Unit D: Controlling Pests and Diseases in the Orchard

Lesson 4: Identify and Control Weeds in the Orchard

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

1. Describe types of weeds based on life cycle and growth.
2. Identify ways weeds are spread.
3. Explain the identification of weeds.
4. The Importance of Weed Control in the Orchard
5. Name weed control techniques used in the orchard.

Recommended Teaching Time: 3 hours

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

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

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint Slides
Weeds of Afghanistan- either live or preserved samples along with their seeds

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

Annual	Nodes
Artificial weed dispersal	Perennial
Auricles	Post-emergent
Biennial	Pre-emergent
Collar	Rhizomes
Cotyledons	Sheath
Herbaceous perennials	Stolons
Hypocotyl	Weed
Internode	Woody perennials
Ligule	
Natural weed dispersal	

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.

Give students 5 minutes to list as many orchard pests as they can. Once they have done this write their list on a chalkboard or on an overhead. Many of the students will probably list insects or mammals. If any students list weeds congratulate them and point out to the class that weeds can also be a pest in the orchard.

Use this approach to move into Objective 1.

Summary of Content and Teaching Strategies

Objective 1: Describe types of weeds based on life cycle and growth.

(PowerPoint Slide #3)

I. A **weed** is a plant growing where it is not wanted or a plant out-of-place. Weeds can be divided into three categories based on their life spans and their periods of vegetative and reproductive growth.

(PowerPoint Slide #4)

A. An **annual** weed is a plant that completes its life cycle within one growing season. Annuals reproduce from seeds only. Two types of annual weeds occur, depending upon the time of year in which they germinate.
   1. Winter annuals germinate in the fall and will actively grow until late spring when they produce seed, and they will die during periods of heat and drought stress.
   2. Summer annuals germinate in the late spring and actively grow during the summer months. They produce seed by late summer and die during periods of low temperatures and frost.

(PowerPoint Slide #5)

B. A **biennial** weed is a plant that will live for two growing seasons.
   1. During the first summer the plant develops a root system and a compact, low-growing cluster of leaves called a rosette.
   2. Biennials flower and produce seed during the second summer and die before winter.

C. A **perennial** weed can live for more than two growing seasons and may reproduce by seed and/or vegetative growth. Perennials are classified as either herbaceous or woody, depending whether the stems over winter.

(PowerPoint Slide #6)

   1. ***Herbaceous perennials*** die back to the ground each fall, but their root systems overwinter and the plants resprout the following spring from buds on the root systems.
   2. ***Woody perennials*** have persistent aboveground stems that remain from season to season, although their leaves may die in autumn.
   3. A noxious weed is a plant that causes great harm to other organisms by weakening those around it.

a. Most noxious weeds are very difficult to control and require extended periods of treatment followed by close monitoring.

Use TM: D4-1 to cover the life cycles of the various weeds. For extra practice, print out the chart and cut out the pieces and then have the students arrange the pictures into the correct cycle for each class of weed. Have the students discuss the types of weeds that grow in Afghanistan and fit into the different life cycles.

Objective 2: Identify ways weeds are spread.

(PowerPoint Slide #7)

II. Most weeds grow in isolated locations.

A. Dispersal spreads them over wide areas and into places where they have not been a problem before. Dispersal occurs in two major ways: natural and artificial.

(PowerPoint Slide #8)

1. ***Natural weed dispersal*** is the movement of weeds by wind, water, and wildlife. Weed seeds often have stickers or feathery features that make natural dispersal easy. Lighter seeds may be blown by the wind. Heavier seeds may be washed by water runoff or carried in the hair of animals. Seeds eaten by birds, rodents, and other animals may pass through the digestive tract undigested and viable. They may be dropped on the land in feces and germinate when conditions are right.

(PowerPoint Slide #9)

2. ***Artificial weed dispersal*** is accomplished by people and the activities they carry out in producing and harvesting crops. Both seed and vegetative parts of weeds may be dispersed. Machinery can transport weeds as they move from one field to another. Mulch materials may contain weed seed.

Pass around many examples of weed seeds (or any seeds available) for the students to observe. Once they have observed the seeds have them write down how they believe the seeds are dispersed. Write down student responses on the chalkboard or use the computer and projector and see if the answers are similar.

