



***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**

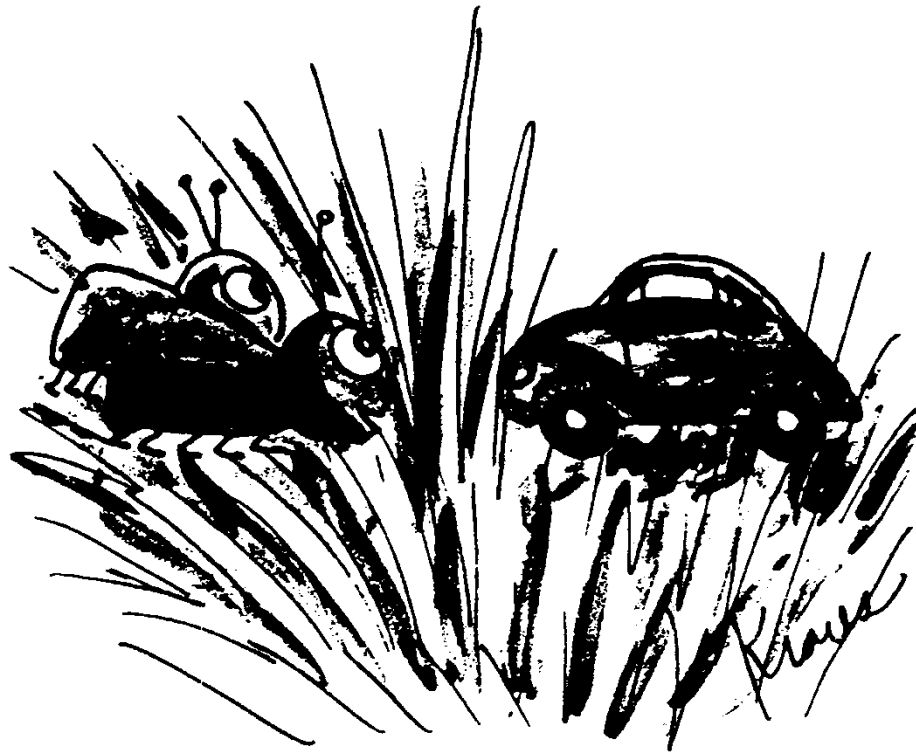
- **laying eggs in uncultivated fields during late summer**
  - **Sunflower**
  - **Pinto beans**
  - **Soybeans**
  - **Pastures**



