

# The Use of Entomopathogenic Nematodes against *Tipula paludosa*

## Critical Review of Results

*Jesko Oestergaard*

*Institute for Phytopathology, Dep. Biotechnology and  
Biol. Control, Christian-Albrechts-University Kiel*

# Damage by *T. paludosa*

- Damage through feeding on leaves, complete defoliation possible
- Major damage during March and April
- Secondary damage by crows from autumn to spring
- Weeds develop in damaged areas





# Influencing factors for the virulence of EPN

- Host finding
- Host invasion
- Nematode species
  - Bacterial infection
  - Interaction with the insect immune system
    - Nematode encapsulation
    - Immune response against the symbiotic bacteria
- Larval stage of *Tipula*
- Abiotic factors (temperature, etc.)

# Host finding and invasion

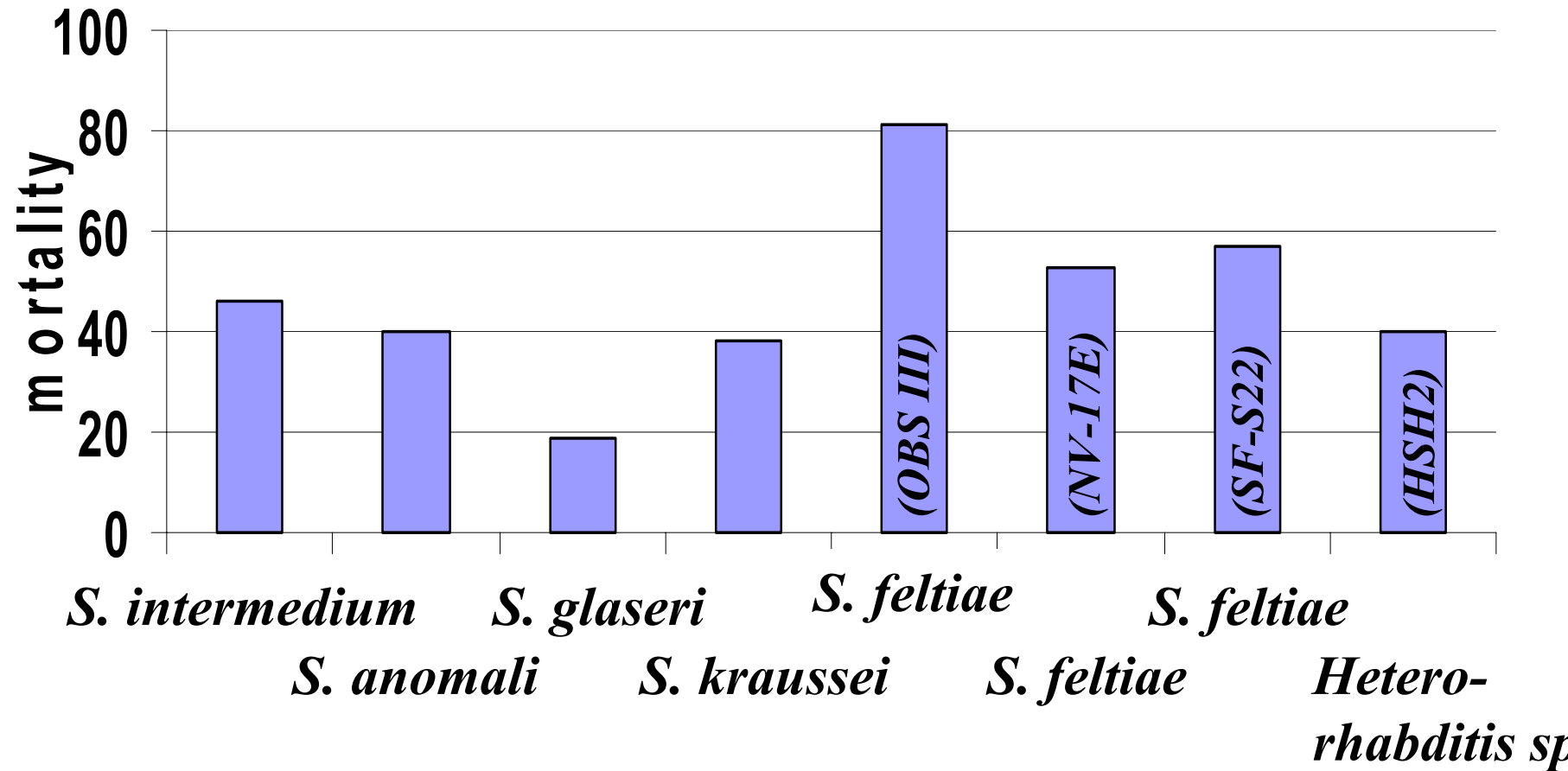
- *Tipula* larvae are attractive to EPNs.
  - No difference in the aggregation of dauer larvae in response to larvae of *T. oleracea* and *G. mellonella* could be shown. (Peters & Ehlers 1999)
- Invasion of *Tipula* larvae is limiting control
  - Penetration into *G. mellonella* was significantly higher than into *T. oleracea*.  
(Peters & Ehlers 1999)



