

Methods of Weed Control

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Types of Weed Control

- ▶ Preventative
- ▶ Biological
- ▶ Cultural
- ▶ Mechanical
- ▶ Chemical

Types of Weed Control

- ▶ **Preventative** – excluding new weeds by careful selection of soil or other inputs and keeping areas sanitary such that weeds are not introduced or spread.

Eclipta growing in and around nursery pots can be moved to ornamental beds. These pots should be avoided or carefully cleaned of all weed propagules.



Types of Weed Control

- ▶ **Biological** – use of living organisms to suppress or control weeds



Types of Weed Control

- ▶ **Cultural** – Anything done to “culture” or promote the growth of your crop. Examples include adding compost, aeration, fertilization, irrigation, variety selection, pruning, etc.

No-till is a cultural practice gaining favor in Oklahoma and the high plains.



Selecting crop species best adapted to your region is a cultural practice.

Types of Weed Control

- ▶ **Mechanical** – Targeting weeds with physical or nonchemical methods to achieve preemergence or postemergence suppression.



Pulling weeds, laying a fabric for a physical barrier, cutting weeds, burning weeds, shading weeds. These are all mechanical controls.

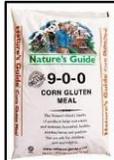


Types of Weed Control

- ▶ **Chemical** – Use of an herbicide, whether synthesized or purified from a natural source, to control weeds. Some products are marketed as “all natural” or “nonchemical” when they are actually chemically based.



Examples of chemical herbicides. Contrary to propaganda, “organic” does not mean “nonchemical.”



Mechanical/Physical Control

- ▶ Hand weeding
- ▶ Tillage
- ▶ Mowing
- ▶ Mulches
- ▶ Flooding
- ▶ Fire

Mechanical and Physical Control

Hand hoeing and pulling

Hand hoeing and pulling are the earliest (historically) and simplest types of weed control.

Still a major weed control method for about 70% of the world's farmers (primarily in less industrialized countries).



Hand hoeing and pulling

- ▶ Effective against all weeds
- ▶ Crop value must be high
- ▶ Other options not available
- ▶ Human labor must be relatively cheap (low value)
- ▶ A few weeds have escaped other control measures



Tillage

Kills by severing, dislodging, or burying plants and seeds.



Tillage objectives

- ▶ Seedbed preparation
- ▶ Control of plant pathogens, insects and rodents
- ▶ Temporarily improve soil physical conditions
- ▶ Incorporate crop residues
- ▶ Improve soil surface conditions for rainfall retention
- ▶ Incorporate fertilizers, herbicides, or soil amendments

Tillage types

All tillage operations will help to control weeds.

- ▶ Primary tillage: Initial breaking of the soil (10–90 cm deep)
- ▶ Secondary tillage: Additional leveling, breaking, and firming to prepare seedbed (10 cm or less)
- ▶ Selective cultivation: Control weeds after crop emergence

Disadvantages of tillage

- ▶ Soil erosion (wind, water)
- ▶ Bring weed seeds to surface
- ▶ Spread vegetative propagules
- ▶ Cannot be performed in wet soil
- ▶ Potential damage to crop roots

Tillage systems:

▶ Conventional tillage system

- 1) Primary tillage
- 2) Seedbed preparation (may involve multiple operations)
- 3) Planting
- 4) Selective cultivation (may involve multiple operations)



▶ **Conservation tillage:** any tillage system that reduce the loss of soil or water when compared to a non-ridged conventional tillage system. Usually leaves a layer of crop residue on the soil surface that reduces erosion and conserves moisture.

Tillage Systems

- ▶ **Reduced tillage:** use of primary tillage in conjunction with special planting techniques to reduce or eliminate secondary tillage operations.
- ▶ **No tillage:** a narrow seedbed is prepared with no additional disturbance of the soil.



Best tillage sequence:

1. A period of warmth and moisture
 2. Weed emergence
 3. Tillage
 4. A dry, warm period
- Repeat cycle

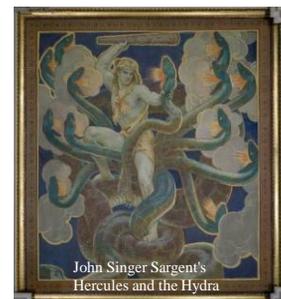
Soil surface should be dry for tillage – wet soil will allow plants to reestablish root connections.

Most effective on annuals, biennials, and simple perennials.

Frequent cultivations are effective in suppressing creeping perennials.

