

**Susceptibility of different grub  
species to  
*Heterorhabditis bacteriophora* and  
*Steinernema scarabaei***

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# White grubs (Scarabaeidae)



*Amphimallon solstitialis* - June Beetle

- ⌘ Turf: *Phyllopertha*, *Amphimallon*, *Hoplia*, *Aphodius*, (*Melolontha*)
- ⌘ Nurseries: *Anomala dubia*, *Serica brunnea*
- ⌘ Orchards, Berries: *Phyllopertha*, *Melolontha*

# *Heterorhabditis bacteriophora*



## strength

- ⌘ wide host range (white grubs, cutworms, weevils)
- ⌘ High yields in mass production
- ⌘ effectiveness easy to observe
- ⌘ persistently good results if temperature and moisture requirements are met

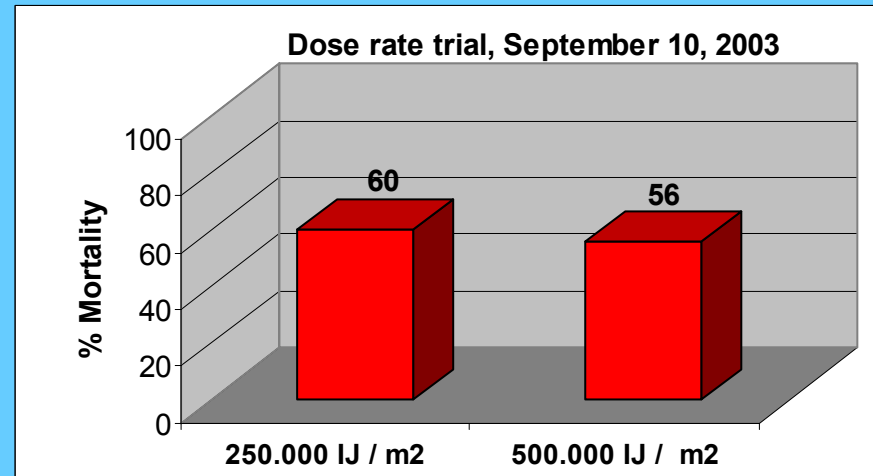
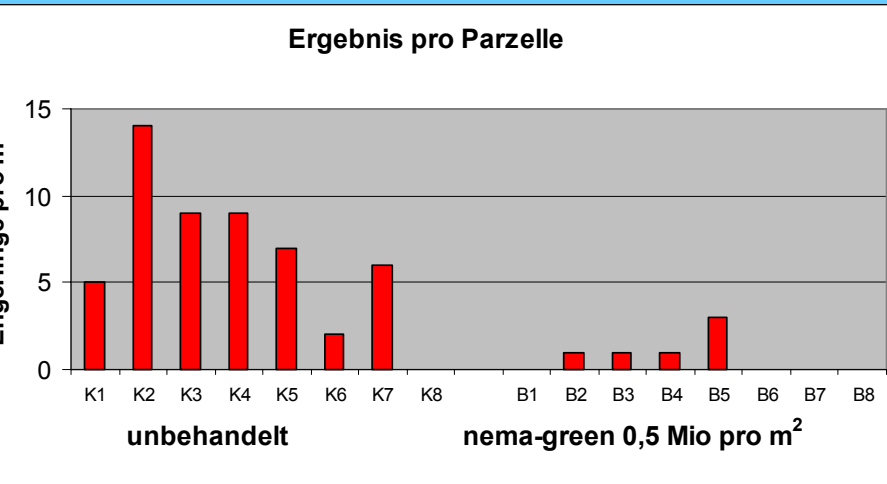
## weaknesses

- ⌘ needs minimum temperature of 11 °C
- ⌘ no effect against *Amphimallon* and *Melolontha*

# Susceptibility to *Heterorhabditis bacteriophora*

- +++ *Phyllopertha horticola* (Garden chafer)
- ++ *Aphodius contaminatus* (Dung beetle)
- + *Anomala dubia*
- + *Hoplia philanthus* (Welsh chafer)
- + *Serica brunnea* (Brown chafer)
- *Amphimallon solstitiale* (June beetle)
- *Melolontha melolontha* (Cockchafer)

