



Novel approaches to management of apple blossom weevil

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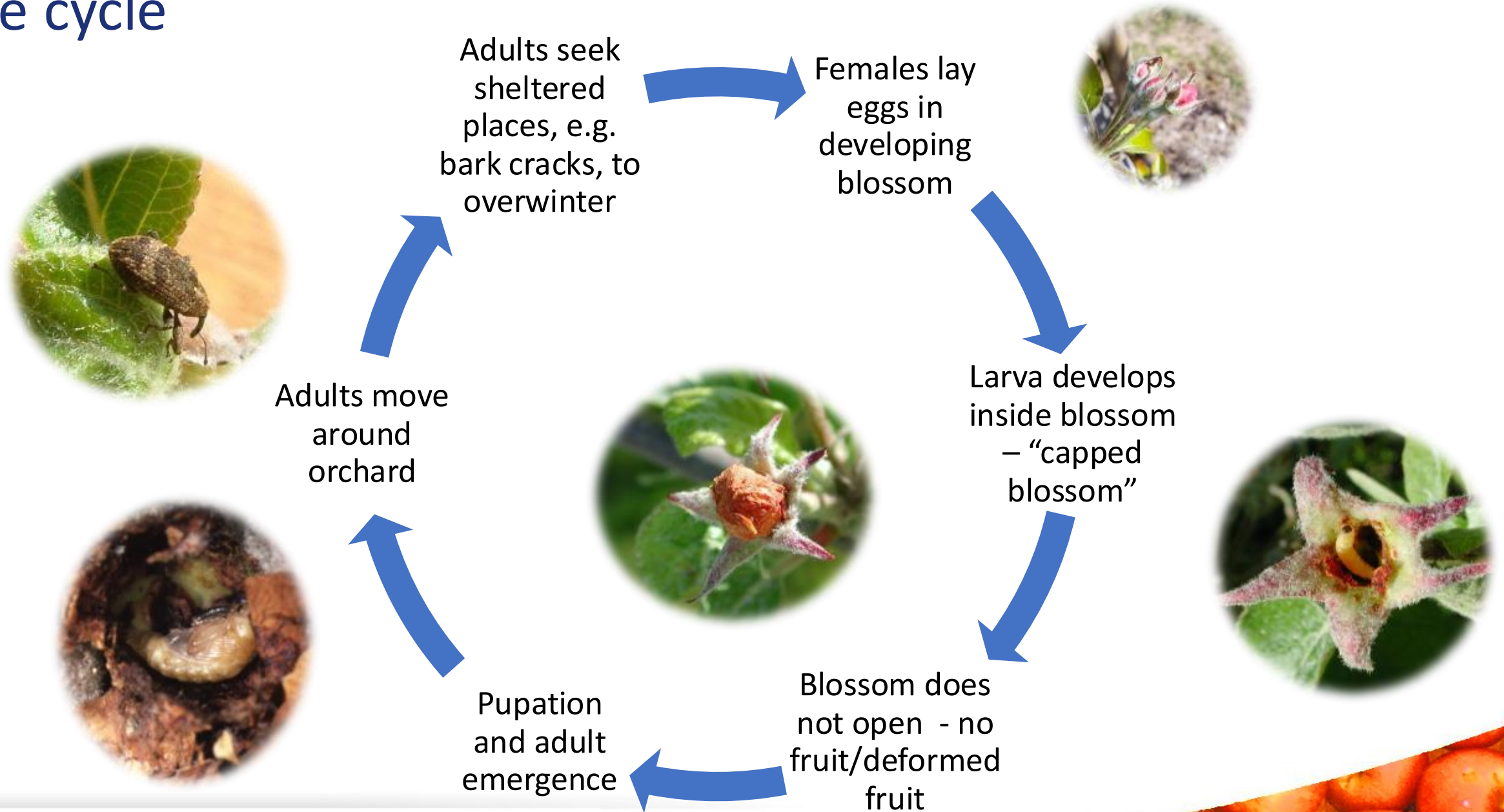
Apple blossom weevil *Anthonomus pomorum*

- Until recently:
 - Minor pest in conventional orchards
 - More significant in organic orchards
- Re-emerging; loss of Gazelle
- Damage potential:
 - Patchy but locally very significant (serious yield losses)
 - Particularly bad on cv. that don't drop damaged fruit
 - Number of affected orchards increasing
 - Significant potential damage (> 37% of flowers attacked)¹



¹ Miñarro, M., & García, D. (2018). Unravelling pest infestation and biological control in low-input orchards: the case of apple blossom weevil. *Journal of Pest Science*, 91(3), 1047-1061.