# Wheat Leaf Rust Pathway



# ***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**



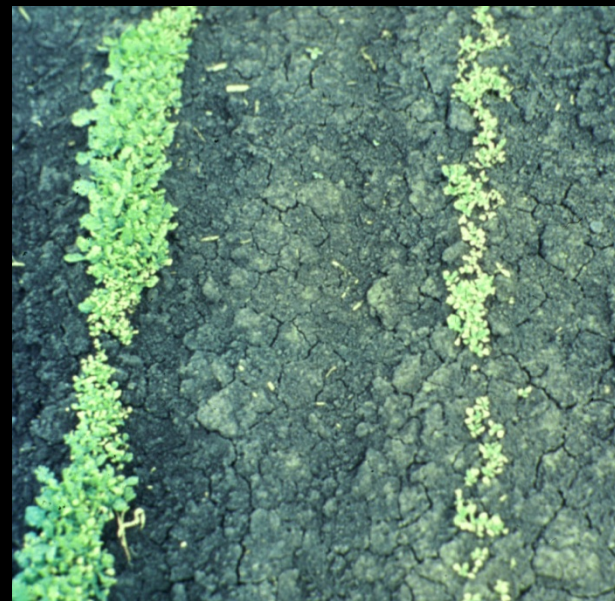
# ***Examples of Pest Surveys***

- ◆ **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**





# ***HRSW Variety Response to Tan spot/Septoria***

**Susceptible**

**Russ**

**Kulm**

**Grandin**

**2375**

**Oxen**

**Intermediate**

**Sharp**

**Bacup**

**AcCora**

**Trenton**

**Parshall**

**Reeder**

**McNeal**

**Most tolerant**

**Gunner**

**Keene**

**Verde**

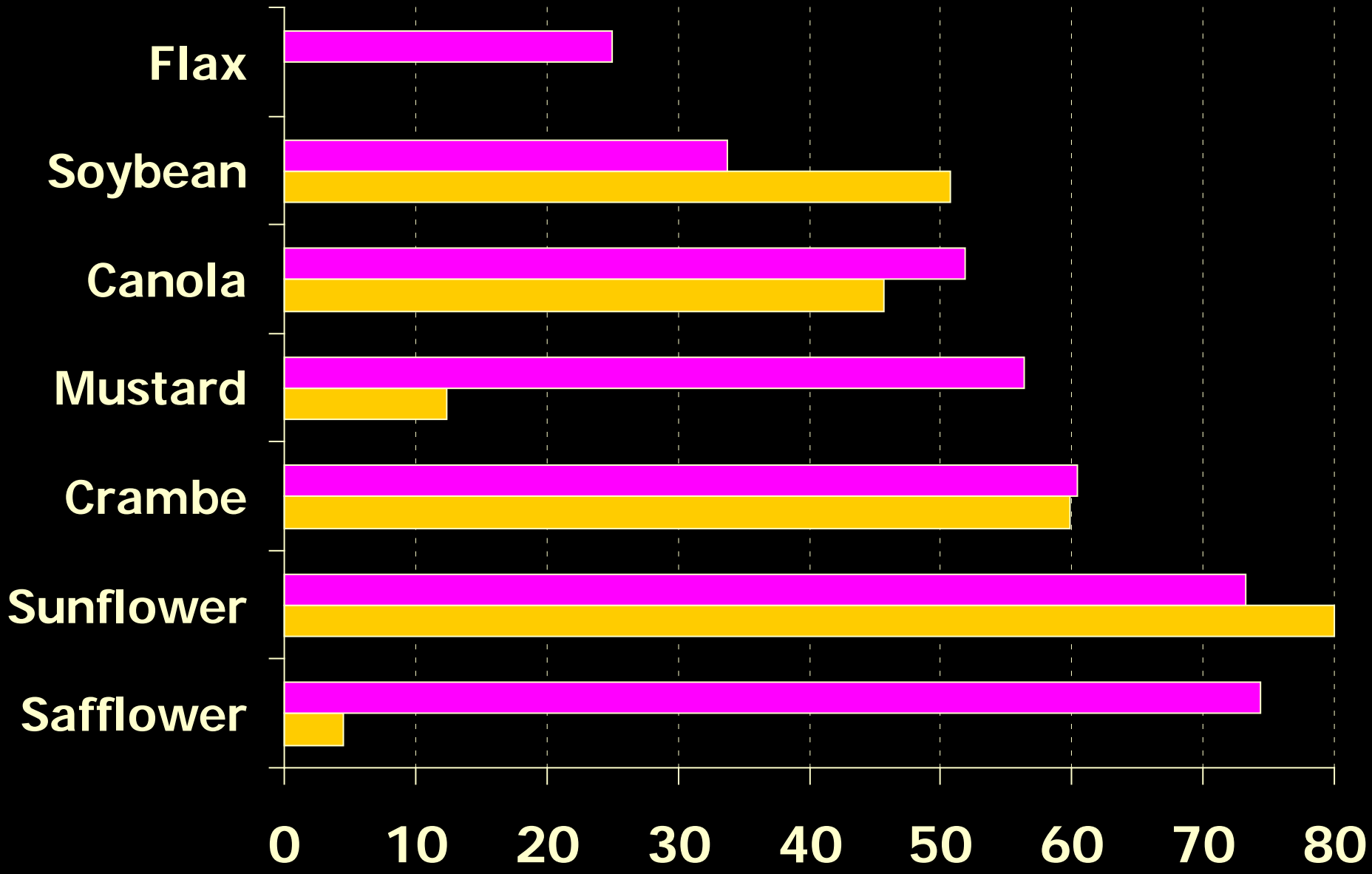
**Amidon**

**Lars**

**Forge**

**2398**

# *Oilseed Crops & Sclerotinia*



Schatz, 1990-92, unpub.

