Natural enemies

Decision Making
for Insect Management
in Grain Crops

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Natural Enemies

- **ALL pests have natural enemies**
- **There are 3 categories of natural enemy:**
  - **Predators** eg. lady beetles, lacewings, hoverflies, spiders, etc
  - **Parasitoids** eg. various wasps, flies
  - **Pathogens** eg. various bacteria, fungi, viruses, nematodes

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– **Generalists** – attack many different prey species

eg. predatory mites, lacewings, carabid beetles, etc.

OR

– **Specialists** – selective in their prey choice

eg. *Trichogramma* wasps (each species parasitize eggs of several moth species)

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Diadegma wasps (only parasitize DBM larvae)

The Natural Enemy Zoo

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These target Spring Pests

Ladybird adult

Green lacewing larva

Brown lacewing adult

Damsel bug

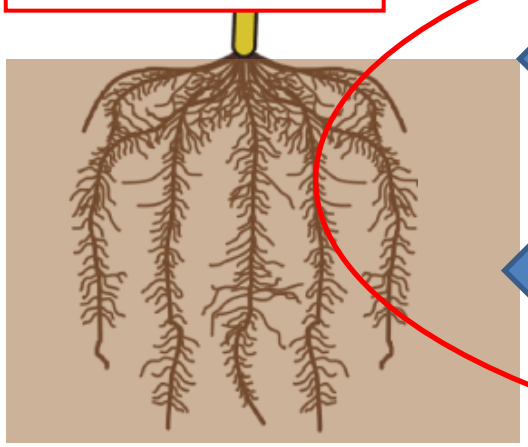
Canopy searching

Trichogramma wasp

Hover fly larva

Aphid parasitoid

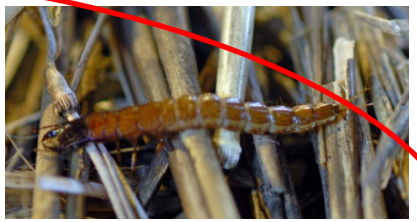
These target Establishment Pests



Ground foraging

Wolf spider

Carabid adult



Carabid larva

Below ground

Rove beetle

Predatory mites

Natural Enemies for Grain Crop Pests

- There are very few ‘pre-packaged’ natural enemies for Australian grain pests
  - examples include Bt (bacteria) and NPV (virus) products

NPV infected noctuid larva

Natural Enemies for Grain Crop Pests

- Conservation of existing natural enemies is therefore the main tactic available to grain growers
  - Use of selective insecticides
  - Judicious use of broad-spectrums

    E.g. border, spot or barrier sprays, seed-treatments, reduced rates
  - Habitat preservation

