

CHAPTER 6

WEED MANAGEMENT

LEARNING OBJECTIVES

After completely studying this chapter, you should:

- Be able to define a weed and its four stages of development.
- Understand the differences between annual, biennial, and perennial weeds.
- Be able to give examples of cultural weed controls.
- Know the advantages and disadvantages of the various methods of herbicide applications.
- Understand herbicide carryover and how to prevent it.
- Know what herbicide adjuvants are.

Weeds are plants growing where they are not wanted. They can reduce yields by competing with crops for water, nutrients, and light. Some weeds release toxins that inhibit crop growth; others may harbor insects, diseases, or nematodes that attack crops. Weeds often interfere with harvesting operations, and at times contamination with weed seeds or other plant parts may render a crop unfit for market. Profitable crop production depends on effective weed control.

DEVELOPMENT STAGES

Most crop plants and weeds have four stages of development:

- **SEEDLING**—small, delicate, newly emerged plants.
- **VEGETATIVE**—plant grows quickly, producing stems, roots, and leaves.
- **SEED PRODUCTION**—plant's energy is directed into producing flowers and seeds.
- **MATURITY**—plant produces little or no energy. Some plants begin to dry out or **desiccate**.

LIFE CYCLES OF WEEDS

Weeds can be classified according to their life cycle. The three types of plant life cycles for weeds are annual, biennial, and perennial.

ANNUAL

Plants that complete their life cycle in one year are **annuals**. They germinate from seed, grow, mature, produce seed, and die in one year or less. Annuals reproduce by seed only and do not have any vegetative reproductive parts. Summer annuals may germinate from seed in the spring, flower and produce seed during the summer, and die in the summer or fall. Winter annuals germinate from seed in the fall and reproduce and die the following year. Annual weeds are easiest to control at the seedling stage.



Cocklebur.

BIENNIAL

Biennials complete their growth cycle in two years. The first year, the plant produces leaves and stores food. The second year, it produces fruits and seeds. Biennial weeds are most commonly found in no-till fields, pastures, and unmowed fencerows. They are easiest to control in the seedling stage.



Bull thistle is a biennial.

PERENNIAL

Perennials are plants that live for two or more years. Perennials can reproduce by seed or vegetatively. The plant parts that allow perennials to spread without producing seeds are **stolons** (creeping above-ground stems—e.g., white clover and strawberries), **rhizomes** (creeping belowground stems—e.g., milkweed, quackgrass), **tubers** (enlarged underground stems—e.g., potato, yellow nutsedge), and **bulbs** (underground stem covered by fleshy leaves—e.g., tulip). Because perennial weeds can propagate (spread) underground, they can be the most difficult weeds to control. Removing the aboveground vegetation will not stop the weed from spreading.

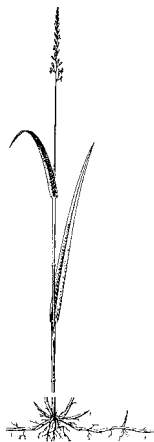
Annuals, biennials, and perennials can reproduce from seed. Many weeds produce large quantities of seeds. Seeds are easily dispersed across a field by wind, rain, machinery, animals, and people. Weed seeds can germinate after being dormant for long periods of time. They can also tolerate extremes in weather such as temperature and moisture. To prevent seed dispersal, you should control weeds before they produce seeds.

COMMON WEEDS IN MICHIGAN

GRASS AND GRASSLIKE WEEDS

Annuals

- Barnyard grass
- Large crabgrass
- Smooth crabgrass
- Giant foxtail
- Yellow foxtail
- Green foxtail
- Fall panicum
- Wild-proso millet
- Witchgrass



Monocot or Grass plant.

Perennials

- Johnsongrass
- Yellow nutsedge
- Quackgrass

BROADLEAF WEEDS

Annuals

- Ladysthumb
- Pennsylvania smartweed
- Wild buckwheat
- Common lambsquarters
- Redroot pigweed
- Eastern black nightshade
- Common cocklebur
- Jimsonweed
- Common purslane
- Common ragweed
- Giant ragweed
- Velvetleaf
- Common chickweed
- Shepherd's purse
- Horseweed (Marestail)
- Prickly lettuce
- Wild mustard
- Yellow rocket

Biennials

- White campion
- Wild carrot
- Bull thistle

Perennials

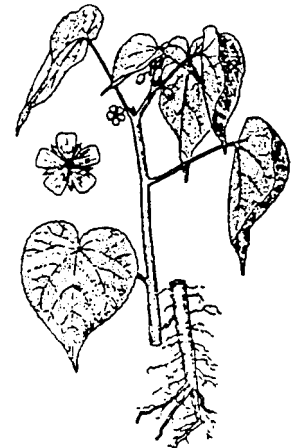
- Milkweed
- Hemp dogbane
- Canadian thistle
- Dandelion
- Field bindweed
- Perennial sow thistle
- Swamp smartweed
- Goldenrod
- Plantain



Yellow Nutsedge.