■ lbs/A ■ % infection



# ***Cultural Strategies***

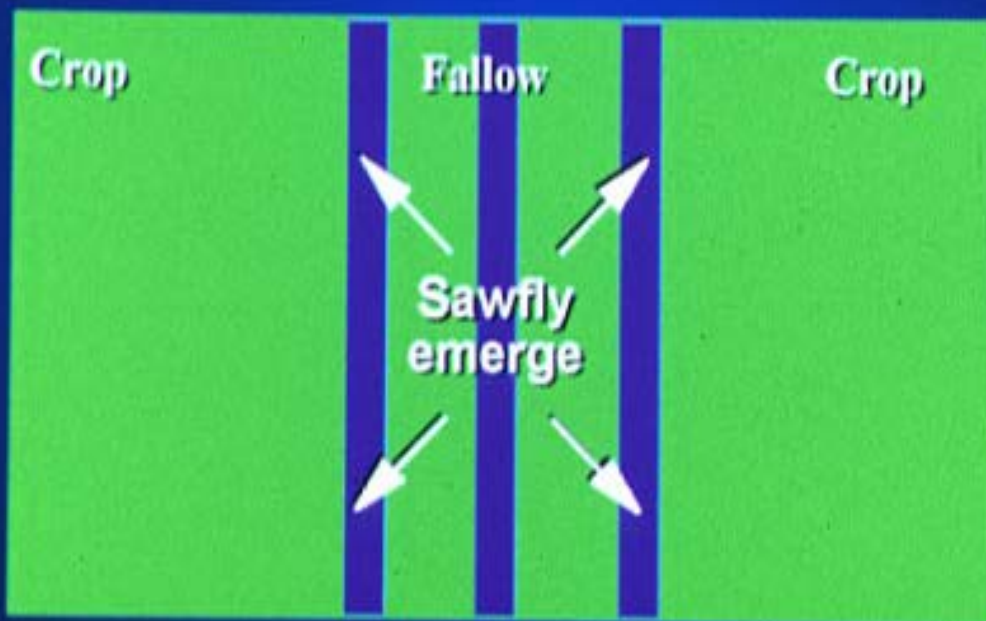
## ***Sunflower Beetle Planting Dates***

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

Charlet, Harbour, Knodel, 1998, unpub.

