About Myself

Education:
• University of Nebraska-Lincoln
  • B.S. of Horticulture (Sustainable Food Production)
  • B.S. of Applied Science (Diversified Agriculture)

Experiential Background:
• Soil Nutrient Management / Irrigation Research
• Vegetable Production / Organic Farming Research
• Field Scouting / Diagnostics
• Integrated Pest Management
IPM Overview

Pest Identification  Monitoring for Signs & Symptoms  Control Action Guidelines

**Economic Injury Level** – The lowest population density of a pest that will cause economic damage; or the amount of pest injury which will justify the cost of control.

**Action Threshold** – The point at which a pest control action must be taken to prevent unacceptable damage.
Identifying Windows of Opportunity

- Adult
- Immature (Nymph or Larvae)
- Pupa
- Egg
<table>
<thead>
<tr>
<th>Cultural Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Land + Water Management</strong></td>
</tr>
<tr>
<td>○ Maintain the ecosystem in a healthy state to minimize competitiveness of pests.</td>
</tr>
<tr>
<td>○ Avoid over/under watering to reduce plant stress</td>
</tr>
<tr>
<td>○ Control water levels (diseases, mosquitos, aquatic weeds, etc.).</td>
</tr>
</tbody>
</table>

D. G. Alston, Important Components of a Successful Pest Management Program, USU Fact Sheet, July 2011
# Mechanical Control

<table>
<thead>
<tr>
<th>Hand Removal</th>
<th>Mowing</th>
<th>Traps</th>
<th>Physical Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Hand pull weeds.</td>
<td>- Mow down weeds within an area <strong>before</strong> they produce seeds.</td>
<td>- Traps are primarily used to monitor and control insect and vertebrate pests.</td>
<td>- Floating Row Covers are used to protect row crops.</td>
</tr>
<tr>
<td>- Physically remove the pest from the plant.</td>
<td></td>
<td>- Attractive traps usually use visual cues (color) and/or odors (pheromones, food baits) to attract pests to them.</td>
<td>- Sticky bands can be placed around tree trunks to prevent insects crawling up.</td>
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<td></td>
<td></td>
<td>- Passive traps are placed in areas with pest activity or use wind currents to catch pest.</td>
<td></td>
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</tbody>
</table>

ROW COVER

PLASTIC “MULCH”
WEED BARRIER

YELLOW STICKY TRAP
## Biological Control

<table>
<thead>
<tr>
<th>Predators</th>
<th>Parasites</th>
<th>Pathogens</th>
<th>Herbivorous Insects of Weeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Organisms that eats or kills another (e.g. predatory insects, mites, birds, mammals, reptiles, etc.).</td>
<td>○ Organism that lives in or on another and kills it while completing its life cycle (e.g., parasitoid).</td>
<td>○ Microbial agent that attacks and invades another organism (e.g. bacteria, virus, nematode).</td>
<td>○ Plant feeding insect that attacks weeds.</td>
</tr>
</tbody>
</table>
## Chemical Control

<table>
<thead>
<tr>
<th>Synthetic Pesticides</th>
<th>Organic Pesticides</th>
<th>Biological Pesticides</th>
<th>Insect Growth Regulators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human-made in a laboratory; chemically joined compounds or elements (e.g. most herbicides, diazinon, malathion, carbaryl, benomyl, streptomycin, etc.)</td>
<td>Derived from plant, animal, or naturally occurring rock or petroleum oil sources (e.g., rotenone, sabadila, ryania, nicotine sulfate, pyrethrum, soaps, oils, microbial agents, lime sulfur, copper, etc.)</td>
<td>A subset of organics that specifically refers to products developed from naturally occurring microbial agents such as bacteria, viruses, and fungi (e.g., <em>Bacillus thuringiensis</em>, a bacterial pathogen of many insects.)</td>
<td>Kills insects by interfering with the normal process of juvenile development; common IGRs disrupt either the insect’s hormonal process or exoskeleton development.</td>
</tr>
</tbody>
</table>

D. G. Alston, Important Components of a Successful Pest Management Program, USU Fact Sheet, July 2011
### Mode of Action (MoA)

The way a pesticide works. Specifically how it affects the target site within an organism. Typically a critical protein or enzyme in the insect.

