Principles of Weed Control in Vegetables

Joe Masabni
jmasabni@ag.tamu.edu
Texas A&M
College Station

Improving Lives. Improving Texas.

One of the most Serious Vegetable Production Problem in Texas

Goal of any Effective Weed Control Program is to Reduce or Eliminate the Weed Seed Bank

Weed Management Approaches

1. Prevention
2. Eradication
3. Control

1. Prevention
Stopping a weed species from contaminating a field

Contamination through Introduction of New Seed

• Birds and animals
• Contaminated crop seed
• Transplants
• Irrigation water
• Farm machinery
2. Eradication
The complete elimination of all living weed plants, plant parts, and seed from a field

3. Control
The process of limiting the economical impact of weeds

Major Methods of Weed Control
1. Mechanical
2. Cultural
3. Biological
4. Chemical

Systems Approach to Weed Control

1. Mechanical Control
   a. Cultivation
   b. Mulching
   c. Solarization
   d. Flooding
   e. Flaming
   f. Mowing
a. Keys to Successful Cultivation
• Proper equipment & adjustment
• Proper depth
  – Root pruning can be more detrimental than weed presence
• Timing

Timing: Stale Bed Culture
Approach:
• Spray with a PRE herbicide, or with a POST contact (Gramoxone) or systemic (Roundup) after weeds emerge and don’t disturb soil until planting
• Min. disturbance at planting is also suggested

b. Plastic Mulch
Excessive Weeds  No Weeds

Mulch
BSC Hand-Operated Plastic Layer

• Suitable for large garden or small truck farm
• 2-3 ft. plastic widths
• HP 5.5 – 14
• Can apply drip tape at the same time

Truck Garden Plastic Layer

• Will attach to lawn tractor
• Flat bed application
• 3 ft plastic 1000 ft rolls
• Small 1000 ft drip tape rolls

c. Solarization

Solarization of a Raised Bed

11-05-2012. 83 days later

Solarized  Non-Solarized

3-12-2013. 210 days later

Solarized  Non-Solarized
2. Cultural Control
   a. Smother Crops
   b. Competitive Crops
   c. Crop Rotation
   d. Allelopathy
   e. Beneficial Animals
### Vegetable Families

<table>
<thead>
<tr>
<th>Family</th>
<th>Crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cruciferae</td>
<td>Kale, Cauliflower, Cabbage, Broccoli, Brussels Sprouts, Kohlrabi, Radish, Turnip, Mustard</td>
</tr>
<tr>
<td>Solanaceae</td>
<td>Potatoes, Tomatoes, Eggplant, Pepper, Tobacco</td>
</tr>
<tr>
<td>Amaryllidaceae</td>
<td>Chives, Garlic, Leek, Onion, Shallot</td>
</tr>
<tr>
<td>Chenopodiaceae</td>
<td>Beet, Spinach</td>
</tr>
<tr>
<td>Gramineae</td>
<td>Corn</td>
</tr>
<tr>
<td>Compositeae</td>
<td>Artichoke, Lettuce, Endive</td>
</tr>
<tr>
<td>Leguminoseae</td>
<td>Pea, Bean</td>
</tr>
<tr>
<td>Apiaceae</td>
<td>Carrot, Celery, Cilantro, Dill, Parsley, Parsnip</td>
</tr>
<tr>
<td>Cucurbitaceae</td>
<td>Cucumber, Melon, Pumpkin, Squash, Zucchini, Gourd</td>
</tr>
</tbody>
</table>

### Good Rotation

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Bad Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring = tomato</td>
<td>Year 1 = tomato</td>
</tr>
<tr>
<td>Fall = Spinach</td>
<td>Fall = Irish potato</td>
</tr>
<tr>
<td></td>
<td>Year 2 = Bean</td>
</tr>
<tr>
<td></td>
<td>Spring = Bean</td>
</tr>
<tr>
<td></td>
<td>Fall = Mustard</td>
</tr>
<tr>
<td></td>
<td>Year 3 = Cantaloupe</td>
</tr>
<tr>
<td></td>
<td>Spring = Cantaloupe</td>
</tr>
<tr>
<td></td>
<td>Fall = Onion</td>
</tr>
</tbody>
</table>

