Using Integrated Pest Management to Reduce Crop Production Costs

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Integrated Pest Management
IPM

“IPM is a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks”

National IPM Network
IPM is ECOLOGICAL Based Pest Management

Maintain profitability by using control only as needed
Minimize environmental impact
Minimize pest selection pressures
Pest Biology
When are Pest Common?

- SPRING WHEAT
- Early season pests: weeds, wireworms, cutworms, grasshoppers, seedling blights
- Mid-late season pests: aphids, grasshoppers, wheat midge, scab, leaf diseases
Biology

Where are pests coming from?

- Grasshopper
  - laying eggs in uncultivated fields during late summer
    - Sunflower
    - Pinto beans
    - Soybeans
    - Pastures
Pest Identification

What species of new beetle is this?
Pest Forecasting Systems

Small Grain Disease Forecasting System

- Fusarium head blight, tan spot, Stagnospora (Septoria)
- use weather data (temperature, R.H., rainfall), spore counts, crop growth stage
- predict risk of infection
- apply fungicide to avoid yield loss
Trapping – Pheromone/Other Canola Insect Pests

Bertha Armyworm

Diamondback Moth

Crucifer Flea Beetle
Examples of Pest Surveys

- Provide data on relative pest prevalence, severity and location
- Canola Disease Survey
- Small Grains IPM Survey
- Sunflower Survey
- Wheat Midge Soil Survey
IPM Alternatives

- Cultural or Agronomic practices
  - Selecting resistant or tolerant varieties
  - Crop rotation
  - Cultivation
  - Planting dates
  - Sanitation
  - Planting trap crops
<table>
<thead>
<tr>
<th>Susceptible</th>
<th>Intermediate</th>
<th>Most tolerant</th>
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</thead>
<tbody>
<tr>
<td>Russ</td>
<td>Sharp</td>
<td>Gunner</td>
</tr>
<tr>
<td>Kulm</td>
<td>Bacup</td>
<td>Keene</td>
</tr>
<tr>
<td>Grandin</td>
<td>AcCora</td>
<td>Verde</td>
</tr>
<tr>
<td>2375</td>
<td>Trenton</td>
<td>Amidon</td>
</tr>
<tr>
<td>Oxen</td>
<td>Parshall</td>
<td>Lars</td>
</tr>
<tr>
<td></td>
<td>Reeder</td>
<td>Forge</td>
</tr>
<tr>
<td></td>
<td>McNeal</td>
<td>2398</td>
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</table>
### Cultural Strategies

#### Sunflower Beetle Planting Dates

<table>
<thead>
<tr>
<th>Location</th>
<th>Planting Dates</th>
<th>Yield (gm/head)</th>
<th>% Defoliation</th>
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<tbody>
<tr>
<td>Carrington</td>
<td>Early (15 May)</td>
<td>44a</td>
<td>11.4a</td>
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<tr>
<td></td>
<td>Mid (28 May)</td>
<td>57b</td>
<td>5.0b</td>
</tr>
<tr>
<td></td>
<td>Late (12 June)</td>
<td>55b</td>
<td>0.7c</td>
</tr>
<tr>
<td>Minot</td>
<td>Early (22 May)</td>
<td>73a</td>
<td>8.5a</td>
</tr>
<tr>
<td></td>
<td>Mid (29 May)</td>
<td>78a</td>
<td>8.0a</td>
</tr>
<tr>
<td></td>
<td>Late (8 June)</td>
<td>77a</td>
<td>5.5c</td>
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</table>

Wheat Stem Sawfly Management

**Objective:** Using susceptible varieties as a trap strip in crop-fallow systems
IPM Alternatives

- Mechanical
  - Hand weeding
  - Trapping devices

- Physical
  - Heat
  - Cold
IPM Alternatives

- Biological
  - Augmentation of natural enemies
  - Introduction of parasites or predators
  - Propagation of diseases of pests
Biocontrol Agents of Leafy Spurge: *Aphthona* complex of flea beetles