Warning

If you till a creeping perennial weed only once, you're just encouraging it!



Tillage of creeping perennials

Effect of repeated tillage on creeping perennials

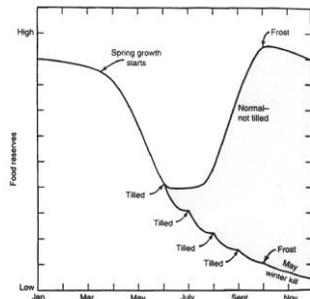


FIGURE 8.11 The principle of carbohydrate starvation. In perennial weeds, shoots are repeatedly removed by tillage, thus reducing the carbohydrate reserves of the plant until eventual death occurs. (Modified from Adkins and Monaco, 1991.)

Mowing

- ▶ Cutting of weed foliage at a specified height
- ▶ May kill weeds or least prevent seed production
- ▶ Depletes underground food reserves of perennial weeds
- ▶ Most effective on tall growing plants and annual broadleaf weeds



Mowing situations

Most effective in areas where complete kill is not the objective

- ▶ Turf
- ▶ Pastures
- ▶ Orchards, vineyards
- ▶ Roadsides
- ▶ Ditchbanks
- ▶ Powerline rights-of-way
- ▶ Vacant lots



Mowing

- ▶ Should always be done before weed seed set
- ▶ It may alter the stature of some weeds:



- This may be a disadvantage where low-growing weeds are still able to produce seeds.

Mulches

Mulches exclude light and smother weeds.



Good mulch properties

Good mulches are:

- ▶ Opaque and thick enough to exclude light.
- ▶ Inexpensive enough relative to expected income to justify the high cost of materials/application.
- ▶ Able to be applied efficiently.



Mulch materials

Materials used as mulches include:

- ▶ straw
- ▶ sawdust
- ▶ wood chips
- ▶ bark chips
- ▶ grass clippings
- ▶ rice hulls
- ▶ plastic
- ▶ paper
- ▶ rocks
- ▶ combinations of the above



Mulch Uses

Mulches are mostly used in small acreage or high value crops

- Landscaping
- Crops such as pineapple, melons, strawberries
- Home veg. gardens



Disadvantages of mulch

- ▶ High cost of materials and application
- ▶ Thin spots or tears allow weeds to break through
- ▶ Interferes with other weed control operations
- ▶ May alter soil temperature and water status
- ▶ May require further expense for disposal of plastics



Flooding

Deprive weeds of oxygen – kill existing weeds.
Suppress germination of weed seeds.



Flooding

- ▶ Can be an effective when water is plentiful and/or a flood tolerant crop is grown.
- ▶ Controls herbaceous perennial weeds.
- ▶ Flooding will not significantly affect viability of dormant annual weed seeds in soil.
- ▶ Generally need 6–10 inches of standing water for 3–8 weeks during summer.
- ▶ For rice this is very effective because the crop thrives under flood conditions.



Flooding problems

Continuous flooding leads to increase in flood tolerant weeds:

- ▶ Barnyardgrass
- ▶ Arrowhead
- ▶ Purple nutsedge

Flame cultivators

- Direct flame toward the ground--may be aimed between crop rows
- Heating of cytoplasm causes cell rupture.
- Symptoms of injury and death may take several hours to be noticeable
- Effective for crops that have the meristem below ground (protected) or are tall with woody stems
- Used effectively in alfalfa, cotton, cranberry, sugarcane, soybean, and mint

Flame cultivators

- ▶ Flaming is non-selective (equivalent to tillage), but grasses have better chance of surviving than broadleaf weeds.
- ▶ Other uses of fire include burning of crop residue, which may kill weed seeds still on the plants. Also burning of irrigation ditches is effective in clearing brush buildup



Soil Solarization

- ▶ Cover moist, tilled soil with clear plastic sheets
- ▶ Solar energy heats soil to temperatures high enough to kill weed seeds and pathogens.
- ▶ Requires extended periods of full sun (4–8 weeks), so most suited to tropics and semitropical regions where air temperature naturally exceeds 40°C
- ▶ Greatest effect is in the top 4–6 inches of soil



Other methods

Heat and steam used for sterilizing soil for greenhouses. Kills weed seeds and plant pathogens.

Electricity can be used but has not found commercial success.

Cryogenic weed control.

Microwave weed control.

Summary

- ▶ Understand the principles of how mechanical/physical methods control weeds.
- ▶ Understand the pros and cons of the various mechanical weed control methods.
- ▶ Be able to apply these methods appropriately to different crop situations.