# EPNs against *T. paludosa*

- *H. megidis*, *H. bacteriophora* were not infective (Gerritsen et al. 1998)
- *S. feltiae* → 50% mortality, 100-300DI/insect (Ehlers and Gerwien 1993)
- *S. carpocapsae* → 50% mortality with 500DI/insect (Lam and Webster 1972)

# Mortality of *T. paludosa* (L2) at 20°C with 100 DJ/larva



(Sulistyanto et al. 1994)

# Symbiotic bacteria

- *Photorabdus luminescens*
  - *H. bacteriophora*: No mortality recorded against tipulids
- *Xenorabdus bovienii*
  - *S. feltiae*: LC<sub>50</sub> against *T. oleracea* 135,000 CFU
  - *S. intermedium*: 17% mortality with 246,000 CFU
  - *S. affinis*: 11% mortality with 400,000 CFU

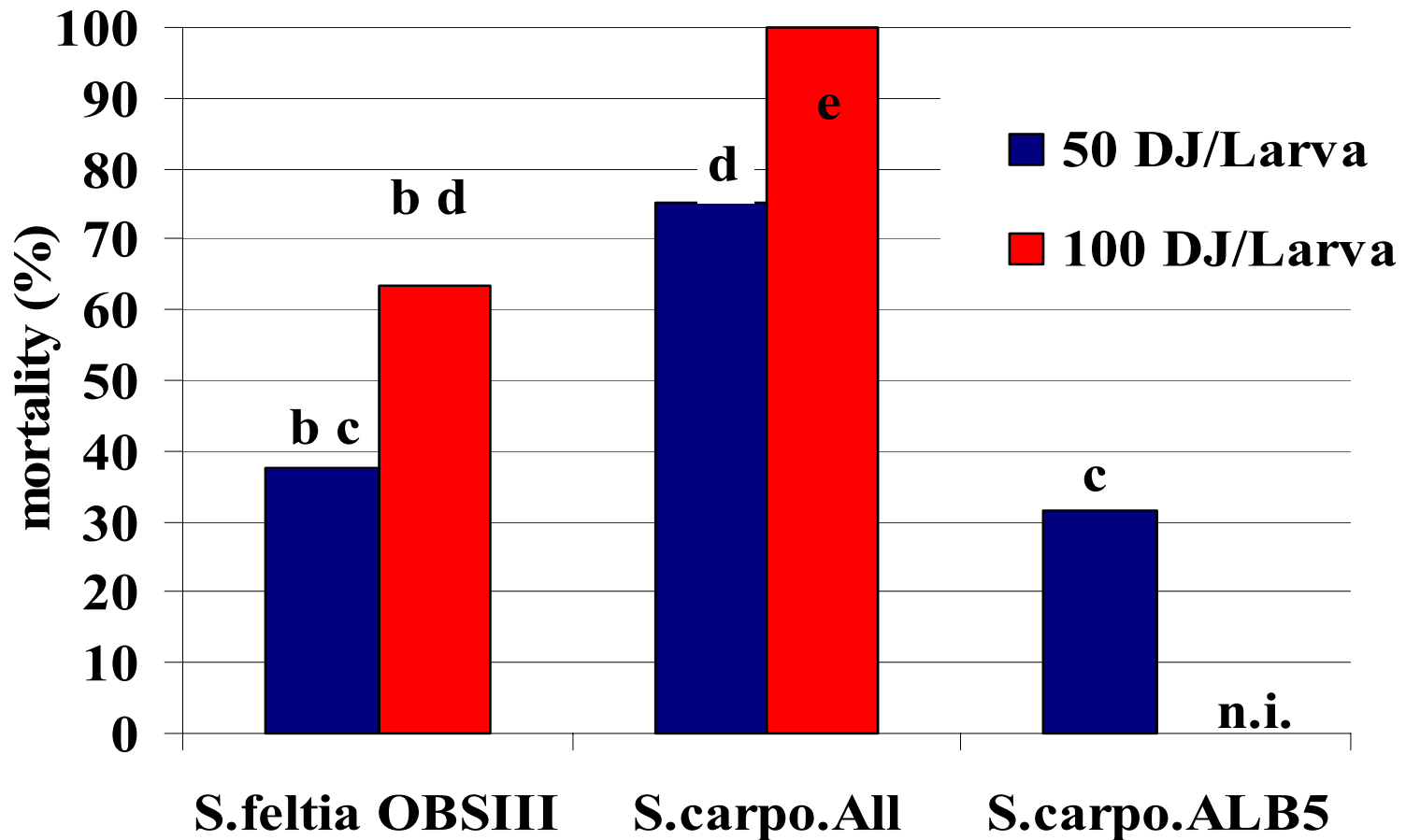
(Ehlers and Steenwerth 1996)
- *Xenorhabdus nematophilus*
  - *S. carpocapsae*: ?

