The development of a routine methodology for measuring tolerance of potato cultivars to PCN
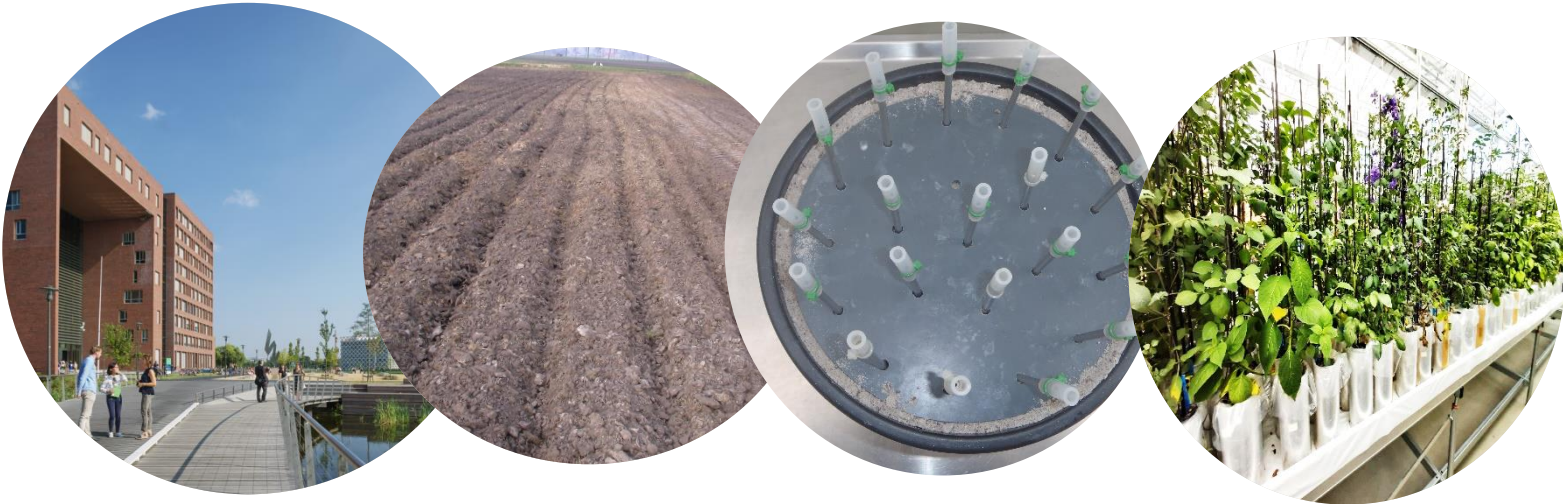
Misghina Goitom Teklu and Leendert Molendijk

NAO 31-03-2023 Project idea

WAGENINGEN
UNIVERSITY & RESEARCH

Statement of the problem:

- Virulent populations of PCN populations are spreading in The Netherlands.

- Classical resistance to PCN is getting circumvented.

- Population densities in the field will increase.

- If the population densities gets > 2 eggs (g dry soil)$^{-1}$
    - Yield reduction will be apparent.

- There is no full resistance for the virulent populations so far.
    - Screening and introgression will take time. (and hopefully start soon)!

- An immediate solution is to use tolerant cultivars; however a robust, rapid and simple method of tolerance testing methodology is not yet in place?

- The research started in 2016 – 2021 was not successful.

Objectives:

- To prove that a reliable and affordable method for determining tolerance can be conducted in the glasshouse.

- A test comparable with the current RS test.

- To provide a written protocol (SOP) for routine tolerance test.

Methodology

Experimental Design:(NAK Emmeloord, WUR)

- Three pot sizes, will be used: 10 replications each!
  - 10 kg
    - 5 kg
      - 2 kg

- 12 densities of nematodes (0, 0.125, 0.25 -128 J2(g dry soil)$^{-1}$.

- Test population has to be decided? Pa3 (Chavornay)?

- Current virulent PCN populations that we have?

- Test cultivar Seresta?

- Desiree will be used for quality check of the inoculum.

- In total we are planning to have 370 pots.

