Enhancing beneficial insects to prevent pest outbreaks

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“Natural enemies” (“Beneficials”)

- **Predators:**
  - Ground beetles
  - Spiders
  - Syrphid flies
  - Assassin bugs
  - Lacewings
  - Ladybugs

Lebia grandis

- **Parasitoids:**
  - Parasitic wasps
  - Parasitic flies
  - Parasitic beetles

Copidosoma floridanum

- **Diseases**
  - Fungi
  - Virus
  - Bacteria

Bertha armyworm killed by virus

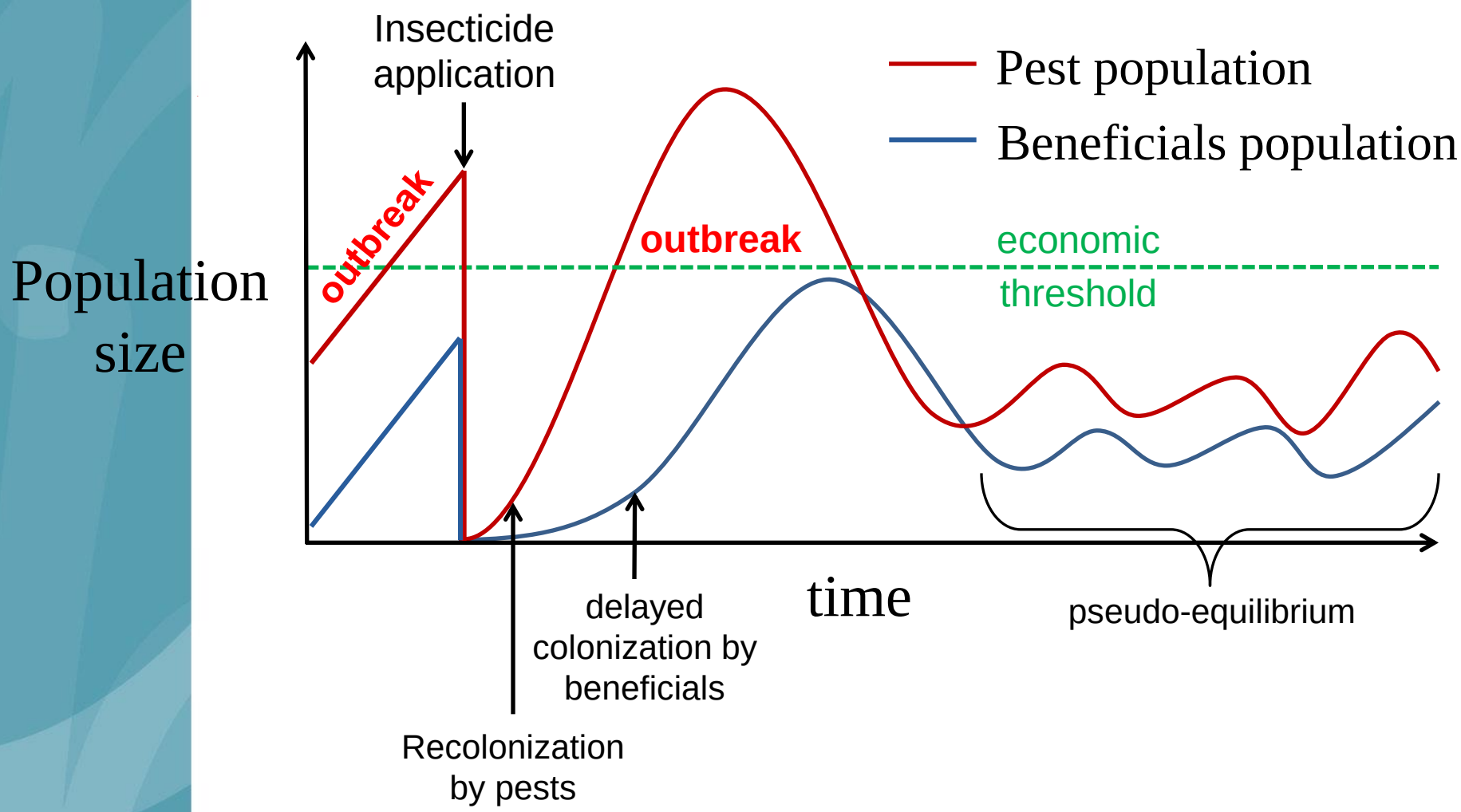
Photo credits:

Peggy Greb, USDA

Mike R. Strand

Canola Council of Canada

Pest/beneficials population dynamics (without external variables)



What insects need

- **Food**
- **Habitat**

3 points to preserve beneficials

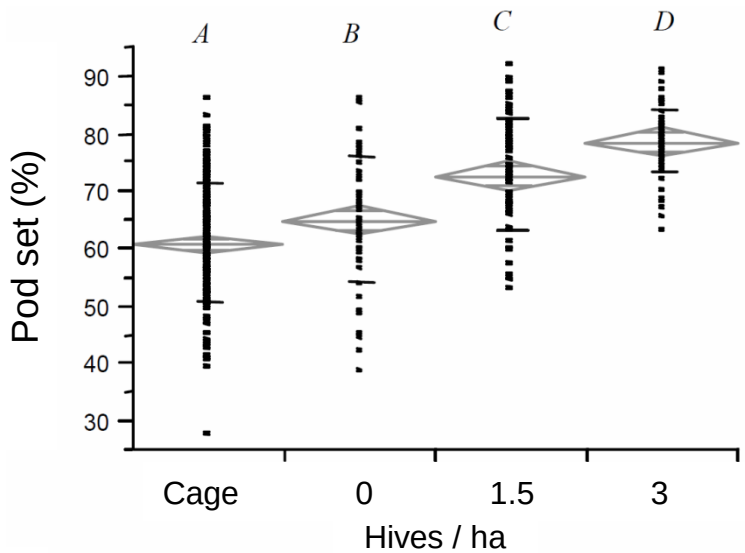
1- Minimum soil disturbance

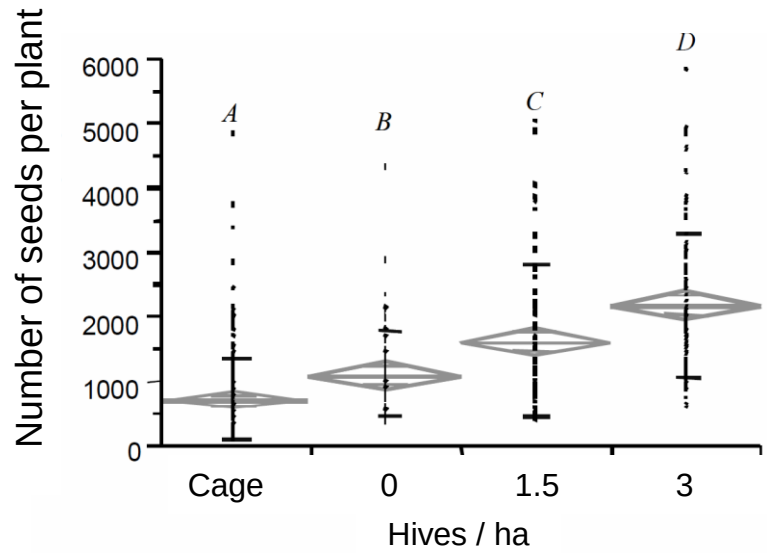
2- Maintain insect biodiversity (restrict use of insecticides)