# 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**

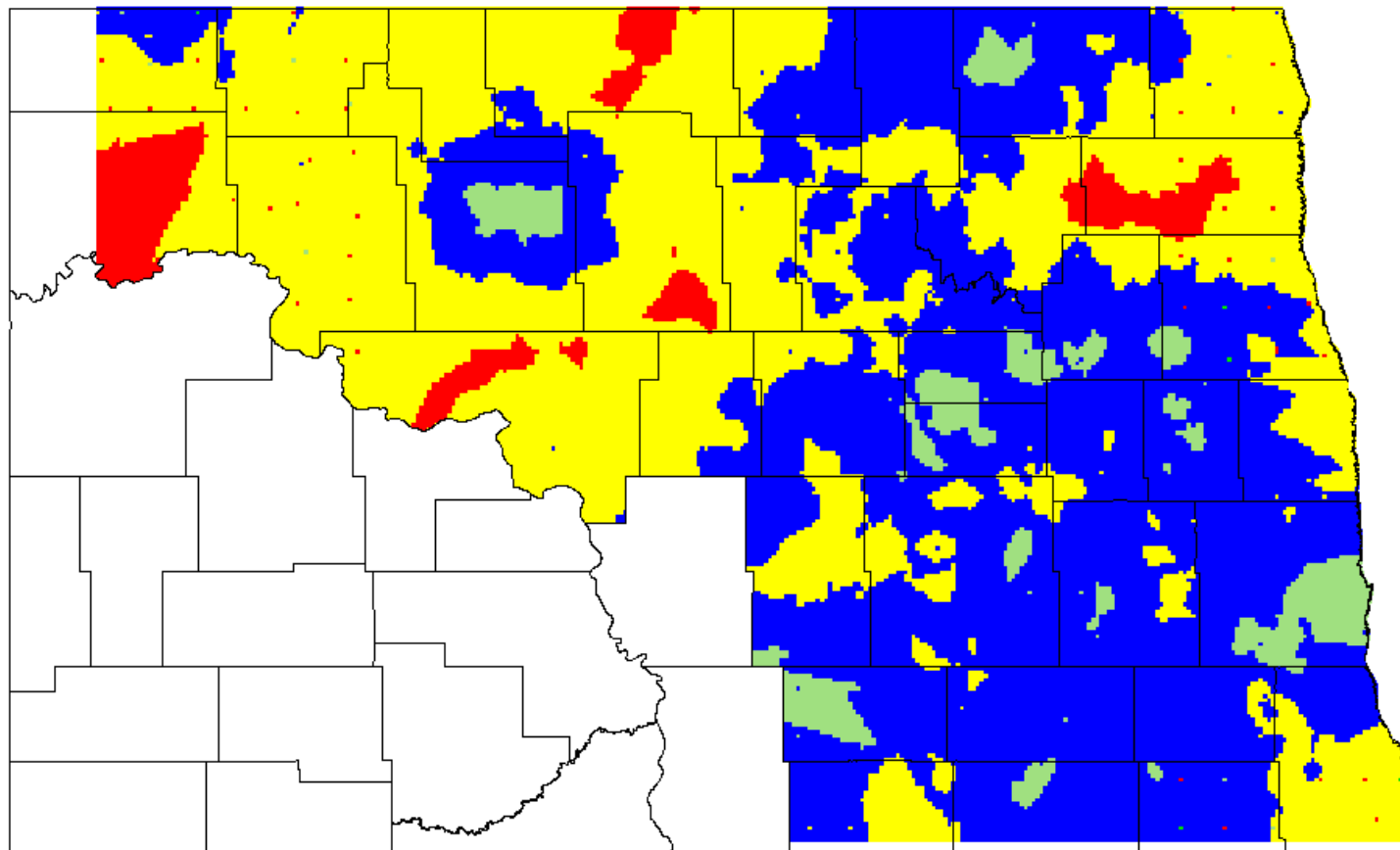


**30% of releases successful in reducing leafy spurge densities in ND**



***Macroglenes penetrans***  
Egg-larval parasite of  
the Wheat Midge

# 1999 WHEAT MIDGE SURVEY -- PARASITE



Not Surveyed   75 - 100   50 - 74   25 - 49   1 - 24   0  
% parasitized midge larvae



**NORTH DAKOTA  
WHEAT COMMISSION**

## NDSU

Department of Entomology  
North Dakota Extension Service  
North Dakota Agricultural Experiment Station

# **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**





# ***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

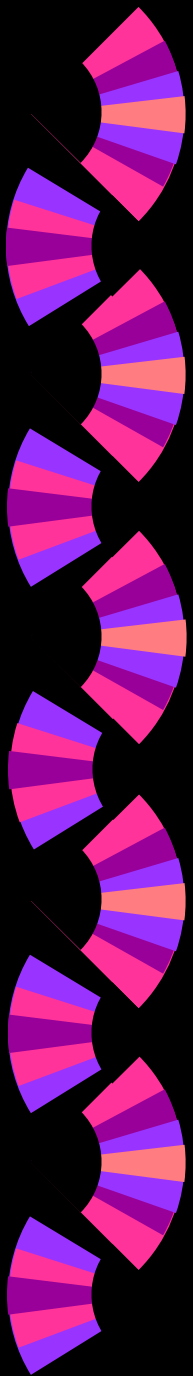
- **Wheat midge** = 1 per 4-5 wheat heads

