IPM 101

ELEMENTS OF PEST MANAGEMENT

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Outline:

- Define What is a Pest
- IPM Terminology and How It Works
- Pest Sampling
- Various Tools Used in IPM Programs
- Example
- Pesticides
- Pesticide Safety
- Questions
Pest Definitions:

• Any organism that affects or conflicts with human profit, convenience or welfare.
• An organism that interferes with the availability, quality, or value of a managed resource.
• A plant out of place.
• No organism is intrinsically a “pest” but becomes one when its lifestyle somehow conflicts with our lifestyle.
Pest Types

Insects, Mites, Ticks, Spiders

Snails and Slugs

Vertebrates – mice and birds

Plant Pathogens – powdery mildew

Weeds – crabgrass, knapweed
PEST CATEGORIES

1. KEY
2. Occasional
3. Potential
4. Migrant

Codling Moth
Mormon Cricket
Pest Identification

1. The “Looks Like It” Method
2. The “Spot Character” Method
3. The “This is the Right Place to Find It” Method
4. The “I’m the World’s Authority on this Group” Method
5. The “Keying It Out” Method
Identification Rules:

1. Be accurate!
2. Never guess at or “fake” an ID
3. Don’t’ be afraid to seek assistance
Having Trouble Deciding What You Have?
What is (IPM)?

Integrated Pest Management

IVM = Integrated Vegetation Management
Integrated Pest Management

“A pest management philosophy that utilizes all suitable pest management techniques and methods to keep pest populations below economically injurious levels. Each pest management technique must be environmentally sound and compatible with landowner or producer objectives.”
1) Recognizes there is no “cure-all” in pest control.
   - Dependence on any one pest management method will have undesirable effects.

2) Determine and correct the cause of the pest problem.
   - Understanding Pest biology and ecology is essential.
   - Manipulate the environment to the crop’s advantage and to the detriment of the pest.

3) Recognizes that eradication of a pest is seldom necessary or even desirable, and generally not possible.
   - Some damage is unavoidable and acceptable
Key Components of an IPM Program

**Learn**: Understand key weed, disease, insect pest, natural enemy and crop/plant life cycles

**Prevent**: Prevention through good planning, e.g. site selection, variety, crop rotation, farm hygiene, optimum production time

**Monitor**: Crop/Plant monitoring for weeds, disease, insect pests, mites, beneficials. Use all available monitoring tools.

**Control decision**: What action is the most appropriate for the crop/plant stage and the observed pest pressure, e.g. biological, soft option products, targeted chemicals or mechanical control

**Review**: Assess harvest %, crop records, yields damage against management decisions

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**Review**

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IPM Terminology
“the pest population density at which control measures should be applied to prevent the population from reaching the economic injury level.”
“a level below which pest damage can be tolerated and above which it cannot be tolerated.”
Economic Injury Level Variables

1. Stage of Plant Development
2. Crop Cultivar Differences
3. Climatic Conditions
4. Area to Area Differences
5. Closeness to Harvest
6. Treatment Costs
7. Crop Value
8. Consumer Standards
“that level of pest presence or damage which significantly offends the aesthetic values of people who use the resource.”
Economic Threshold and Injury Levels

above EIL, benefit > cost

below EIL, cost > benefit
Economic Threshold and Injury Levels

above EIL, benefit > cost

below EIL, cost > benefit

pest population without control

control

EIL

ET

time

number of pests

“Utilizes all suitable pest management tactics/tools…”

- Cultural
- Mechanical
- Sanitary
- Natural
- Biological
- Host Plant Resistance
- Pesticides
How do you know when to treat for insect pests?
How Do You Know When to Treat for Insect Pests?

Make SURE the Insect in Question is indeed a PEST!!!
Sweep Netting
Drop or Beat Sheet
Pitfall Trap
Yellow Sticky Traps
V Light Trapping

UV Light Trapping
PHEROMONE Traps
Where to Take Samples?