Life cycle



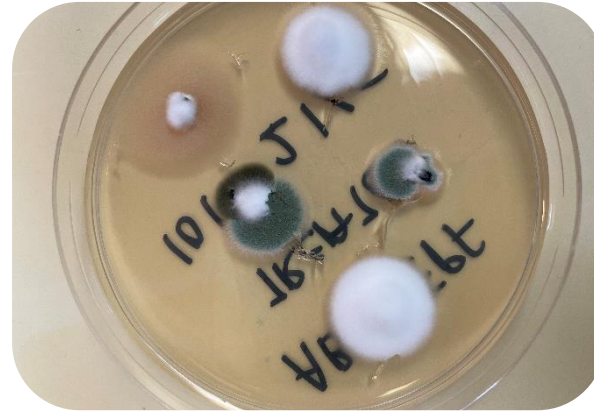
Alternative control options



Parasitoids



Nematodes



Entomopathogenic
fungus



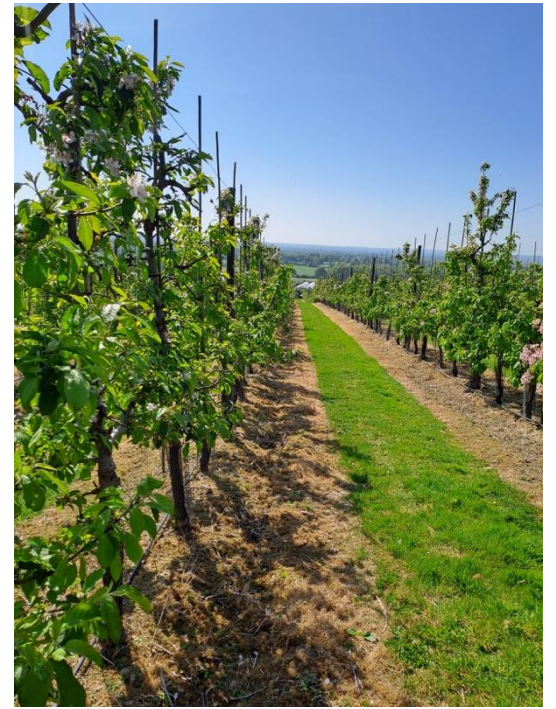
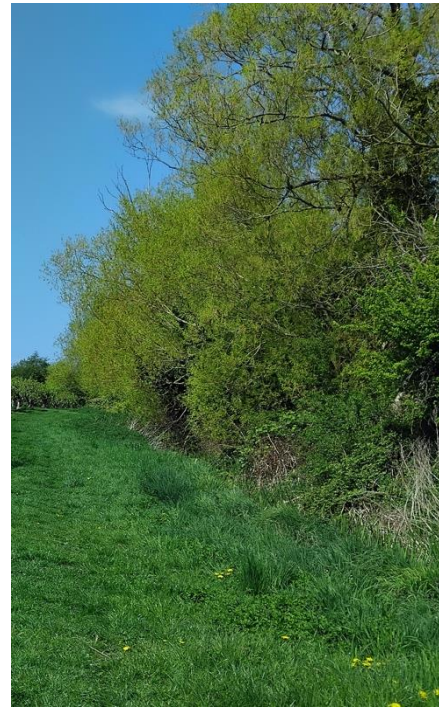
Natural predators,
e.g. birds



Which orchards are at risk?