Yield loss (Seinhorst model)

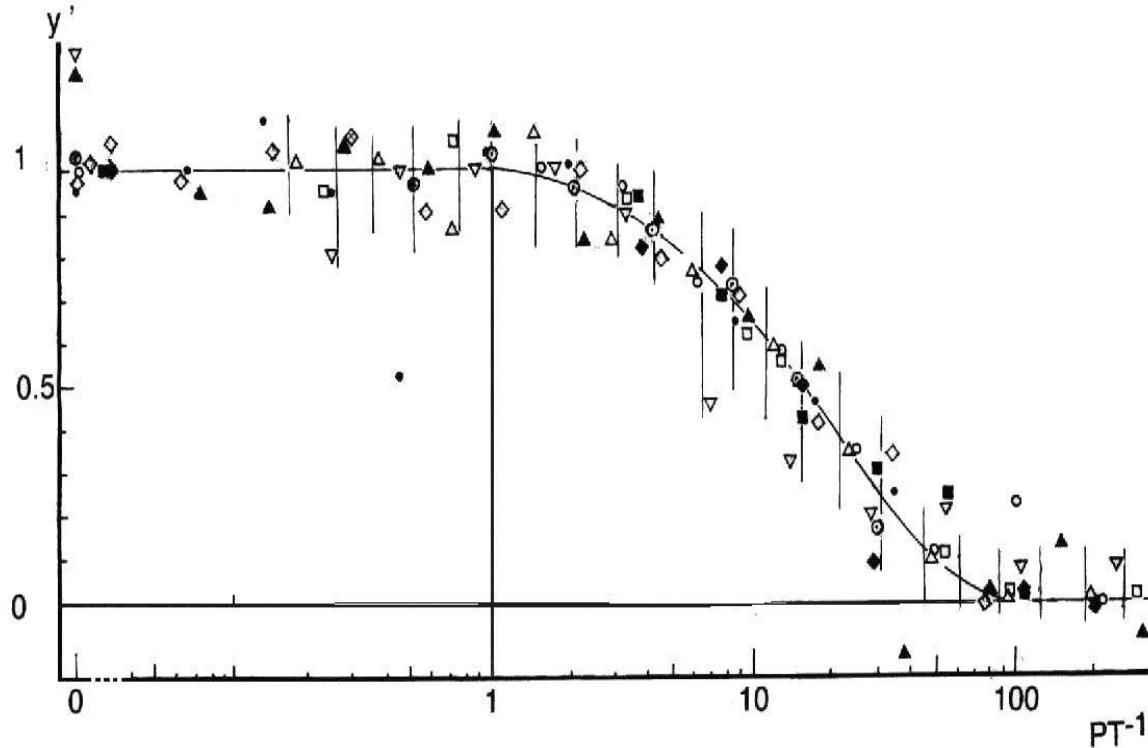$$Y = m + (1-m) \times 0.95^{(P_i / T - 1)} \ldots \text{for } P_i > T \ldots \text{ranges of } P_i$$

