



Young Scientists Meeting Section 6

Population development of beet cyst nematodes and their damage potential to sugar beets under different temperature regimes

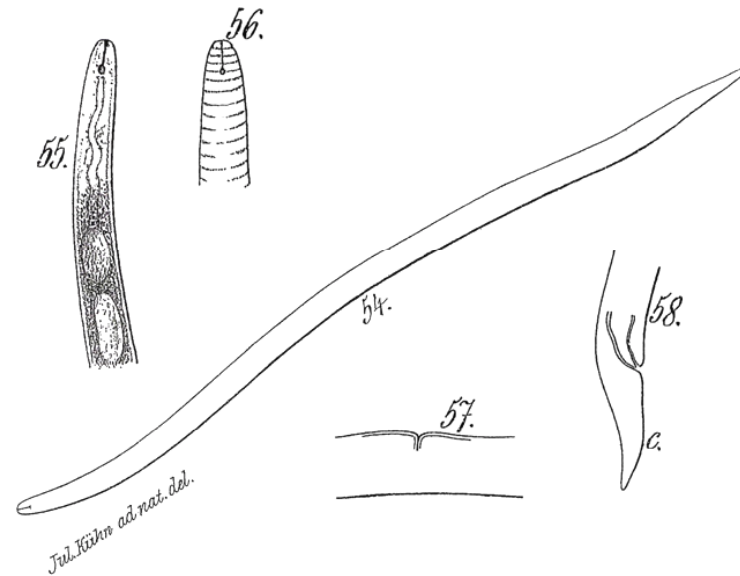
Bart Vandenbossche – Björn Niere – Stefan Vidal



Julius Kühn



Photo: Julius Kühn and his microscope (Schwabe, 1968)



Nematode drawings of *Ditylenchus dipsaci* (Kühn, 1858).

- Julius Kühn
 - > Linked occurrence beet cyst nematodes with beet replant disease
 - > Described important plant nematode, *Ditylenchus dipsaci*