Questionnaire: looking at orchard characteristics and ABW prevalence

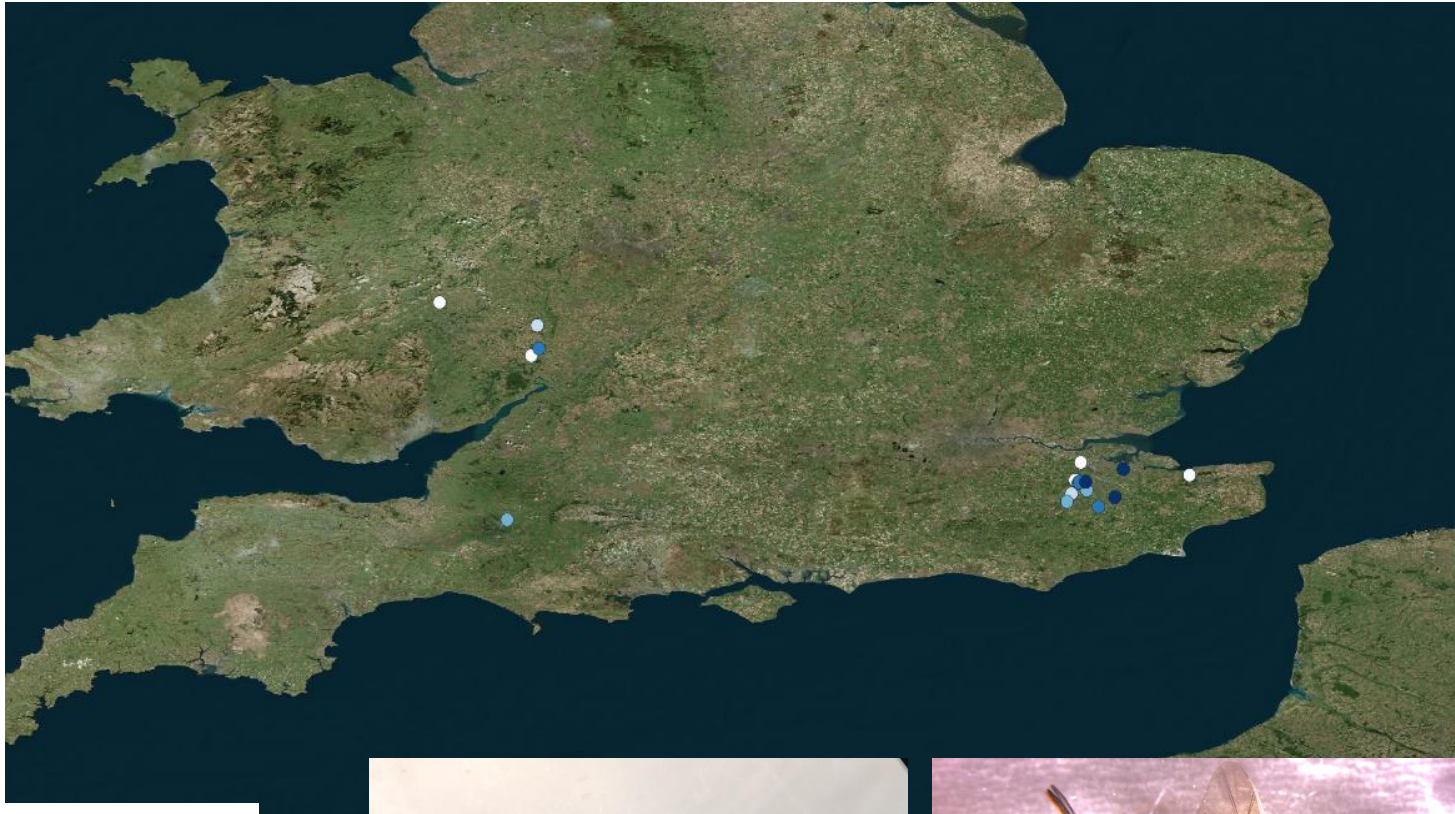
- Higher ABW orchards often:
 - Had less alleyway vegetation
 - Were near mixed hedgerows
 - Had hawthorn nearby
 - Had other crops nearby including vines, cherries
- Need more data (+ ground-truthing) to confirm why.



