Economic Decision Levels for Pest Populations

PMA 4570/6228
Lab 4
July 7, 2016
Steps towards successful pest management

1. Correct pest identification
2. Pest monitoring
3. Economic thresholds - Decision making for management
4. Choice of optimum pest control options
5. Evaluation
Injury vs. Damage

- **Injury** - the affect of pest activities on the host

- **Damage** – monetary value lost due to the pest injury

Direct vs. Indirect

- Codling moth injury on apple
- Leaf miner injury on squash
Injury vs. Damage

- Any insect infestation causes injury but not all levels of injury cause damage
  - Some injury is “acceptable” or “tolerable”
- Small levels of injury may not justify time and cost to control the insect

What is the particular level of injury that will cause enough damage to justify control measures/actions?

For example: How many spider mites does it take to make a strawberry grower decide to apply a miticide?
The decision making process....

- How much damage ($) is this pest causing?
- What is the cost of controlling this pest?
Economic Injury Level (EIL)

- **Economic Injury Level** - pest density that will justify the cost of applying control measures

- EIL is the “break-even point” – the pest density at which the cost of control equals the amount of damage caused by that pest

Pest density is:

- Above the EIL - damage exceeds the cost to control
- Below the EIL - damage is lower than the cost to control

**Best to control NOW!**
Economic Injury Level

\[ EIL = \frac{C \times N}{V \times I} \]

**C** = cost of controlling the pest per unit area (eg. \$/acre)

**N** = number of pests injuring the commodity per unit area (eg. \#/acre)

**V** = value of the commodity per unit area (eg. \$/acre)

**I** = percentage of commodity injured (% loss expressed as a decimal)

- *EIL is expressed as number of pests per unit area (pest density)*
EIL Equation

\[ EIL = P = \frac{C}{V \times I \times D \times K} \]

- **C** = Cost of management/area (eg. $/ha)
- **V** = Market value/unit of product (eg. $/Kg)
- **I** = Injury/(insect/area) (eg. chewed leaves/insect/ha*)
- **D** = Damage/area/injured unit (eg. $(Kg \text{ lost}/ha)/\text{chewed leaf}$*)
- **K** = 1-proportion of unavoidable injury

*EIL is expressed as number of pests per unit area (pest density)*

*I x D is often combined into D’ which is weight lost per insect*
Cost of controlling a pest/acre is $500 with 800 insects causing injury on the commodity. This commodity is valued at $2000/acre and the percentage commodity injured by the pest is 10%. Calculate the EIL for this pest.

\[
EIL = \frac{C \times N}{V \times I} = \frac{500 \times 800}{2000 \times 0.10} = \frac{400000}{200} = 2000
\]

Main driving forces for the EIL is the cost of control and the value of the commodity.
**Economic Threshold (ET)**

- **Economic (Action) Threshold (ET)** – the pest level at which control measures should be taken in order to avoid losses.
  
  - Remember ....EIL is the lowest level of pest that will cause economic damage.
  
  - Control actions take time to show their effects!!
What factors are important when determining ET?

- Lifecycle of your pest
- Time required for your control action to take effect
- Environmental conditions

- ET is not calculated but will always be below the EIL
Main factors include:

- market value (V) - inverse relationship with EIL: as market value increases, less injury is tolerated
- management costs (C) – linear relationship: as the cost increases, net benefits decreases
- injury per insect (I) – inverse relationship
- Insect numbers (N) – linear relationship with EIL

\[ EIL = \frac{C \times N}{V \times I} \]
Homework

- Economic Decision Levels for Pest Management handout
- Worth 9 pts
- DUE: Tues. July 19 at beginning of lab in hardcopy
- Show calculations
Economic Decision Levels for Pest Populations

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Lab 7
July 14, 2016
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EIL Example

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- Main driving forces for the EIL is the **cost of control** and the **value of the commodity**
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