

Commercial application strategies of  
*Metarhizium brunneum* for *Hylobius* control.

HIRP 2025  
LALGUARD M52



**LALLEMAND PLANT CARE**

# LALLEMAND AT A GLANCE

A GLOBAL LEADER IN THE DEVELOPMENT, PROPAGATION AND MARKETING OF MICROORGANISMS AND THEIR DERIVATIVES

Founded in Montréal by  
Fred A. Lallemant at the  
end of the 19th century



Yeast  
production  
started in 1923



Owned by the  
Chagnon  
family since  
1952



Nearly 5,000 employees  
globally across several  
business units



ANIMAL  
NUTRITION



BAKING



BIOFUELS &  
DISTILLED SPIRITS



BIO-INGREDIENTS



BREWING



COSMETICS  
& BEAUTY



HEALTH  
SOLUTIONS



OENOLOGY



PHARMA



PLANT  
CARE



SPECIALITY  
CULTURES



FOOD  
PROBIOTICS

+50 plants and labs:  
31 yeast &  
11 bacteria plants;  
11 research labs



Worldwide  
presence



MICROBIAL  
BY  
NATURE

LALLEMAND

# LALGUARD M52

*Metarhizium brunneum* strain Ma43



*Effective control in  
growing media or  
soil incorporation*



*Improved  
application against  
target insects*

# Bioinsecticide for sustainable pest management

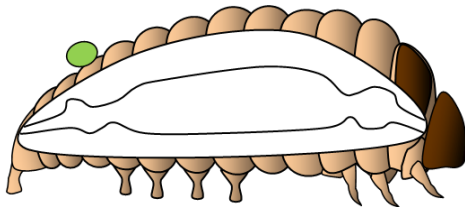
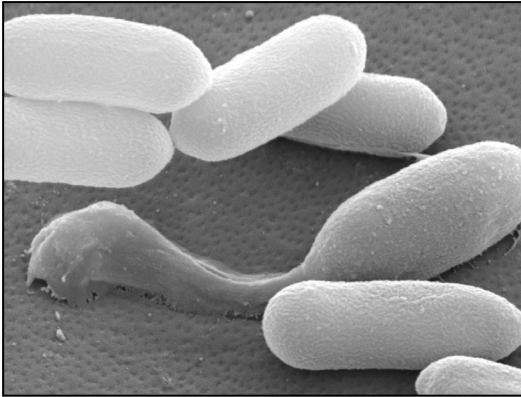
- **Formulated with the entomopathogen** *Metarhizium brunneum* strain Ma43\*
- **Proven efficacy on a broad range of key pests** in greenhouse and open field
- **Highly adapted** to IPM programs using beneficials, biologicals and conventional products
- **Environmentally friendly**
  - Great tool for insecticide resistance management
  - Maximum Residue Limit (MRL) exemption
  - Organic and ecological farming



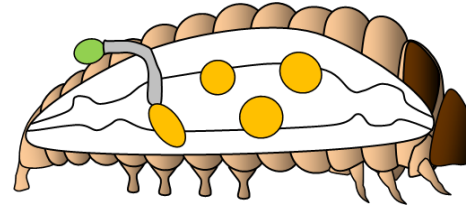


# Modes of action

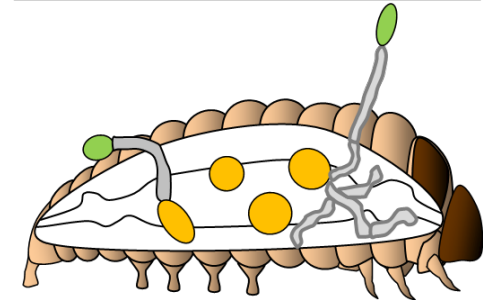
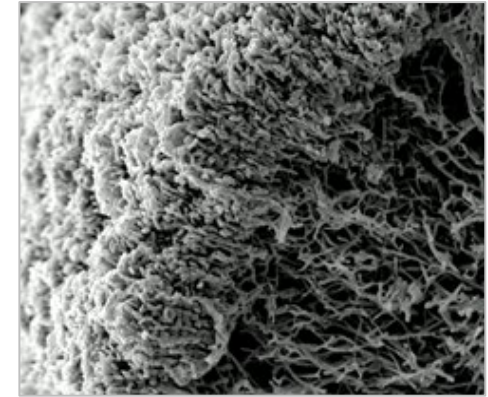
Spore **adhesion** and  
**germination**  
(2 to 6 h)