30% of releases successful in reducing leafy spurge densities in ND

- *A. nigriscutis*
- *A. flava*
- *A. lacterosa*
Macroglenes penetrans
Egg-larval parasite of the Wheat Midge
Biocontrol of Crucifer Flea Beetle
Dr. Denise Olson

- Beauveria bassiana
- Common soilborne fungus
- Spray direct at overwintering sites
- 1999 Field success <5% infection in Mohall and Minot

NDSU Ext. Service
IPM Alternatives

- Chemical
  - Herbicides, Insecticides, Fungicides
  - Miticides, Nematicides, Rodenticides, Avicides
  - Biorational pesticides
  - Defoliants/Dessicants
Economic Threshold (E.T.)

- Tool to make objective decisions
- Integrates crop value and management costs with biological information
  - pest injury and yield
- Questions asked:
  - Is action necessary?
  - If so, what tactics should be used?
  - When to use tactic(s)?
E.T. for Common Insect Pests

- Wheat
  - Wheat midge = 1 per 4-5 wheat heads

- Canola
  - Crucifer Flea beetle = 25% foliar damage
  - Diamondback moth = 20 larvae per square foot

- Sunflower
  - Red seed weevil = 6-9 per head (oil sunflower) vs. 1 weevil per head (confection sunflower)
Factors Affecting E.T. Red Sunflower Seed Weevil on Oil Sunflowers

- cost of the insecticide treatment per acre
- market price of crop in dollars
- plant population per acre
Cutworms on Oil Sunflower

Know population of sunflowers in field?
- If low (<15,000 plants/A) tolerate less damage
- If high (>20,000 plants/A) tolerate more damage

Determine size of larvae?
- Small larvae will eat more plants
- Large larvae will eat fewer plants - done feeding

<table>
<thead>
<tr>
<th>Practice</th>
<th>% Using Practice</th>
<th>% Using for Pest Control</th>
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</thead>
<tbody>
<tr>
<td>Crop Rotation</td>
<td>76</td>
<td>78</td>
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<tr>
<td>Variety Selection</td>
<td>57</td>
<td>68</td>
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<tr>
<td>Row Crop Cultivation</td>
<td>41</td>
<td>76</td>
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<tr>
<td>Moldboard Plow</td>
<td>35</td>
<td>69</td>
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<td>Harrow/RH</td>
<td>38</td>
<td>62</td>
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<tr>
<td>Beneficial Insects</td>
<td>10</td>
<td>58</td>
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</table>
### Other Pest Management Practices used by ND Producers - 1996

<table>
<thead>
<tr>
<th>Practice</th>
<th>% Producers Using</th>
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<tbody>
<tr>
<td>Ag Consultant</td>
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<tr>
<td>Field Monitoring</td>
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<tr>
<td>Economic Thresholds</td>
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<tr>
<td>Growth Staging</td>
<td>66</td>
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<tr>
<td>Weather Forecasting</td>
<td>63</td>
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<tr>
<td>IPM</td>
<td>25</td>
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</tbody>
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The IPM Continuum

Conventional
- chemical based
- cultural controls
- resistant varieties

System Based
- pest monitoring
- predictive model
- biocontrol
- biorational

Information Based
- biocontrol
- parasites
- predators
- mating disruption

Field Based
- field scouting
- trapping
- physical
- chemical
- rotation
- sanitation
- calendar sprays
- "hard" chemicals

The IPM Continuum
example: Orange Wheat Blossom Midge

cultural controls

resistant varieties

pest monitoring

predictive model

biocontrol

bio rational

information based

parasites

predators

Bt, Naturalytes mating disruption

insect, weed disease, crop

field scouting trapping

physical chemical

rotation

sanitation

calendar sprays "hard" chemicals
IPM Technologies and Services Available

- NDAWN - ND Ag Weather Network
- Hotlines - Potato, cercospora, wheat midge, other
- DTN, Crop Pest Reports, Ag Alerts
- Internet - World Wide Web sites
Thanks

Thank-you
Bye!!