## ◆ 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**

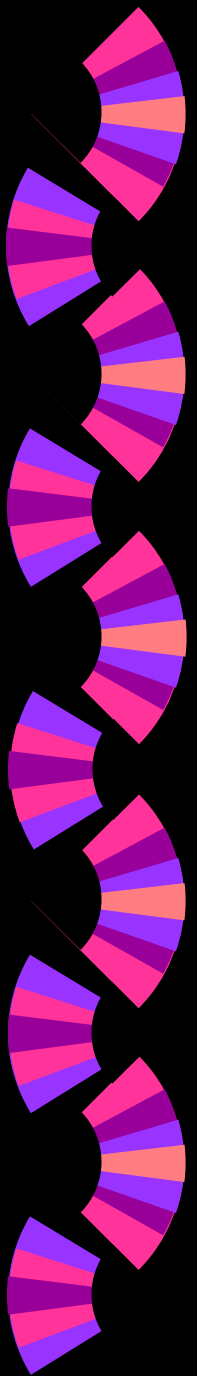
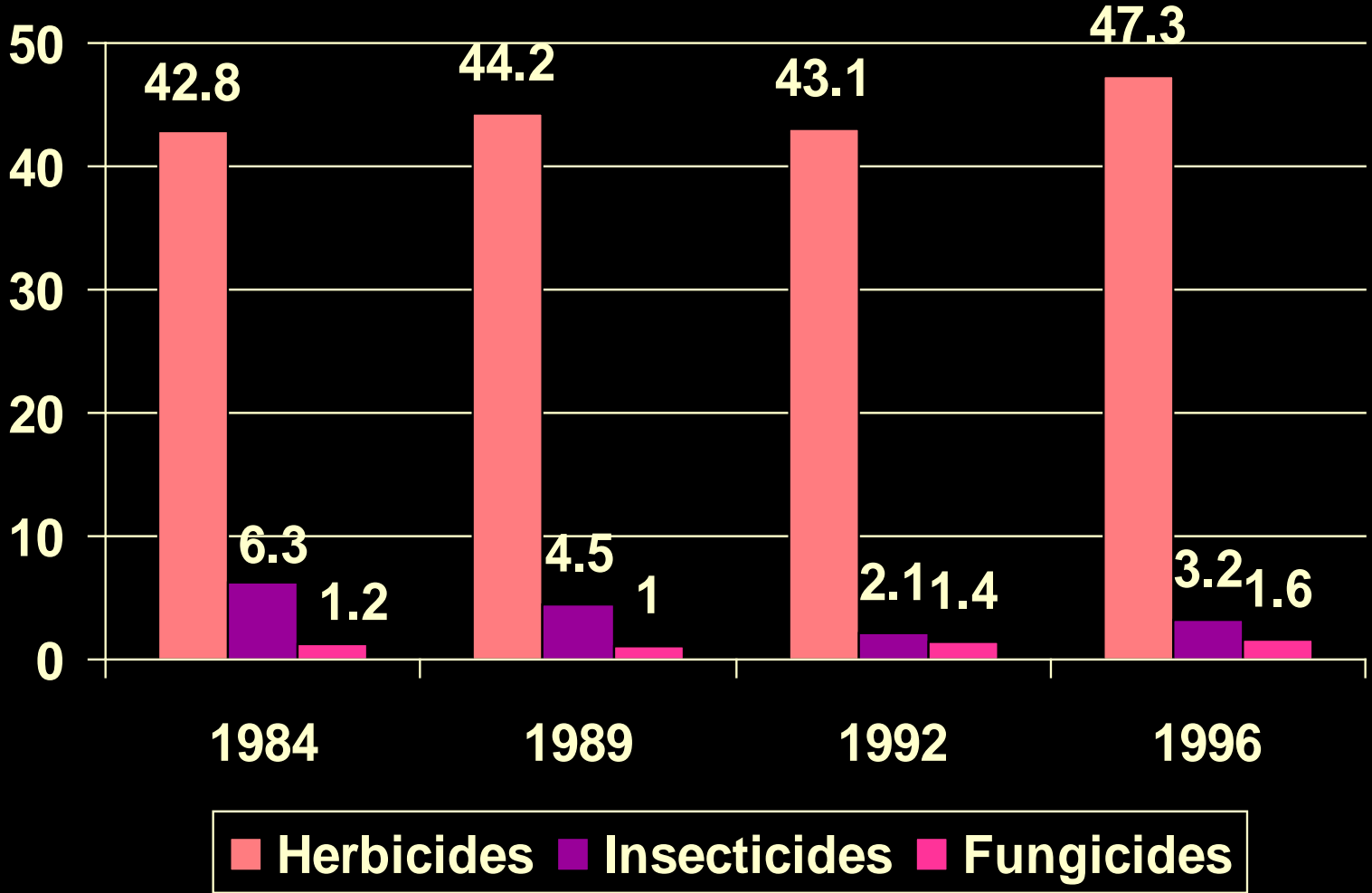