# LD<sub>50</sub> *S. feltiae* against *T. oleraceae*

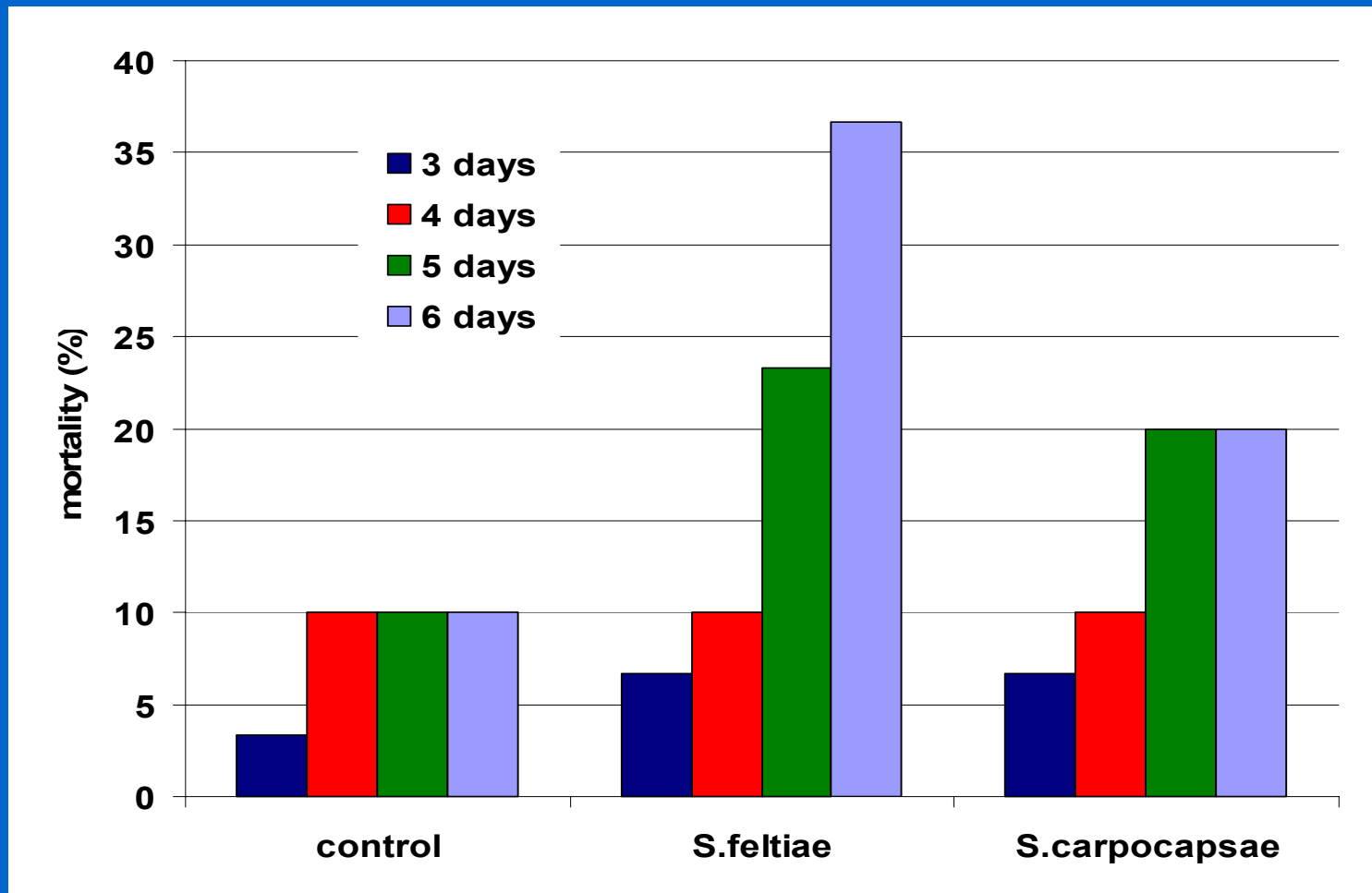
Larval stage	age	LD <sub>50</sub>
L1	0,5	25
L1	4	46
L1/L2	6	7
L2	18	29
L2/L3	22	28
L3	32	13
L4	72	56

