Testing of beet cyst nematode (*Heterodera schachtii*) resistant sugar beet varieties:

Neighbouring effects and interference of nematode population density in variety trials

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H. schachtii in variety trials

- **Three different kinds of varieties:**
  - **susceptible**
  - **tolerant**
  - **resistant**

Hypotheses

- **Hypothesis 1: Resistant varieties with low canopy suffer from shadowing effects displayed by tolerant and susceptible varieties in neighbouring plots**

- **Hypothesis 2: Tolerant and susceptible varieties show increased yield in plots neighbouring resistant varieties in nematode infested fields**

Research question

Is yield of resistant varieties underestimated in variety trials?

Investigations

- **4 field trials with six-row plots, harvested row-by-row to investigate the effect of neighbouring rows on yield**

- **2 field trials with six-row plots and alternating one-row plots to investigate the effect of neighbouring rows on *H. schachtii***

Investigations

- **4 field trials with six-row plots, harvested row-by-row to investigate the effect of neighbouring rows on yield**

- 2 field trials with six-row plots and one-row plots to investigate the effect of neighbouring rows on *H. schachtii*
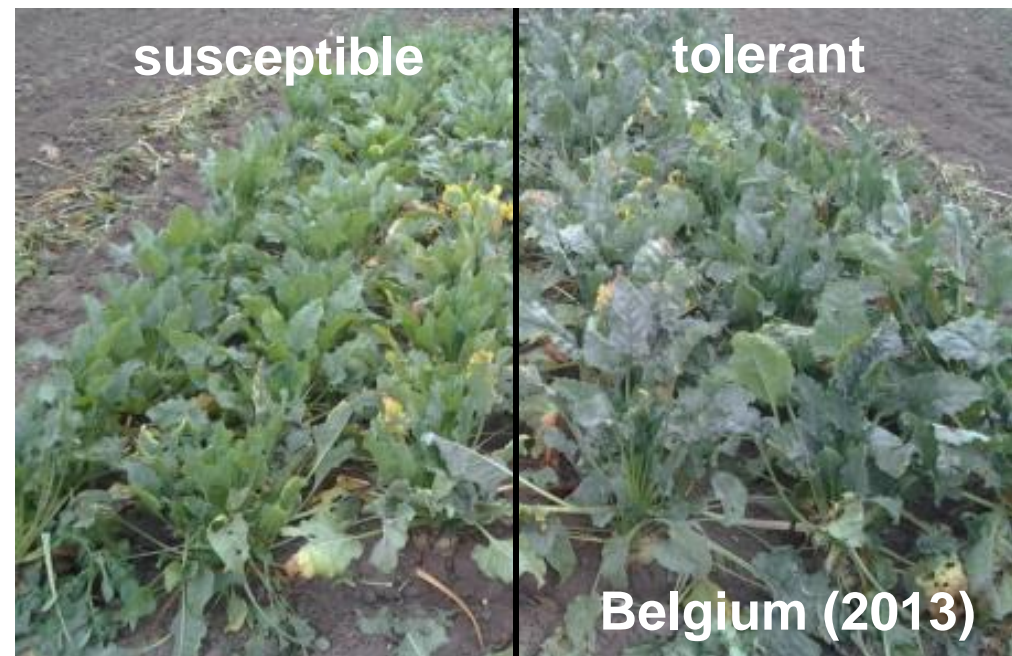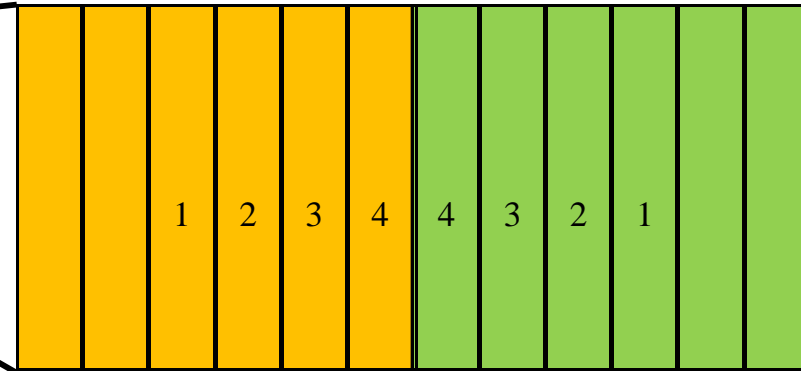
Neighbouring effects on yield