# ***Cutworms on Oil Sunflower***

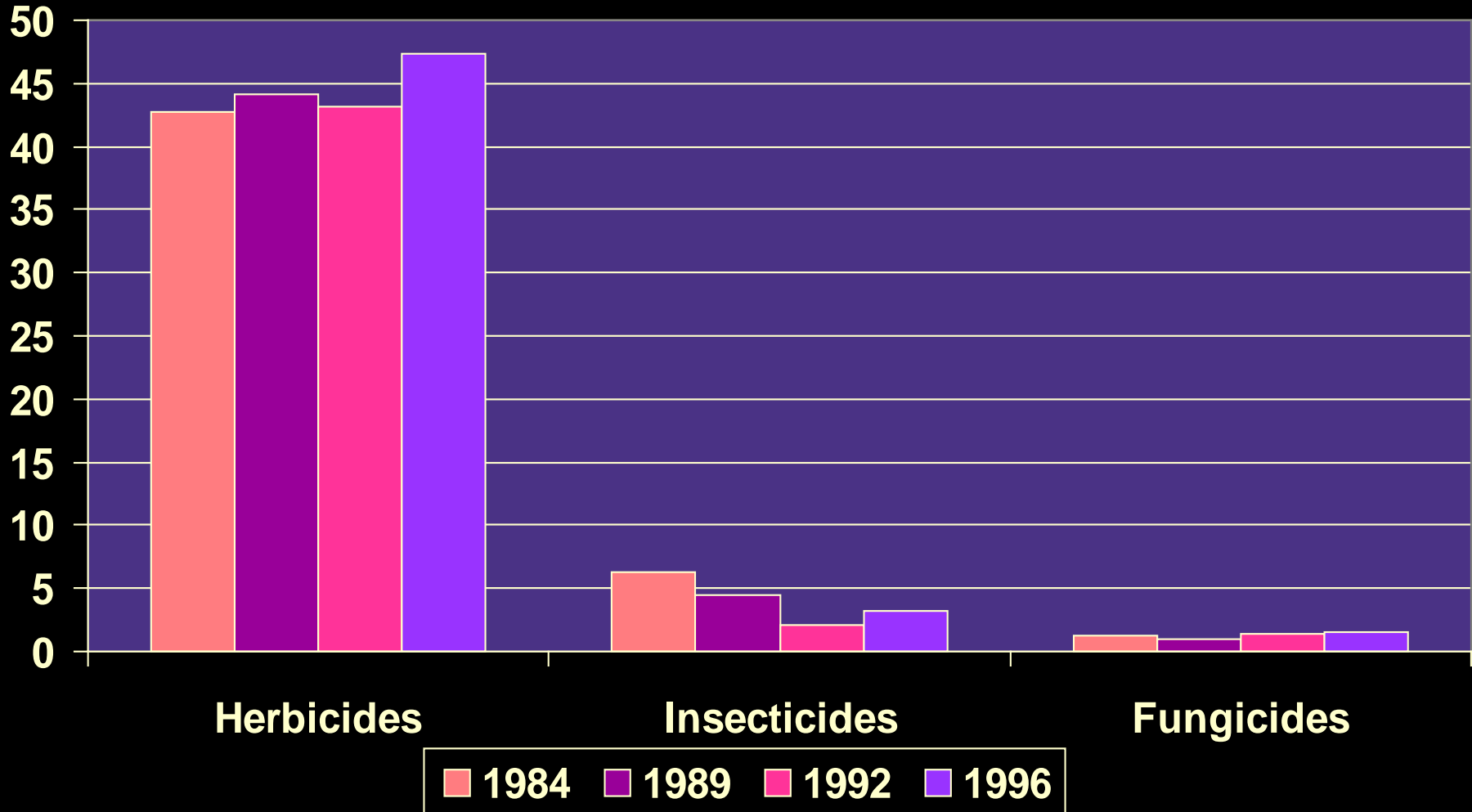


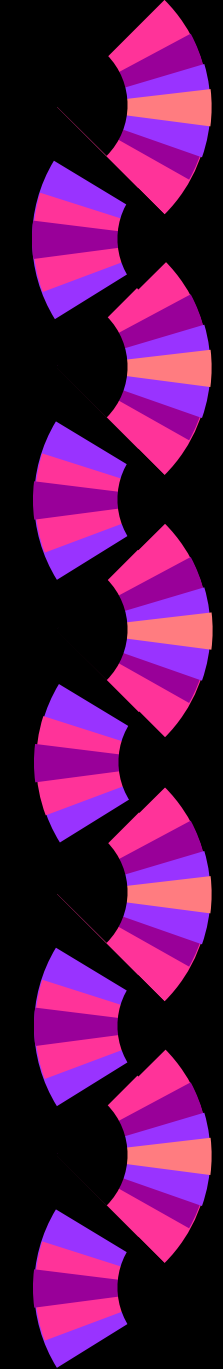
- ◆ **Know population of sunflowers in field?**
  - If low (<15,000 plants/A) tolerate less damage
  - If high (>20,000 plants/A) tolerate more damage
- ◆ **Determine size of larvae?**
  - Small larvae will eat more plants
  - Large larvae will eat fewer plants - done feeding