Risk factors?



Could parasitoids help?



Parasitism (%)

- 0 - 0.54
- 0.54 - 7.54
- 7.54 - 12.74
- 12.74 - 17.5
- 17.5 - 33.3

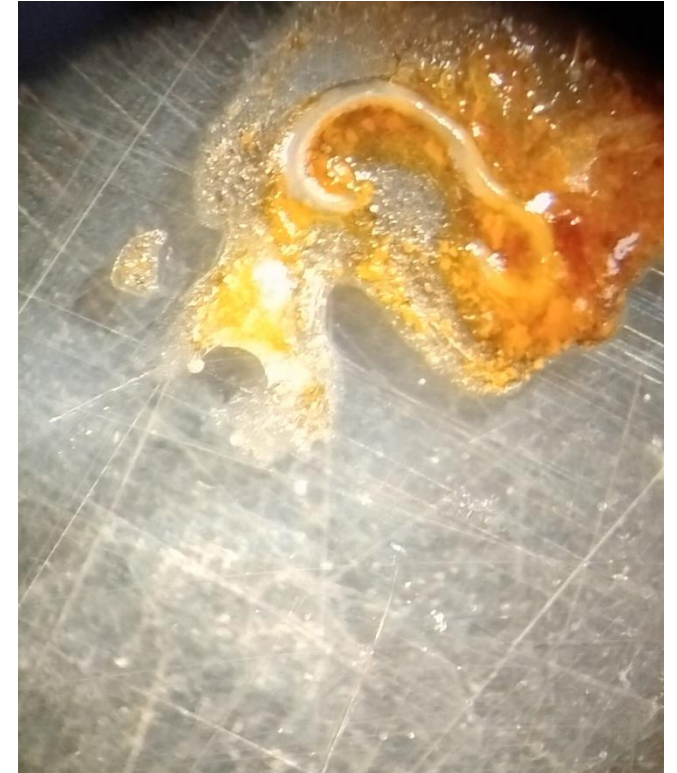
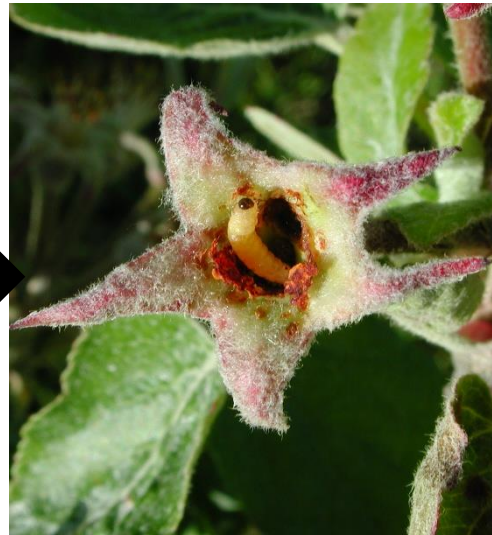


- Capped blossom from 22 sites
- Average parasitism rate = 12.1%
- Max rate >30%
- *Scambus pomorum*
- Candidate to develop commercially...?
- We will investigate how to boost naturally.
- May be more present on organic, less sprayed, less managed orchards.