# Garden Chafer (*Phyllopertha horticola*)



Plot trials Golfcourse Aukrug 2003:

A. Treatment 18 Juli

No regular irrigation in August

Control rate 88 %

B. Treatment 10 September

Half of standard rate

Control rate 60 %

# June beetle

## (*Amphimallon solstitiale*)

- ☑ 2-year life cycle
- ☑ adults appear around solstice (June, 21)

Biological control:

- ☑ Mediocre susceptibility to *H. bacteriophora*
- ☑ Highly susceptible to *Steinernema scarabaei*



# Control of June beetle with *Heterorhabditis bacteriophora*

## Under supervision of Henk Vlug

1. Soccer field Zwolle, NL

☑ Ideal conditions (Moisture, temperature, wetting agent, nematode quality)

☑ Treatment at moult from L1 to L2 (20 August)

⇒ no grubs, no feeding of crows

2. Golfcourse Bad Bentheim, D

☑ Mixed population of *Amphimallon* and *Phyllopertha*

☑ Ideal conditions (Rain), no fairway irrigation installed

☑ Treatment 1 August, 2002

⇒ no grub damage in 2002 and 2003

# Brown Chafer

## (*Serica brunnea*)

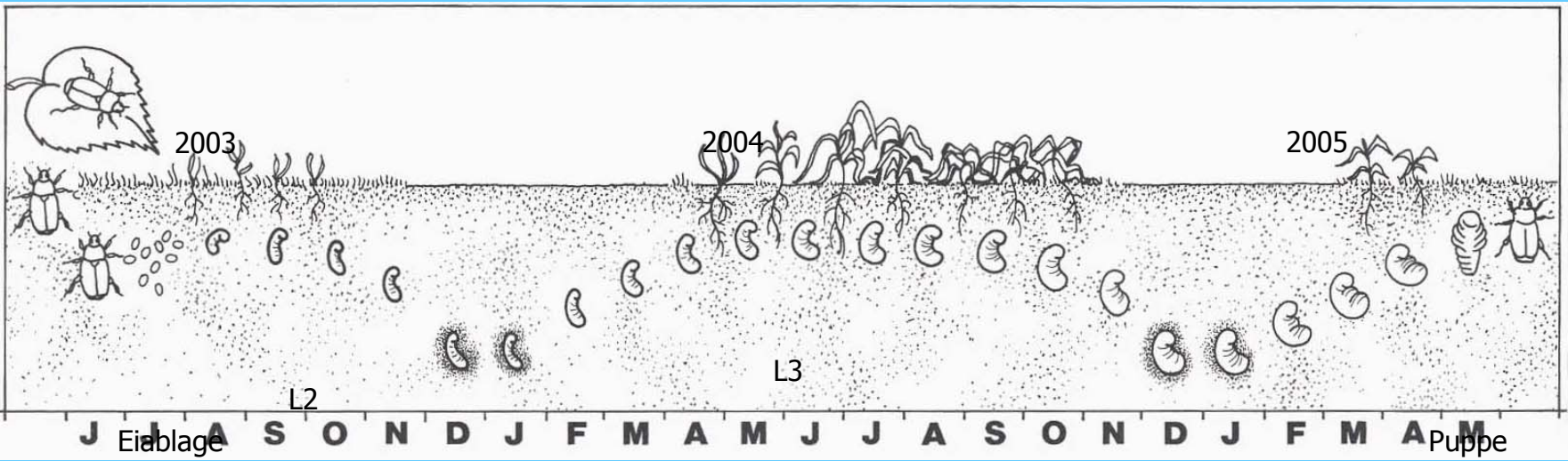
- ☒ In Netherlands and North West Germany
- ☒ In nurseries (*Taxus*, *Syringa*)
- ☒ 2-year life cycle
- ☒ Beetles fly Juli / August at dusk

Bioassay: 100 IJ  $\Rightarrow$  25 % Mortality  
 $\Rightarrow$  Treatment April - Juli  
when temperatures  $> 12^{\circ}\text{C}$