Objective 3: Explain the identification of weeds.

(PowerPoint Slide #10)

III. The ability to identify weeds shortly after emergence is an important part of an integrated weed control program.

(PowerPoint Slide #11)

A. Seedling identification is needed for the most effective use of postemergence herbicides to control weeds before they cause crop yield losses.

1. Weed seedlings are very small, so identification requires close examination of the plants, often with the aid of a hand lens.
2. Most crop scouts are not expert taxonomists, but by knowing the key vegetative features of the major weeds found in field crops, the scout can learn to identify most of the problem weeds shortly after their emergence.

(PowerPoint Slide #12)

B. Weeds are separated into the categories of grass, grasslike, and broadleaf plants. Knowing the differences between these categories is important because most herbicides control one type of weed more effectively than another.

(PowerPoint Slide #13)

1. Grass plants have long narrow leaves with parallel veins. The stems are round or flattened and hollow except at the nodes (joints), where they are solid.
   a. Grasslike plants resemble grasses, but they are not susceptible to all of the same herbicides as grasses.
2. The leaves of broadleaf plants are not generally as long and narrow as those of grass or grasslike plants, although the shapes vary considerably among species. The veins of most broadleaf plants are netlike.

(PowerPoint Slide #14)

C. Vegetative identification of grass weeds. The major vegetative parts of the grasses used in identification include the blade, sheath, ligule, auricles, collar, stolons, bud-shoot, and rhizomes. The leaf is composed of the sheath and the blade.

(PowerPoint Slide #15)

1. The ***sheath*** encloses the stem and is connected to the blade at the junction formed by the collar. The ***collar*** is located on the outer side of the leaf and the ligule points upward on the inner side of the leaf. The ***ligule*** resembles a continuation of the sheath where it joins the blade.

(PowerPoint Slide #16) This is a picture of a grass weed that identifies the important vocabulary words.

(PowerPoint Slide #17)

2. ***Auricles***, which are present in only a few species, are fingerlike projections of the collar that extend around the shoot.

(PowerPoint Slide #18)

3. ***Stolons*** are modified above-ground stems that grow horizontally over the ground. Stolons develop roots at the nodes, giving rise to new plants. Joints of the stems are called ***nodes***. The part between two adjacent nodes is called an ***internode***. ***Rhizomes*** are modified underground stems that produce new plants from the nodes.

(PowerPoint Slide #19) This slide illustrates a stolon and rhizome.

(PowerPoint Slide #20)

4. The arrangement of the leaf or leaves in the budshoot can also be used to identify grasses. The leaf or leaves are classified as rolled or folded in the budshoot.

(PowerPoint Slide #21)

D. Vegetative identification of broadleaf weeds. The major vegetative parts of the seedling broadleaves include the cotyledons, true leaves, hypocotyl, and roots.

(PowerPoint Slide #22)

1. ***Cotyledons*** are the seedling leaves of the broadleaf plant, which are two in number with dicotyledonous weeds. They appear opposite each other on the stem. If a plant is a perennial and emerges from vegetative parts, the shoot will lack cotyledons because these are found only in seedlings.

(PowerPoint Slide #23)

2. The rhizomes, tubers, bulbs, or budding roots of perennials can help identify the plants.
3. The true leaves consist of all leaves produced after the cotyledon leaves.
4. Leaf arrangement and shape of the cotyledons and true leaves are generally the first characteristics used to separate weed species.

(PowerPoint Slide #24)

5. The ***hypocotyl*** is the portion of the stem between the cotyledons and the seedling roots.

Bring in samples of weeds for each student or groups of students. Have them identify the major parts of the weed presented in this objective. Try to provide many different varieties of weeds. Present TM: D4-2 to the students and discuss the differences in grasses or bring in specimens so they can see the differences.

Objective 4: The Importance of Weed Control in the Orchard

(PowerPoint Slide #25)

IV. Just as insects need to be controlled in the orchard, weeds need to be controlled too. Weeds can have just as much of an impact on the productivity of an orchard as insects can. Following are some reasons to control weeds in the orchard.