Redroot Pigweed.



Velvetleaf.

WEED CONTROL

CULTURAL CONTROL

Crop competition is a very useful method of weed control. Production practices that optimize crop growth enable the crop plants to compete effectively with weeds. Crop management practices that can improve the competitive ability of the crop are crop and variety selection, planting date, population, soil fertility, drainage, etc. Recommended crop production practices are also beneficial weed control practices.

Crop rotation may also be helpful in maintaining adequate weed control. Many weeds cannot tolerate crop rotation.

MECHANICAL CONTROL

Tillage buries weeds or destroys their underground plant parts. Small annual and biennial seedlings are more effectively controlled with tillage. Disturbing the soil, however, can bring new weed seeds near the soil surface and create more weed problems.



CHEMICAL CONTROL

The first step in successful chemical weed control is the correct identification of the weeds. Annual weeds are easier to kill when they are small seedlings and when conditions favor rapid growth, but, crop plants are also easily injured under these conditions. Selective herbicides should control the weeds with little or no injury to the crop.

Timing and rate of herbicide application are very important in chemical weed control. Applying herbicides at the wrong time often results in poor weed control and crop injury.

TYPES OF HERBICIDES

Chemical weed control can be obtained with herbicides applied either preplant incorporated, preemergence, or postemergence. Many herbicides can be applied by more than one of these methods.

Preplant Herbicide Soil Applications and Incorporation

Preplant incorporation applications are herbicides applied and incorporated into the soil before planting. Incorporation of some herbicides is required to prevent them from volatilizing (becoming a gas) into the air or decomposing in the sun.

Advantages of preplant soil applications and incorporation:

- Early weed control reduces weed competition with the crop.
- Wet weather will not delay cultivation or herbicide application to control weeds.
- Preplant soil application and incorporation is less dependent on rainfall for herbicide activation than preemergence herbicide applications.

Disadvantages of preplant soil applications and incorporation:

- Incorporating the herbicide too deep in the soil can reduce weed control.
- A streaking pattern of good and poor weed control can result from incomplete soil incorporation.
- Growers apply herbicide without identifying the weeds. They are preventive applications.
- It is incompatible with a no-till system.



Preemergence Herbicide Applications

Preemergence herbicide applications are applied to the soil surface after the crop has been planted but before the crop or weeds emerge. Typically, preemergence herbicide applications require rainfall within one week following the application to ensure that the herbicide moves into the soil.

Advantages of preemergence applications:

- Early control of weeds reduces weed competition with crop.
- They can be used in all tillage systems.
- Planting and herbicide application may be done at the same time.

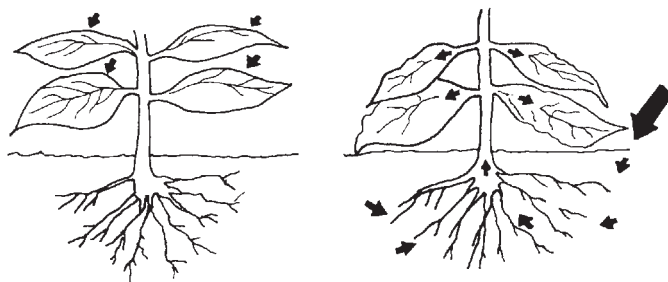
Disadvantages of preemergence applications:

- They depend on rainfall and are ineffective in dry soil conditions.
- On sandy soil, heavy rains may move the herbicide down in the soil to the germinating crop seed and cause injury.
- Growers apply herbicide without identifying the weeds. They are preventive applications.

Postemergence Herbicide Applications

Postemergence herbicide applications are applied to the foliage of the weeds after the crop and weeds have emerged. There are two types of postemergence herbicides: contact and systemic. **Contact herbicides** kill only the plant parts that they touch. Typically, the above-ground parts of a weed, such as the leaves and stems, turn brown and die. Contact herbicides are commonly used to control annuals.

Systemic or translocated herbicides are absorbed by the weed's roots or leaves and moved throughout the plant. Translocated herbicides are more effective than contact herbicides against perennial weeds because the herbicide reaches all parts of the plant, but, translocated herbicides may take up to three weeks to kill the weeds.



Contact Herbicide

Translocated Herbicide

Advantages of postemergent applications:

- Herbicide is applied after the weed problem occurs (remedial application).
- They are less susceptible to environmental conditions after the herbicide application than preemergent herbicides.
- They are useful for spot treatments.
- Postemergent herbicide applications have short or no soil residual.

Disadvantages of postemergent applications:

- Postemergent herbicides are environmentally sensitive at the time of application.
- Weeds must be correctly identified.
- Timing of the application is critical for effective weed control.
- Postemergent herbicides should not be applied to wet foliage.
- Weather may not permit a herbicide application at the proper time.

