Control of the hazelnut weevil *Curculio nucum* with entomopathogenic nematodes

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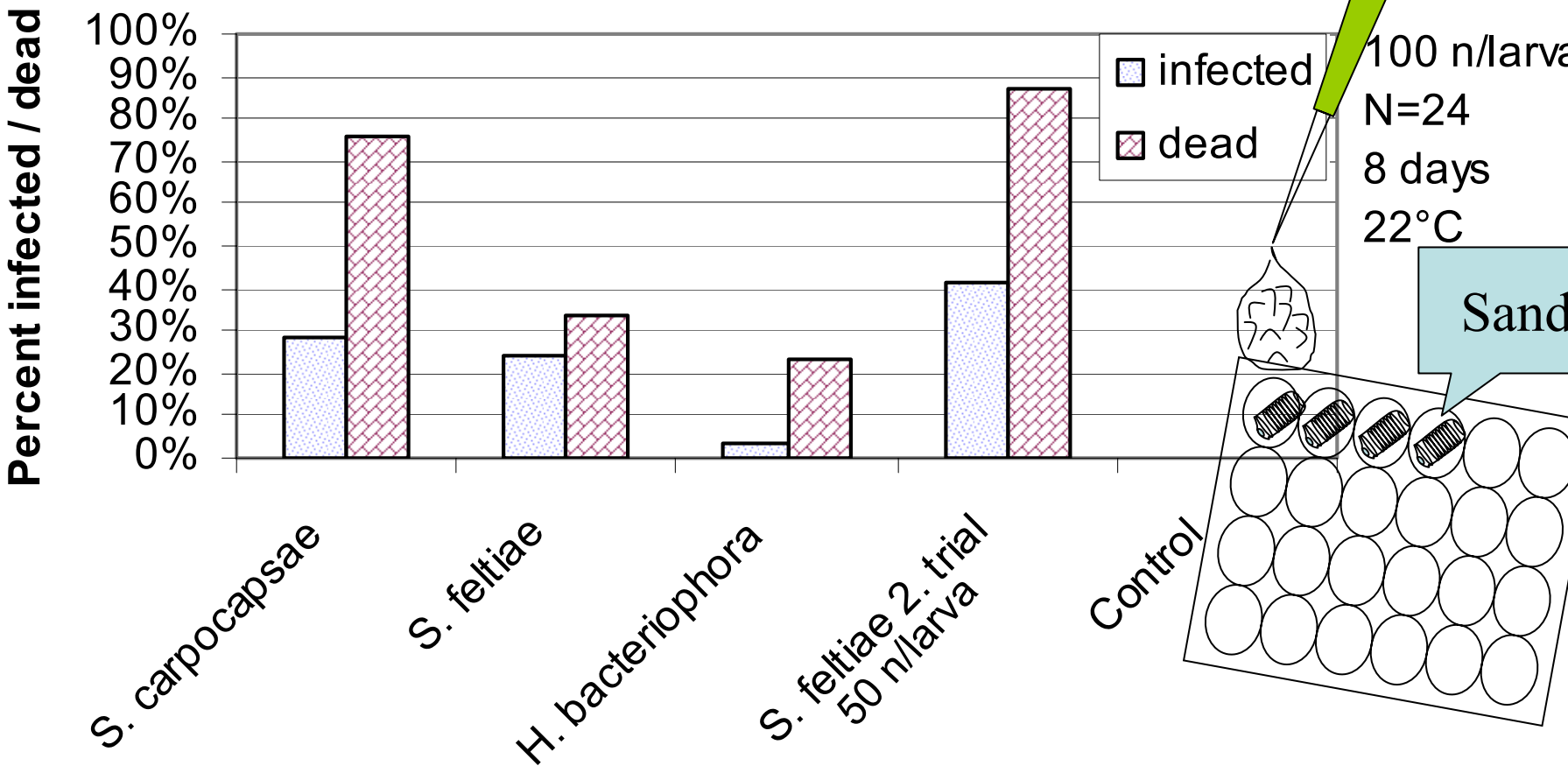
The problem

- Losses in hazelnut plantations
- Common treatment: insecticide against adults (endosulfan and/or carbaryl to adults)
- Alternative: Soil treatment to reduce weevil population