- **Three varieties:**
    - **susceptible (medium leaf canopy)**
    - **tolerant (high leaf canopy)**
    - **resistant (low leaf canopy)**

- **Four locations:**
    - **Belgium   (2013 and 2014)**
    - **Sweden   (2013)**
    - **Germany   (2014)**
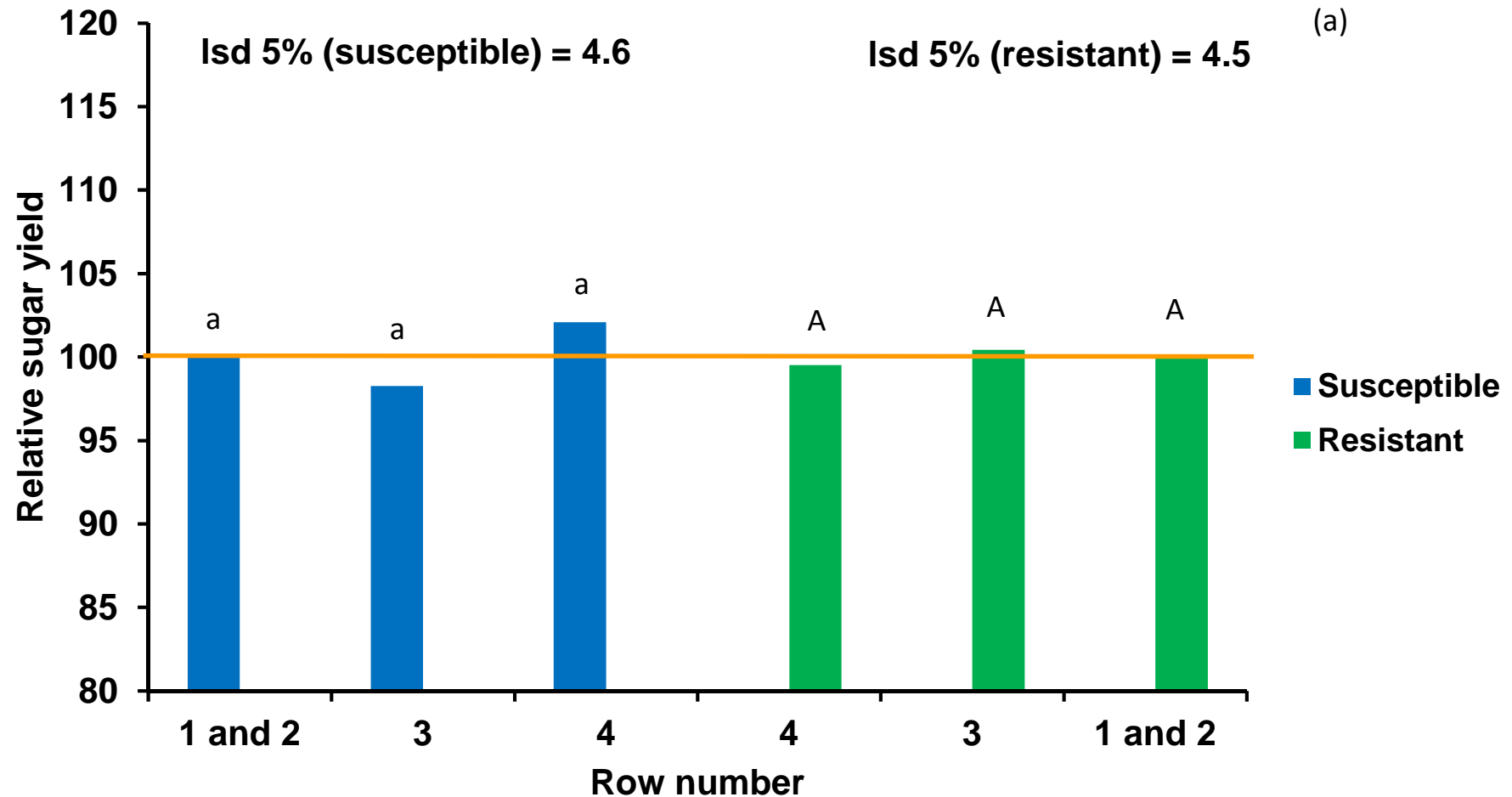
Neighbouring effects on yield