### Bad Rotation

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Bad Rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring = tomato</td>
<td>Year 1 = tomato</td>
</tr>
<tr>
<td>Fall = Spinach</td>
<td>Fall = Irish potato</td>
</tr>
<tr>
<td></td>
<td>Year 2 = Bean</td>
</tr>
<tr>
<td></td>
<td>Spring = Bean</td>
</tr>
<tr>
<td></td>
<td>Fall = Snow pea</td>
</tr>
<tr>
<td></td>
<td>Year 3 = Cantaloupe</td>
</tr>
<tr>
<td></td>
<td>Spring = Cantaloupe</td>
</tr>
<tr>
<td></td>
<td>Fall = Pumpkin</td>
</tr>
</tbody>
</table>

###奥地利冬小麦

- 4/1

###马铃薯

- 2/1 to 5/1

###豌豆

- 5/1 to 7/1

###荞麦

- 7/1 to 8/15

###大蒜

- 8/15 to

###大蒜

- 5/15

###荞麦

- 5/15 to 6/15

###大麦

- 6/15 to 9/15

###花椰菜

- 9/15 to

###甘蓝

- 3/1

###甘蓝

- 3/5

###番茄

- 3/5 to 7/15

###秸秆

- 7/15 to 9/1

###益生动物

- 9/1 to

###有机除草剂

Corn Gluten Meal
- Examples: Orland’s Safe-T-Weed, Corn Weed Blocker
- Preemergent herbicide that kills feeder roots of germinating seeds but does not harm established plants that already have true leaves.
- Has high N content (9-1-0) so it works also as a fertilizer

Weed Barriers
- Examples:
  - WeedGuardPlus - Biodegradable weed barrier
  - Newspapers
  - Cardboard
- Garden fabric weed barrier, example: Sunblet Weed Fabric - non-biodegradable

Postemergent Herbicides
- Examples:
  - Avenger Weed Killer
  - GreenMatch EX burndown herbicide
  - WeedZap
  - 20% vinegar
  - BurnOut II
- Contain citrus oil, clove oil, cinnamon oil, d-limonene, vinegar oil, etc.

Mechanical Weed Control
- Hoeing: a lost art as people become more dependent on chemical products. Hoeing is best done with a sharp hoe when weeds are 1" tall. At that stage, disturbing the soil surface with the sharp hoe with forward and backward movements is enough to uproot all weeds.
- Glaser Weed Hoes

Flamer
- 400,000 btu. Best for weeding row crops, perennials, trees and vines, and sidewalks

Mechanical
- Hoeing: best done with a sharp hoe when weeds are 1" tall. At that stage, disturbing the soil surface with the sharp hoe with forward and backward movements is enough to uproot all weeds.
- Tools for perennial weeds:
  - Fiskars Uproot Weeder and Root Remover
  - Grampa’s Weeder
Most Importantly

- Don’t forget ‘mulching’
- Plastic mulch is approved for organic production
- Biodegradable mulch is available:
  - Coco fiber weed mat
  - Mega Mulch compressed brick
  - Planters Mulching Paper
  - Cocoa Peat
  - Cocoa mulch

CHEMICAL WEED CONTROL

Handheld Weed roller

- Round*Up application
- Padded roller
- Use around perennial crops
- Use along edge of mulch to kill weed avoids drift

Success Of Chemical Weed Control

- Determined by:
  - How well label is read
  - proper application equipment
  - appropriate herbicide

Danville Industries, 124 West Main, Harper, Kansas
67058 ph #1 800 662-4212

Keys to Good Chemical Control

Herbicides Classified Based on Time of Application

- Preplant
- Preplant Incorporated
- Preemergence
- Postemergence
- Post-transplant
Summary

- The most effective means of controlling weeds is through a systems approach
- A good weed control systems combines several control techniques
  - Mechanical
  - Cultural
  - Chemical

Ten Steps Toward Organic Weed Control

1) LOWER WEED PRESSURE

By managing your weed seed bank to reduce the need for cultivation and hand hoeing.
- Thoroughly compost animal manures to kill off weed seeds, or avoid using manure altogether.
- Keep weeds from going to seed: cultivate solely for that purpose.
- Reduce weed influx by keeping alleys and field edges mowed or harrowed.
- Power wash tillage equipment after use in fields with a noxious weed problem.