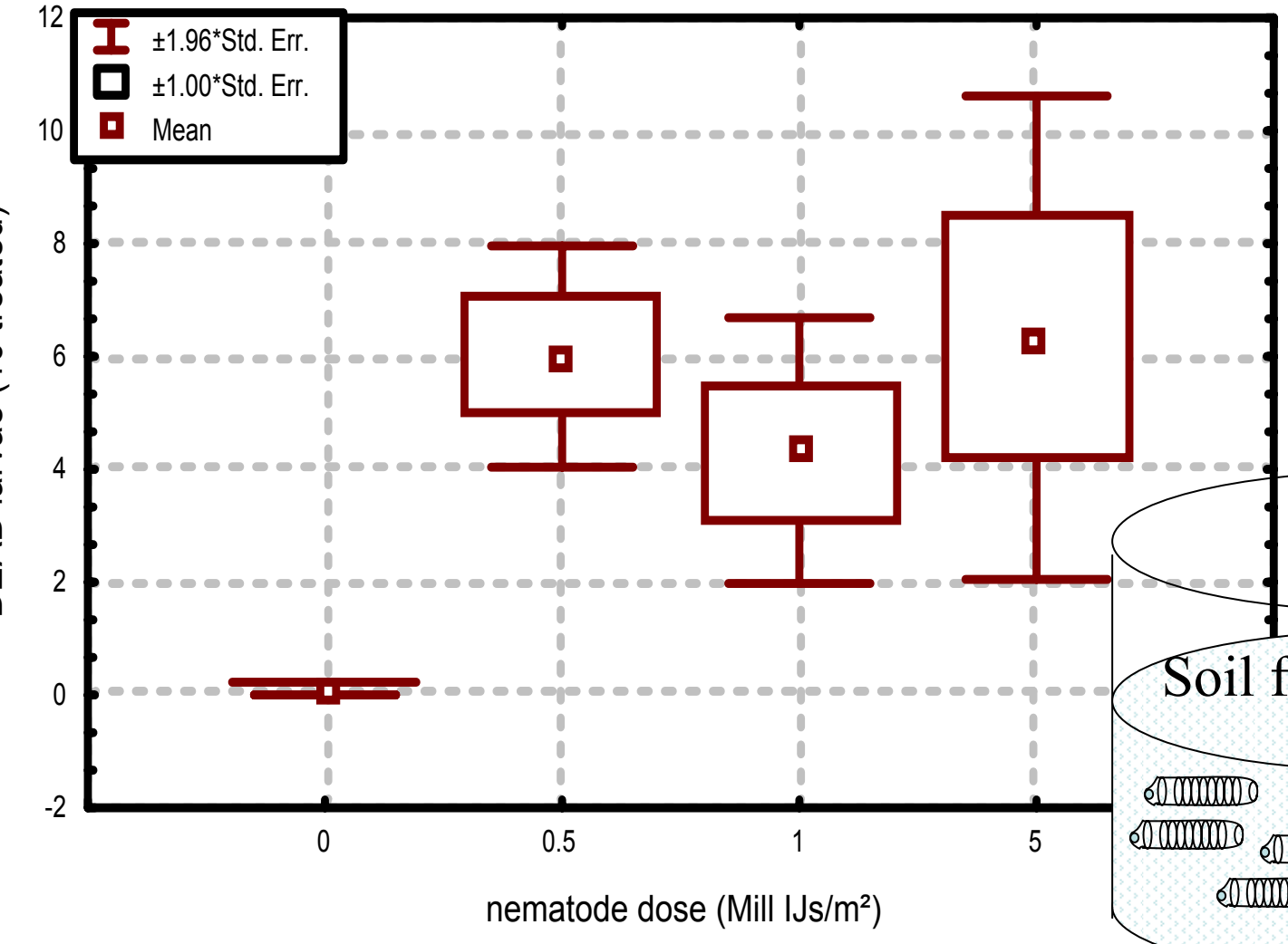
Life cycle

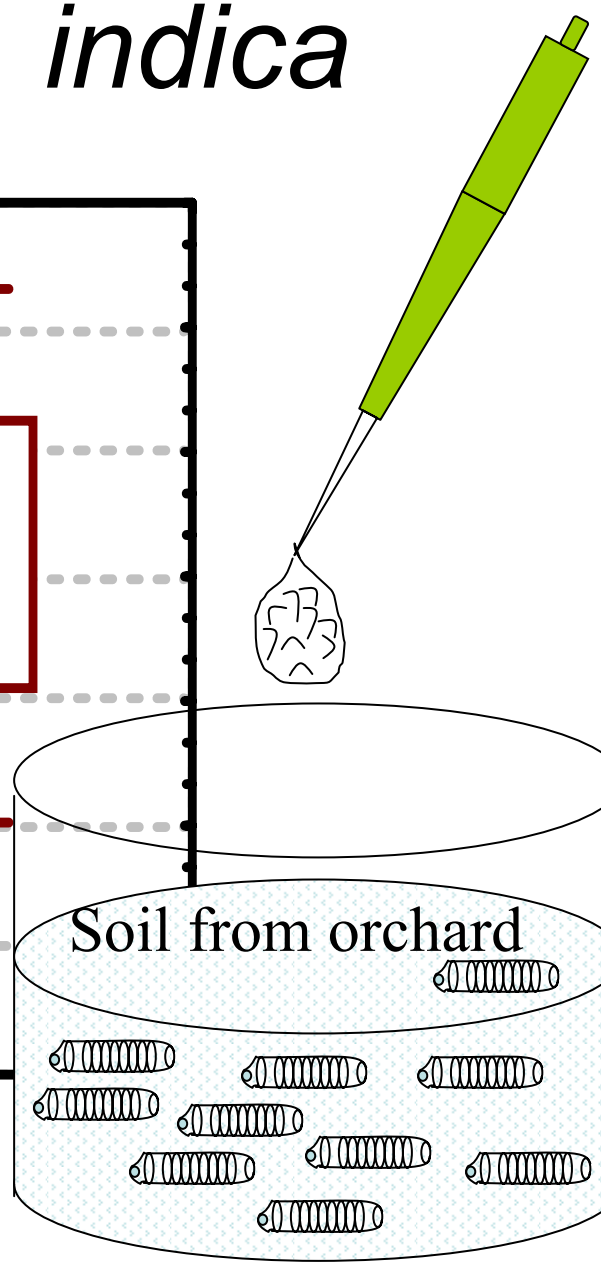
- Overwintering adults lay eggs in spring around 10th of June
- Infested nuts fall from end of July to mid August, larvae leave nuts
- 2 weeks ahead in 2003
- Larvae spend winter in soil and pupate next spring and emerge in summer
- Many larvae pupate only after 4-5 years