Field trial plan

Replicate A	
Susceptible	Resistant
Susceptible	Tolerant
Resistant	Tolerant
Replicate B	
Tolerant	Susceptible
Resistant	Tolerant
Resistant	Susceptible
Replicate C	
Resistant	Tolerant
Susceptible	Resistant
Tolerant	Susceptible
Replicate D	
Susceptible	Resistant
Tolerant	Susceptible
Tolerant	Resistant

Row numbers

1 2 3 4   4 3 2 1

susceptible   **tolerant**

Belgium (2013)

Susceptible vs. Resistant

lsd 5% (susceptible) = 4.6   lsd 5% (resistant) = 4.5   (a)

Relative sugar yield — Row number

Susceptible
Resistant

no indication of shadowing effect on neighbouring plots

Susceptible vs. Tolerant
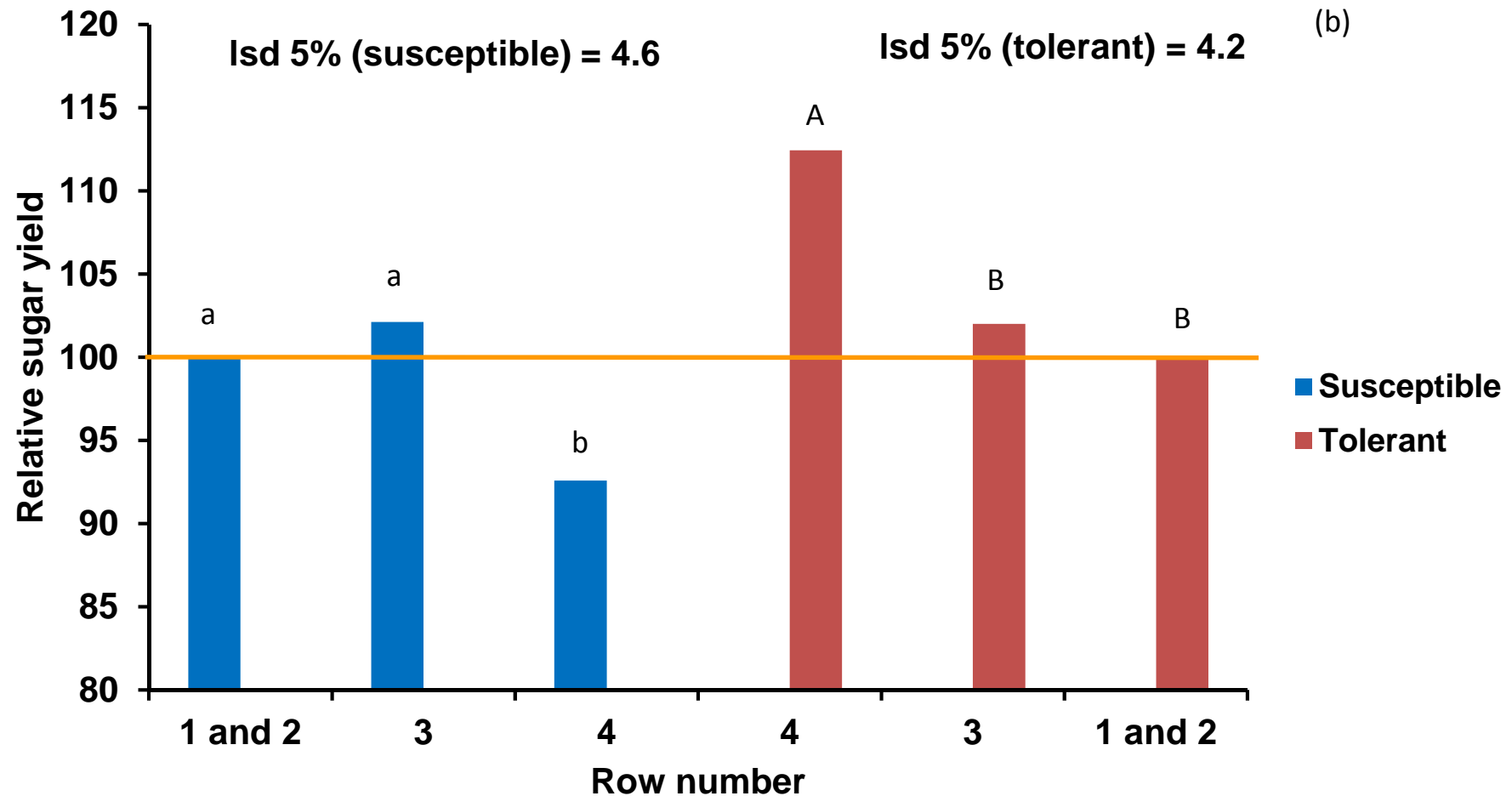
lsd 5% (susceptible) = 4.6   lsd 5% (tolerant) = 4.2   (b)