(PowerPoint Slide #26)

A. Reduced competition: trees may be much larger than most weeds, but they have root systems that do not compete well with other plants.
   1. Where a cover crop or weeds grow, the bulk of tree roots form in the second and third foot of soil.
   2. If competition is reduced, the trees form the highest percentage of their roots in the much more biologically active first two feet of soil depth.
   3. In areas with poor quality soils, the orchardist should not give the best foot of soil to the weeds.

(PowerPoint Slide #27)

B. Nutrient Management: Weeds can greatly out-compete the trees for nutrients, especially nitrogen.
   1. This complicates the growers attempts to create an efficient nutrient balance in the trees, as it is never certain from one application to the next what percentage of the applied nutrient will enter the trees, or when it will get there.
   2. Trying to compensate for weed growth by applying higher rates of nitrogen fertilizer may increase the nutrient in the tree, but more often leads to greatly increased weed growth.

(PowerPoint Slide #28)

C. Irrigation and Water Management: Weeds use water, which would have been much more beneficial to maintain fruit quality during the hot portion of the Summer.
   1. Perhaps even more important, weeds block the sprinkler pattern, which may greatly decrease the efficiency of water application.
   2. Blocked sprinklers over-water some areas of the orchard, and under-irrigate others, leading to leaching and drought stress in the same orchard block.

3. Weeds also have the aggravating ability to lean over and tangle the mechanisms of sprinkler heads, preventing their rotation.

(PowerPoint Slide #29)

D. Rodent Management: mice can cause great damage to an orchard.
   1. During snowy winters, they sometimes chew the bark off of the lower portions of trunks, especially on younger trees.
      a. While growers try to save these damaged trees with approach grafts or bridge grafts, these methods are very slow and expensive, and do not always work well.
   2. Mouse control is a season-long effort, with reduction of mouse cover as the key component.
      a. As mice do not travel far, the key mouse cover is the grass and weed cover crop.
   3. Well mowed grass and a fairly clean weed strip is the most effective mouse management program.

If possible, have the students tour an orchard to observe how weeds are managed. Have them take notes regarding the weeds in the orchard. Have them answer questions like, "Are the weeds being controlled well?" "Should anything different be done in this orchard?" "What type of weed management program would they recommend?"

Objective 5: Name weed control techniques used in the orchard.

(PowerPoint Slide #30)

V. There are multiple methods of weed control available for use in the orchard.
   A. Selection of the correct method depends upon the size of the orchard, number of trees, and the orchard layout.
   B. The best weed control technique should take the type of weed into account. This is why identification of the weed's growth and reproduction is very important when deciding how to treat a weed.

(PowerPoint Slide #31)

   1. Mechanical control—This method involves weed control by hand pulling or hoeing. This is a very low cost and effective control method although it is very labor intensive.

(PowerPoint Slide #32)

   2. Herbicides—This method involves the use of a group of chemicals that prevent weed germination or kill actively growing weeds. Herbicides can be divided into several major groups, depending on how and when they kill weeds. Two of the major groups are:
      a. ***Pre-emergent*** herbicides are applied before the weed seeds germinate. This group of herbicides stops or prevents seed germination.
      b. ***Post-emergent*** herbicides kill actively growing weeds. These chemicals require careful application to prevent the killing of desirable plants.

(PowerPoint Slide #33)

   3. Mulching- This method involves placing materials such as wood chips or plastic around the base of a tree to prevent weed growth. Care should be taken to keep the mulch away from the base of the tree as this could cause rot or serve as a breeding ground for fungus, molds and insects which can damage the tree.

Present the students with the weeds from the earlier objectives and have them recall the orchard they visited. Have them determine the best method of weed control for the weeds they are presented with. Present TM: D4-3 to the students and have them decide if there are any other advantages or disadvantages to the methods of weed control presented.

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 #34** can be used as review.

Application: Have the students go outside and find examples of weeds. They should identify these weeds and discuss their life cycle. LS: D4-1 will aid in this application.

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

Answers to Sample Test:

Matching

1. F
2. G
3. H
4. C
5. E
6. A
7. D
8. B

Short Answer

1. Answer should be taken from TM: D4-3
2. Answers from Objective 4 include: Reduced competition, Nutrient Management, Irrigation and Water Management, Rodent Management. Descriptions will vary but should be similar to those in Objective 4.