Pest Monitoring/Sampling
Pest Monitoring/Sampling
How many can I tolerate???????
Arsenal of Tools…

• Cultural
• Mechanical
• Sanitary
• Biological
• Host Plant Resistance
• Pesticides
What is “Cultural Control”

• Agronomic practices that are designed to:
  - Optimize growing conditions for the crop/plant.
  - Anything that increases a crop’s/plant’s competitive edge will result in increased tolerance to pests often resulting in reduced pesticide use.
  - Create unfavorable conditions for the pest
Mechanical/Physical Control?

- Uses machinery and/or other physical tools to control pests
  - Tillage
  - Hoeing/Digging
  - Pruning
  - Hand picking
  - Physical barriers
What is Mechanical Control?
What is Sanitary Control?

- These practices are important because it is an attempt to keep pests out of the field.

- Methods to avoid introducing a pest into a field
  - Cleaning field equipment
  - Planting certified seed
  - Quarantines
Biological Control

“The intentional use of one living organism to control/suppress another organism.”
Weed Biocontrol

The intentional use of one living organism to control/suppress another organism, such as **WEEDS**
Biological Weed Control?
What is Host Plant Resistance?

- Manipulating the crop to withstand or tolerate pests
  - Natural breeding method
  - Genetically modified plants
    - Examples: Glandular-haired Alfalfa, Bt Corn, Roundup Ready Canola
  - Not a permanent method of control
IPM Example: Squash Bug

*Anasa tristis* (DeGeer)  
(Hemiptera: Coreidae)
IPM Example: Squash Bug

3 or 4 - 30 to 40 SB?
IPM Example: Squash Bug
IPM Example: Squash Bug

Physical Barrier
IPM Example: Squash Bug

Vacuum
IPM Example: Squash Bug

Handpick/Water
IPM Example: Squash Bug

- Using Vinegar for Squash Bugs...

My squash have really declined within 2 days...
Question:

Should Pesticides be used in an IPM Program?
What are Pesticides?

“any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest”
Pesticides also include:

- Plant Growth Regulators
- Defoliants
- Dessicants
- Antitranspirants
- Attractants
- Repellents
- Chemosterilants
- Disinfectants
Over 1 billion pounds of pesticides (i.e. weed killers, insecticides, and fungicides) are used in the United States (US) each year and approximately 5.6 billion pounds are used worldwide (1) to do everything from protecting crops to warding off malaria.

Pesticides Types Used in the U.S. (1980-2007)

Source: Estimates for 1980-1987 are from Donaldson et al., and the estimates for 1988-2007 are from Grube et al.
2002 Pesticide Usage By State

TOTAL INSECTICIDE, FUNGICIDE, HERBICIDE, AND OTHER PESTICIDE PER ACRE
U.S. CROP PRODUCTION: 2002
Jenks - Natural Breaks Classification

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<th>State</th>
<th>Lbs/Acre</th>
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<tr>
<td>Virginia</td>
<td>3.23</td>
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</tbody>
</table>

SOURCE DATA
Cropped Acreage per State from 2002 Census Data
(Quick Stats search parameters Commodity: Ag Land, Data Item: Ag Land, Cropland-Acres, Domain: Total, Locale: State
Pesticide Mania!!!

- Pesticide Features
  - Easy to Use
  - Fast-acting
  - Effective
  - Economical
  - Easy to find
What About Non-Pests???
Pesticide Use Concerns:

...Non-target organism toxicity

...Environmental and water contamination

...Pest resurgences and 2° pest outbreaks

...Resistance

...Residue effects on humans
Off-target movement of pesticides
Pollinators in Decline: Honey Bees

- **Pesticides** (neonicotinoids)
- Viruses
- Nosema (fungal parasite)
- Nutrition
- Parasitic Mites (Varroa destructor)
- Stress
Pest Resistance:
487 unique cases of herbicide resistance globally, = (253 species). Weeds have evolved resistance to 23 of the 26 known herbicide sites of action and to 163 different herbicides (92 crops in 70 countries) (January 3, 2018 Weed Science.ORG)
Biomagnification of pesticides in a food chain
Thin Shelled Eggs Caused by DDT
Should Pesticides be used in an IPM Program?

- Pesticides can be used in an IPM program, however only as a last resort and of course in a manner that is legal.

- Pesticides are to be used when there is no risk of environmental damage or when benefits outweigh the risks. Use pesticides only when other control practices aren’t available, economical or practical.
Questions?

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