**Penetration** of cuticle and  
**multiplication** inside host  
(< 3 days)



In case of high RH, the fungus  
**emerges** and **sporulates** at surface  
(3 to 5 days)





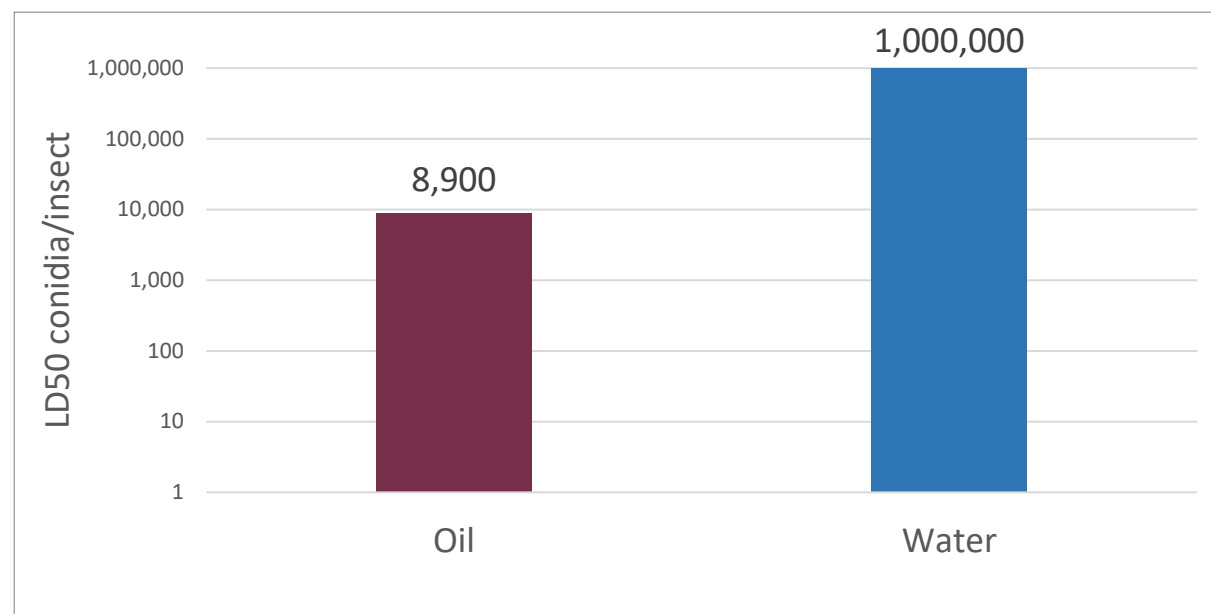
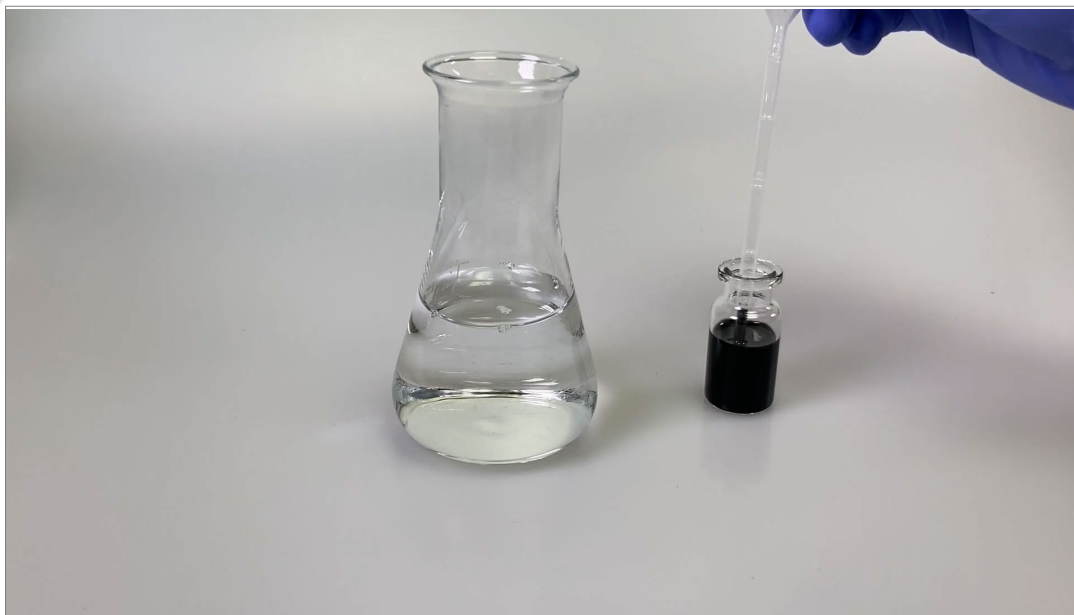
# LALGUARD M52<sup>OD</sup>