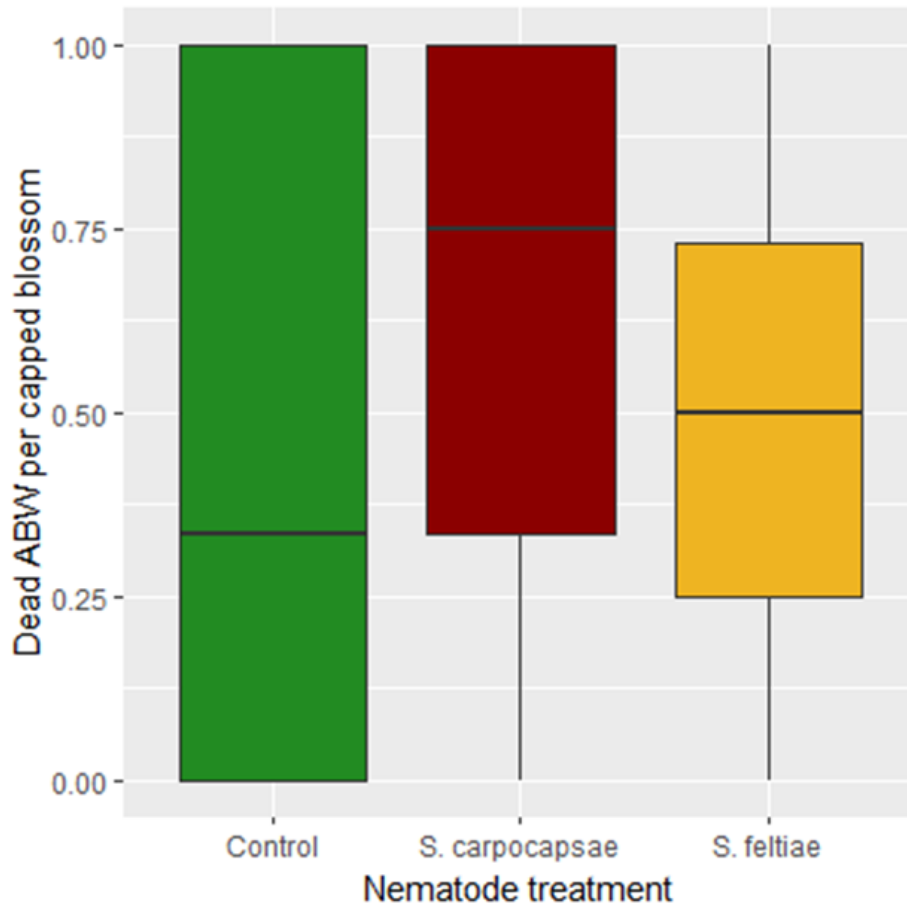
Why nematodes?

- Larvae are soft-bodied and vulnerable
- But develop inside buds
- Need something that can enter the buds and contact larvae



Do nematodes work?

We think so!



- Dipped capped blossom in nematode suspension with 0.5% Silwet-77 (wetting agent)
- Where blossoms were collected immediately and incubated in lab, 100% infection
- Where blossoms left in field, lower % - but after 9 days, this was higher (up to 50%).
- High rates of infection if given sufficient time to infect and kill.

Wetting agent



- Nematodes need wetting agent to swim into buds
- 0.5% Silwet-77 is too much for field use!
- Some phytotoxicity on dipped leaves
- Lower concentration needed for field applications, e.g. 0.05%
- Other wetting agents may also be suitable



Why EPF?

- Entomopathogenic fungus
 - *Beauveria bassiana* – Naturalis-L
 - *Metarhizium* spp. including *M. anisopliae*, *M. brunneum*
- Adult weevils have hard exoskeleton
- EPF strains often beetle-derived
- Several formulated for vine weevil
- Use in combination with other options?