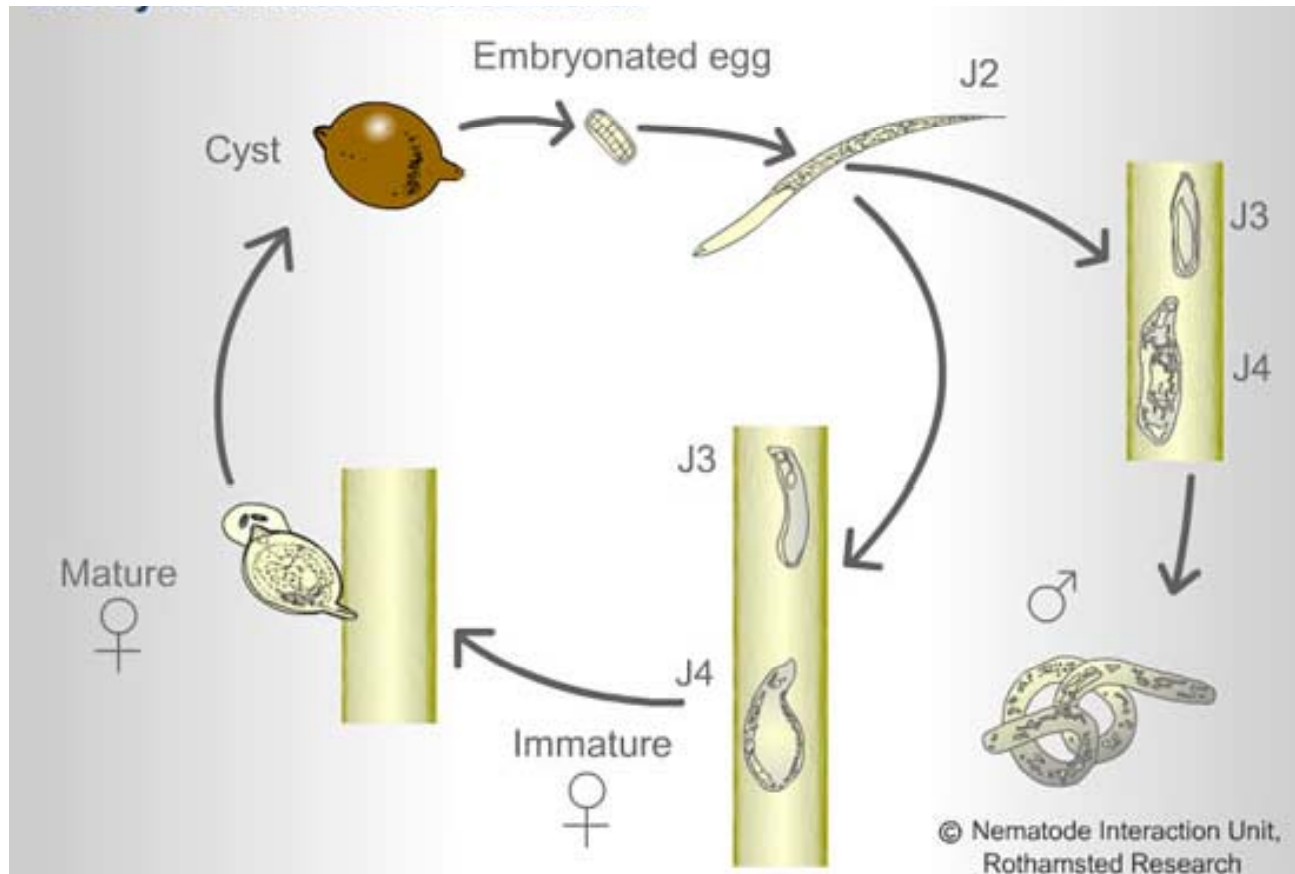
Beet cyst nematodes

- ***Heterodera schachtii***
 - > most important nematode pest of sugar beet
 - > present in almost all beet growing areas
 - > annual damage: 90 million euro
 - > 150 years of research, including breeding for resistance

- ***Heterodera betae***
 - > less prevalent
 - > damage potential: little known
 - > multiplication on cultivars with low susceptibility to *H. schachtii*?



Life cycle of *Heterodera schachtii*



- A certain amount of **degree days** (thermal time) above basal temperature needed to complete life cycle
- *Heterodera betae*: no males

Research objectives

1. Potential climatic effects on the **development** of beet cyst nematodes.
2. Potential climatic effects on the **damage potential** of beet cyst nematodes.

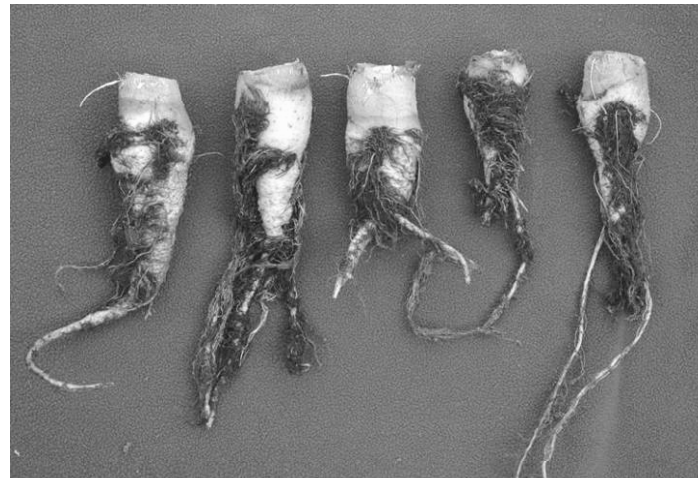


Photo: Björn Niere

Experimental set-up in climate chambers

- Temperature
 - > 2 different temperature regimes
 - > Temperature difference of 4 °C between treatments

Week	T 1 (°C)	T 2 (°C)
1,2	8	12
3,4	10	14
5,6	12	16
7,8	14	18
9,10	16	20
11,12	18	22
13,14	20	24
15,16	22	26
17-29	24	28



- Host plant: cultivar Monza (susceptible)