Clear effect on border row, row 3 is not influenced!
Canopy height was highest in tolerant variety

Tolerant vs. Resistant
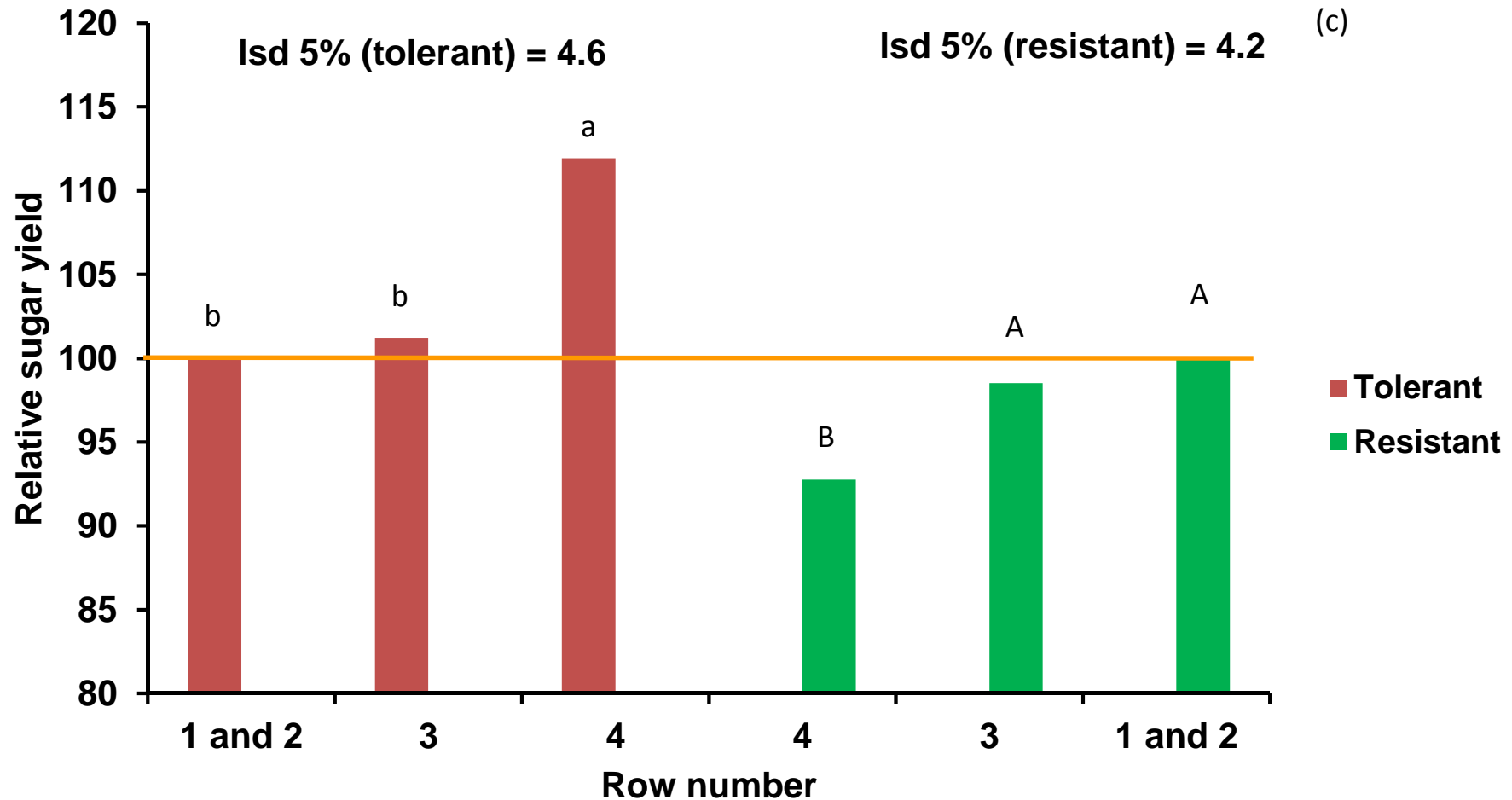
Clear effect on border row, row 3 is not influenced!
Canopy height was highest in tolerant variety

Effect of harvesting system on yield

	resistant	susceptible	tolerant
2 rows out of 6	100	n.s.	100
4 rows out of 6	100	n.s.	101
6 rows out of 6	99	n.s.	105
3 rows out of 3	97	n.s.	109

100 = yield in the 2-rows-out-of-6 harvesting system.