*A highly effective improved formulation*

Highly miscible

Oil-based formulation increases efficacy

- Helps the conidia to stick to the insect cuticle
- Oil can protect spores from UV and desiccation
- Enhances prolonged persistence - rain fastness



LD50: average number of conidia which lead to 50% mortality

# Control against *Hylobius*

Several years of research in both lab and open field testing, helps us understand the efficacy of entomopathogenic fungi (EPF) for the control of *Hylobius*.

Testing included:

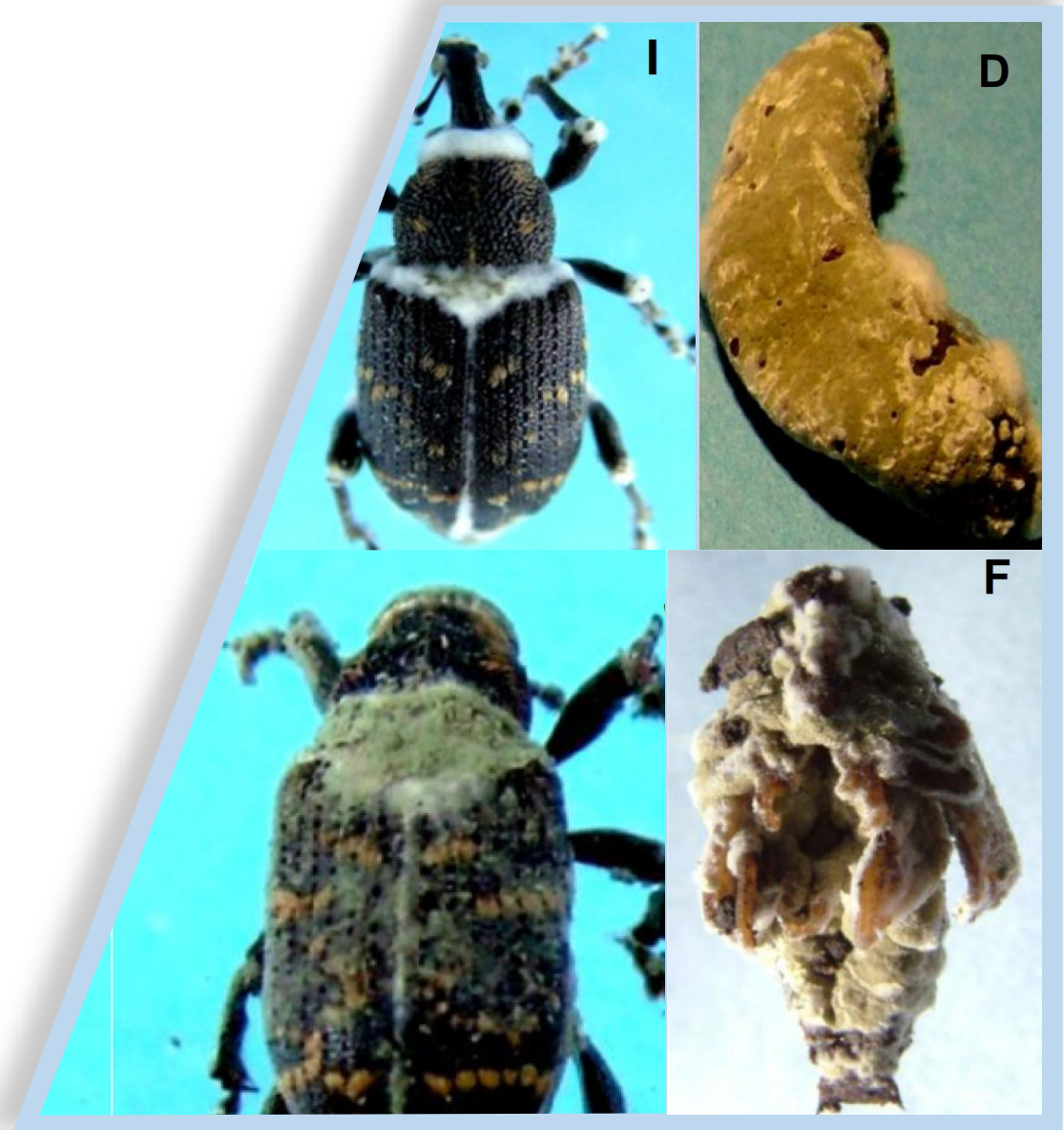
- several different commercially available strains of EPF.
- mortality rates of EPF on different developmental stages of the insect.
- influence formulation and application strategies have on the control of the different developmental stages.