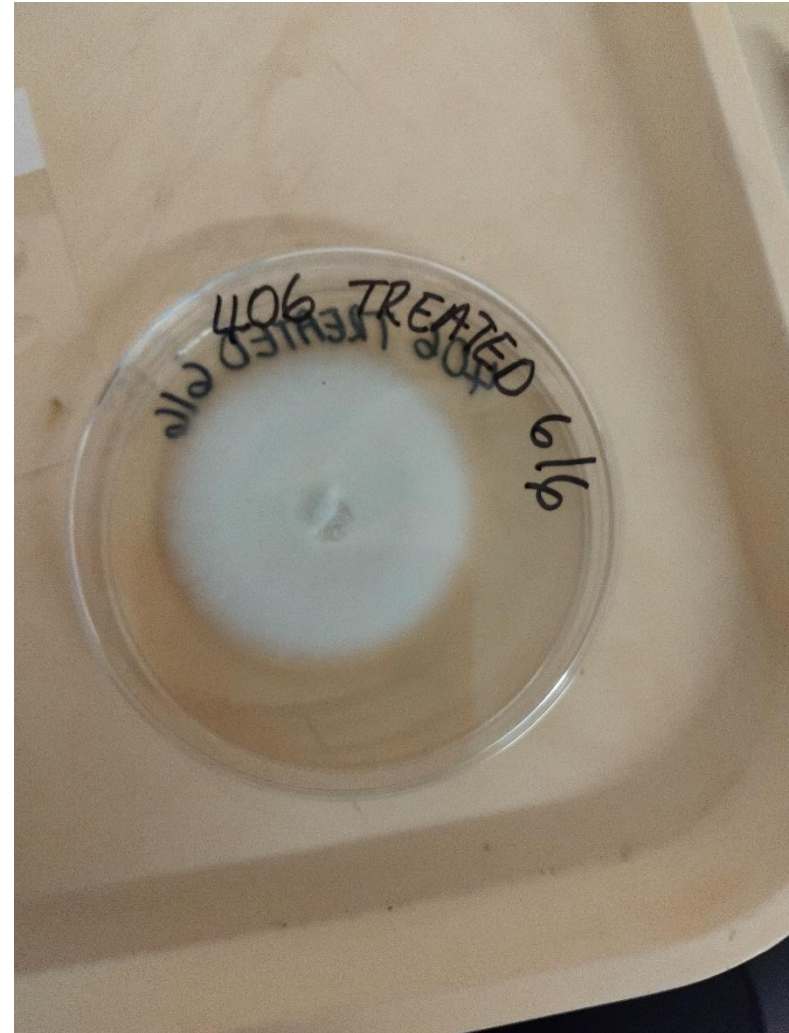
Beetle species (not ABW) infected with a *Beauveria* fungus

Does EPF work?

Lab bioassays initially – Naturalis-L and a *Metarhizium* (not yet registered)

Do either of them kill weevils in lab?

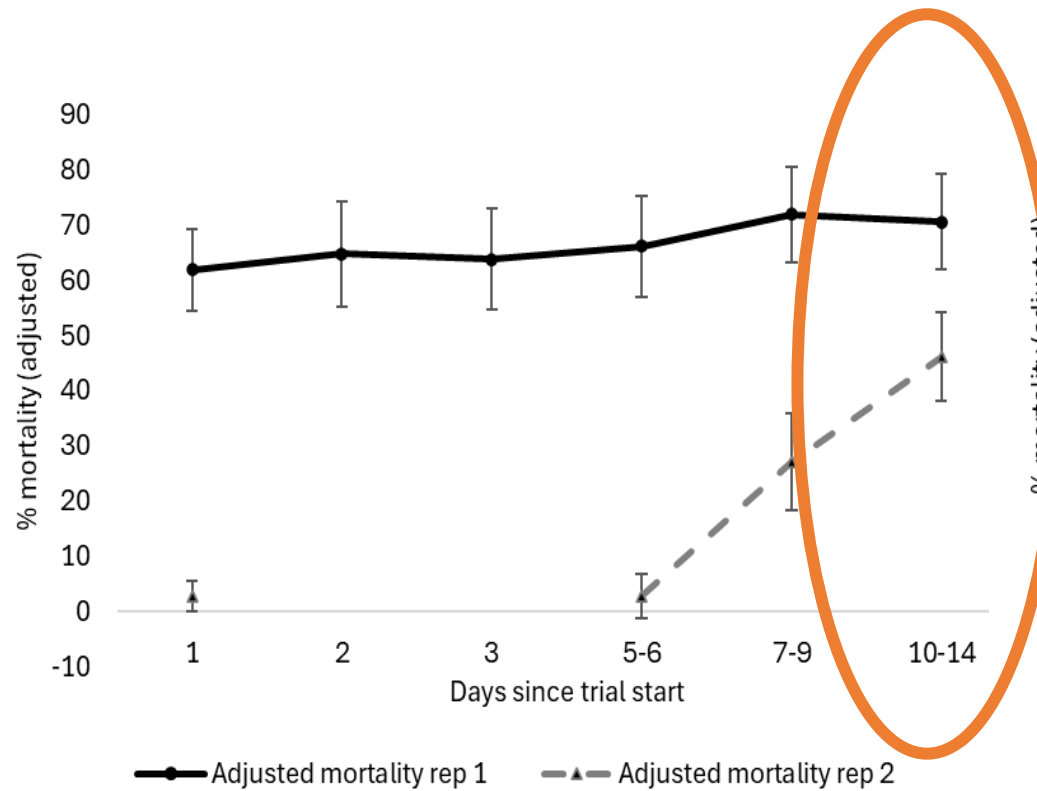
Which is most promising for future field trials?