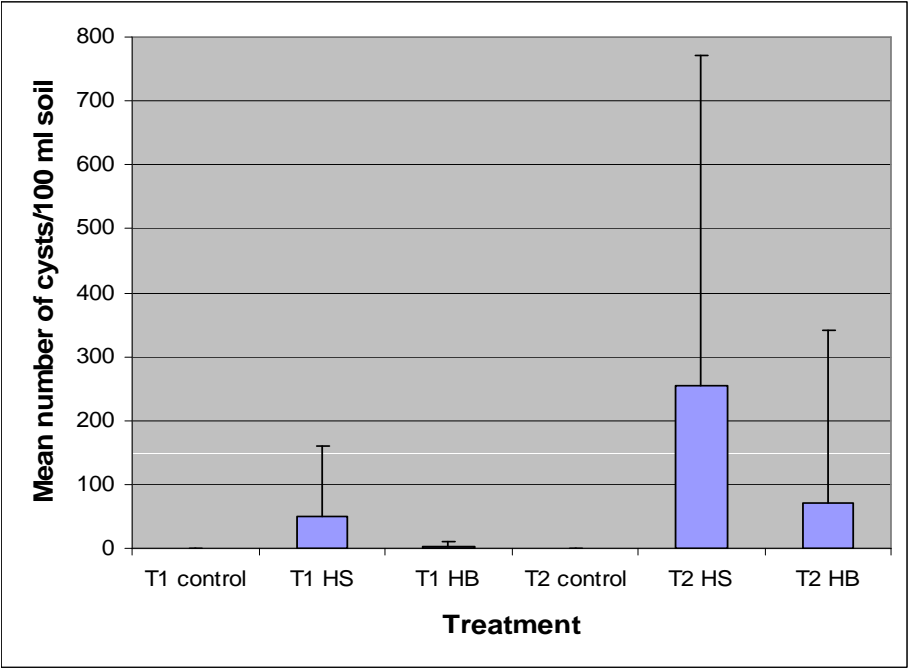
Experimental set-up

TRT	T (°C) regime	Challenge
T ₁ control	1	no
T ₁ HS	1	<i>Heterodera schachtii</i>
T ₁ HB	1	<i>Heterodera betae</i>
T ₂ control	2	no
T ₂ HS	2	<i>Heterodera schachtii</i>
T ₂ HB	2	<i>Heterodera betae</i>

Results: Population development



Final population of beet cyst nematodes



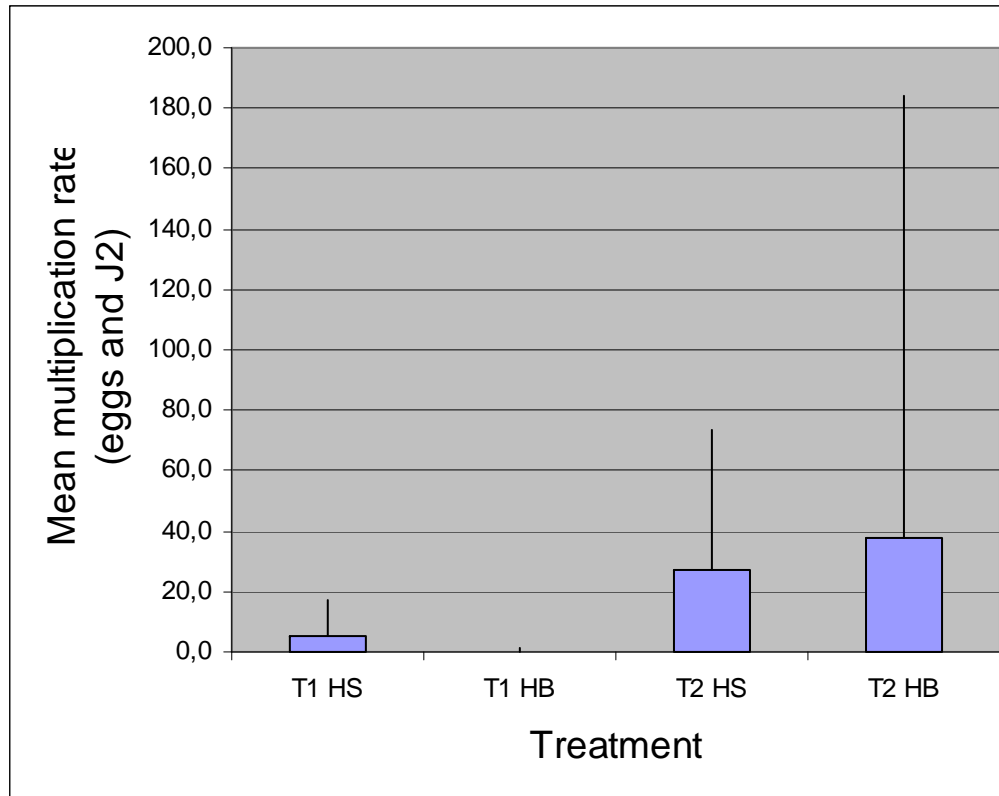
TRT	T (°C) regime	Challenge
T ₁ control	1	no
T ₁ HS	1	<i>Heterodera schachtii</i>
T ₁ HB	1	<i>Heterodera betae</i>
T ₂ control	2	no
T ₂ HS	2	<i>Heterodera schachtii</i>
T ₂ HB	2	<i>Heterodera betae</i>