# Control against *Hylobius*

- *Metarhizium* has been proven highly effective.
  - 80-90% control\* of larvae, with effects against adults and eggs.
  - Can persist behind bark.
  - Importance of formulation on spore viability.
  - Slower acting compared to conventional options but persists longer in the field



Work presented by Dr. Tarqic Butt, Swansea University. "Alternative options for protection against Hylobius" 17 October 2024.

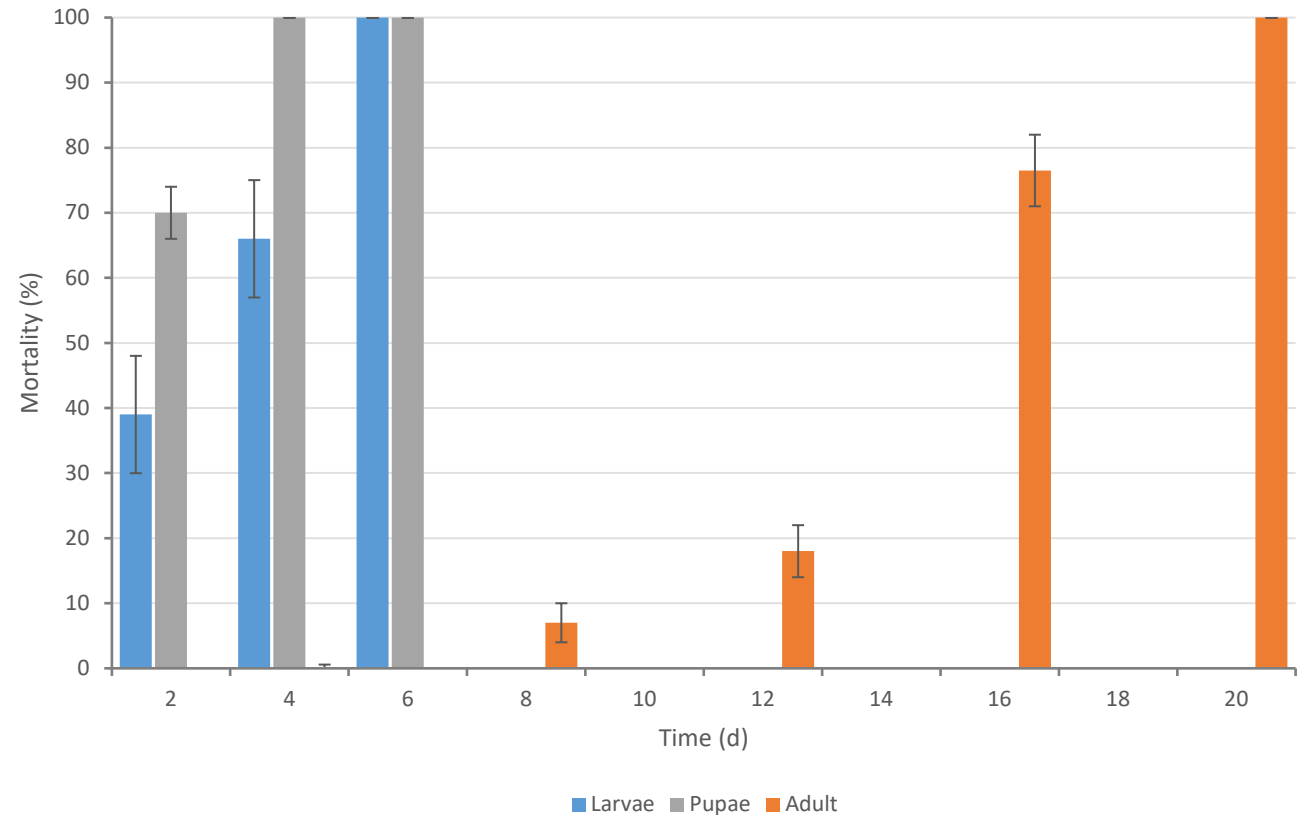
\* Ansari, M. & Butt, T. (2012). Susceptibility of different developmental stages of large pine weevil *Hylobius abietis* (Coleoptera: Curculionidae) to entomopathogenic fungi and effect of fungal infection to adult weevils by formulation and application methods. *Journal of Invertebrate Pathology* 111(1), 33-40