2) DIVERSIFY ROTATIONS to keep a particular weed from proliferating.

- Alternate crops with different tillage requirements or time of planting.
- Include small grains or sod crops in the rotation if possible, to vary the habitat for weeds.

3) USE COVER CROPS: they compete with weeds while providing other benefits.

- Select species for rapid growth that starve weeds of light and nutrients.
- Sow at high rates, drill the seed and even irrigate if necessary to assure thick stands and rapid establishment of cover crops.
- Regular incorporation of cover crops enhances soil tilth, making cultivation easier. Since frequent cultivation can harm soil structure, it is important to compensate by adding clean organic residues whenever practical.

4) FEED THE CROP, NOT THE WEEDS by manipulating fertilizer placement and timing.

- Avoid pre-plant broadcasting of soluble nutrients that may be more readily utilized by fast-growing weeds than slow-growing crops, and may even stimulate weed germination.
- Apply fertilizer near the rows where it is more likely to be captured by the crop.
- When using expensive bagged organic fertilizers, band at low rates at planting or sidedress; rely on mid-season release of nutrients from compost and/or green manures for primary fertility.
5) PICK THE RIGHT TOOL FOR THE JOB.

- Blind, "over-the top" cultivation controls very small weeds, just germinated or emerged, before and sometimes after planting.
- Flex-tine cultivators (e.g. Lely weeder), or rotary hoes are excellent for shallow cultivation of the entire surface of the field.

5) PICK THE RIGHT TOOL FOR THE JOB.

- Shallow between-row cultivators such as basket-weeders, beet-hoes, or small sharp sweeps are used to cut off and uproot small weeds after the crop is up. These can get very close to the crop when it's small, without moving much soil into the row, and may be the only tools used on delicate crops like leafy greens.
- As vigorous crops grow, soil can be thrown into the row to bury in-row weeds using rolling cultivators (e.g. Lilliston), spyder wheels (e.g. Bezzerides), large sweeps or hilling disks. Some of these tools can be angled to pull soil away from the row when plants are small, and later turned around to throw soil back on the row during subsequent cultivations.

6) COMBINE TOOLS to cover the different zones in the field.

- Between-row, in-row, and wheel-track weeds must all be attacked.
- Watch out for narrow strips that are missed because they pass between too-few tools.
- Front-mounted or belly-mounted tools plus rear-mounted toolbars facilitate combinations that can assure complete coverage.

7) SET UP FOR SPEED to minimize cultivation time and expense.

- Perfectly straight rows and alert tractor drivers are essential
- Uniform row spacing across comparable crops enhances the utility of a cultivation set-up.
- Consider multiple-row units; gauge wheels are helpful on wide units or if fields aren't level.
- With frequently-used tractor-mounted cultivators, get them set just right and leave them on all season to avoid repeated mounting and adjustment.

8) TIMING IS EVERYTHING: get the weeds while they're small, before the field looks weedy.

- Very shallow cultivation of "white thread" weeds can minimize bringing up more weed seeds.
- Keep an eye on the weather and try not to get beat by the rain; if you do, be ready with the heavy artillery - more aggressive tools for bigger weeds, when you can get in.

9) CONSIDER STALE SEED BEDS OR STALE ROWS using flame-weeders.

- Prepare soil for planting, then use a flamer to kill very small weeds without disturbing the soil.
- One or two flamings are used, just before and/or after planting, but prior to crop emergence.
- Single burners flame just the crop row, multiple burner units cover a whole bed.
- Backpack, push-type and tractor-mount units are in use.
10) EXPERIMENT to fine-tune your weed management tactics.

- Start on a small scale with tools and techniques that are new to your farm.
- Identify your problem weeds and compare different combinations of rotations, cover crops, and cultivation tools for their effectiveness in providing control.
- Keep an eye out for new tools, or new ways to use old tools.
- Leave a "control" row or section untreated, so you can see the effectiveness of your tactics.