Digging into the Toolbox: Cultural management practices for home vegetable gardens

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Tennessee Extension Master Gardener State Conference

Image credits: OZInOH
Our time today

Main crops

Secondary crops

Practices

What do they look like when fit together?
Section 1

MAIN CROP CHOICES
Cultivar selection

1. Address your biggest challenges

2. Be aware of new cultivars

3. Make adjustments to practices if you can’t meet challenges with cultivars
Options for vegetable resistance

• Fusarium, Verticillium
• Root knot nematode
• Powdery mildew, some downy
• Viruses

• Some cultivars available for early and late blight
Tomato possibilities

- Defiant PHR- HR, IR
- Mountain Merit- HR
- Stellar- HR, IR, Septoria
- Iron Lady- HR, IR
- Mountain Magic – HR, IR
- Plum Regal- HR, IR
- Jasper- IR, IR, Septoria
- Lemon Drop
- Matt’s Wild Cherry

- Late blight (*Phytophthora infestans*)
- Early blight (*Alternaria solani*)

- Mr. Stripey- LB (one star)
Seed purchase

- Black rot-cruciferous
- Lettuce mosaic virus
- Bacterial spot- pepper
- Basil downy mildew

DISEASES AND PROBLEMS:
To prevent bacterial spot and phytophthora, drip irrigate only, plant only in well-drained soils, minimize soil compaction, follow a 4-year crop rotation. Sunscald is caused by an inadequate foliage canopy. Prevent blossom end rot with adequate soil calcium and regular moisture. Big bushy plants with few peppers can be caused by an excess of nitrogen, hot or cold temperature extremes during the flowering period, tarnished plant bug injury, and choice of late, poorly-adapted varieties.

BACTERIAL SPOT NOTICE:
Bacterial spot can be seed borne. All Johnny's pepper seed lots are tested for bacterial spot.

NOTE:
A disease-free test result does not guarantee a seed lot to be disease-free, only that in the sample tested, the pathogen targeted was not found.
Plant selection

• What seeds were used?
• Were seeds treated?
• Where were the plants produced?

• Grow your own or buy local - shop where there are repercussions
Section 2

PRACTICES
Rotation 101

- Pests
- Disease
- Fertility
- Weeds
Basic principles

• Families/types
• N attributes
• Depths
• Seasons
• Cover

• Must adapt to fertility, disease in real time
<table>
<thead>
<tr>
<th>Corn</th>
<th>Squash</th>
<th>Zucchini</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pea</td>
<td>Green Beans</td>
<td>Broccoli</td>
</tr>
<tr>
<td>Tomato</td>
<td>Eggplant</td>
<td>Carrots</td>
</tr>
</tbody>
</table>

Image credits: Isabel Eyre, AAS, Suzy Morris
| Year Two |
|----------|----------|
| ![Image 1](image1.jpg) | ![Image 2](image2.jpg) |
| ![Image 3](image3.jpg) | ![Image 4](image4.jpg) |
| ![Image 5](image5.jpg) | ![Image 6](image6.jpg) |
| ![Image 7](image7.jpg) | ![Image 8](image8.jpg) |
| ![Image 9](image9.jpg) | ![Image 10](image10.jpg) |

Image credits: Isabel Eyre, AAS, Suzy Morris
Rotation realities

- We are often gardening in small spaces
- Multiple families often grown together
- We often grow multiple crops a year
## Rotation 201 - the botanical elements

<table>
<thead>
<tr>
<th>Family</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apiaceae</td>
<td>Carrot, celery, parsnip</td>
</tr>
<tr>
<td>Chenopodiaceae</td>
<td>Beet, spinach, chard</td>
</tr>
<tr>
<td>Cucurbitaceae</td>
<td>Cucumber, squash, pumpkin, watermelon</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Corn</td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Okra</td>
</tr>
<tr>
<td>Brassicaceae</td>
<td>Broccoli, mustard, Brussels sprouts, kale, collards, kohlrabi, radish, turnip, cabbage, cauliflower, radish</td>
</tr>
<tr>
<td>Solanaceae</td>
<td>Tomato, potato, pepper, eggplant</td>
</tr>
<tr>
<td>Alliaceae</td>
<td>Chives, garlic, leek, onion</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Beans, peas, edamame</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>Lettuce, sunflower, endive</td>
</tr>
</tbody>
</table>
General and Specific

- Foliar-2 yrs and soil – 4 yrs
- Clubroot in radish and cabbage- 7 years
- Fusarium wilt in muskmelon- 5 years
- Fusarium wilt in peas- 5 years
0. What is IT?

1. How long can it survive
2. What else can it infect
3. How else can it survive
4. How can it be spread
## Pulling it together

<table>
<thead>
<tr>
<th>Year</th>
<th>Plot 1</th>
<th>Plot 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>One</td>
<td>Tomato, pepper {cr}</td>
<td>Tomato, (vetch)</td>
</tr>
<tr>
<td>Two</td>
<td>Kale, mustard, collards {rr}</td>
<td>Cucurbit, brassica</td>
</tr>
<tr>
<td>Three</td>
<td>Pea, spinach, chard</td>
<td>Corn, (field pea)</td>
</tr>
<tr>
<td>Four</td>
<td>Sweet potatoes</td>
<td>Beet, chard (Buckwheat) {vw}</td>
</tr>
</tbody>
</table>
Other considerations