# Effects against different *Hylobius* development stages

Laboratory testing against *Hylobius* measured mortality rates at different development stages.

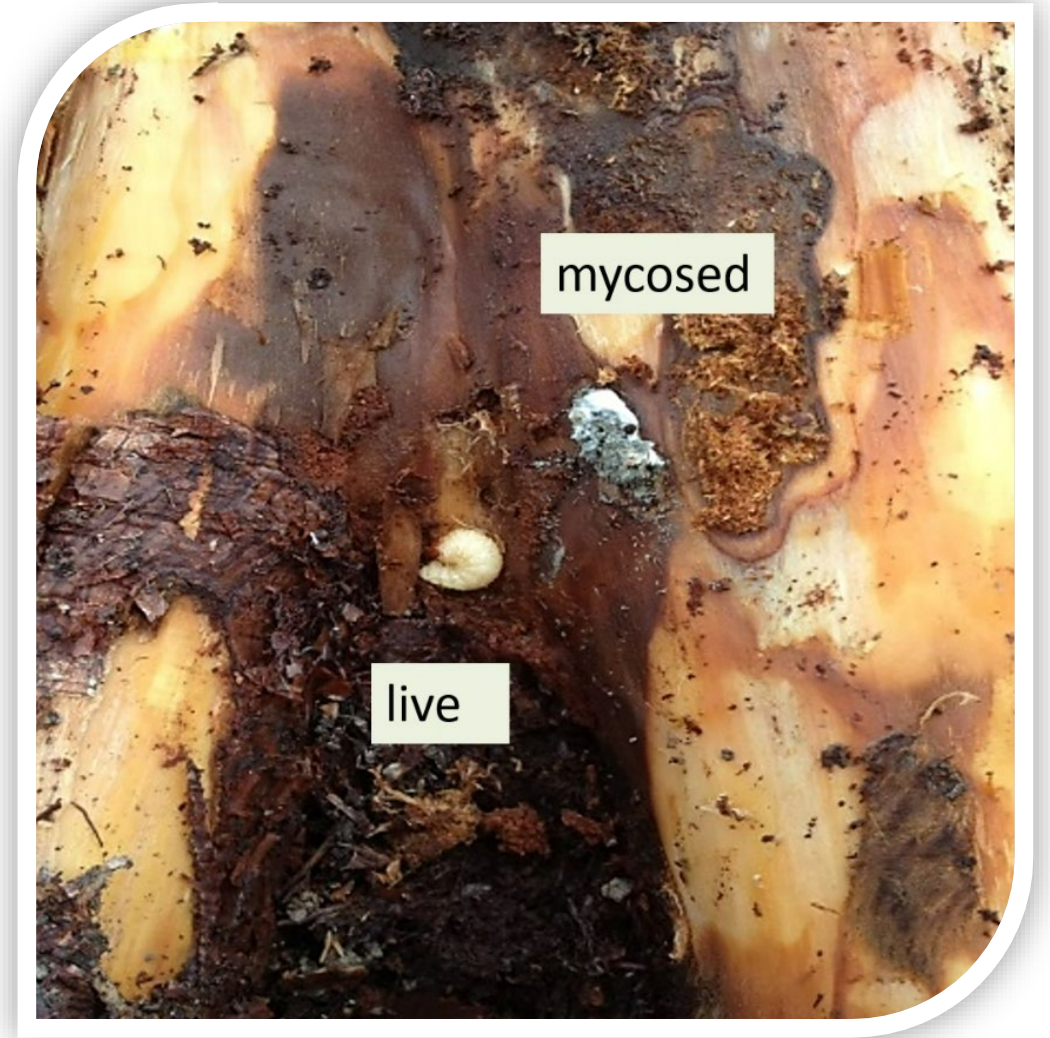
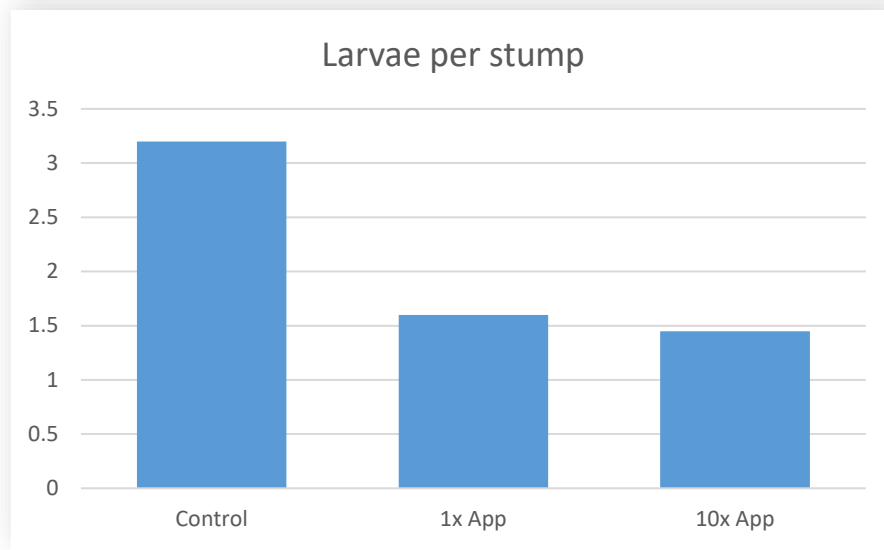
- Early stages were significantly more susceptible to the entomopathogenic fungi than the adults, resulting in much quicker time to death.