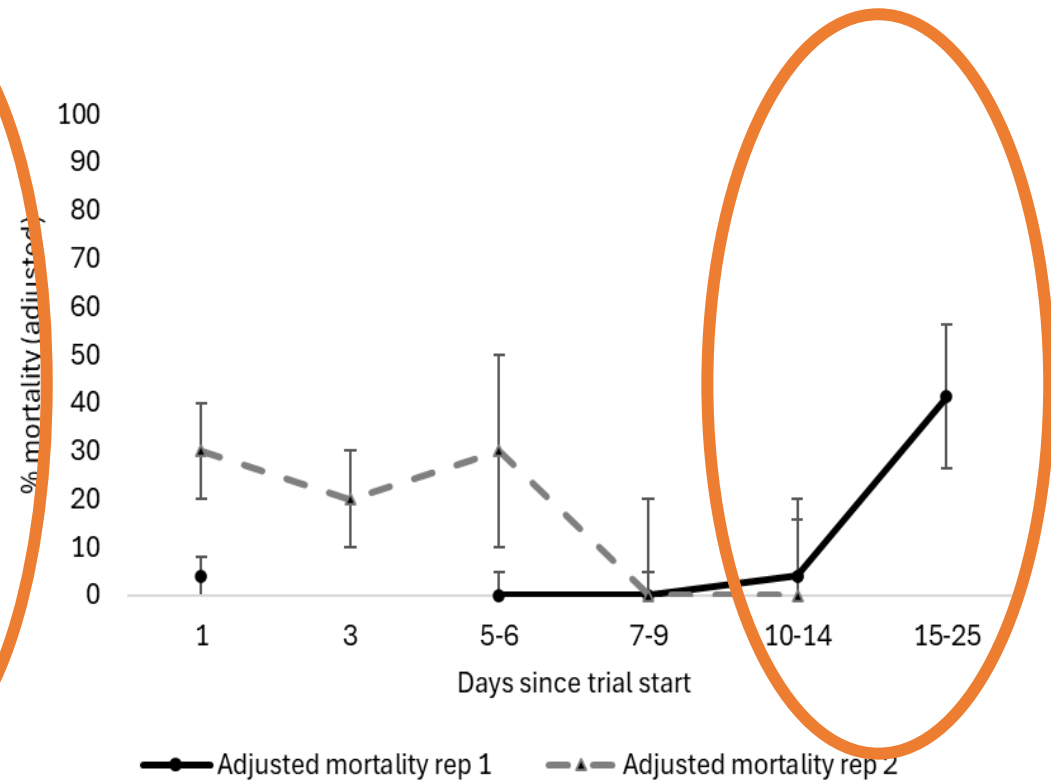
Does EPF work?

Maybe? More work needed.

Beauveria bassiana (Naturalis-L)



Metarhizium brunneum product



Recommendations

- **Alleyway vegetation** may be protective for orchards (supporting natural enemies?) but more work needed – see if it works for you?
- **Nematodes have high potential** – we want to trial these further.
 - Talk to your agronomist about appropriate wetting agents
- Naturalis-L or other **EPF formulation not ready** for deployment yet; need EAMU and more trials.
- **Parasitoid wasps are already present** on many orchards. Encouraging them (e.g. by providing additional habitat like native trees in windbreaks to host summer prey) could contribute to reduced ABW pressure.



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...who sent us capped blossom and filled in the survey

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