# ***Hoplia philanthus***

## ***Control with Heterorhabditis bacteriophora***



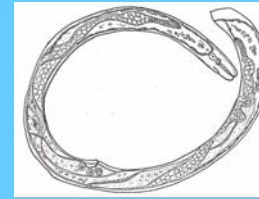
Minshad Ansari

Bioassay with 100 IJ: 32 % Mortality, 200 IJ: 77 %

Treatments begin of September not satisfying (*susceptibility of larval stages, temperature*)

⇒ Treat in Spring (L2) as soon as soil temperatures >12°C

# *Steinernema scarabaei*



Isolated from epizootics in Japanese and Oriental beetle larvae in turf areas in central New Jersey

Biology similar to that of other entomopathogenic nematodes

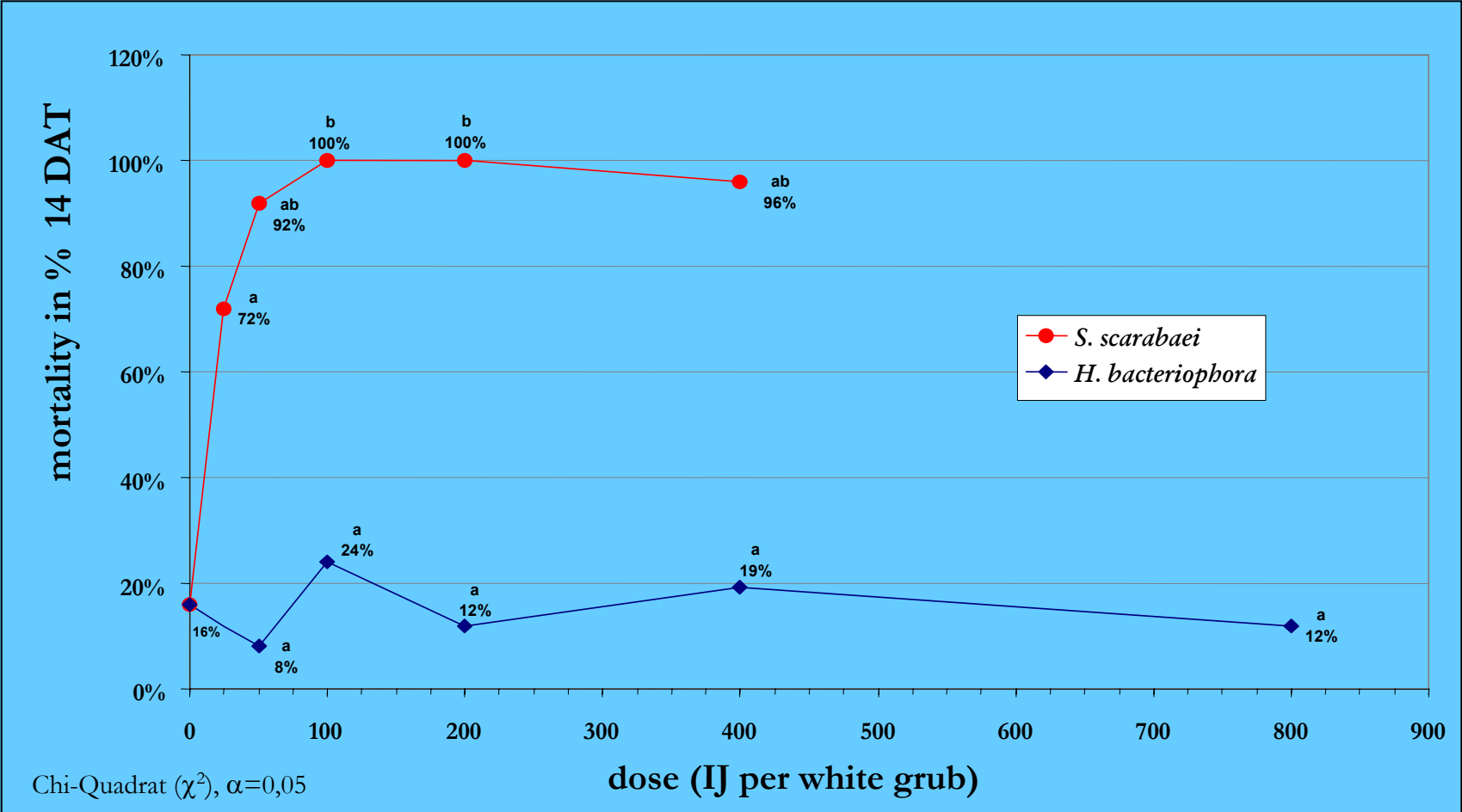
## strength

- ⌘ wide range of susceptible white grub species
- ⌘ Excellent efficacy in laboratory studies