Laboratory assessment sandy-loam



Lab-results with *H. indica*





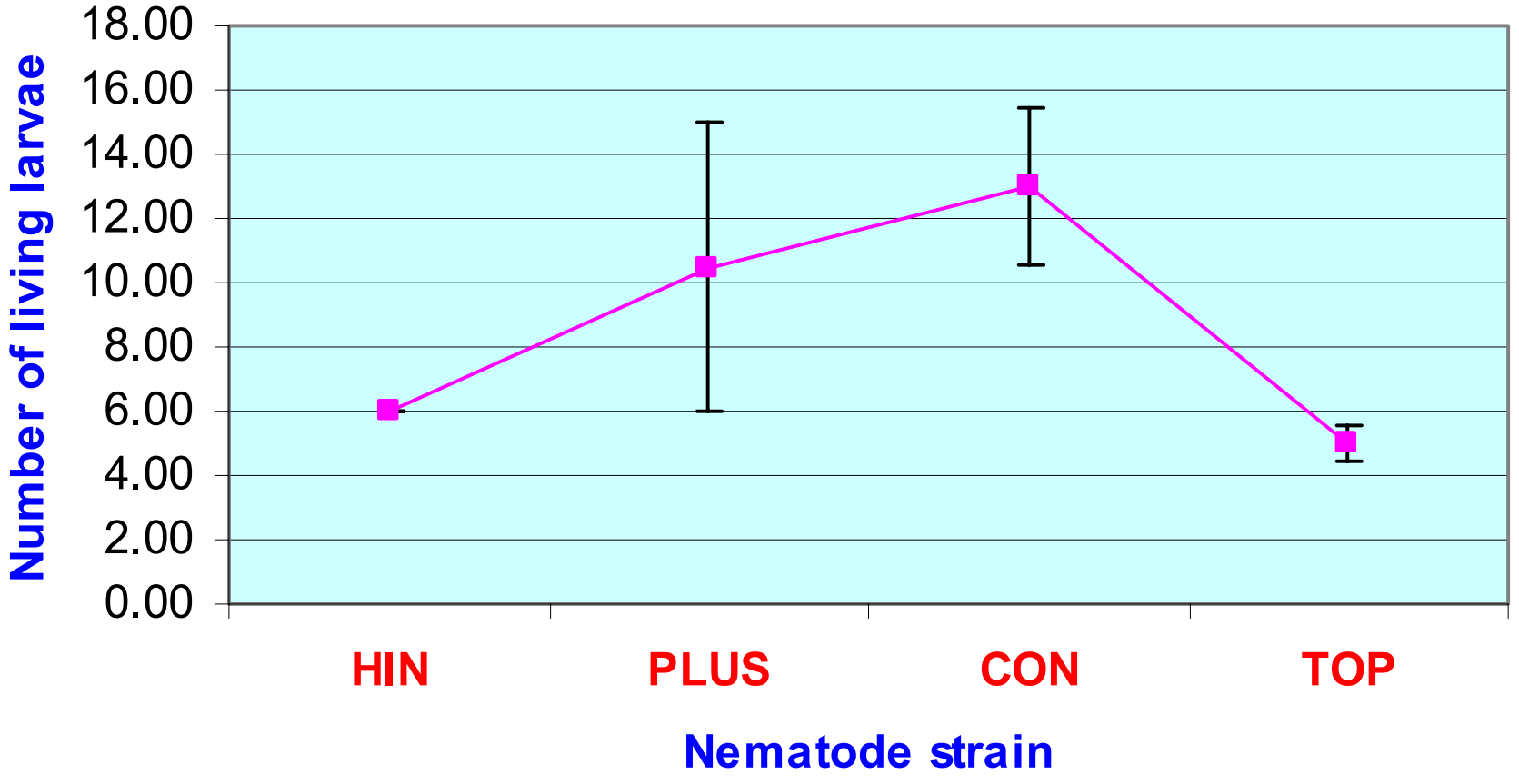
Field trials

- **LOCALISATION OF THE TRIAL :**
  EARL DE PEYRAL (M. Patrick CHASSAC) 47290 BEAUGAS
- **ORCHARD CARACTERISTICS** :
  - CORABEL variety, (12 years old)
  - 6 by 3 meters spacing ;
  - **Clay soil, calcareous** ;
  - Micro sprinkler system (water flow is 20 litres per hour)