Yield of resistant variety is underestimated.
Yield of tolerant variety is overestimated, especially in three-row systems
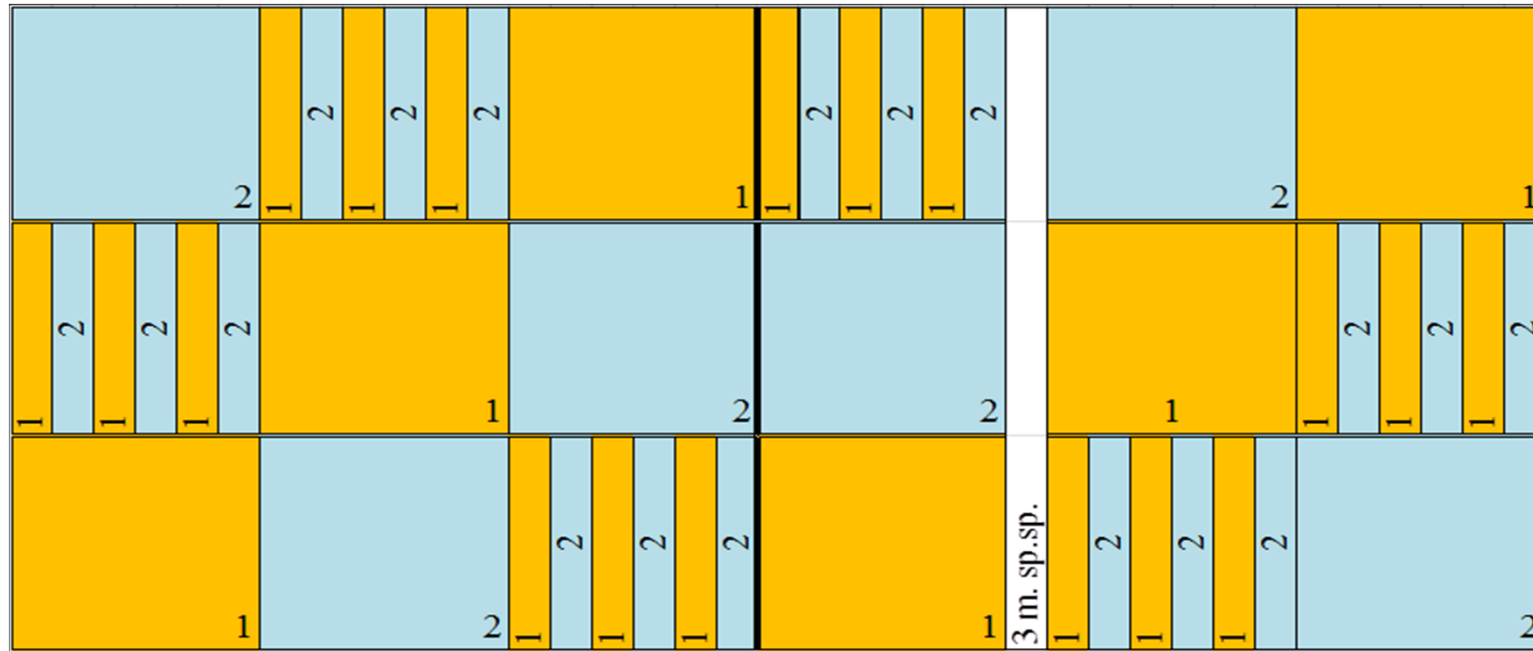
Conclusions (1)

- **Yield of resistant variety was underestimated (3%) and tolerant variety overestimated (9%) in three out of three rows harvesting system. No effect of system on susceptible variety.**

- **Neighbouring effect only visible in border row**

Investigations

- 4 field trials with six-row plots, harvested row-by-row to investigate the effect of neighbouring rows on yield

- **2 field trials with six-row plots and alternating one-row plots to investigate the effect of neighbouring rows on *H. schachtii***

