



**A new mycoinsecticide for
treatment of grain storage**

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Opportunity in grain storage

- Spoilage, yield loss, rejection of traded grain
- Grain beetles, mites, psocids, moths
- Insects survive in building fabric, move into grain at harvest
- Most stores treated when empty
- Some products available for grain admixture

Opportunity in grain storage

- Reduction in available chemicals to treat grain storage
 - Pirimiphos-methyl, deltamethrin, chlorpyrifos-methyl, phosphine gas
 - Diatomaceous earth, heat treatment, CO₂
- Resistance concerns
- Consumer pressure

A mycoinsecticide for grain storage

- From over 100 UK storage premises, over 70,000 insect cadavers were processed
- 8 isolates identified as *Beauveria bassiana*
- Some isolates caused high levels mortality
- Need to improve delivery & efficacy in realistic conditions



DEFRA funded project



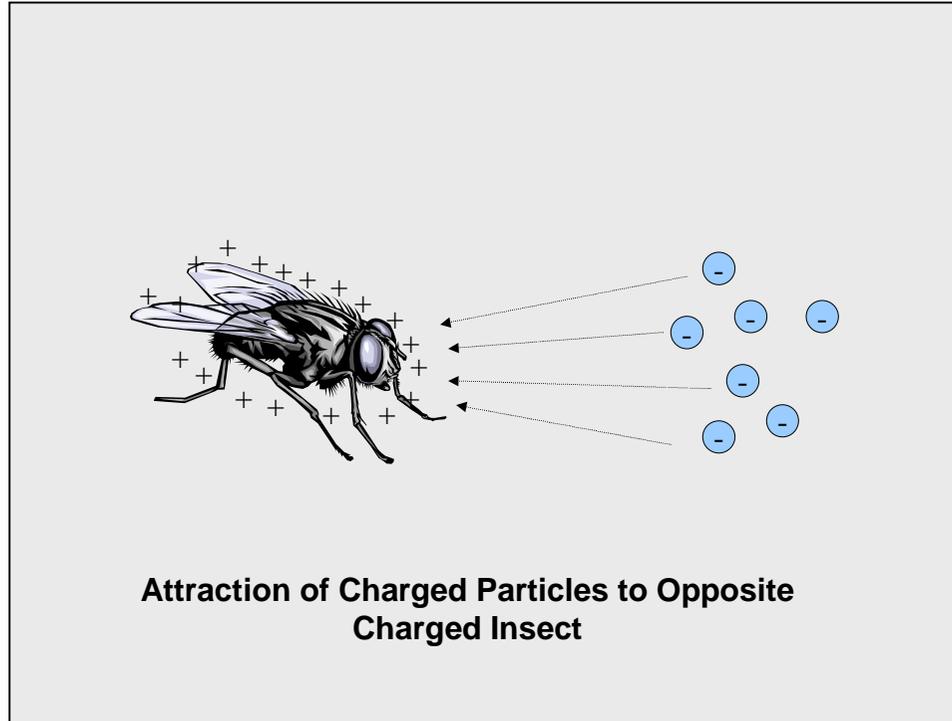
The Food and Environment
Research Agency