Trial design

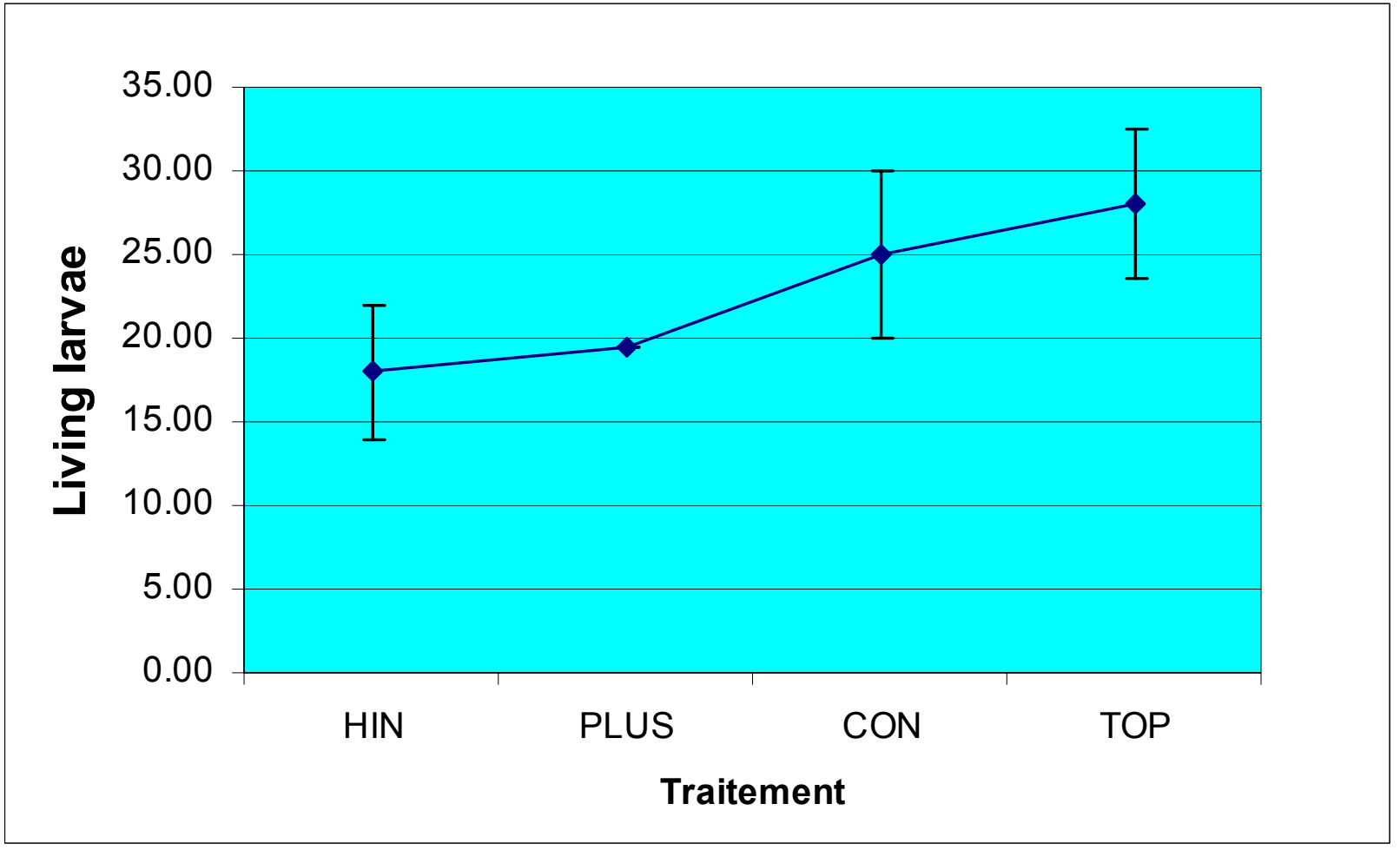
- **3 nematodes strains, plus an untreated control**
- **Evaluation over 4 years (1/4 of plots each year, until 2007)**
- **5 replications per modality (= strain x investigation year)**
- **All together 80 containers**
  38 cm in diameter,
  50 cm depth,
  46 litres in capacity
- **Completely randomised block design**