\* Ansari, M. & Butt, T. (2012). Susceptibility of different developmental stages of large pine weevil *Hylobius abietis* (Coleoptera: Curculionidae) to entomopathogenic fungi and effect of fungal infection to adult weevils by formulation and application methods. *Journal of Invertebrate Pathology* 111(1), 33-40

## Open field research

- Field trials by Tilhill Scotland showed 50% control.
- *Metarhizium* applied to stumps in field had good control with little difference between standard or higher rates.

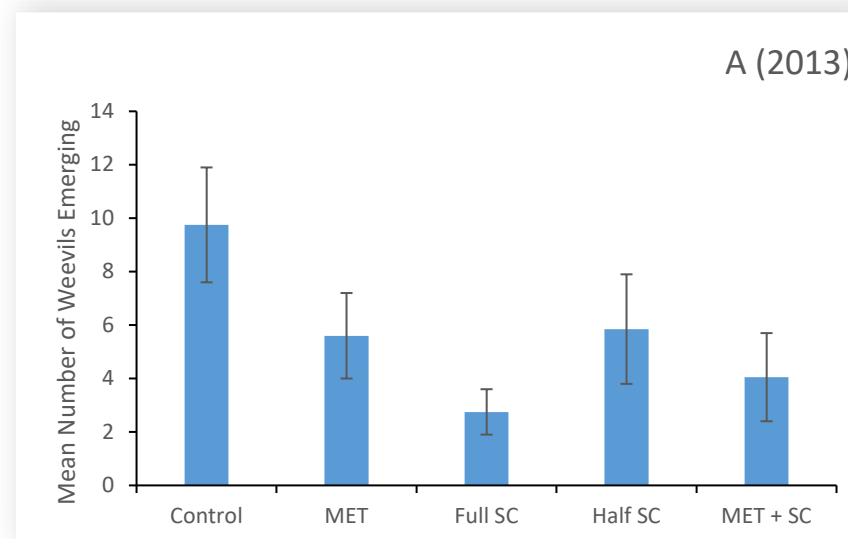
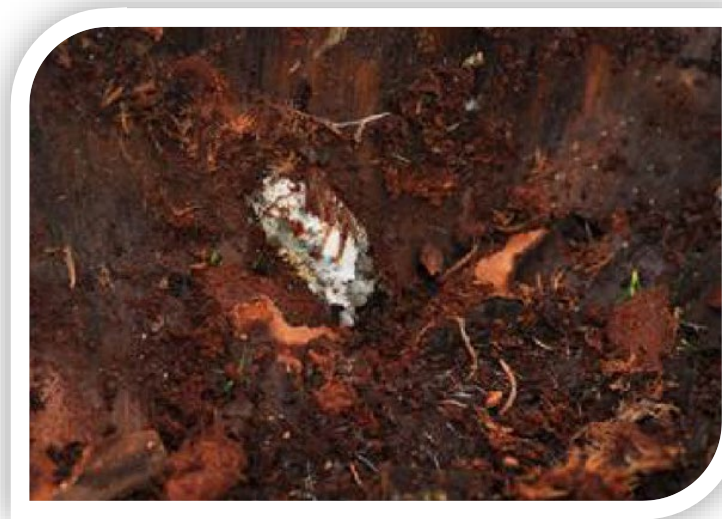