• Not necessarily fixed

• Often long rotations interspersed

• Gardeners can drop crops completely….
Solarization

- Clear plastic (110-130 at 2 in.)
- Smooth, moist soil
- Bright sun
- Heat retention (single vs. double)
The hit list (Partial)

• Fusarium sp.
• Pythium sp.
• Southern blight
• Rhizoctonia solani
• Bact canker - Clavibacter mich.
Key practical steps

• UV protected plastic
• 1-6 mil (balance durability with light)
• Soil moisture critical
• Four to six weeks in summer
• Well secured, no punctures
• Clean plastic
• Be careful at edges
# Seed treatment

<table>
<thead>
<tr>
<th>Crop</th>
<th>Temperature (F)</th>
<th>Minutes</th>
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<tbody>
<tr>
<td>Brussels sprouts, eggplant, spinach, cabbage, tomato</td>
<td>122</td>
<td>25</td>
</tr>
<tr>
<td>Broccoli, cauliflower, carrot, collard, kale, kohlrabi, rutabaga, turnip</td>
<td>122</td>
<td>20</td>
</tr>
<tr>
<td>Mustard, cress, radish</td>
<td>122</td>
<td>15</td>
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<tr>
<td>Pepper</td>
<td>125</td>
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<tr>
<td>Lettuce, celery</td>
<td>118</td>
<td>30</td>
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</tbody>
</table>

Grafting uses

- Soil borne disease issues
- Heirloom cultivars
- Stress resistance

Ken Chamberlain, OARDC
Rootstocks chosen carefully

### Description of Commercial Tomato Rootstocks as of September 15, 20:

#### Common Tomato Diseases and Pests and Susceptibility Characteristics

Rating rootstock (RS) characteristics is complex because strains of pathogens differ and plant responses to them are rarely "yes" or "no." The approaches to and outcomes of rating RSs differ. This table was compiled using only publicly available information provided by seed company catalogs and at websites. Companies refer to RSs generically as "resistant" (R below). Others describe RS resistance to a disease or pest as complete (HR below) or partial or intermediate (IR below). Others use numerical scales which have been converted to R, HR and IR below.

<table>
<thead>
<tr>
<th>Rootstock Variety</th>
<th>Product URL</th>
<th>Developer</th>
<th>Bacterial</th>
<th>Corky</th>
<th>Fusarium</th>
<th>Fusarium</th>
<th>Fusarium</th>
<th>Fusarium</th>
<th>Fusarium</th>
<th>Southern</th>
<th>Verticillium</th>
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<tr>
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<td>IR</td>
<td>HR</td>
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<tr>
<td>Abooi</td>
<td>Click Here</td>
<td>Asahi</td>
<td>IR</td>
<td>IR</td>
<td>HR</td>
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<td>HR</td>
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<td>Click Here</td>
<td>Gatter</td>
<td>IR</td>
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<tr>
<td>Arnoo</td>
<td>Click Here</td>
<td>Spanger</td>
<td>R</td>
<td>R</td>
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Section 3

SECONDARY CROPS
Cover crops

- Rye, barley, oats
- Non host for RKN and many plant diseases
- High biomass
- Weed allelopathy
Cover crops- legumes

- Crimson clover, vetch, field pea
- Supplies N- Can aid in management
- Potential disease risks (Phythium- Rhizoctonia complex)
Cover crops

- Buckwheat (*Fagopyrum esculentum*)
- Polygonaceae
- Summer annual, non legume
- Weed suppression, pollinator support
Cover crops

• Brassicas- mustards, radish
• Lower germ temps
• High biomass
• Could be spring or fall sown
• Isothiocyanates
• Many garden crops in the same family
Many other benefits

- Organic matter
- Biological communities
- Nutrients
- Water holding capacity
Section 4

INTEGRATED APPLICATION
What are we battling?

Image credits: Sally Miller, OSU, Bugwood.org
Cucurbit downy mildew 
(*Pseudoperonospora cubensis*)

- One mating type
- Green bridge
  - Resistance (slows it down)
  - Protective sprays
Bacterial spot  
(Xanthomonas campestris pv. vesicatoria)

- Devastating in warm, moist conditions
- Survives on debris, soil (?) 1 yr (1/10000-100)

- Can be seed transmitted- clean transplants!!
- Tested clean or hot water treated
- Two year rotation
- NO overhead watering
- Can survive on stakes and volunteers

Image credits: Howard F. Schwartz, Colorado State University, Bugwood.org
Fusarium wilt
(F. oxysporum sp. lycopersici)

- 5-7 year rotations
- Use resistance (know race)
- Seed and equipment borne
- Solarization

Florida Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Bugwood.org
White mold
(Sclerotinia spp)

• Infects 360 plant species
• Long-lived sclerotia

➢ Corn and cereal rotations (5 years out)
➢ Control weedy hosts
➢ Broccoli before lettuce example
Lettuce (Pythium and Rhizoctonia sp.) Soil

- Saprophytes
- Recent incorporation of organic matter
- Solarization
- Seed treatment (?)
- Thorough OM breakdown
Root knot nematode
(Meloidogyne sp.)

- Vetch can be an alternate host

- Small grain routinely incorporated
- Long rotations
- Use resistant varieties
- Eliminate weeds
- Maybe solarization
- Grafting

Image credits: Texas A&M AgriLife Extension
In Conclusion

- Learn nuances of tools
- Plan and be willing to re-plan
- Identify
- Integrate, integrate