MARKS &
SPENCER



Entostat as a delivery system

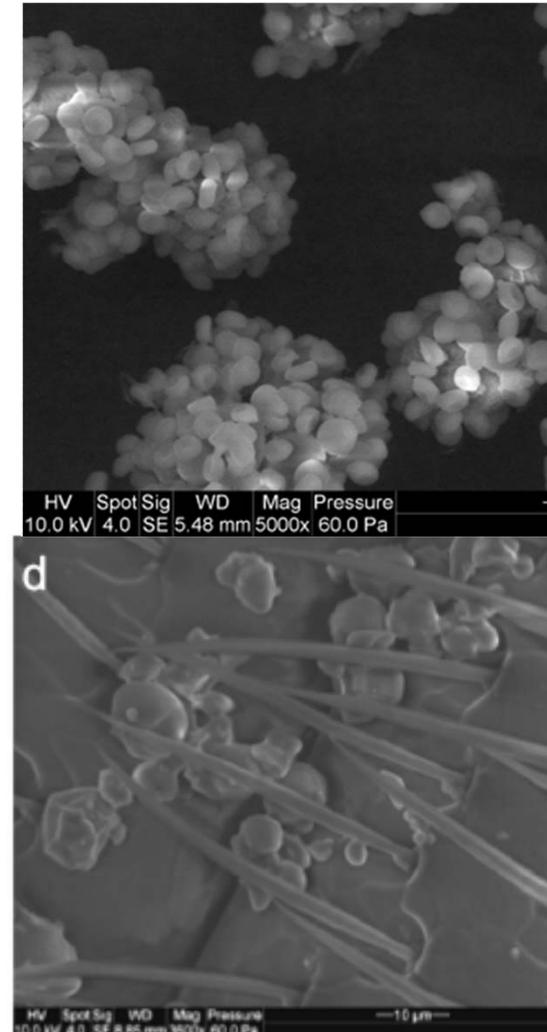


Carnauba wax is a bipolar electret, tribocharging 80% to the negative



Entostat as a delivery system

- Spores adhere to the exterior of Entostat particles and detach on contact with insect
- Inclusion of Entostat raises mean particle size to safe threshold
- Treated beetles retain spores with Entostat > 72 h after exposure



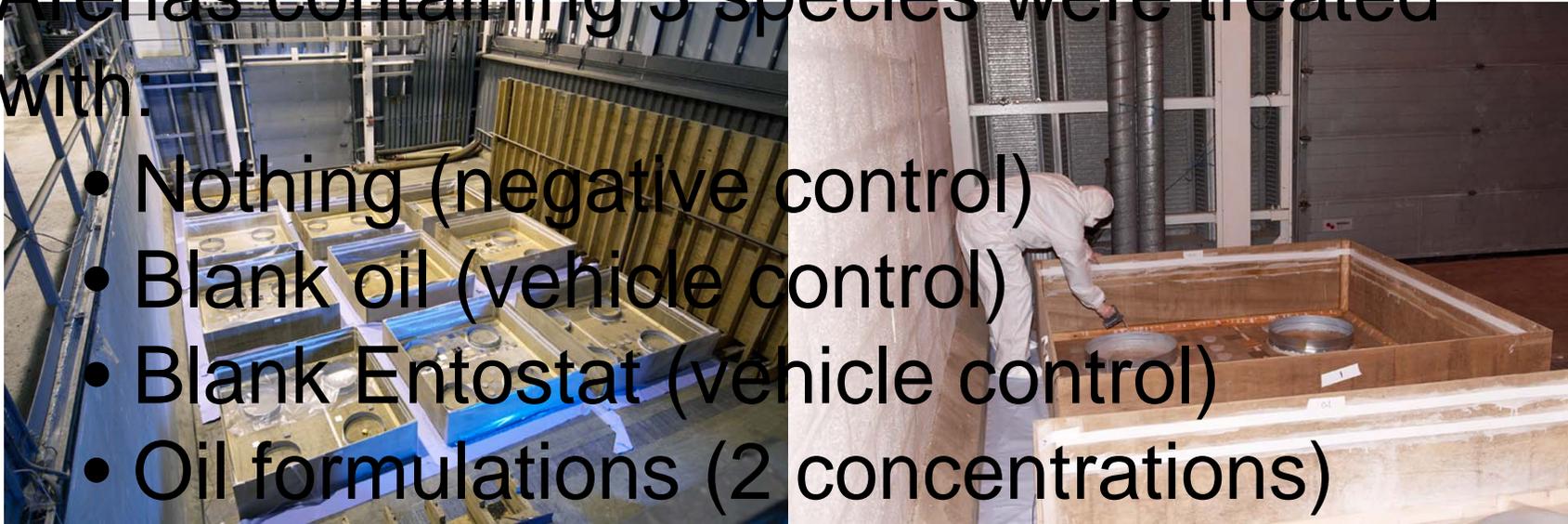
Nansen et al., 2007. Uptake, retention, and repellency of a potential carrier of active ingredients in crack and crevice treatments for stored-grain beetles. *Journal of Stored Products Research*. Vol 43, pg 417-424