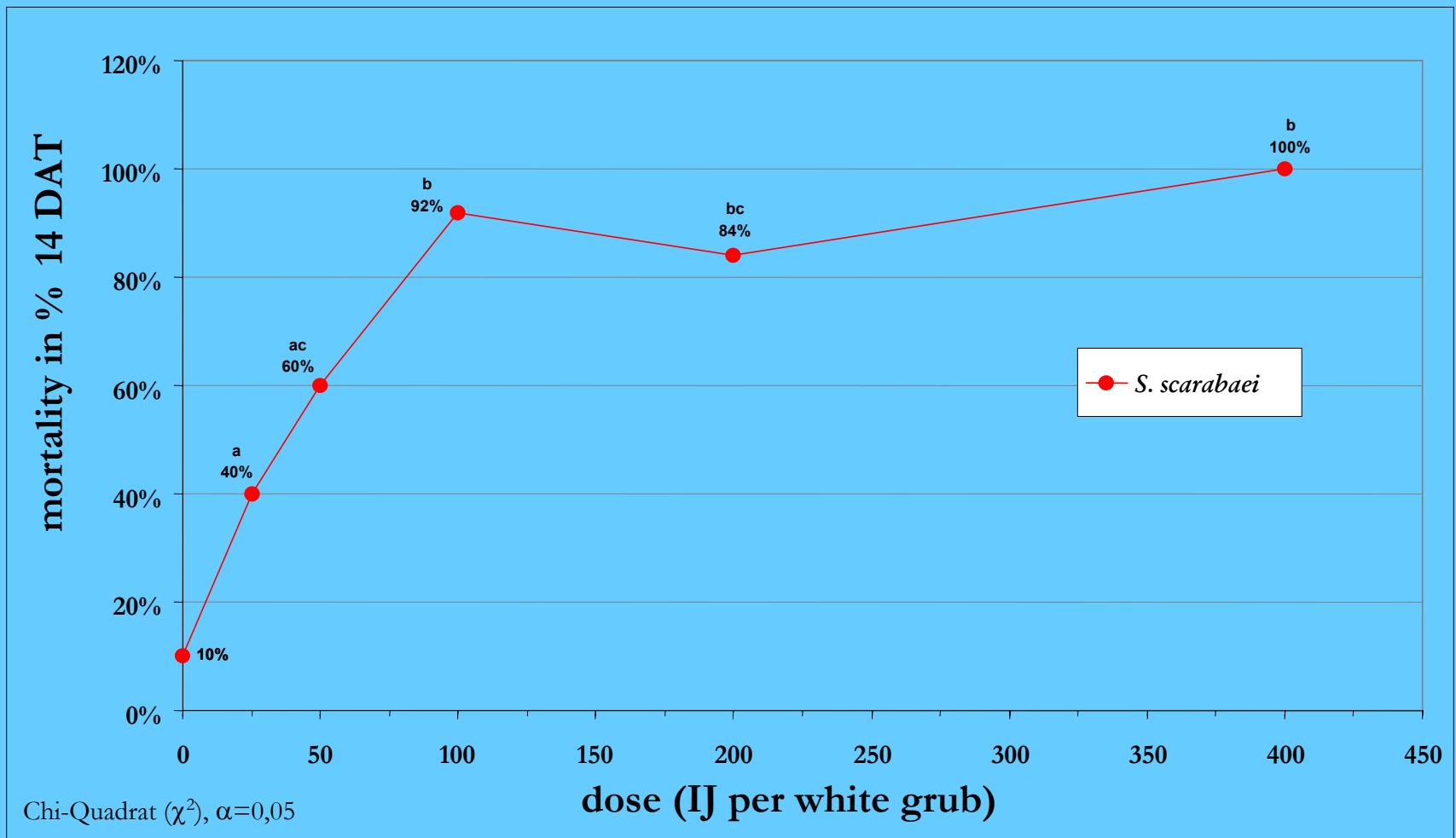
## weaknesses

- ⌘ No success in liquid culture production so far
- ⌘ Data about performance under field conditions only from the US