Peters + Ehlers (1994). J. Invertebr. Path. 63, 163-171

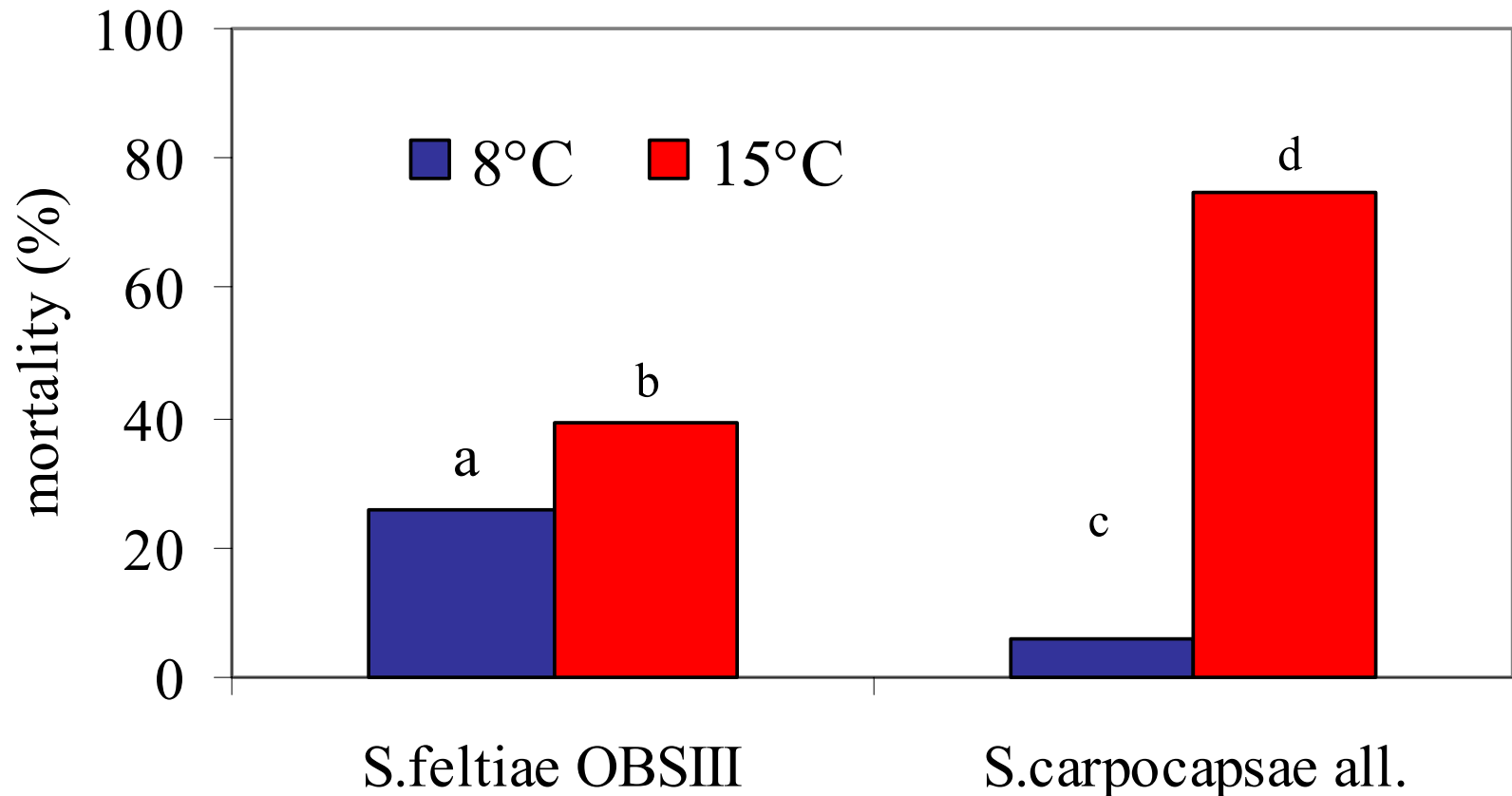
# Mortality of *T. paludosa* (L1) at 15°C