Results: Population development



Multiplication rate: eggs and second-stage juveniles (J2)



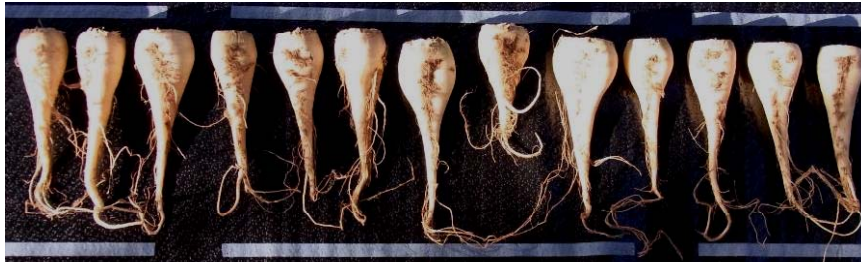
TRT	T (°C) regime	Challenge
T ₁ HS	1	<i>Heterodera schachtii</i>
T ₁ HB	1	<i>Heterodera betae</i>
T ₂ HS	2	<i>Heterodera schachtii</i>
T ₂ HB	2	<i>Heterodera betae</i>



Results: Damage potential

Sugar beet damage by beet cyst nematodes

T_1 (°C)



T_1 control



T_1 *Heterodera schachtii*



T_1 *Heterodera betae*

T_2 (= $T_1 + 4$ °C)



T_2 control



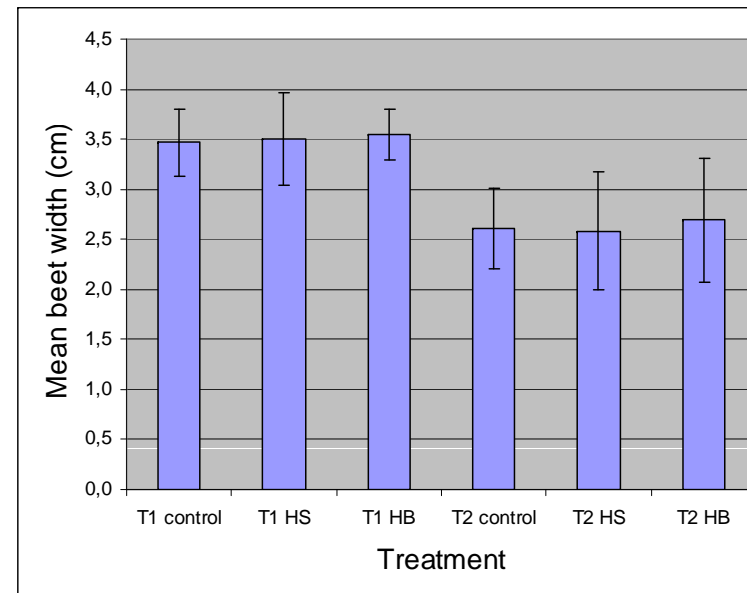
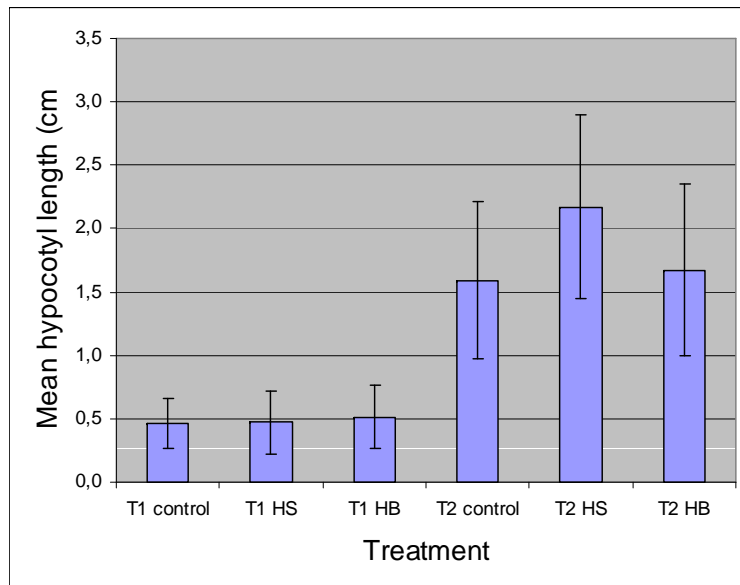
T_2 *Heterodera schachtii*