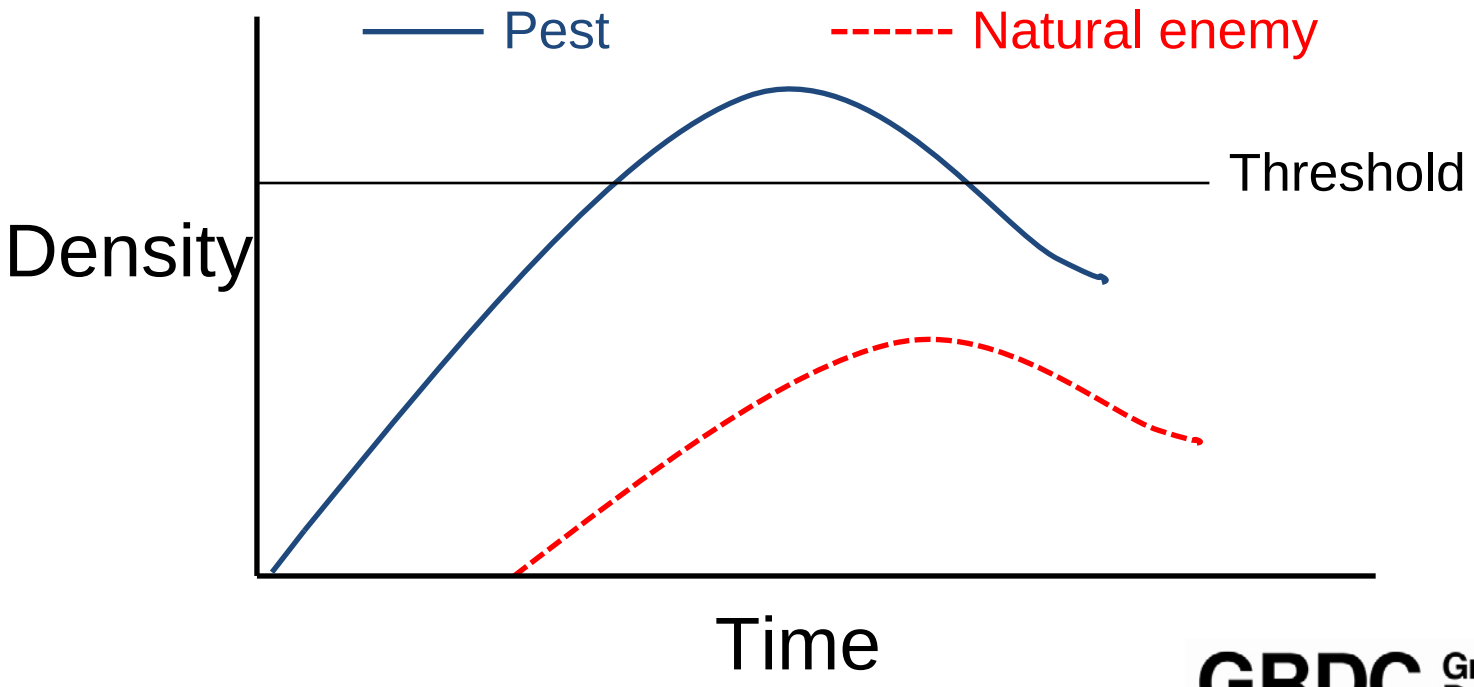
    E.g. native vegetation

What Makes for a Successful Natural Enemy?

- High reproductive rate
- Good searching ability
- Adaptability to different environmental conditions
- Mobility
- Synchronization with its host pest

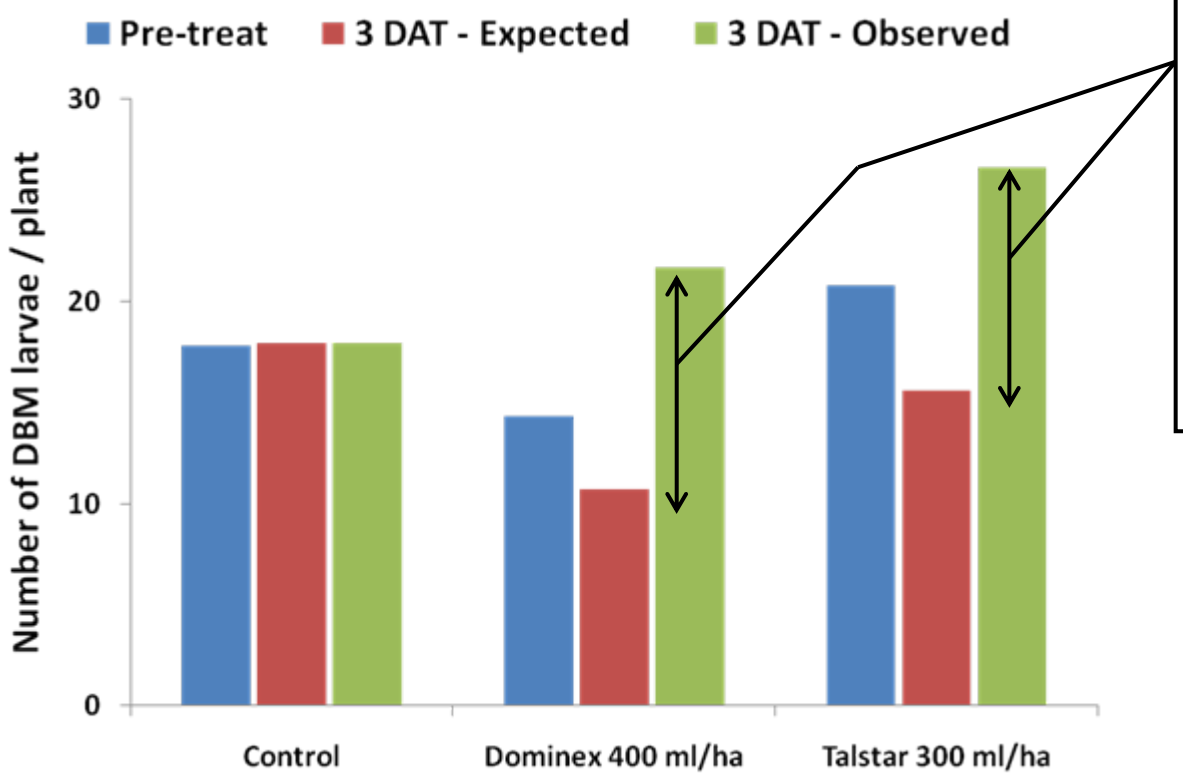
The Achilles heel of many nat. enemies: poor synchronization with the host pest

Too big a lag between the arrival/build-up of the pest and the response from the natural enemy



Example of natural enemy impact and insecticidal disruption

DBM trial: SP's



DBM larval increase due to SP elimination of predators.