First evaluation in 2003



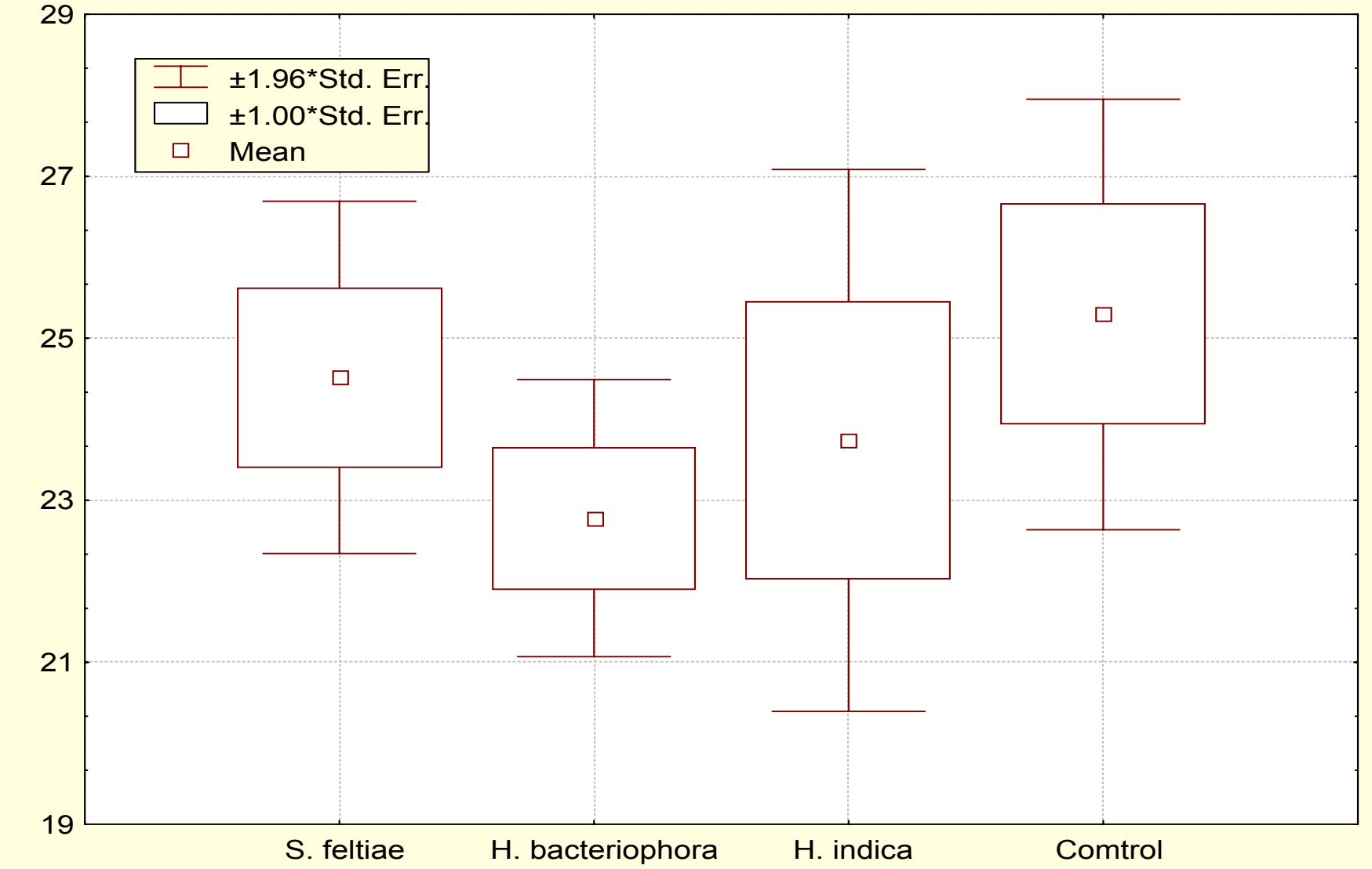
Erroneously treated with 2.2 million / m² !