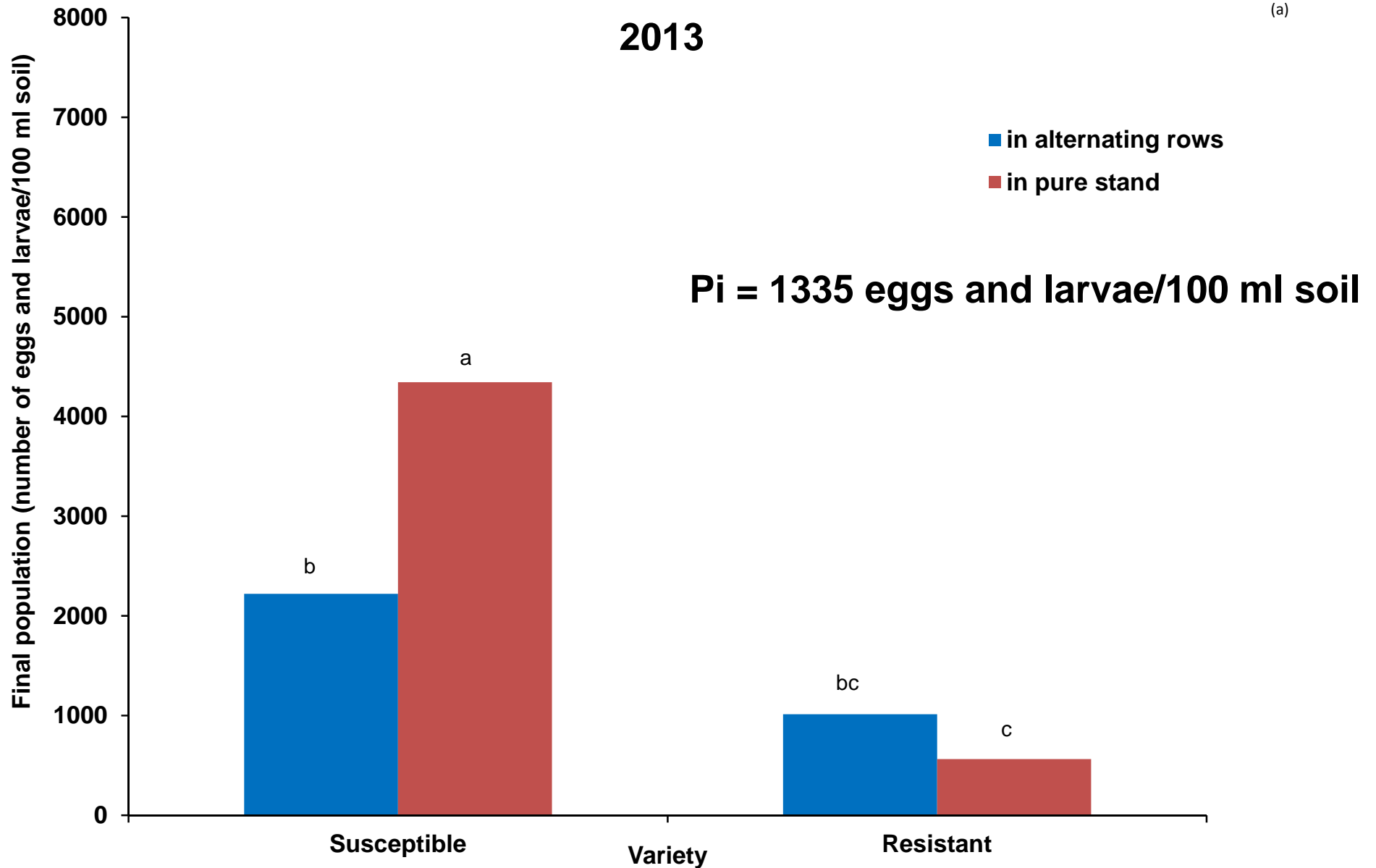# Neighbouring effects on *H. schachtii*

Field trial plan

Susceptible / resistant variety

Plots with alternating rows and pure stand

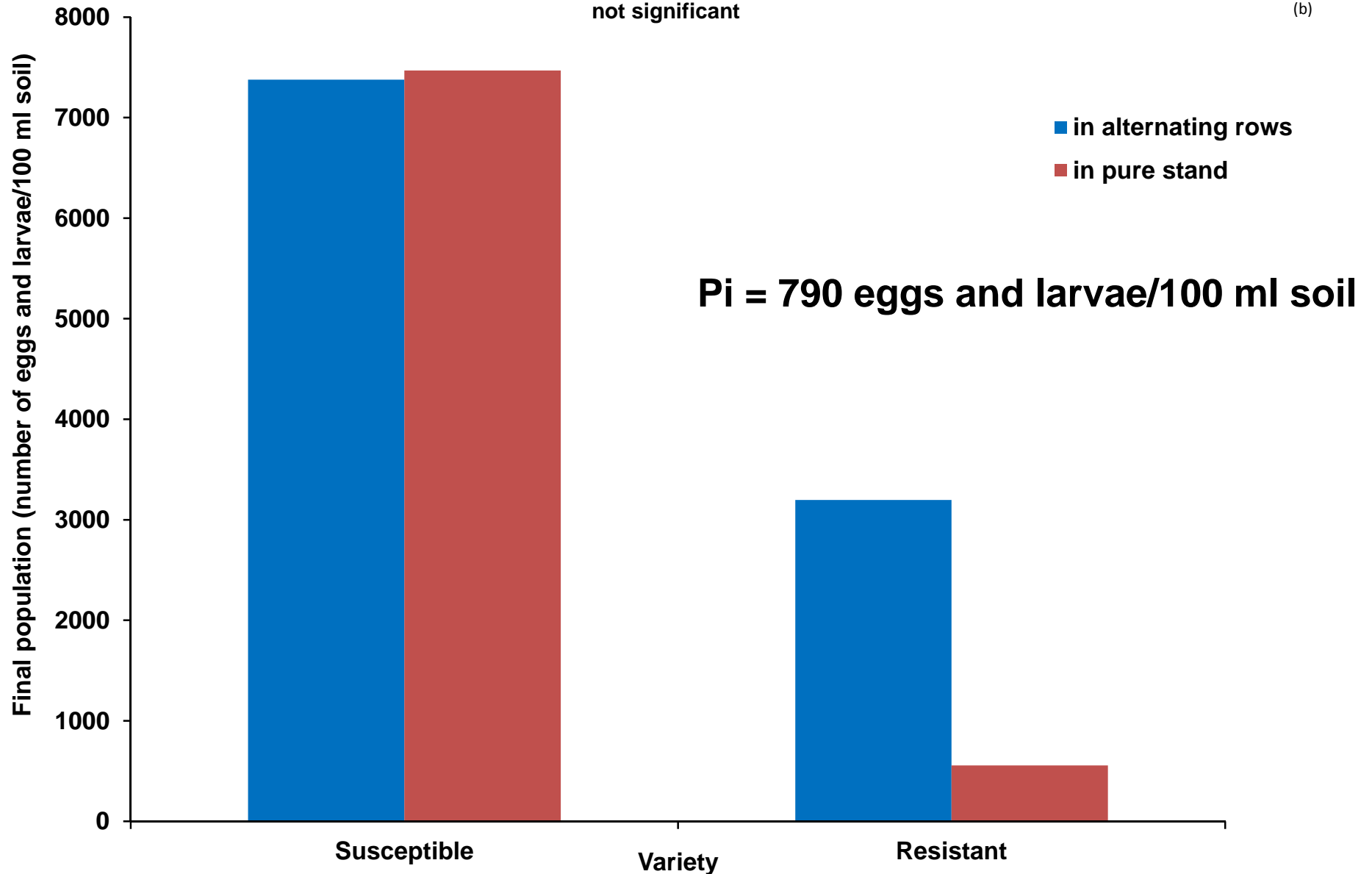# Number of nematodes in susceptible variety reduced by neighbouring a resistant variety…

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…but not in 30-60 cm

2013
not significant

(b)

Final population (number of eggs and larvae/100 ml soil)

- in alternating rows
- in pure stand

Pi = 790 eggs and larvae/100 ml soil

Susceptible   Variety   Resistant

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Conclusions (2)

- *H. schachtii* population in plots with resistant variety was not significantly influenced by the susceptible neighbour

- *H. schachtii* population in plots with susceptible variety was significantly lower when growing next to the resistant variety than in pure stand

Main conclusion

- **In systems where 3 rows are sown and all 3 rows are harvested, yield of the resistant variety was underestimated**

- **This was mainly due to interference by canopy height. Interference by _H. schachtii_ seemed to be of secondary importance _but existing_**

Thanks for making this possible

- **Syngenta Crop Protection A.G.**
  - Mr. S. Mittler
  - Mrs. C. Bonadei
- **Colleagues from IfZ, NBR, IRBAB, JKI and IRS**