Nb. The impact on the DBM parasitoids not detectable until 7-10 DAT. (Likely to be greater than predator effect.)

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Why integrate pest management practices?

IPM Programs based on natural enemies are resilient

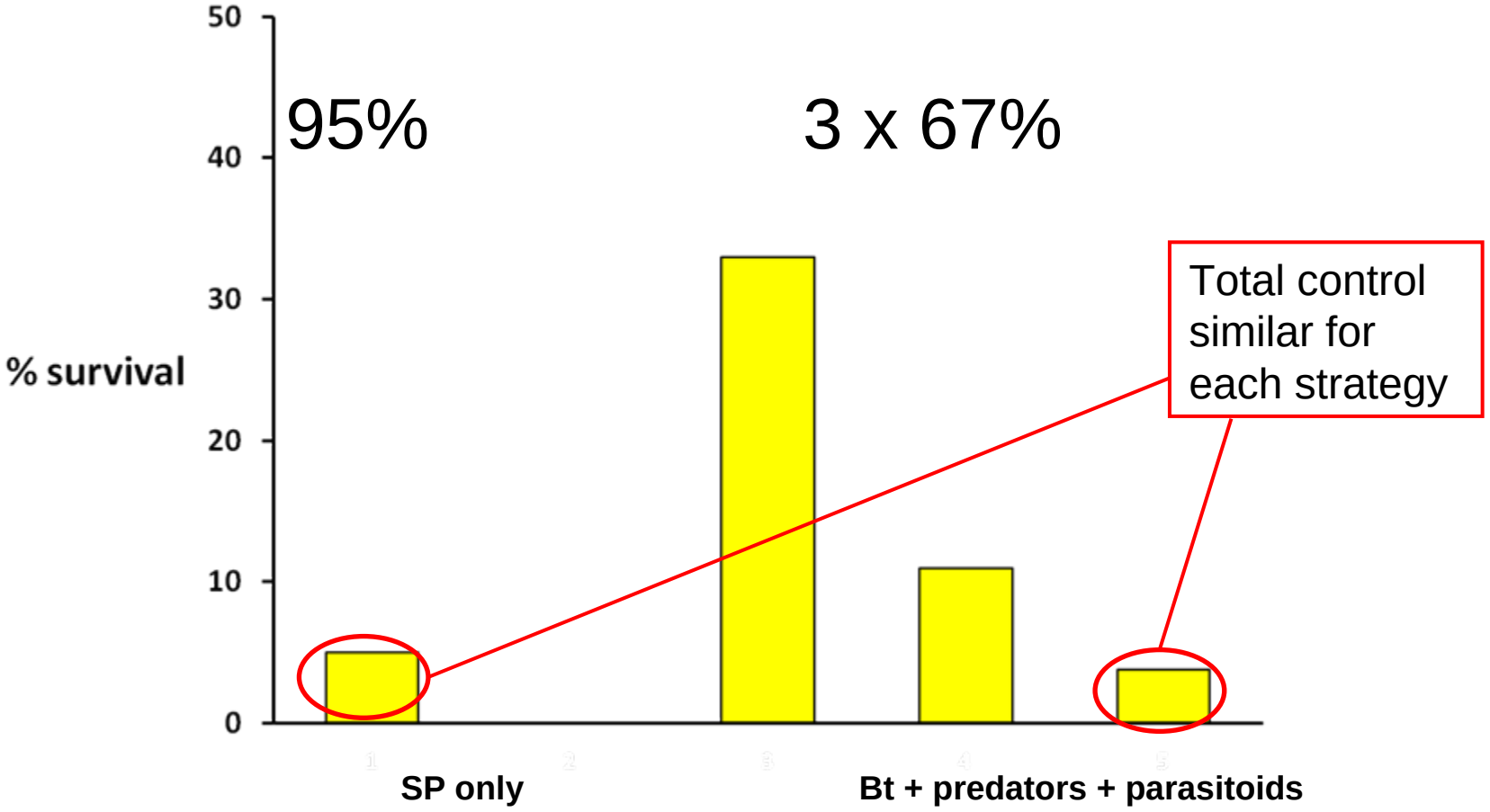
They recover following disturbances

Integration for robust pest management

Two hypothetical control strategies:

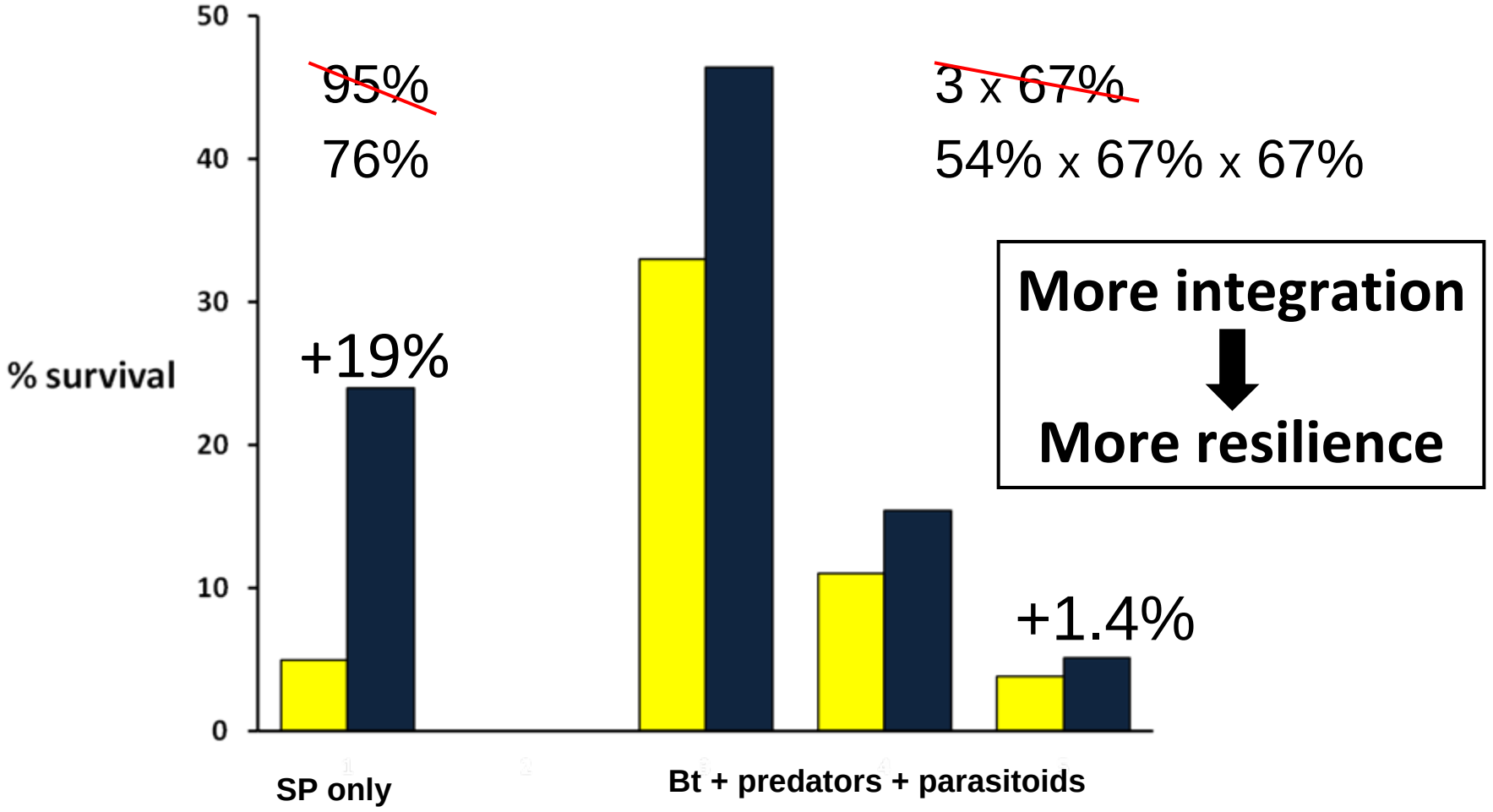
1. SP insecticide alone (95% mortality).
2. Bt sprays (67% mortality),
   generalist predators (67% mort.), and
   wild parasitoids (67% mort.).

Integration for robust pest management



Integration for robust pest management

… What if one method is 20% less effective?



More integration

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More resilience

Warning about integration …
…some practices may not be compatible

- Some resistant plant varieties and natural enemies
- Some insecticides and natural enemies

Many Insecticides (especially older chemistries) are more toxic to natural enemies than they are to insect pests

Insecticidal Control of Invertebrate Pests

- Insecticides rarely kill more than 90% of the target pests present in a crop
- This figure does not include inactive stages (eg. eggs, pupae) or those that have temporarily moved outside the crop
- Season-long reductions in pest densities with insecticide applications are typically in the order of 60-80%

Acknowledgement

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