Second treatment and evaluation in 2004

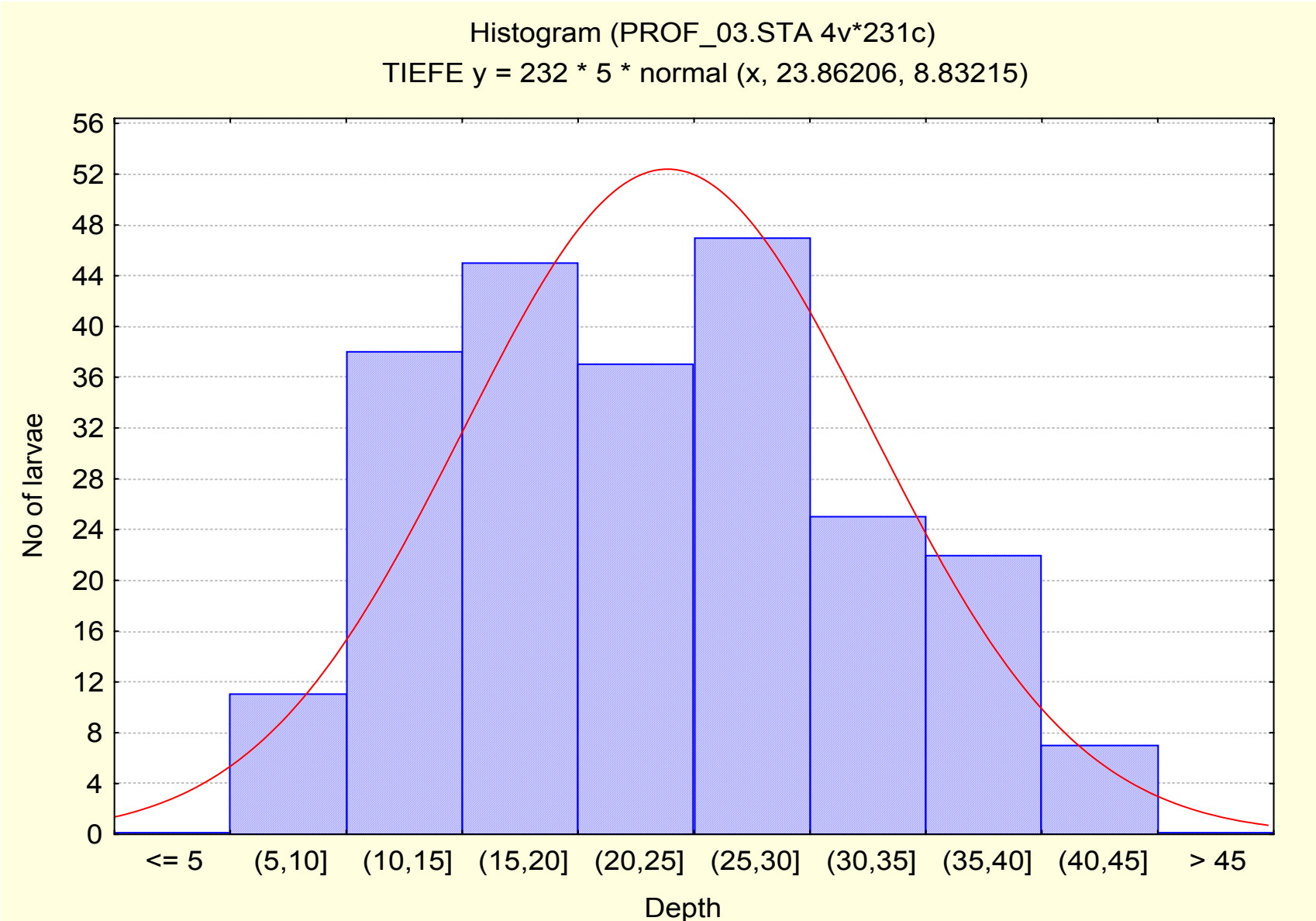


Treated with 0.5 million / m² !