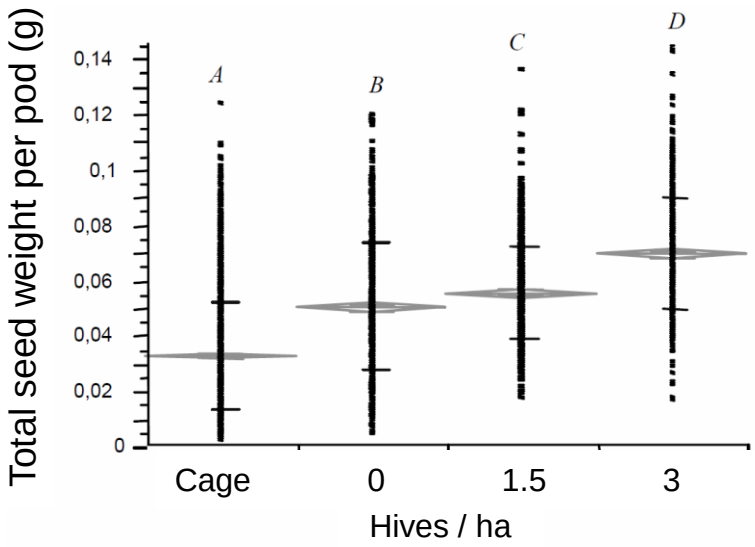
3- Maintain plant biodiversity (restrict use of herbicides and tilling)

- Provide a habitat (shelter from weather, overwintering sites)
- Provide food for insects
- Presence of flowers <u>over time</u> maintains parasitoids… and pollinators

Bees density on canola yield







Also:

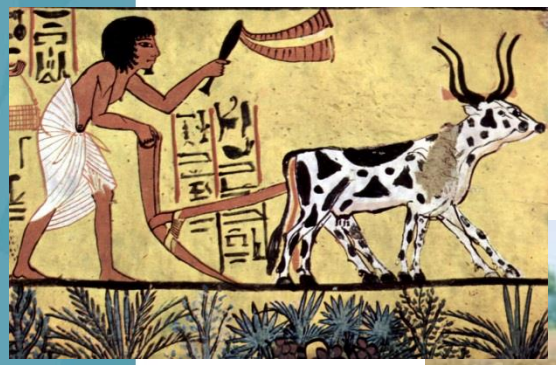
- Earlier ripening
- Homogeneous ripening
- Increases seed germination (83% without pollinators, 96% with pollinators)

References:

Sabbahi R., de Oliveira D., Marceau J. 2005. Influence of honey bee (Hymenoptera: Apidae) density on the production of canola (Crucifera: Brassicacae). Journal of Economic Entomology, Vol. 98, p. 367-372

Kevan, P. G., Eisikowitch D., 1990. The effect of insect pollination on canola (*Brassica napus* L. cv. O.A.C. Triton) seed germination. Euphytica. 45: 39-41

Problem: weed management



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Grant Heilman

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“Manage” weeds & preserve biodiversity

Goal: Maintain an acceptable level of “weeds” or other flowering plants

By:
- Limiting weed reproduction
- Reduce weed emergence
- Increase crop competition over weeds
- Use tilling and herbicide as last resources, on patches if possible

Manage weeds & preserve biodiversity

- **Long rotations**
  - Increase competition of crops over weeds
  - Limit weed reproduction

Manage weeds & preserve biodiversity

- **Long rotations**
- **Seed at high density**
  - Increases crop competition over weeds

Manage weeds & preserve biodiversity

- **Long rotations**
- **Seed at high density**
- **Use cover crops / inter crops** (can include multiple plant species)
  - Increases competition
  - Mulch: Reduces weed emergence
  - Enhances biodiversity, insect habitats, soil structure, prevents erosion, reduces soil crusting, reduces diseases

Manage weeds & preserve biodiversity

- **Long rotations**
- **Seed at high density**
- **Use cover crops / inter crops** (can include multiple plant species)
- **Tilling: short term benefits**

(kills current weeds, but maintains seed bank in soil)

Take home message

Preventing pest outbreaks is part of a <u>systemic approach</u>

- Building up and maintaining biodiversity in time and space is key
- Every field is different
- Much research is still needed in this domain
- Start small – see how it goes – improve
- More and more pests and weeds are resistant to pesticides… new solutions (are) will be needed