Sample Test Name_____

Test

Unit D Lesson 4: Identify and Control Weeds in the Orchard

Part One: Matching

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

a. Herbaceous perennials
b. Natural weed dispersal
c. Ligule
d. Weed
e. Nodes
f. Rhizomes
g. Post-emergent
h. Woody perennials

_____ 1. Modified underground stems that produce new plants from the nodes.

_____ 2. Herbicides kill actively growing weeds. These chemicals require careful application to prevent the killing of desirable plants.

_____ 3. Have persistent aboveground stems that remain from season to season, although their leaves may die in autumn.

_____ 4. Resembles a continuation of the sheath where it joins the blade.

_____ 5. Joints of the stems

_____ 6. Die back to the ground each fall, but their root systems overwinter and the plants resprout the following spring from buds on the root systems.

_____ 7. A plant growing where it is not wanted or a plant out-of-place.

_____ 8. The movement of weeds by wind, water, and wildlife.

Part Two: Short Answer

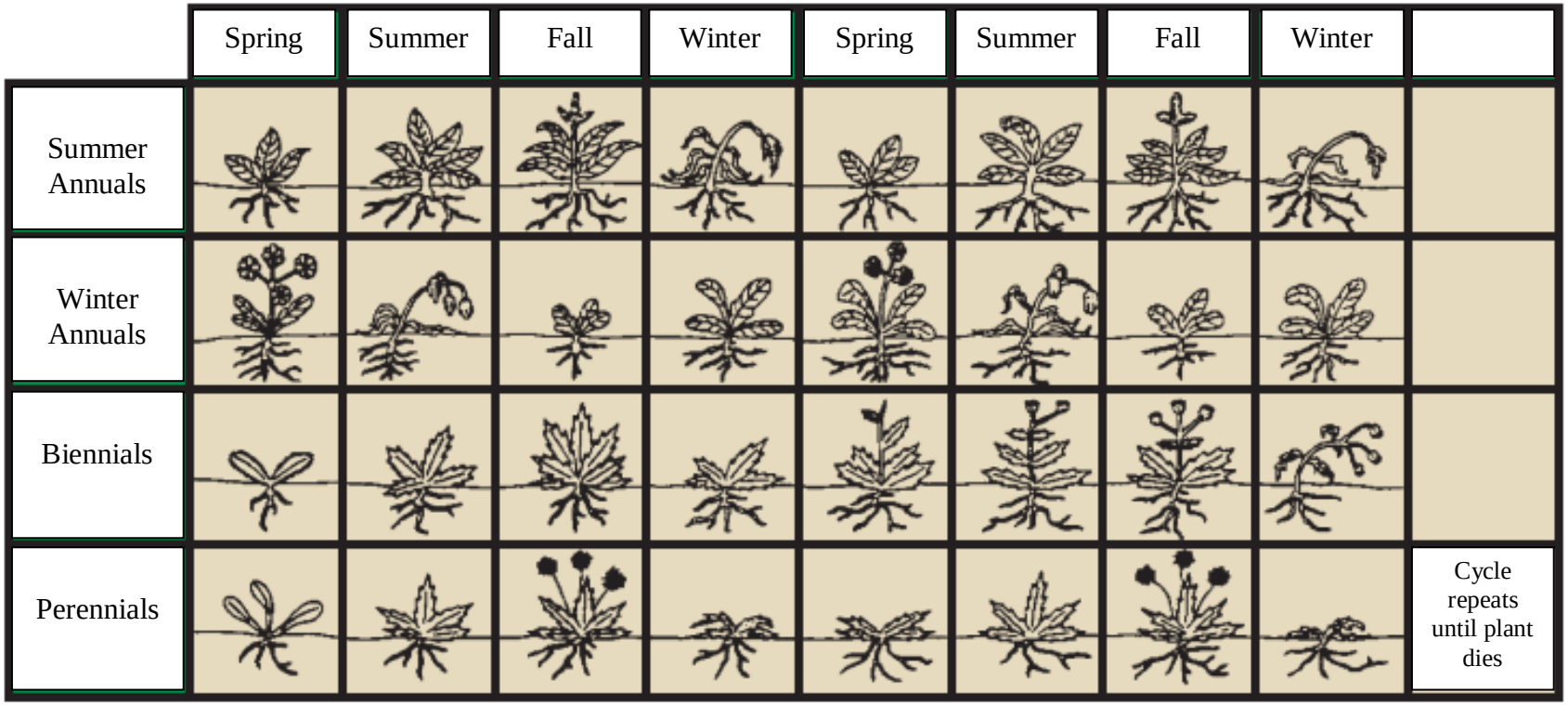
Instructions. Provide information to answer the following questions.