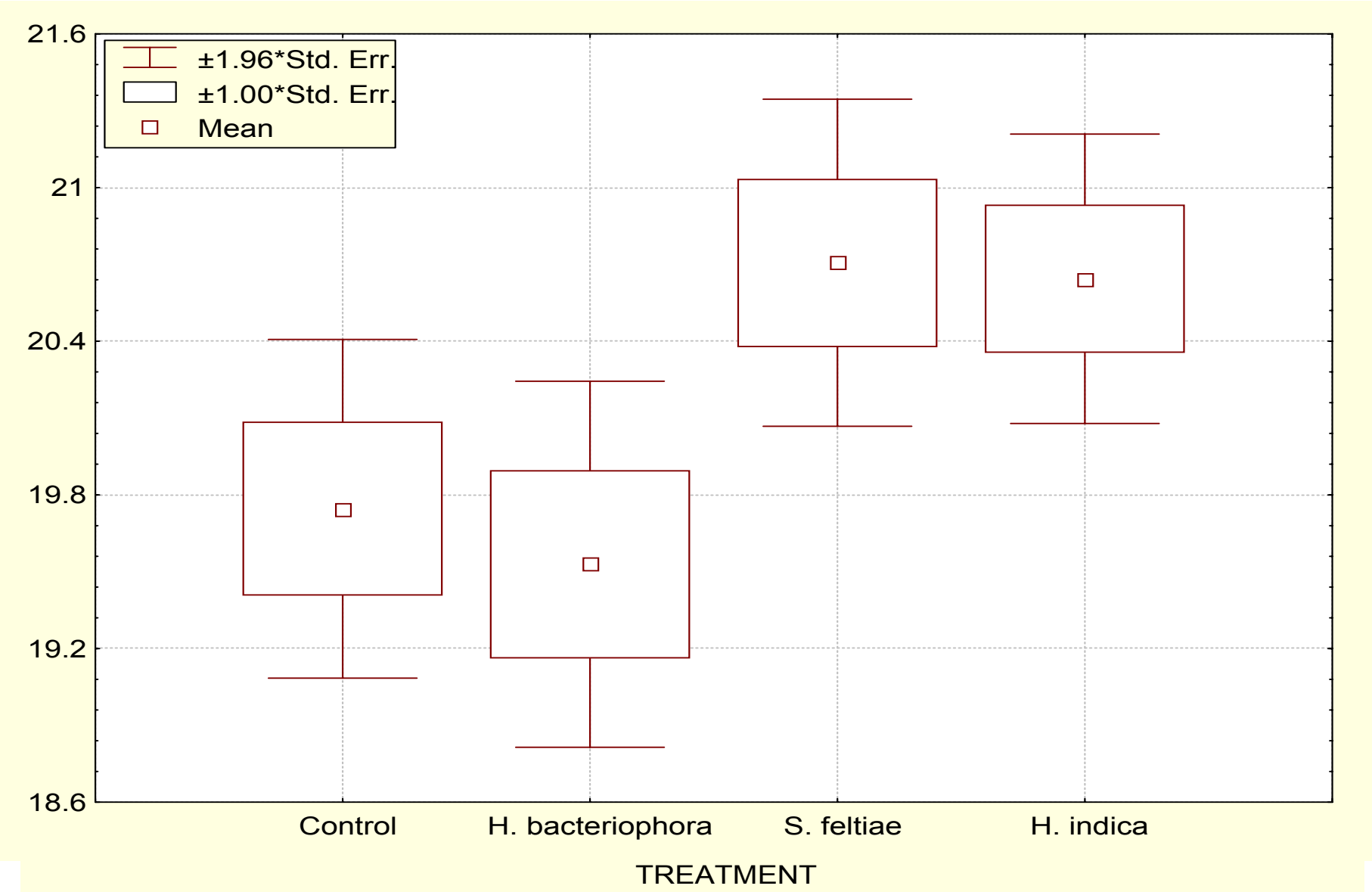
Vertical distribution of larvae (2003)



