Basic principles of weed management

Calvin Odero

Everglades Research & Education Center
What is a weed?

• A plant out of place or growing where it is not wanted
• An obnoxious plant
• A plant that is objectionable or interferes with activities and welfare of humans
• etc

Definitions of a ‘weed’ are based on our perceptions of the impact of the plant
Weed classification

Type of plant

Grasses
- One cotyledon
- Leaves narrow, parallel veins, arranged in sets of two
- Stems rounded or flattened

Sedges
- One cotyledon
- Leaves narrow, parallel veins, arranged in sets of three
- Stems triangular in cross section

Broadleaves
- Two cotyledons
- Leaves wide
- Veins branch out in different directions

*Fall panicum*  
*Yellow nutsedge*  
*Smellmelon*
Weed classification

Life history

Annuals
- Spiny amaranth: Completes life cycle in one year

Biennials
- Wandering cudweed: Lives more than one but not two years

Perennials
- Bermudagrass: Persist over several years, short- to long-lived
Harmful aspects of weeds

- Compete with the crop for light, moisture and nutrients
- Reduce crop yield and quality
- Increase crop production and processing costs
- Serve as hosts for disease and insect pests
- Decrease land value and crop choice
- Human hazards and aesthetically unpleasing
- Impede water flow along waterways, canals and ditches

Bermudagrass

Coffee senna

Water hyacinth
Weed management

• Weed management is a combination of
  – Prevention
  – Eradication
  – Control
Weed prevention

• Stopping weed species from contaminating an area
• Most difficult component, but potentially the most effective
• Accomplished by
  – Preventing new weed seeds into fields in contaminated seed cane, rotational crop seeds, and machinery
  – Preventing weeds from going to seed
  – Preventing vegetative reproduction of perennial weeds
  – Scouting for new infestations
  – Spot treatments to prevent patch expansion and large infestations
  – Education about weeds (especially weed identification)
3.5-inch common lambsquarters producing seed

- 30,000 to 172,000 seeds/plant
- 7- to 12-year seed longevity
Spiny amaranth producing seed prior to cultivation
Weed eradication

• Complete elimination of all living plants including their vegetative propagules and seeds
• Persistent roots and seeds are more difficult to eliminate
• More difficult than prevention and control
• Eradication efforts have rarely been successful
• Justified only for the elimination of serious weeds in a limited area
  – Perennial weed in a small area of a field
Napiergrass in a sugarcane field
Weed control

• Reactive process
• Limiting weed infestations and minimizing weed competition
  – **Goal**: ensure minimal effect of weeds on crop growth and yield
• Degree of control is a matter of **economics**, balance between **cost of control** and **crop yield loss**
• Methods of weed control
  – Mechanical/physical
  – Cultural
  – Chemical
Mechanical weed control

• Machine tillage
  – Weed control
  – Seedbed preparation
  – Burying crop residue
Figure 1. Influence of primary tillage on vertical distribution of total weed seed to a 15-cm depth in the soil after a dry bean crop (1). LSD (0.01) for plow NS and for chisel 34.5%.

Mechanical weed control

- Flooding
  - Selective weed control in rice
  - Potentially impacts weed seed viability in flooded fallow fields
  - Can be risky because it may encourage semi-aquatic weed species such as sprangletop, coast cockspur
Physical control

• Mulching
  – Controls weeds by excluding light
  – Green harvested cane mulch
    • Shift to large-seeded weeds such as vines
Cultural weed control

• Usually refers to habitat management
  – Manipulation of the crop-weed relationship in favor of the crop at the expense of the weed

• Describes practices not specifically for weed control that can reduce impacts of weeds
Cultural weed control

• Crop rotation
  – Allows for breaking of life cycles
  – Allows for rotation of herbicides and other weed control programs
Cultural weed control

- Weed-free seed cane
- Crop population/stand
Cultural weed control

- Fertilizer placement
  - Placing the fertilizer where the crop, but not weeds, has access allows the crop to be more competitive - banding

- Selection of cultivars that have quick canopy closure
Chemical weed control

Preemergence herbicides
- S-metolachlor + Atrazine + Mesotrion (Lumax EZ)
- Atrazine (several)
- Metribuzin (Sencor, Tricor)
- Mesotrion (Callisto)
- Pendimethalin (Prowl H₂O)
- Clomazone (Command)

Postemergence herbicides
- S-metolachlor + Atrazine + Mesotrion (Lumax EZ)
- 2,4-D amine (several)
- Dicamba (Clarity, Banvel)
- Ametryn (Evik)
- Atrazine (several)
- Metribuzin (Sencor, Tricor)
- Mesotrion (Callisto)
- Topramezone (Armezon)
- Asulam (Asulox)
- Halosulfuron (Sandea)
- Halosulfuron + Dicamba (Yukon)
- Trifloxysulfuron (Envoke)

Preemergence/Fallow
- Glyphosate (several)
Remember for chemical weed control

• Do it right
  – Proper herbicide(s)
  – Proper herbicide rate(s)
  – Proper placement of material
  – Proper time of application
  – Proper manner of application

• READ THE HERBICIDE LABEL, IT’S THE LAW
Integrated Weed Management (IWM)

• Development of a weed management program using a combination of preventive, cultural, mechanical, and chemical practices

• Applying the principles of IWM
  – Minimize overall economic impact of weeds
  – Reduce environmental impacts of herbicides
  – Provide optimum economic returns

• Development of IWM program is based on a few general rules that can be used on any field
1. Prevent weeds before they start

- Best method of weed control is to keep weeds out of the field
  - Field sanitation
  - Control of volunteer weeds
  - Planting clean seed cane or certified rotational crop seed
  - Cleaning field equipment
2. Help the crop compete against weeds

• Several things can be done to give the crop an advantage over weeds
  – Fertilizer placement
  – Competitive crop varieties
3. Keep weeds off balance

• Don’t give weeds a chance to adopt
  − Crop rotation
4. Making a control decision

- **Scout** your field to assess the type and number of weeds to help determine adequate spray operation and any other control measure.
- Economic threshold – level of weed infestation at which the cost of weed control equals the increased return on the crop yield.
- Consider the cost of delaying weed control.
What constitutes an effective weed management program?

- Weed identification
  - Spiny amaranth
  - Fall panicum
  - American black nightshade
What constitutes an effective weed management program?

- Identify the weed(s)
- Select proper control measure(s)
- Use an integrated approach (use multiple tools)
- Implement the program
- Document and keep records
  - Field history
  - Cropping practices