# *% ND Farmland Acreage Treated*



# ***% ND Farmland Acreage Treated***





## ***Use of Alternative Practices by ND Producers (1996 Pesticide Use & Pest Management Practices Survey)***

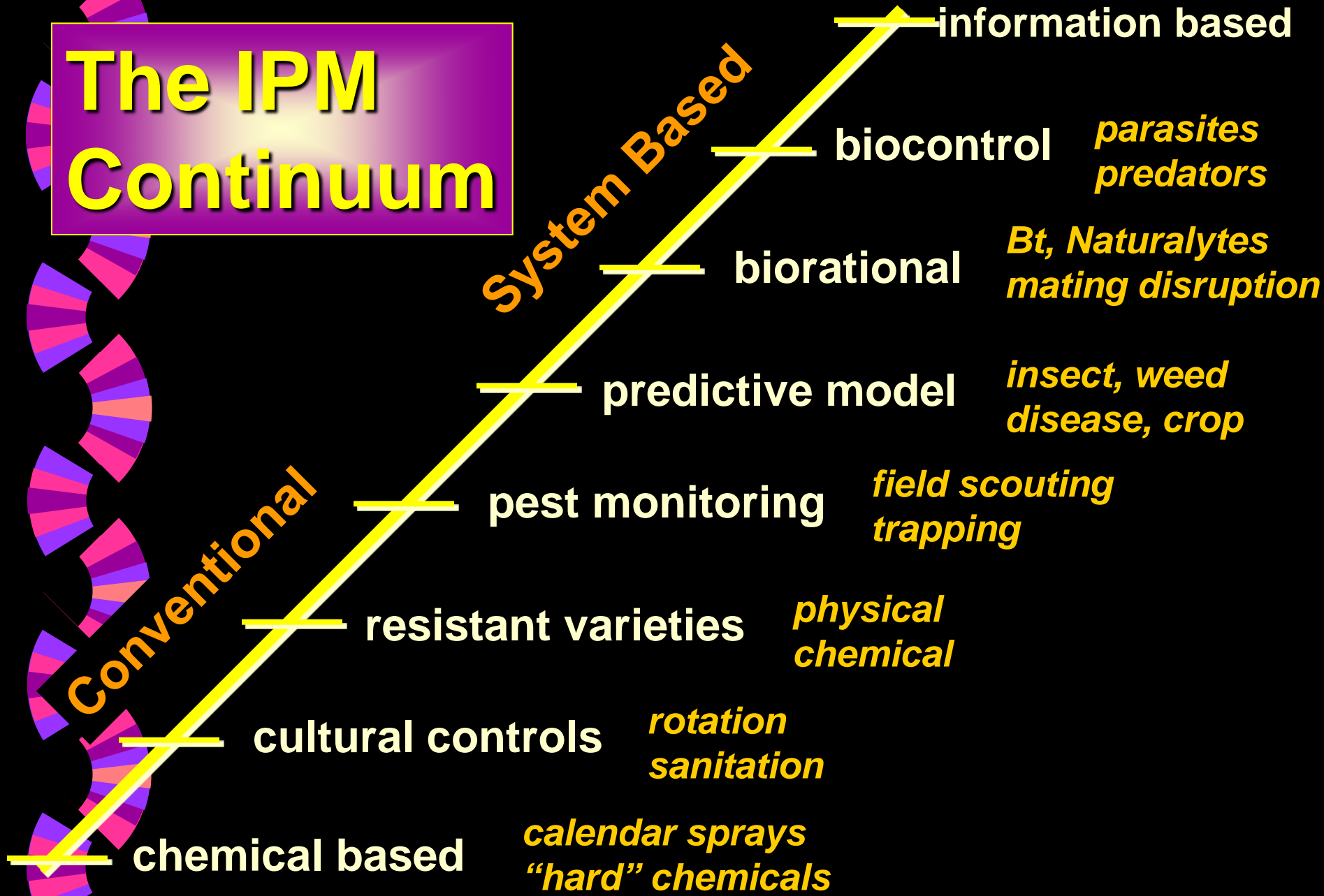
<b><i>Practice</i></b>	<b><i>% Using Practice</i></b>	<b><i>% Using for Pest Control</i></b>
<b><i>Crop Rotation</i></b>	<b>76</b>	<b>78</b>
<b><i>Variety Selection</i></b>	<b>57</b>	<b>68</b>
<b><i>Row Crop Cultivation</i></b>	<b>41</b>	<b>76</b>
<b><i>Moldboard Plow</i></b>	<b>35</b>	<b>69</b>
<b><i>Harrow/RH</i></b>	<b>38</b>	<b>62</b>
<b><i>Beneficial Insects</i></b>	<b>10</b>	<b>58</b>