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# Open field research

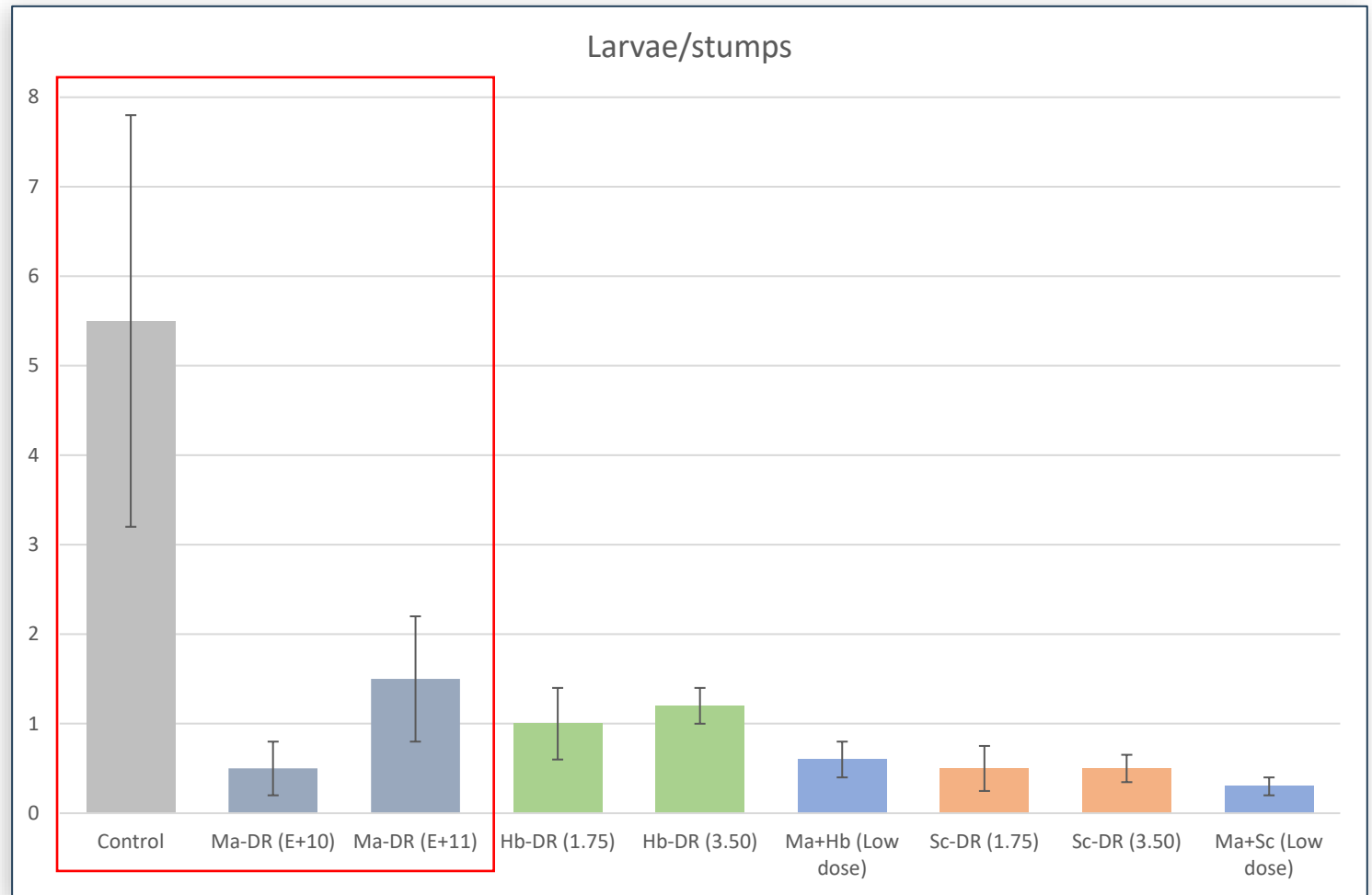
Open field research conducted in 2013 (Glendine, Slieve Bloom, Laois) and 2014 (Cloondara, Longford).