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<tr>
<th>Nerve &amp; Muscle</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most current insecticides act on nerve and muscle targets. Insecticides that act on these targets are generally fast acting.</td>
<td>Insect development is controlled by juvenile hormone and ecdysone, by directly perturbing cuticle formation/deposition or lipid biosynthesis. Such insect growth regulators are generally slow to moderately slow acting.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respiration</th>
<th>Mid-Gut</th>
</tr>
</thead>
<tbody>
<tr>
<td>Several insecticides are known to interfere with mitochondrial respiration by the inhibition of electron transport and/or oxidative phosphorylation. Such insecticides are generally fast to moderately fast acting.</td>
<td>Lepidopteran-specific microbial toxins that are sprayed or expressed in transgenic crop varieties.</td>
</tr>
</tbody>
</table>
Field Scouting

• Scout Often (Weekly)
• Scout in areas where insects or diseases are likely to occur (Field borders, Wet areas, etc.)
• Visual observation
  • Signs (Physical damage or evidence caused by a pest)
  • Symptoms (Plants reaction to a pest)
• Sweep net
• Trap (sticky, pheromone, etc.)
# Plant Pathology

<table>
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<tr>
<th>BACTERIA</th>
<th>FUNGI</th>
<th>VIRUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria are microscopic, single-celled prokaryotic organisms, without a defined nucleus, that reproduce asexually by binary fission (one cell splitting into two). They occur singly or in colonies of cells.</td>
<td>Fungi are eukaryotic organisms that lack chlorophyll and thus do not have the ability to photosynthesize their own food. They obtain nutrients by absorption through tiny thread-like filaments called <em>hyphae</em> that branch in all directions throughout a substrate. A collection of hyphae is referred to as mycelium (pl., mycelia).</td>
<td>Virus particles are extremely small and can be seen only with an electron microscope. Most plant viruses are either rod-shaped or isometric (polyhedral).</td>
</tr>
</tbody>
</table>
Watermelon Mosaic Virus (WMV)

- WMV is in the genus **Potyvirus**.
- Spread non-persistently by aphids.
- Affects summer squash, winter squash, zucchini, gourds, and pumpkins.
- Virus overwinters in infected perennial weeds or alfalfa.
- Management options are very limited.
Powdery Mildew on Cucurbits

- Caused by the fungi *Podosphaera xanthii* and *Erysiphe chicoracearum*.
- Spread by the wind blowing spores.
- Affects summer squash, winter squash, zucchini, gourds, and pumpkins.
- Fungus overwinters on plant debris and produces fruiting structures that contain spores for winter survival.
- Manage by monitoring early on, plant resistant varieties, plow/remove plant residue at the end of season, increase plant spacing.
Squash Bugs

- Squash bugs are in the Coreidae family
- Adults and nymphs feed on hosts with piercing-sucking mouth parts causing wilt
- Adults overwinter in outdoor protected sites.
- Manage by proper field sanitation, hand-removing, trellising, trap crops, crop rotation, etc.

https://www.facebook.com/utahpests/videos/2332808870314267/
Fusarium Wilt

- Caused by the fungi *Fusarium oxysporum*
- Soil-borne
- Fungus infects roots causing damping-off in seedlings or wilting and plant death in older plants
- Fungus overwinters in the soil as chlamydospores (thick-walled modifications of the mycelium)
- Manage by crop rotation
Early Blight in Tomatoes

- Caused by the fungi *Alternaria solani*
- Infections are common during warm periods (78-84 degrees F)
- Prefers wet conditions (standing water, overhead irrigation)
- Spores develop on lesions then dispersed by wind.
- Manage by growing resistant varieties, source pathogen-free seed, apply crop rotation, keep plants vigorous, use fungicides
Flea Beetles

- Flea beetles are in the family *Chrysomelidae*
- Flea beetles overwinter as adults under soil clods, plant debris, and weeds.
- Adults chew shallow pits and small irregular holes in the stems and foliage of the plants.
- Monitor by using sticky traps, row covers, and removing old plant debris.
Resources

usuextensionstore.com/gardening/  pestadvisories.usu.edu/subscribe
Resources

www.facebook.com/groups/utgardeningexperts

Utah’s Gardening Experts
Contact Me

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https://utahpests.usu.edu/ipm/