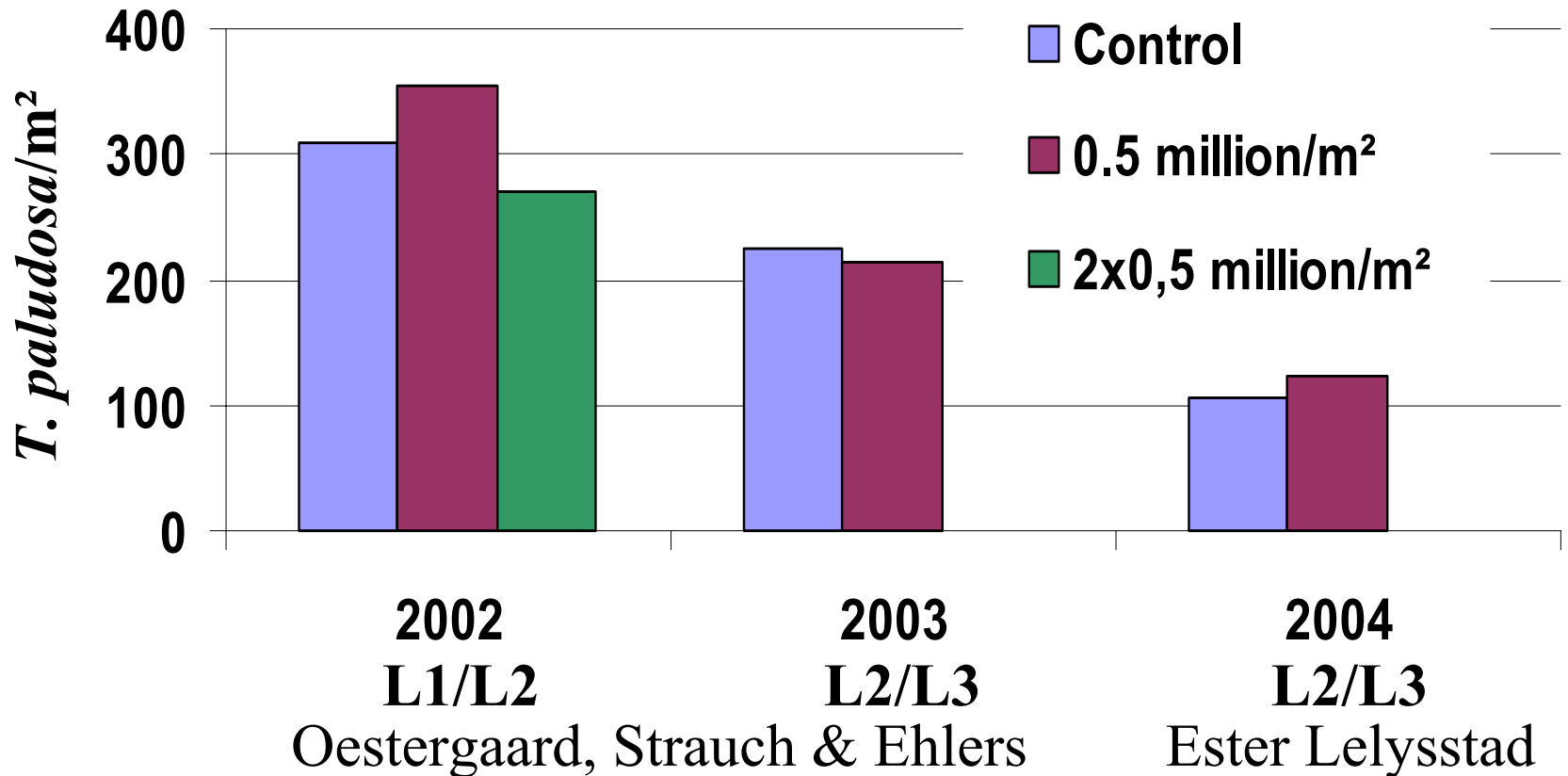
# Efficacy of *S. feltiae* and *S. carpocapsae* against *T. paludosa* L4 (15°C)



