Integrated weed management for vegetables

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Weed management planning

- Think year-long cycles, multiple crops, multiple years
- Assess your weed problems
- Assess your resources and capabilities
- Assess your market – fresh or processed; small-scale or large scale
- Keep records; evaluate
Getting acquainted with weeds
Annual grasses

- barnyardgrass
- crabgrass
- downy brome
- foxtail
Annual broadleaf weeds

- Palmer amaranth
- Chickweed
- Common lambsquarter
- Tall morning glory
- Palmer amaranth
- Common ragweed
Perennial grasses

- tall fescue
- johnsongrass
- bermudagrass
- dallisgrass
Perennial broadleaf weeds

- Curly dock
- Dandelion
- Thistle
- Plantain
Sedges

- purple nutsedge
- yellow nutsedge
Weed Management Tools

- Mechanical – various implements
- Physical - dead mulches, mowing, flaming
- Biological – cover crops, allelopathic additives, biological control agents
- Cultural – crop rotation
- Chemical – synthetic pesticides, biopesticides
Rule of thumb: Diversify
Plan your cropping system

- Rotate crops with different growth habit, plant family, cultural requirement
  - Disrupt the pest life cycle, habitat
  - Example: sweet corn followed by snapbean
- If appropriate, section your field to accommodate different cropping patterns
- Consider your weed control options for each cropping system
Preventive measures

- Do not let weeds go to seed or spread vegetatively
- Keep a clean surrounding buffer area
- Kill perennial weeds before establishing the vegetable area
- Clean farm implements before using it in another location
- Keep track of expanding weed patches
Preplant activities

• Weed inventory
  • Target management to species that are most difficult to control

• Land preparation
  • Perennial weeds – tillage in the fall, before weeds go dormant; can choose to apply non-selective herbicide (i.e. glyphosate) first, then till one week later. Organic growers have some herbicidal chemicals to use, but efficacy and spectrum of control is less.
Preplant activities

- Land preparation cont’d. . .
  - Application of desiccant prior to tillage helps kill perennial weeds; otherwise, tillage can spread vegetative propagules of perennial weeds

- Repeat tillage maybe necessary for perennial weeds

- Can practice fallow tillage with supplemental herbicidal compounds to reduce the soil seedbank
Preplant activities

- Preplant, weed-suppressive bioadditives
  - Brassica seed meal
  - Corn gluten meal
  - Green manure – legume (cowpea, winterpea) or grass (sudangrass, rye, wheat)
Preplant activities

• No-tillage, minimum tillage options
  • Crop-dependent
  • Need to be done in conjunction with herbicides, or
  • Cover crops, or
  • Herbicides + cover crops

• This is better done when the soil weed seedbank is already reduced
Preplant activities

- Test your soil
- Apply supplemental fertilizer as needed
  - Options for organic growers – composted manures, pelletized poultry litter
  - Need supplemental nitrogen fertilizer when incorporating or using grass cover crops
Rule of thumb: Give crop the best advantage
There are herbicidal compounds that can be used before planting or before crop emergence

- Synthetic herbicide options in Missouri weed control handbook
- Note crop rotation restrictions for residual herbicides
- Organic herbicide options at OMRI

www.omri.org/omri-lists
Postemergence weed management

- Cultivation; hoeing
  - Use of cover crops, green manure, or brassica seed meal can significantly reduce hoeing effort
  - Cultivation + preemergence herbicide

- Chemical weed control options for row middles
  - Crop-specific: Paraquat, Aim, Sandea, Reflex
  - Organic-approved herbicides
  - Requires hooded sprayers
Postemergence herbicide options

- There are herbicidal compounds that can be applied after emergence of some vegetable crops.
  - **Snapbeans:**
    - Basagran - broadleaf weeds only
    - Reflex – broadleaves and some grasses
    - Poast, Assure II – grasses only
  - Note weed size and crop growth timing; preharvest intervals
The IR-4 Program

• Mission:
  • Registration of pesticides for specialty or minor use crops such as fruits, vegetables, ornamentals, and herbs
  • Ensures that pesticides labeled for food crops do not leave detectable residues in food products at the timing used.

• Has a biopesticide division; working with public or private entities in research and registration
‘Organic’ herbicides

- Scythe™ (Mycogen) – 3 to 10% solution
- Clove oil or cinnamon oil – 1 to 5%
- Matran II (EcoSmart) – 5 to 8%
- Vinegar – citric acid
- AllDown (Summerset) – 5% citric acid

OMRI-approved (See Products List 2011)
Physical Weed Control
Use of mulches and cover crops

- Soil conservation, fertility, physical health
- Water conservation
- Insect and animal biodiversity
- Reduction of some soil-borne pathogens
Mulch options

- Wood chips
- Rice straw or wheat straw
- Rice hull
- Grass clippings
- Shredded paper, cardboard
- Plastic mulch
Cover crop options

- Vetch, winter peas, cowpeas
- Clovers (berseem, subterranean, crimson)
- Small grains (wheat, rye, barley, oat)
- Sorghum sudangrass, ryegrass
- Mixture of grass & legume cover crops
Cover crops for tomato

Without cover

With rye & vetch residue
Efficacy of cover crops and mulches

Source: David Granatstein and Gene Hogue
Plastic mulches:

Need complementary weeding or chemical weed control in the row middles
Lessons from mulch trials

- Balancing act between weed control, soil fertility, crop response, cost
  - **Alfalfa**: poor weed control; high N, excellent crop response
  - **Clover**: good weed control, minimal N
Lessons from mulch trials

- Need to experiment with other mulch/cover crop systems.
  - Combining legume and grass cover crops (best treatment for vegetable weed control)
  - Supplementing mulches with biofertilizer to improve crop health and competitive ability
Biological Weed Control

None adapted for vegetable production
Biocontrol agent: pathogen

Collego – fungal agent for northern jointvetch: 1982, AR rice and soybean
Biocontrol agent: geese

- Prefer to graze on grasses
- As last resort, geese will dig up rhizomes of johnsongrass and bermudagrass
- Need portable fencing, drinking water
- Young geese are effective
Experiment with fire?
Flame weeding

- Mostly propane-fueled
- Effective on seedling broadleaf weeds; temporary burn on grasses
- Repeat flaming is recommended for annual grasses and perennial weeds
- Watch for dead plant materials that can catch fire.
- Do it on calm days
Sample model of flame equipment
Sample model of flame equipment

GP-750 Berm Orchard Flamer: Good for farms <40 A
Efficacy of flaming

- For annual weeds – 95% control with 3 treatments
- For perennial weeds – 75% control after 4 treatments
- Lambsquarters need 3 treatments for 95% control
- Dandelion - 1 flaming if seedling; 4 flamings, 70% control if big

Source: Tom Lanini, UC Davis
Summary

- Sustainable weed management requires good management skills and constant learning.
- There is no ‘one size fits all’ management strategy.
- Sustainable weed management begins with reduction of the soil seedbank and prevention of seed deposit.
Summary

- Organic weed management is not always sustainable.
- Sustainable weed management begins with reduction of the soil seedbank and prevention of seed deposit.
Thank you!