1. List an advantage and disadvantage for two methods of weed control in orchards.

2. Name and describe some reasons for controlling weeds in the orchard.

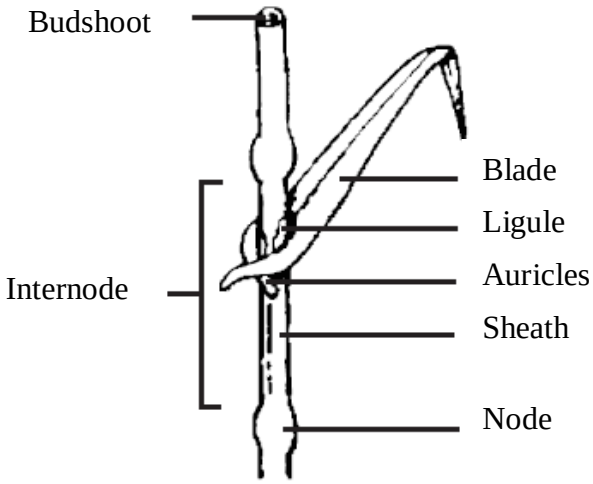
TM: D4-1

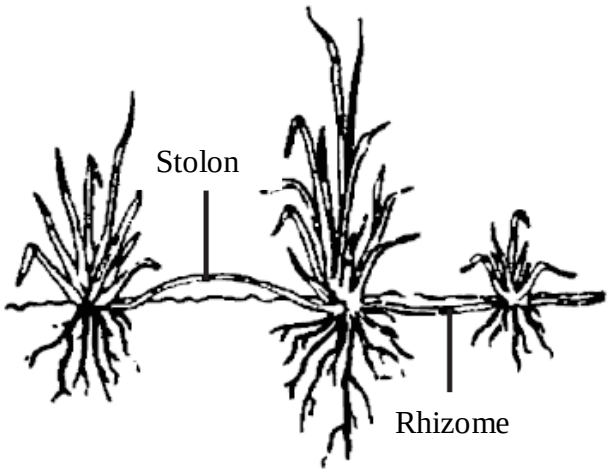
Life Cycles of Weeds



TM: D4-2

Characteristics of Problem Grasses

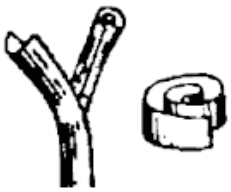




Ligule

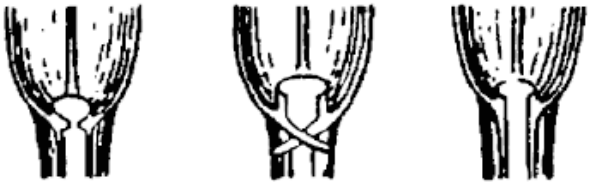
Membranous Hairy Absent

Budshoot



Rolled in the bud

Auricle



Short, stubby Long, clawlike Absent

Folded in the bud

TM: D4-3

Common Weed Control Methods

Tool	Advantages	Disadvantages
Cultivation	• Effective • Non-selective • Equipment readily available	• May damage soil structure • Spread perennial weeds • May damage trees/roots • Short term control
Mulching	• Effective • Non-selective • Holds moisture • Long-term control	• Availability of mulch • Cost of mulch/application • Attractive to insects/mold/fungus • May affect nutrition • Must be free of seeds
Mowing	• Rescue treatment • Quick suppression • Equipment available • Reduce seed spread	• Weeds may still compete • Quick regrowth • Several mowing required • May damage young trees
Herbicides	• Effective • Easy to apply • Can be selective • Timely	• Require 2% soil organic matter • Directed spray equipment • Effects on pest complex • Cost varies

LS: D4-1

Weed Identification

Instructions: Identify as many weeds as possible in areas around the school. Fill out the following chart as a reference to be used for yourself or others.

Name of Weed	**Growth cycle (perennial, annual, biennial)**	**Description (color, height, leaf shape, etc)**