Pilot scale tests of formulations

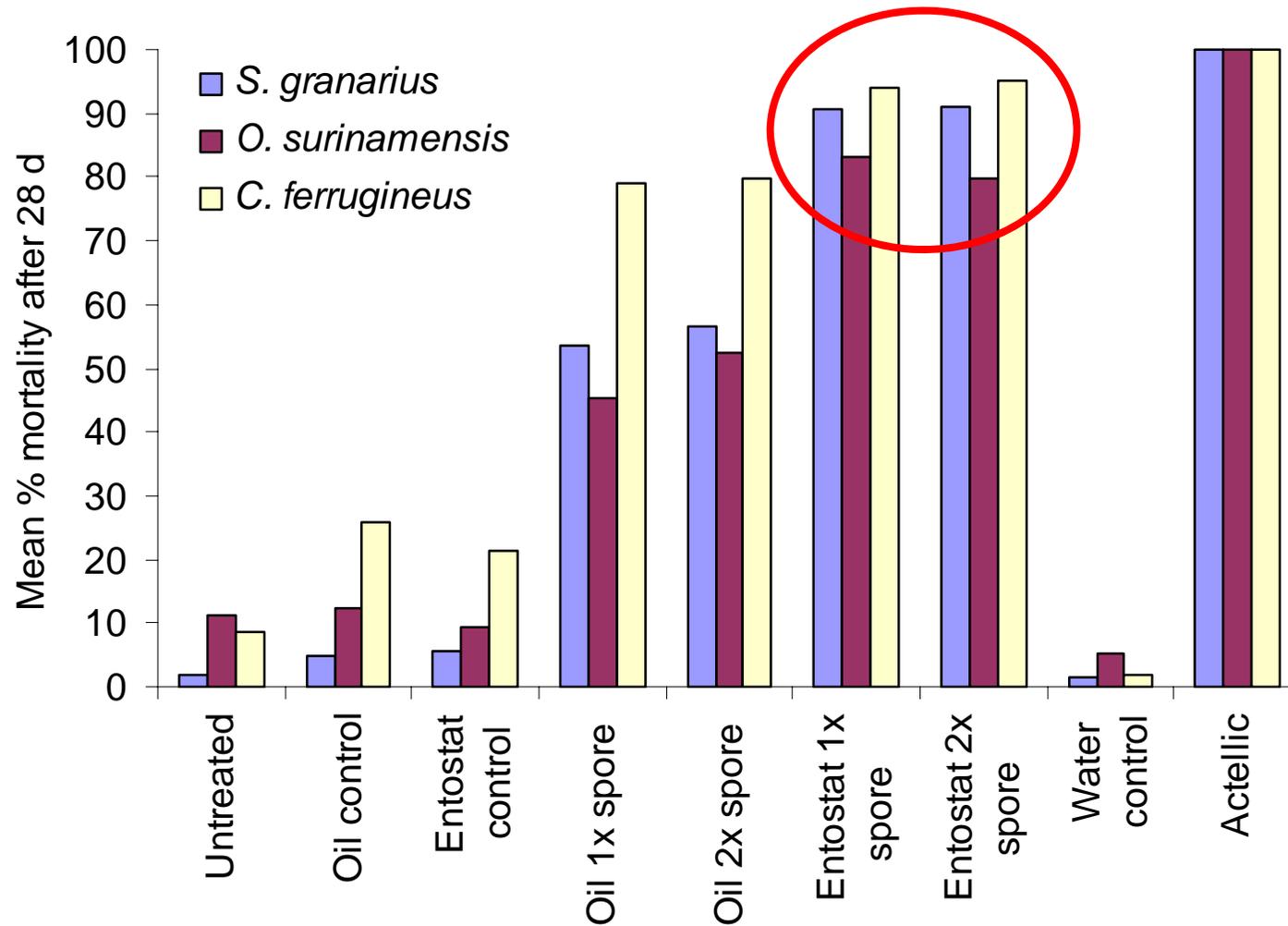
Isolate selected for further field testing was IMI389521

Arenas containing 3 species were treated with:

- Nothing (negative control)
- Blank oil (vehicle control)
- Blank Entostat (vehicle control)
- Oil formulations (2 concentrations)
- Entostat formulations (2 concentrations)
- Actellic (Organophosphate)



Pilot scale tests of formulations



Entostat dusting was more efficacious than oil spray

Concerns of end users

- Level of efficacy and residual effects
- Application to reduce inhalable dust
- Possibility of isolate further down food chain
- Cost
- Reduce Organophosphate use through the whole supply chain?

Technology Strategy Board project

- Develop sprayable formulation
- Develop application methods
- Build registration dossier
- Large scale efficacy testing
- Long term population effects, secondary cycling, persistence, effects on non targets
- Exosect to commercialise with Sylvan Bio



Regulatory plan

- Register new isolate & formulation for fabric treatment. Admixture later?
- Isolates Annex 1 listed were reviewed by Germany
- Pre-submission meeting with the selected regulatory authority is proposed
- Typical review time is 3 yrs and a significant cost for Exosect & Sylvan Bio
- Data requirements identified in regulatory plan
- Large scale efficacy test protocol to be agreed with appropriate regulator

A grayscale scanning electron micrograph (SEM) showing a dense field of spherical cells, likely bacteria or yeast, with some irregular, filamentous structures interspersed among them. The cells are arranged in clusters and appear to have a textured, slightly rough surface.

Thank you for
your attention

Project co-funded by

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