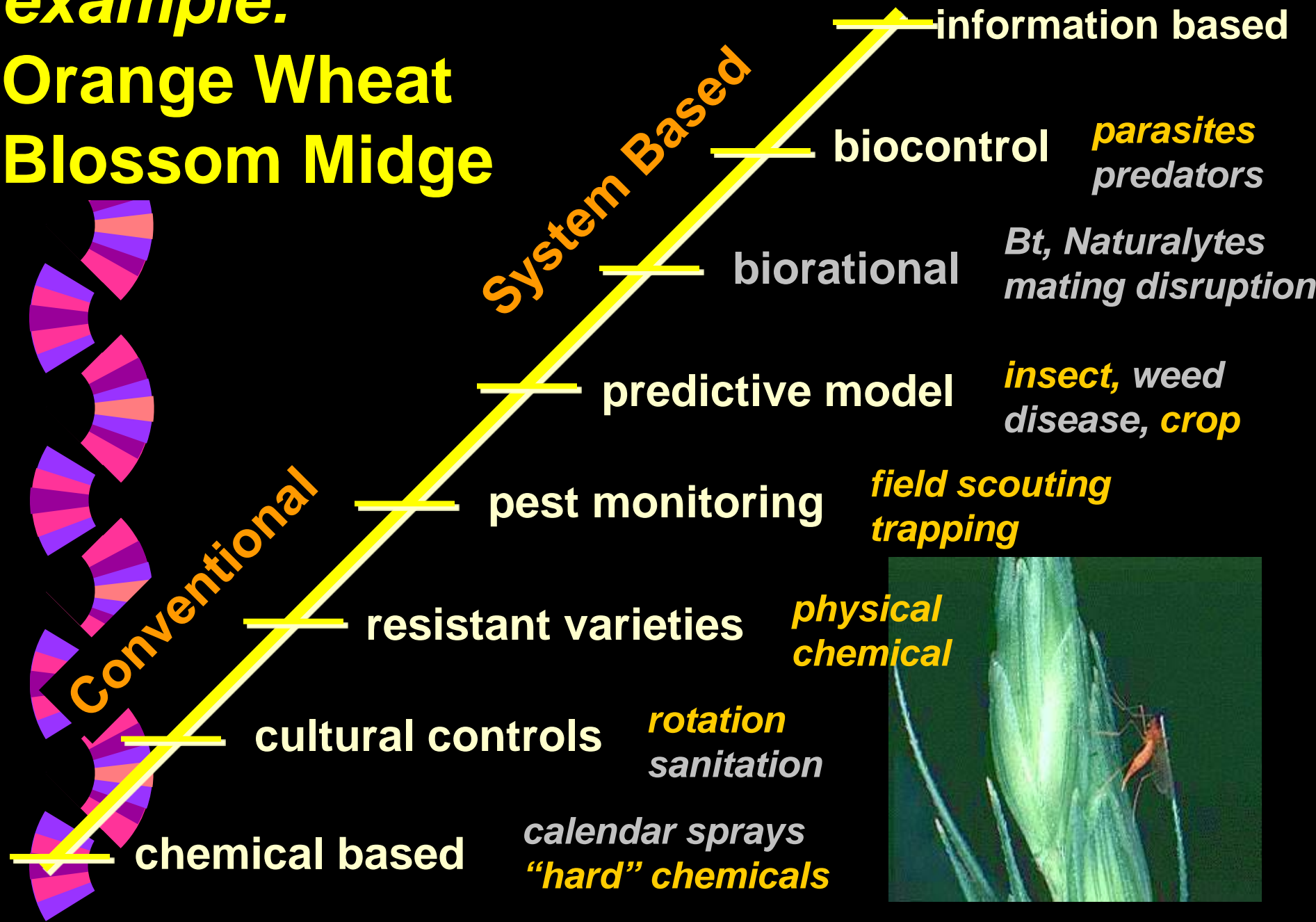
# ***Other Pest Management Practices used by ND Producers - 1996***

<b><i>Practice</i></b>	<b><i>% Producers Using</i></b>
<b><i>Aq Consultant</i></b>	<b>17</b>
<b><i>Field Monitoring</i></b>	<b>75</b>
<b><i>Economic Thresholds</i></b>	<b>60</b>
<b><i>Growth Staging</i></b>	<b>66</b>
<b><i>Weather Forecasting</i></b>	<b>63</b>
<b><i>IPM</i></b>	<b>25</b>

# The IPM Continuum



**example:**  
**Orange Wheat Blossom Midge**







# ***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!!