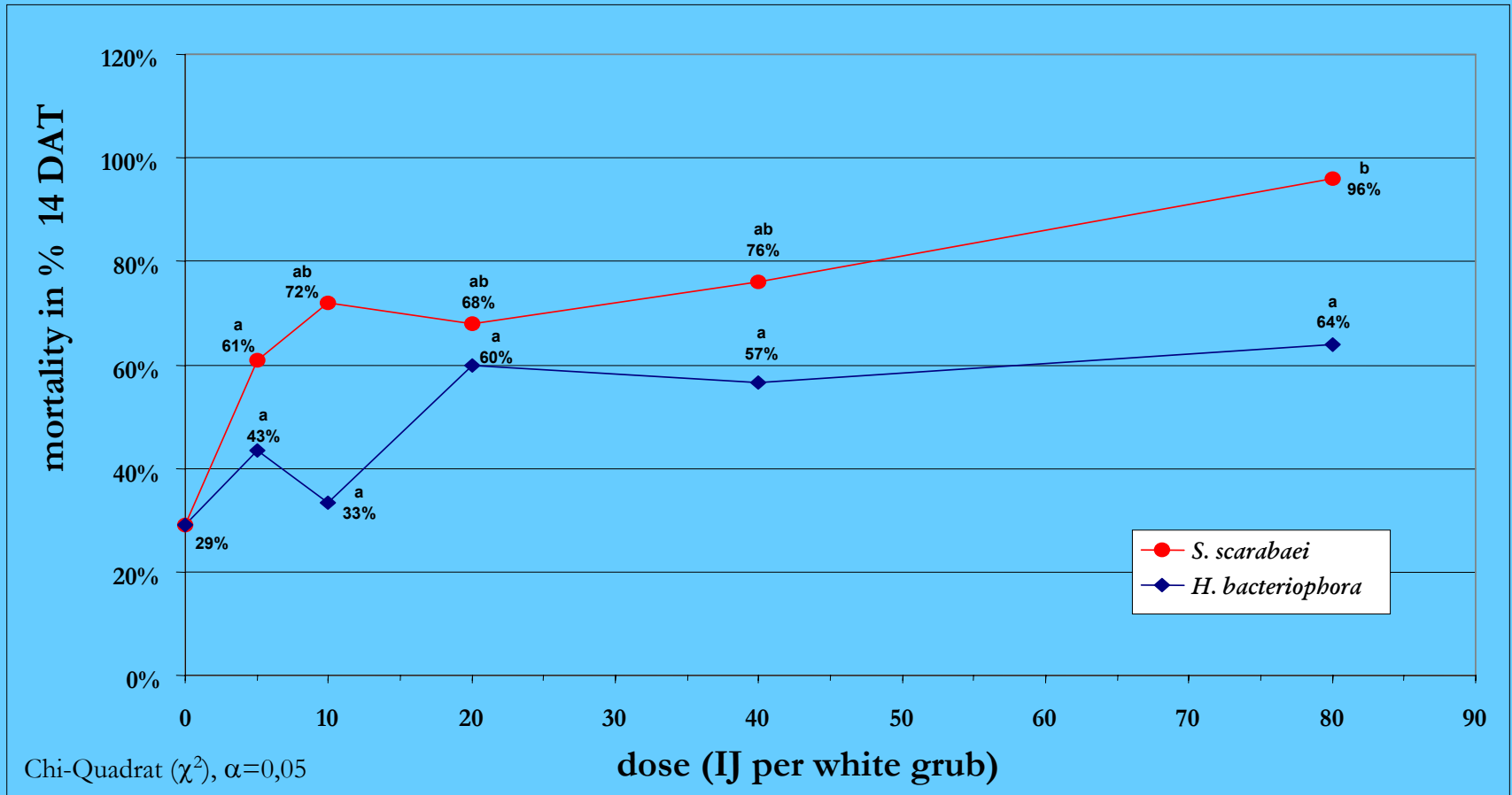
# *Amphimallon solstitialis*



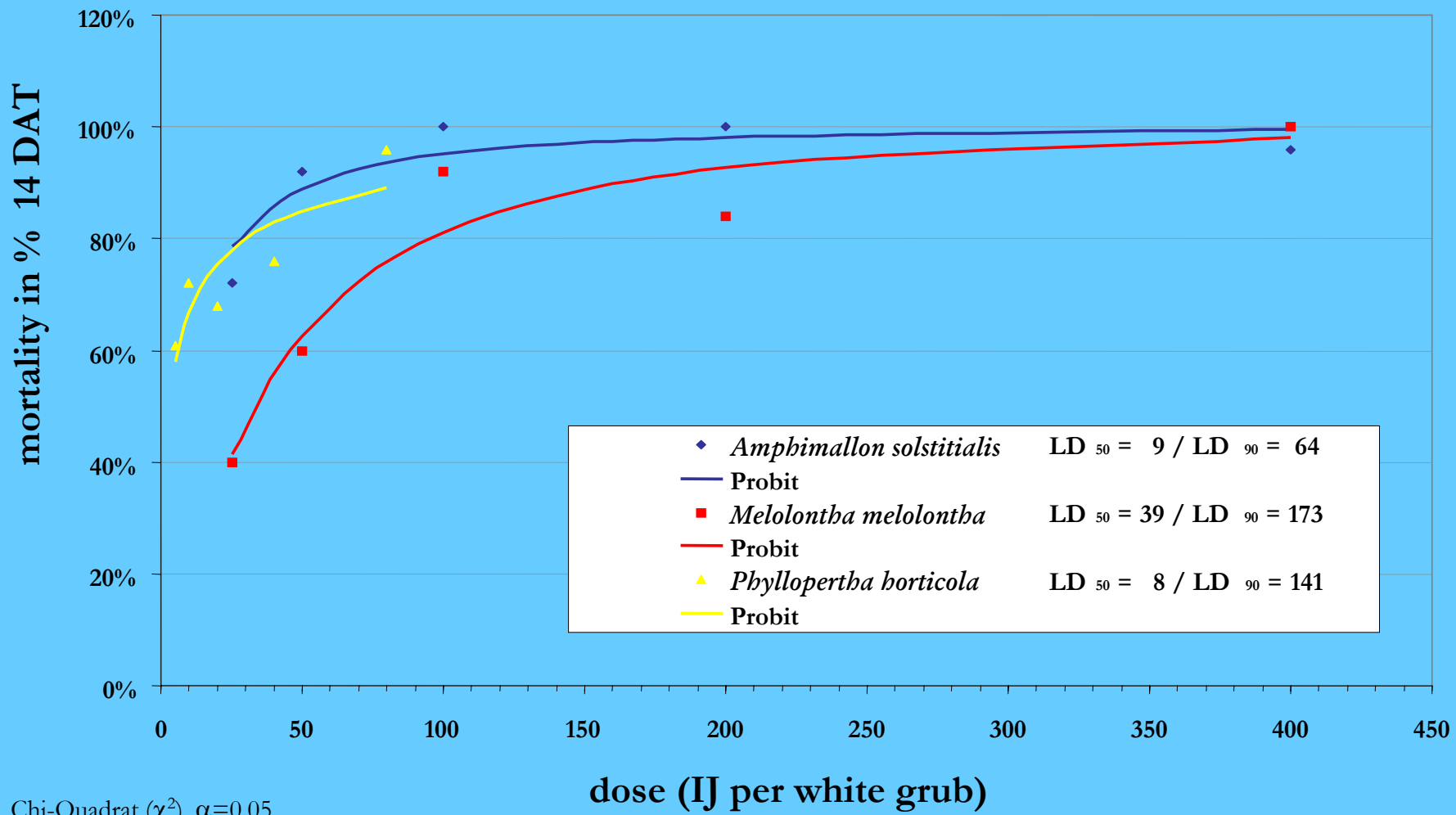
# Melolontha melolontha



# *Phyllopertha horticola*



# Probit - Analysis



Chi-Quadrat ( $\chi^2$ ),  $\alpha=0,05$

**Thank you for your attention!**

