Weed Management in Vegetables

Feb 19, 2018

Ramdas Kanissery
Assistant Professor - Weed Scientist
Southwest Florida Research and Education Center
Immokalee, FL

UF/IFAS
UNIVERSITY OF FLORIDA
Vegetable Production

Important to the economy of SW Florida
- Tomato, Cucumber, Bell Pepper, Water melon etc.

“Weed management is always a key ingredient in the recipe for profitable production”
“Weeds are plants that maintain their abundance under conditions of repeated disturbance”- Liebman
“Weeds are plants that maintain their abundance under conditions of repeated disturbance”– Liebman

“A weed is a plant that has mastered every survival skill except for learning how to grow in rows” – Doug Larson
What are weeds doing in my farm?

Weedy row-middle in sweet corn

SWFREC Veg Farm

Compete for light, nutrients, moisture and space
What are weeds doing in my farm?

Compete for light, nutrients, moisture and space.

Giant Amaranth or Pig weed
Immokalee, FL
What are weeds doing in my farm?

Giant Foxtail in snap beans

Figure credit: Mark Schonbeck, Virginia Association for Biological Farming.
What are weeds doing in my farm?

- Alternate host for pests and diseases

Source of pest and diseases

Figure credit: Mark Schonbeck, Virginia Association for Biological Farming.
What are weeds doing in my farm?

- Alternate host for pests and diseases

Weeds growing adjacent to the crop row providing a moist and favorable environment for fungal growth on the tomato foliage

Figure credit: Mark Schonbeck, Virginia Association for Biological Farming.
“Agricultural weeds can hurt crop yields or increase costs of production”
“Four S of veg weed management”

Scouting

Systematic weed identification

Selection of application timing

Sanitation
Scouting

Systematic weed identification

Selecting application timing

Sanitation
SCOUTING – the first step
SCOUTING – the first step

• **E**arly in the production year - more competition with crops
• **F**requent scouting
• **G**reater scouting at hot spots
  • e.g., edges of field
**SCOUTING – the first step**

Zig-zag pattern of scouting across the field – entire length
Regular Scouting

Systematic identification

Selecting application timing

Field Sanitation
Get the correct weed identification

- Grasses
- Broadleaves
- Sedges
Get the correct weed identification

“Very important step for efficient and economic weed management in vegetables”
Seed head color

Yellow v/s Purple Nutsedge
Seed head color

Yellow v/s Purple Nutsedge

Leaf tip
Get the correct Id

Parthenium

Ragweed

Sweet clover
2017 Trial in Immokalee, FL

Post-emergent Parthenium control

Weed Biomass (Kg/m²)

- Utreched Check
- Halosulfuron
- Glufosinate-Ammonium
- Diquat
- Lactofen

Diquat: effective against heavy Parthenium infestation
Life-cycle of weeds

- Biennials
- Annuals
- Perennials
Life-cycle of weeds

- Annuals
  - Amaranth
  - Crab grass
  - Pusley
Life-cycle of weeds

Biennial

Cut leaf evening primrose
Life cycle of weeds

Perennials

Nut sedge
- Produce vegetative structures
- Eg., stolons, rhizomes, tubers, or large roots

Creeping beggar weed
“Weed garden at SWFREC Immokalee”
“Four S of veg weed management”

Scouting

Systematic weed identification

Selecting application timing

Sanitation
“Does timely weed management help in increasing an economic yield?”
Example of yield response to weed interference

- $y$, crop yield
- $x$, days from crop emergence

Weedy for ‘$x$’ days
Example of yield response to weed interference
Example of yield response to weed interference

$y$, crop yield

$x$, days from crop emergence

Weed free ‘x’ days
Weedy for ‘x’ days
Concept of Critical Weed Free Period
“Critical weed free period”
Concept of Critical Weed Free Period

**Tomato**: 0 to 9 weeks after planting

"Critical weed free period"

**Watermelon**: 0 to 6 weeks after planting

Source: Diane (Report in Growing produce)
Application timing
Application timing
Application timing

- PRE
- POST
- POST
- POST

▲ Planting ▼ Herbicide ▶ Weeds △ Harvest
<table>
<thead>
<tr>
<th>Product</th>
<th>Active ingredient</th>
<th>PRE/POST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Magnum, Brawl</td>
<td>S-metolachlor</td>
<td>PRE</td>
</tr>
<tr>
<td>Chateau</td>
<td>Flumioxazin</td>
<td>PRE</td>
</tr>
<tr>
<td>Prowl</td>
<td>Pendimethalin</td>
<td>PRE</td>
</tr>
<tr>
<td>Roundup</td>
<td>Glyphosate</td>
<td>POST</td>
</tr>
<tr>
<td>Reglone</td>
<td>Diquat</td>
<td>POST</td>
</tr>
<tr>
<td>Aim</td>
<td>Carfentrazone</td>
<td>POST</td>
</tr>
</tbody>
</table>

“Not a complete list….”
For more information refer to:
Herbicide Spraying....

- Read the label – It’s the law
- Use surfactants with POST sprays
- Record the application
- Be cautious about crop injury
Herbicide Spraying....

- Read the label – It’s the law
- Use surfactants with POST sprays
- Record the application
- Crop injury
Glyphosate injury on tomato
Cat facing in tomato possibly from herbicide injury during pre-bloom or post-bloom stage
Regular Scouting
Specific weed identification
Selecting application timing
Sanitation
Prevent weed problems before they start

You may have a clean row middle in the farm...