- When applied at half doses EPF and EPN had additive effects, and results were comparable to full rate EPN applications.
- *M. brunneum* can persist in the environment at 2 years post-application.
- Different EPF species behave differently at different depths
  - *M. brunneum* infected a higher proportion of weevils below soil level



## Open field research

- EPF applications give excellent control of hylobius larvae in spruce stumps. With 70-90% control against larvae.
- EPF and EPN have no obvious synergies but are complementary to each other
  - EPN faster acting – kills within a few days but has short persistence.
  - EPF slower acting but persists better in the soil and behind the bark.

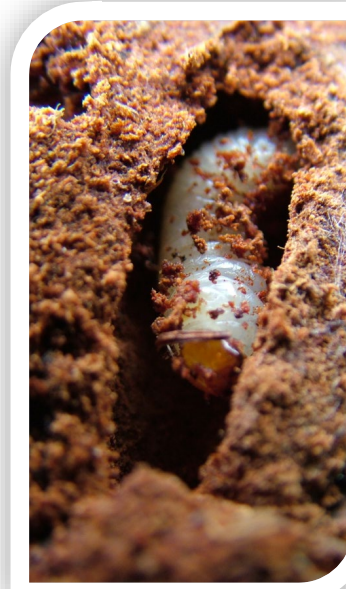




# LALGUARD M52 Target Strategy 1

- **Larvae and Pupae control**

- Reduce emerging adult populations.
- A good strategy to provide enduring and enhanced grub control during the season.
- Applications of the fungus is timed to coincide with the abundance of late-instar or pupal stages in the field.
- Best to eradicate particularly late-instar and pupal stages in the stumps during July and August.
- Rate: target  $2 \times 10^8$  per stump.  
Assuming 2500 trees/ha = 2.5Ltr/ha rate
- Water volume: 0.4Ltr per stump around buttress roots of felled stumps



## Advantages

- 70-90% control of larvae.
- Remains viable in the microclimate behind the bark.

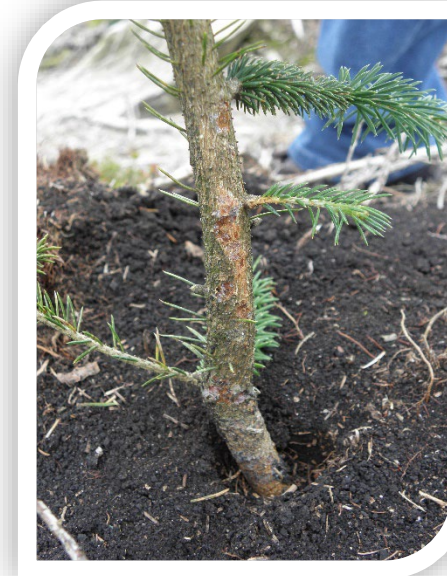
## Hinderances

- Significant water volume required.
- Ease of commercial application at scale.

# LALGUARD M52 Target Strategy 2

- **Adult/Targeted control**

- Directly target adults to disrupt breeding cycles.
- The infection process can reduce the adult's ability to feed effectively, minimizing the damage.
- For viability of commercial applications Lure & Kill strategies would be required.
- Rates and ideal formulation would depend on the IPM strategy



## Advantages

- Effective when sufficient contact between spores and adult beetles.
- Infection process can reduce Hylobius ability to feed.

## Hinderances

- Targeting mobile adults.
- Penetration of thick and highly sclerotised cuticles leads to longer time to death.



# ***The way forward for forestry***

Many strategies have been tried and evaluated mostly separately through the years.

It is clear there is not one stand alone solution to effective control.

A complete strategy should be evaluated taking into consideration commercial constraints.

- Reduce emerging adult populations to enhance the efficacy of physical barrier solutions.
- Reduce application zones against adults using push pull strategies.
- Increase planted tree resilience. PGPM to reduce transplant stress and increase early plant growth.