# Pathogenicity of *S. feltiae* and *S. carpocapsae* against L1

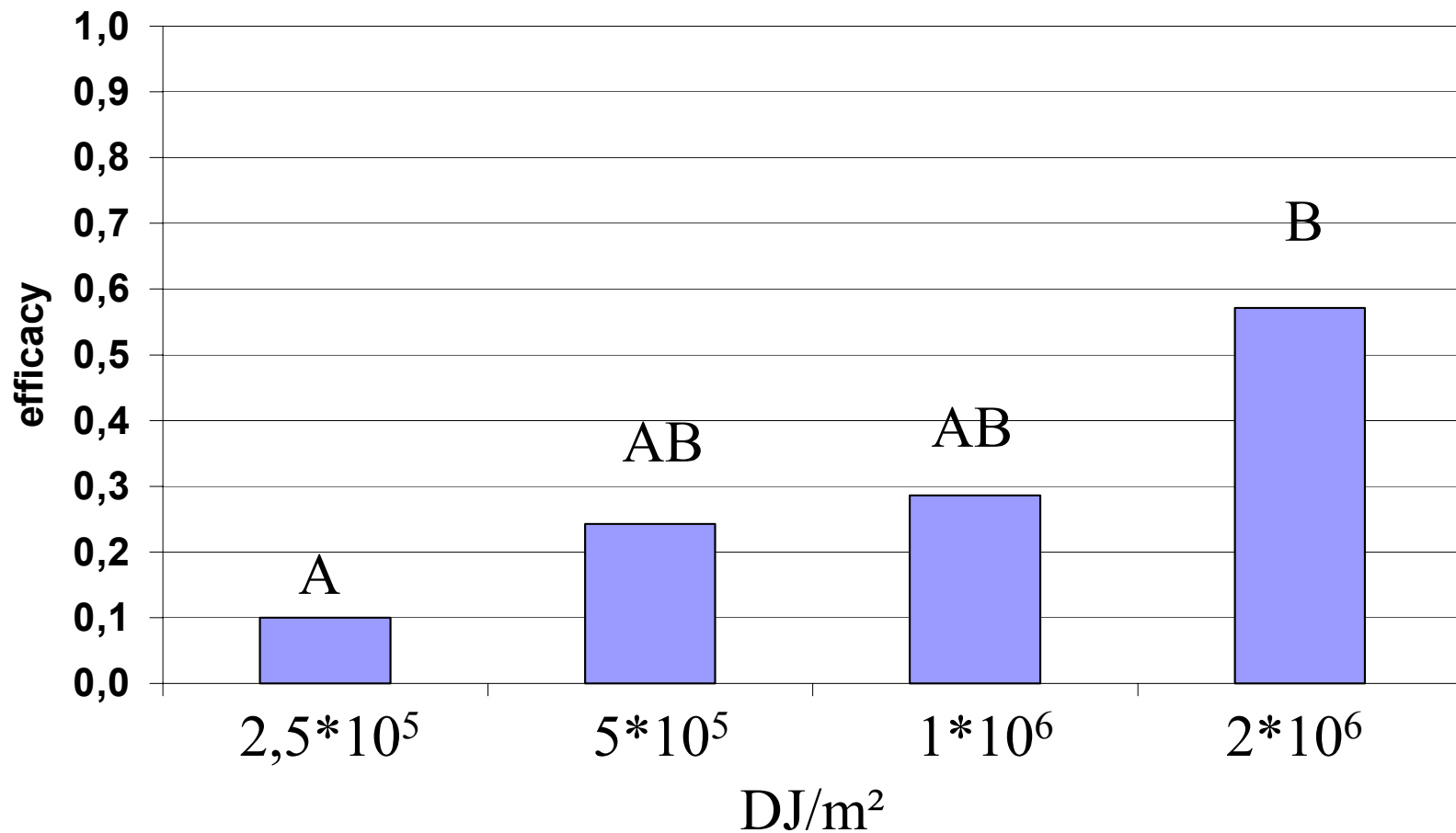


# Field trials with *S. feltiae*

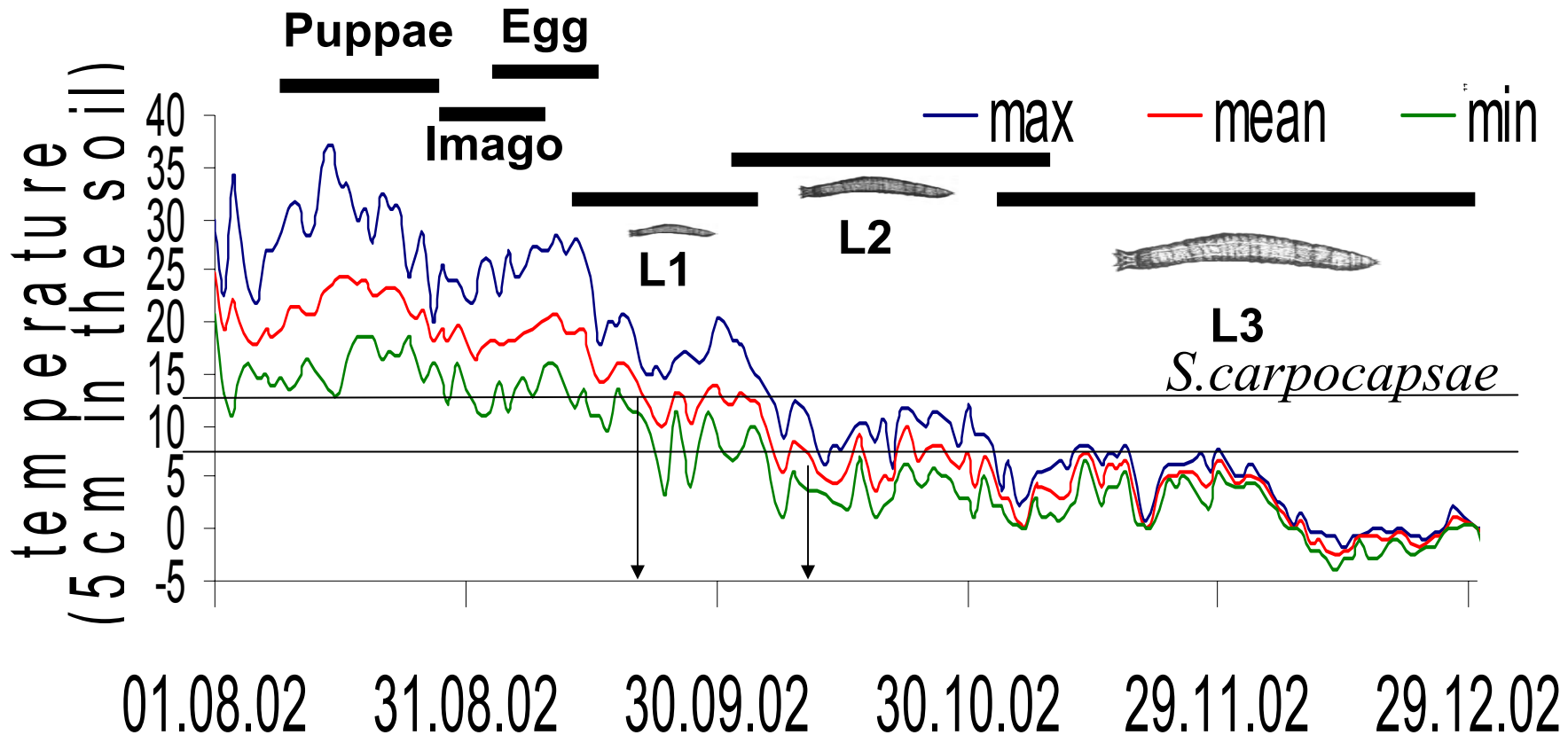


- 0,5 million DJ/m<sup>2</sup> of *S.f* against L1/L2 → No effect (Peters & Ehlers, unpublished)
- Ehlers & Gerwien 1993 reached 50% reduction with 1 million DJ/m<sup>2</sup>

# Field trial at temperatures above 10°C against L2/L3



# Temperature conditions for control of L1/L2



# Conclusion

- Most susceptible stages are L1 and L2
- Against L3 and L4 *S. feltiae* is best at temperatures between 8 and 12°C
- *S. carpocapsae* is best against L1 and L2 at temperatures above 15°C, but were are the soiltemperatures above 15°C in Sept./Okt.?
- Results of field trials over the years with *S. feltiae* against *T. paludosa* were disappointing.

# Acknowledgement

- We gratefully acknowledge the financial support of the German Environment Foundation (DBU)
- Thanks to e-nema for the supply with nematodes