T_2 *Heterodera betae*

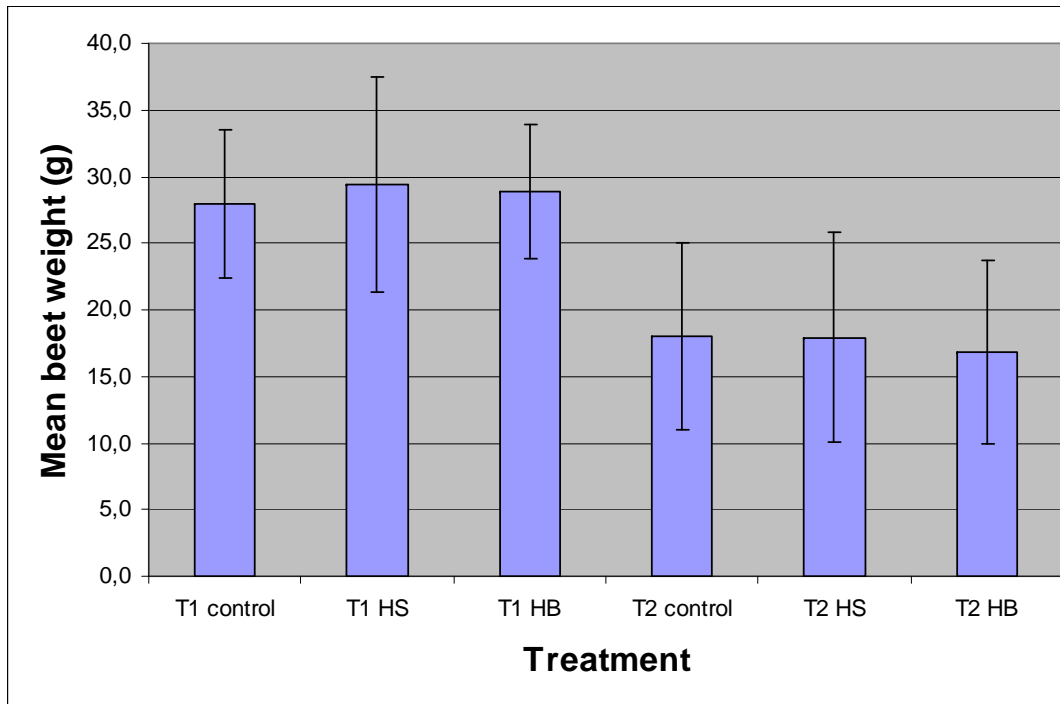
Results: Damage potential

Effects on hypocotyl length and beet width



Results: Damage potential

Effects on beet weight



TRT	T (°C) regime	Challenge
T ₁ control	1	no
T ₁ HS	1	<i>Heterodera schachtii</i>
T ₁ HB	1	<i>Heterodera betae</i>
T ₂ control	2	no
T ₂ HS	2	<i>Heterodera schachtii</i>
T ₂ HB	2	<i>Heterodera betae</i>



Summary

- Study of development and damage potential of *Heterodera schachtii* and *Heterodera betae* on sugar beet, under different temperature regimes
- Population development is temperature dependent. Final population reaches higher values at +4 °C temperature regime.
- No visible reduction in beet weight by beet cyst nematodes. Nematode population too low?

Outlook:

- Experiments with different initial population densities
- Future experiments under day-night temperature regime

Thank you for your attention

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