"> a. Emulsifiable concentrate (EC or E) b. Flowables (F or L) c. Solutions (S) d. Ultra-low-volume solutions (ULV) e. Aerosols (A) f. Liquified gases 2. Dry formulations <ol style="list-style-type: none"> a. Dusts (D) b. Granules (G) c. Soluble powders (SP) d. Wettable powders (WP or W) e. Baits (B)

Instructor Directions	Content Outline
<p>Objective 7</p> <p><i>The application equipment, which depends on the insecticide formulation, is very important for proper application of insecticides. Insecticides may be sprayed, dusted, used in a dipping tank, injected, or mixed with insect food. If possible, different types of sprayers can be shown as visual aids. Refer to PPt 1 when discussing nozzle types.</i></p> <p>☐ PPt 1 – Nozzle Types</p>	<p>Describe how insecticides are applied.</p> <ol style="list-style-type: none"> 1. Sprayers <ol style="list-style-type: none"> a. Hand sprayers b. Low-pressure field sprayers c. High-pressure sprayers d. Air-blast sprayers e. Ultra-low-volume (ULV) sprayers 2. Nozzle types <ol style="list-style-type: none"> a. Solid stream b. Flat fan c. Hollow cone d. Solid cone e. Broadcast
<p>Objective 8</p> <p><i>Calibrating a sprayer means adjusting the equipment so that the insecticide is applied at the desired rate. There are several ways to calibrate sprayers, depending on the equipment used and personal preference. Several ways are presented in HO 1. Stress the importance of always taking the time to calibrate and check equipment.</i></p> <p>☒ HO 1 – Calibrating Sprayers</p>	<p>Distinguish why it is important to calibrate a sprayer accurately.</p> <ol style="list-style-type: none"> 1. It is important to accurately calibrate a sprayer so that each insecticide is used as directed on the label. 2. The best results are obtained by correct calibration. Too much insecticide is dangerous, costly, and wasteful. Too little insecticide will not do an effective job.
<p>Application</p>	<p>Other activities:</p> <ol style="list-style-type: none"> 1. Have students visit an equipment shop or supply store to see the different kinds of insecticides, application equipment (e.g., sprayers, nozzles), and calibration charts. 2. Have students take home problems on calibrating sprayers. 3. Invite a custom insecticide applicator or insecticide dealer to demonstrate how to calibrate a sprayer. If the shop doesn't have the appropriate equipment, ask the individual to bring it for the demonstration.

Instructor Directions	Content Outline
Closure/Summary	<p>Chemical insecticides are commonly used as part of an effective insect control plan. There are many kinds of chemicals from which to choose. Each works in its own particular way. It is very important to select the insecticide formulation and equipment that are most appropriate for the job. Insecticides must be properly applied and the equipment accurately calibrated for effective and safe insect control.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. A pesticide is a general term for any chemical used to kill any pest, whereas an insecticide refers to chemicals that specifically kill insects. 2. Any 6 of the following: contacts, systemics, fumigants, protectants, sterilants, selective insecticides, non-selective insecticides, growth regulators, biologicals 3. Any 6 of the following: pre-emergence, preplant, band, broadcast, dip, directed, drench, foliar, in-furrow, over-the-top, pour-on, sidedress, soil incorporation, spot treatment 4. b 5. c 6. c 7. d 8. a 9. b 10. b