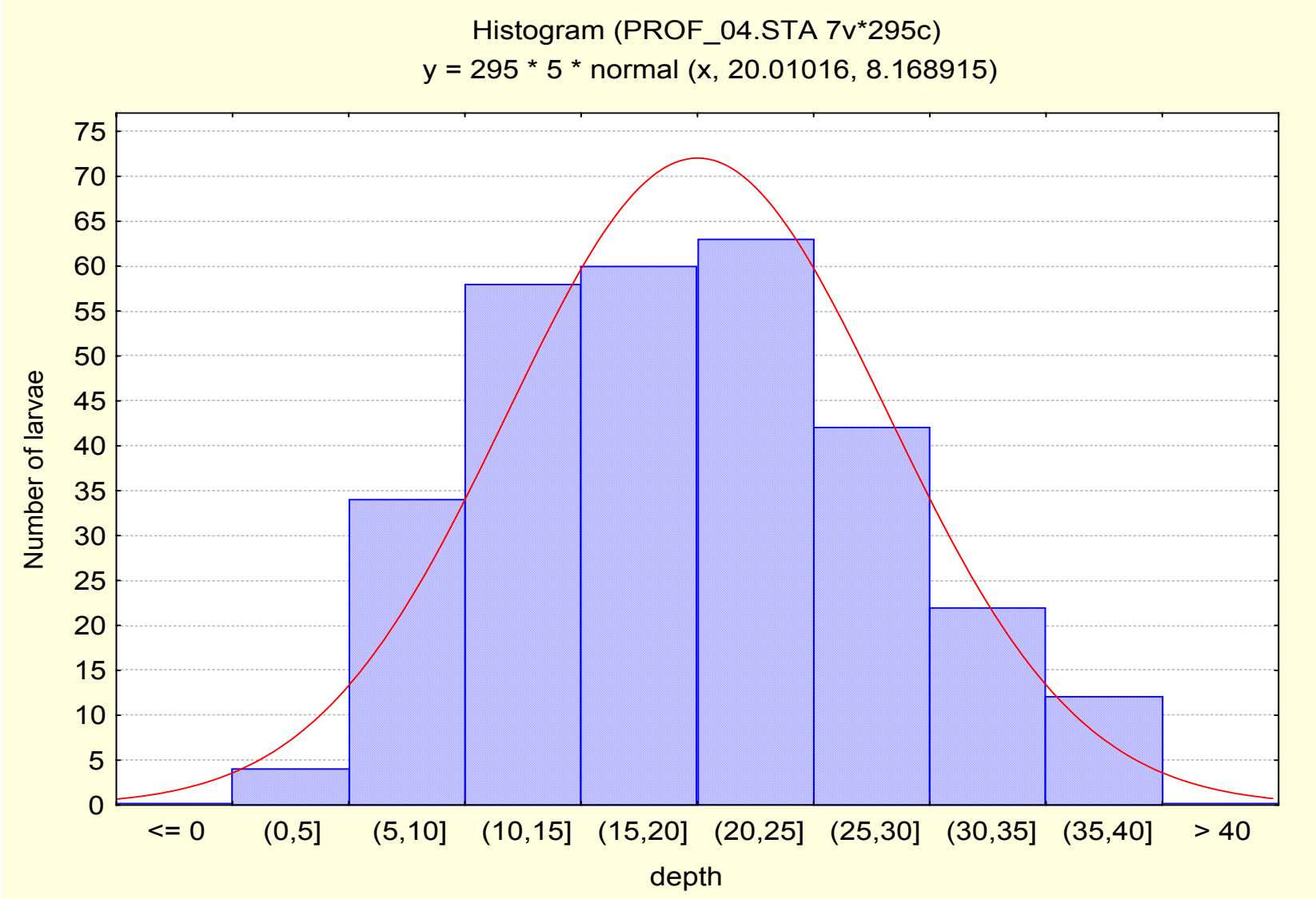
Vertical distribution of larvae 2003



Vertical distribution 2004



Vertical distribution 2004

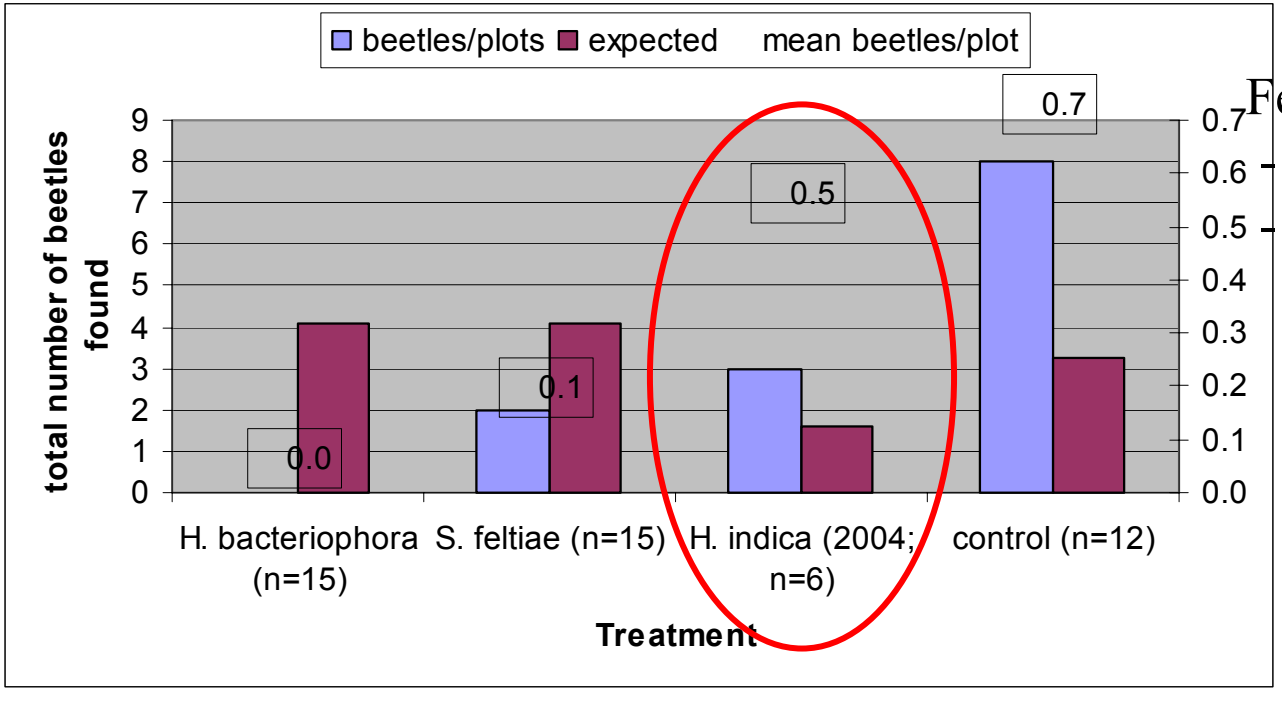


Conclusions

- Best results with *H. indica* and *H. bacteriophora*
- Larvae in soil deep and scattered
- Solutions:
  - Application timing ?
  - Lure larvae with soil moisture ?
  - Apply nematodes via sprinkler or drip irrigation
- Emergence significantly reduced
- Long term control strategy

Beetle emergence in 2005

Plots infested 2003
treated 2003
H. indica treated 2004



Few beetles found:
- heavy rain
- emergence in 2006/2007