“How about the farm perimeter areas?”
“How about the perimeter areas?”
“How about the perimeter areas?”
Prevent weed problems before they start

Ragweed

“Weeds found in farm perimeter areas are potential source of infestation into the cropping area”
White Sweet clover

“Weeds found in farm perimeter areas are potential source of infestation into the cropping area”
Ditch Bank and road side maintenance

Disking is an option on farm perimeters

Chemical control can be used

Field ditches and canals - many herbicides are not labeled for use on aquatic sites

Herbicides – Diquat, Rodeo (Glyphosate)
Volunteer Tomatoes

Could be hosts to
- Pests e.g., white flies

Potential source of inoculum for
- Bacterial spots
- Viruses

“Usually grow from the seed left in the field from a previous crop”

Bacterial spot pathogen can live up to **30 weeks on crop debris** but less than 30 days just in soil.
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops

Weed problem
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops

Weed problem
| Seed Bank | 2,000,000 | 800,000 | 200,000 |
Seed Bank

Examples of Weed Seed Production per Plant*

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000,000</td>
<td>Purslane</td>
</tr>
<tr>
<td>800,000</td>
<td>Black Nightshade</td>
</tr>
<tr>
<td>200,000</td>
<td>Amaranth</td>
</tr>
</tbody>
</table>

*Data collected by researchers across the globe WSSA
Seed Bank

Examples of Weed Seed Production per Plant*

<table>
<thead>
<tr>
<th>Seed Bank</th>
<th>Purslane</th>
<th>Black Nightshade</th>
<th>Amaranth</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Data collected by researchers across the globe WSSA
Seed Bank

2,000,000

Common Purslane

• capsular fruits 'pops off'
2,000,000

Common Purslane

- capsular fruits 'pops off'
- seeds are then spread
Seed Bank

ONE MATURE PLANT produces approximately 320 seeds.
Seed Bank

ONE MATURE PLANT produces approximately 320 seeds. 10% of seeds are lost before shedding, resulting in 288 newly formed seeds.
Seed Bank

One mature plant produces approximately 320 seeds. 10% of seeds are lost before shedding. 288 newly formed seeds are left. 30% of seeds are lost through predation from the soil surface. 202 seeds are added to the soil seedbank.
“Approx. 5% of weed seeds successfully emerge as new seedling”
Important strategy to prevent weed outbreak in your farm

“NEVER LET ‘EM SET SEED”
Strategies for Seedbank Reduction

- Spray before seed setting

“Early spray programs before flowering and seed setting will help reducing the weed proliferation in the upcoming seasons”
Seedbank Reduction

- Spray before seed setting

- Fallow field program

  “Deplete perennial weeds that has rhizomes and tubers”
Seedbank Reduction

Large weed seedbanks can be depleted by:

“Purposely keeping farm out of production during the growing season”

Fallow field program
Fallow period timed to coincide with peak emergence of most dominant species of weeds

Deplete carbohydrate stored in perennial weed rhizomes and tubers

Tillage land at intervals to break the rhizome and facilitate maximum emergence.

Follow-up with a herbicide application (e.g., Glyphosate)

May follow planting a cover crop for preventing further weed emergence.
Fallow period timed to coincide with peak emergence of most dominant species of weeds

Deplete carbohydrate stored in perennial weed rhizomes and tubers

Tillage land at intervals to break the rhizome and facilitate maximum emergence

Follow-up with a herbicide application (e.g., Glyphosate)

May follow planting a cover crop for preventing further weed emergence
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops

Weed problem
Additional Thoughts…..

Help the crops to compete with the weed
• Use healthy transplants
• Proper nutrition
• Prevent nutrient leaching into row-middles

Choke them out – never let weeds to adapt
• Rotate crops
• Rotate herbicide chemistry, if possible
Additional Thoughts.....

Help the crops to compete with the weed
• Use healthy transplants
• Proper nutrition
• Prevent nutrient leaching into row-middles

Choke them out – never let weeds to adapt
• Rotate crops
• Rotate herbicide chemistry, if possible
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops +

Weed problem
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops +

Weed problem +
Management strategy
Management strategy

- Scouting
  - Early and Frequent

- Systematic weed identification
  - Correct weed id
  - Lifecycle

- Selecting application timing
  - Critical weed free period
  - Herbicide spraying
  - Seed bank depletion

- Sanitation
  - Perimeter areas
  - Volunteers
Management strategy

- Scouting
  - Early and Frequent

- Systematic weed identification
  - Correct weed id
  - Lifecycle

- Selecting application timing
  - Critical weed free period
  - Herbicide spraying
  - Seed bank depletion

- Sanitation
  - Perimeter areas
  - Volunteers
Management strategy

- Scouting
  - Early and Frequent

- Systematic weed identification
  - Correct weed id
  - Lifecycle

- Selecting application timing
  - Critical weed free period
  - Herbicide spraying
  - Seed bank depletion

- Sanitation
  - Perimeter areas
  - Volunteers
Management strategy

- **Scouting**
  - Early and Frequent

- **Systematic weed identification**
  - Correct weed id
  - Lifecycle

- **Selecting application timing**
  - Critical weed free period
  - Herbicide spraying
  - Seed bank depletion

- **Sanitation**
  - Perimeter areas
  - Volunteers
Recipe for weed outbreak in your farm

Seed bank +
Favorable conditions +
Susceptible crops +

Weed problem +
Management strategy

Healthy crop and good yield
“What are the top three most problematic weeds on your farm?”
“What are the top three most problematic weeds on your farm?”

“Every weed on the planet”
Thank you...

Contact

Ramdas Kanissery

UF/IFAS SWFREC
2685 State Road N
Immokalee, FL

Phone: (239) 658-3455
rkanissery@ufl.edu

SWFREC weed science team