HERBICIDE CARRYOVER

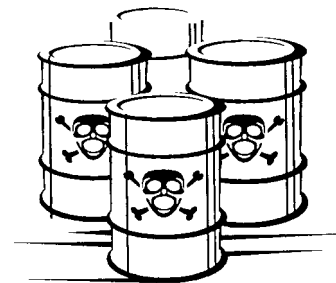
A potential problem of herbicide applications is **herbicide carryover**. This occurs when a herbicide does not break down during the season of application and persists in sufficient quantities to injure succeeding crops. The breakdown of herbicides is a chemical and/or microbial process. Generally the rate of breakdown increases with soil temperature. Very dry conditions during the summer and early fall often increase the potential for carryover of many herbicides.

Herbicide carryover is also influenced by the rate of application, herbicide distribution across a field, soil type, and time. When herbicides are used above the labeled rate and/or not uniformly distributed, herbicide carryover problems may result. Poor distribution is generally the result of improper calibration or agitation, sprayer overlapping, or non-uniform soil incorporation.

Vegetable and ornamental crops are often more sensitive to herbicide carryover than field crops. To reduce the potential of herbicide carryover, read and follow all pesticide label directions. Herbicide labels contain restrictions on the interval between application and planting of various crops. Consult the current version of MSU Extension bulletin E-433, *Weed Control Guide for Vegetable Crops*, for more information on herbicides.

HERBICIDE COMBINATIONS

Herbicides are commonly combined and applied as a tank mix. Combinations are used to give more consistent control or a broader spectrum weed control, to decrease herbicide carryover, or to obtain adequate season-long weed control. Proper application methods must be followed for each herbicide detailed on the EPA-approved pesticide label. Always remember to read the pesticide label before combining or applying herbicides.



HERBICIDE ADDITIVES (ADJUVANTS)

An **adjuvant** is any substance added to a herbicide to enhance its effectiveness. Many commercially available herbicide formulations contain their own particular set of adjuvants to optimize the performance, mixing, and handling of the active ingredient. Sometimes additional additives are required for specific applications or herbicide combinations. The pesticide label will explain how and when to use the necessary adjuvants.

Additives are used primarily with postemergence herbicide applications to improve the coverage of leaf surfaces and increase herbicide penetration into the leaf. Additives do not increase the effectiveness of soil-applied herbicides.

CHAPTER 6

Review Questions

Chapter 6: Weed Management

Write the answers to the following questions and then check your answers with those in the back of the manual.

1. Define a weed.
2. Plants that complete their life cycle in one year are:
 - A. Biennials.
 - B. Annuals.
 - C. Perennials.
 - D. None of the above.
3. An aboveground creeping stem is called a:
 - A. Rhizome.
 - B. Stolon.
 - C. Tuber.
 - D. Bulb.
4. Weeds are easiest to control at the:
 - A. Reproductive stage.
 - B. Vegetative stage.
 - C. Seedling stage.
 - D. Mature stage.
5. Which of the following is an example of a broadleaf weed?
 - A. Quackgrass.
 - B. Green foxtail.
 - C. Wild-proso millet.
 - D. Common ragweed.
6. An example of a perennial grass weed is:
 - A. Quackgrass.
 - B. Wild carrot.
 - C. Barnyard grass.
 - D. Smooth crabgrass.
7. Reducing the competition between a crop and weeds by changing the planting population of the crop is an example of:
 - A. Biological weed control.
 - B. Cultural weed control.
 - C. Chemical weed control.
 - D. Mechanical weed control.
8. Preemergence herbicides generally require rainfall within a week of application to incorporate the herbicide in the soil.
 - A. True
 - B. False

HERBICIDE COMPATIBILITY PROBLEMS

Compatibility problems in tank mixing herbicides usually occur when applicators do not follow mixing directions. Some common causes of compatibility problems are: mixing two herbicides in the wrong order (for example, adding an emulsifiable concentrate to the spray tank before suspending a wettable powder), insufficient agitation, excessive agitation, and air leaks. Problems can also occur when the carrier is a fertilizer such as 28 percent nitrogen or other non-water substances. You should test for herbicide compatibility in a small container before mixing a large tank. If compatibility problems occur, adding compatibility agents may help.

9. Which of the following is true of preplant incorporated herbicide applications?
- A. They provide early weed control.
 - B. They can be used in all tillage systems.
 - C. They typically cause more crop injury than postemergence herbicide applications.
 - D. They are not affected by soil composition and moisture.
10. List two advantages and two disadvantages of postemergence herbicide applications.
11. Systemic herbicides kill weeds on contact.
- A. True.
 - B. False.
12. A preventive herbicide application occurs _____ weeds have emerged.
- A. before
 - B. after
13. A grower has a quackgrass problem in a cucumber field where the plants have three leaves. Which type of herbicide application would you use to control the quackgrass?
- A. Preplant soil incorporated
 - B. Postemergent
 - C. Preemergent
 - D. None of the above
14. The best way to reduce the potential of herbicide carryover is to follow the pesticide label directions.
- A. True
 - B. False
15. What is a herbicide adjuvant?
16. It is **not** necessary to test for herbicide compatibility before mixing a large tank.
- A. True
 - B. False