$$Y = 1 \qquad \qquad \ldots \text{for } P_i \leq T$$
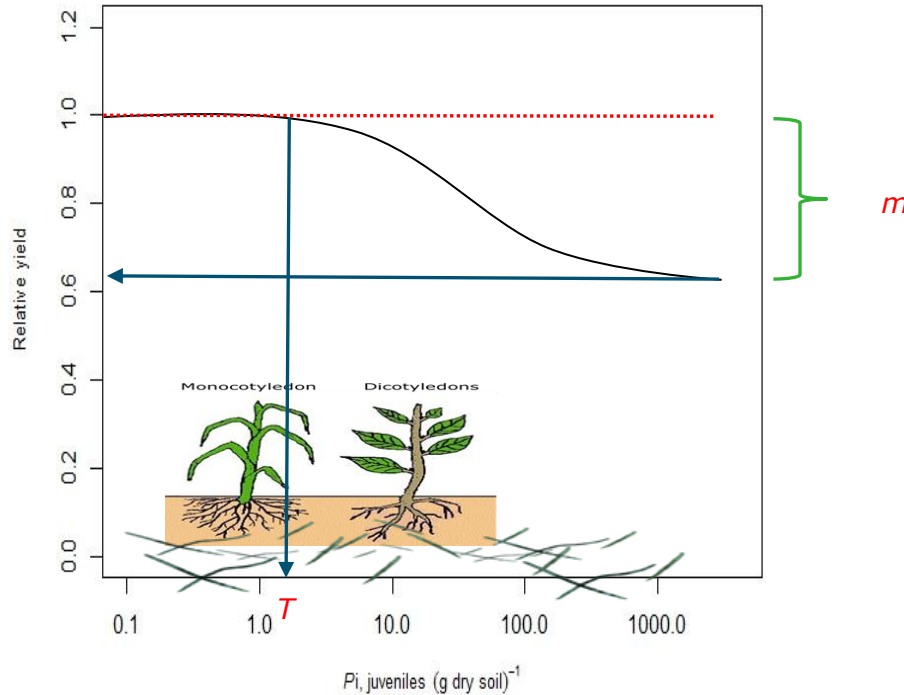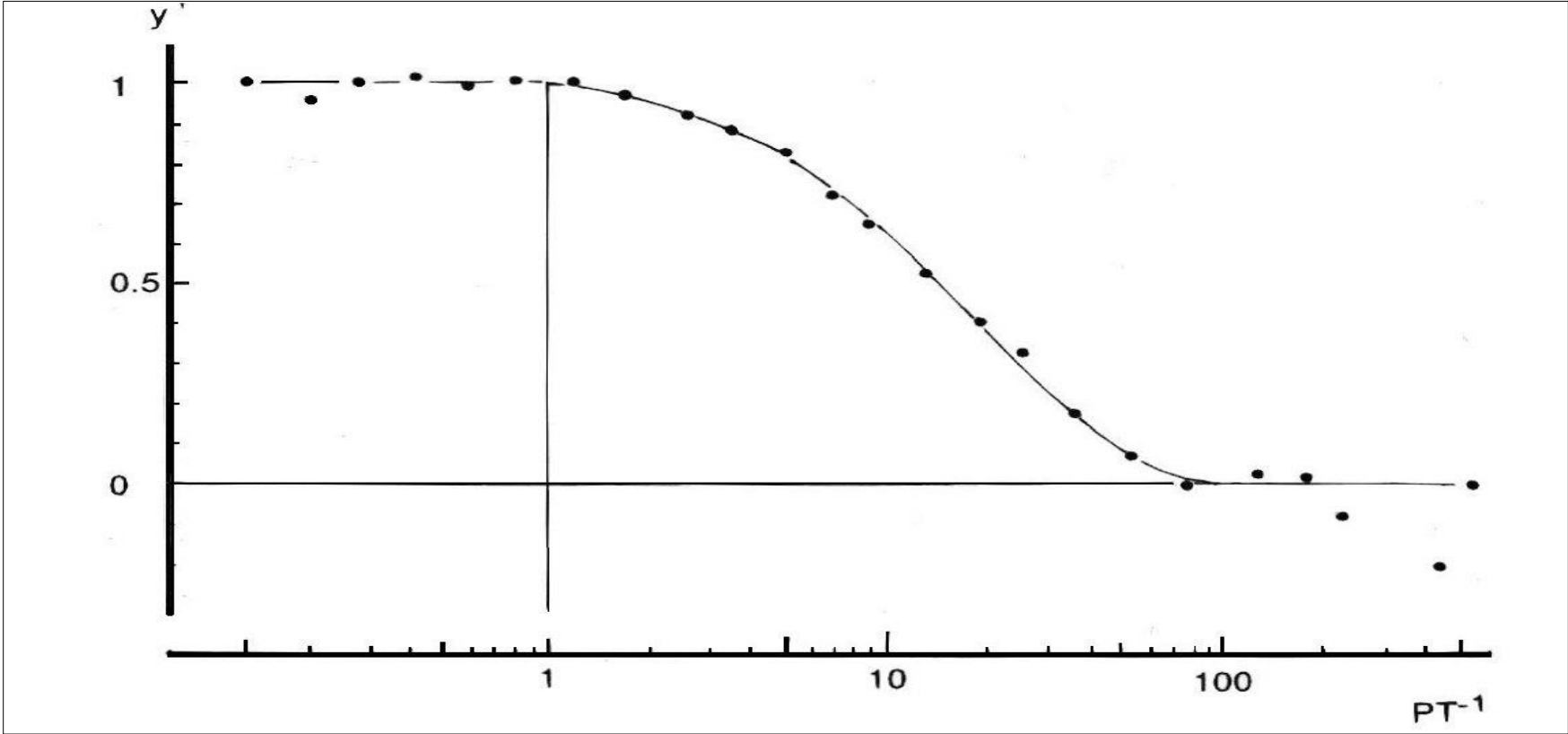

Two parameters:

- Tolerance limit (T)

- Minimum Yield (m)

- Completely tolerant ($m = 1$)

- Relative yield easy to compare between cultivars

Seinhorst model (common relations, 1988)
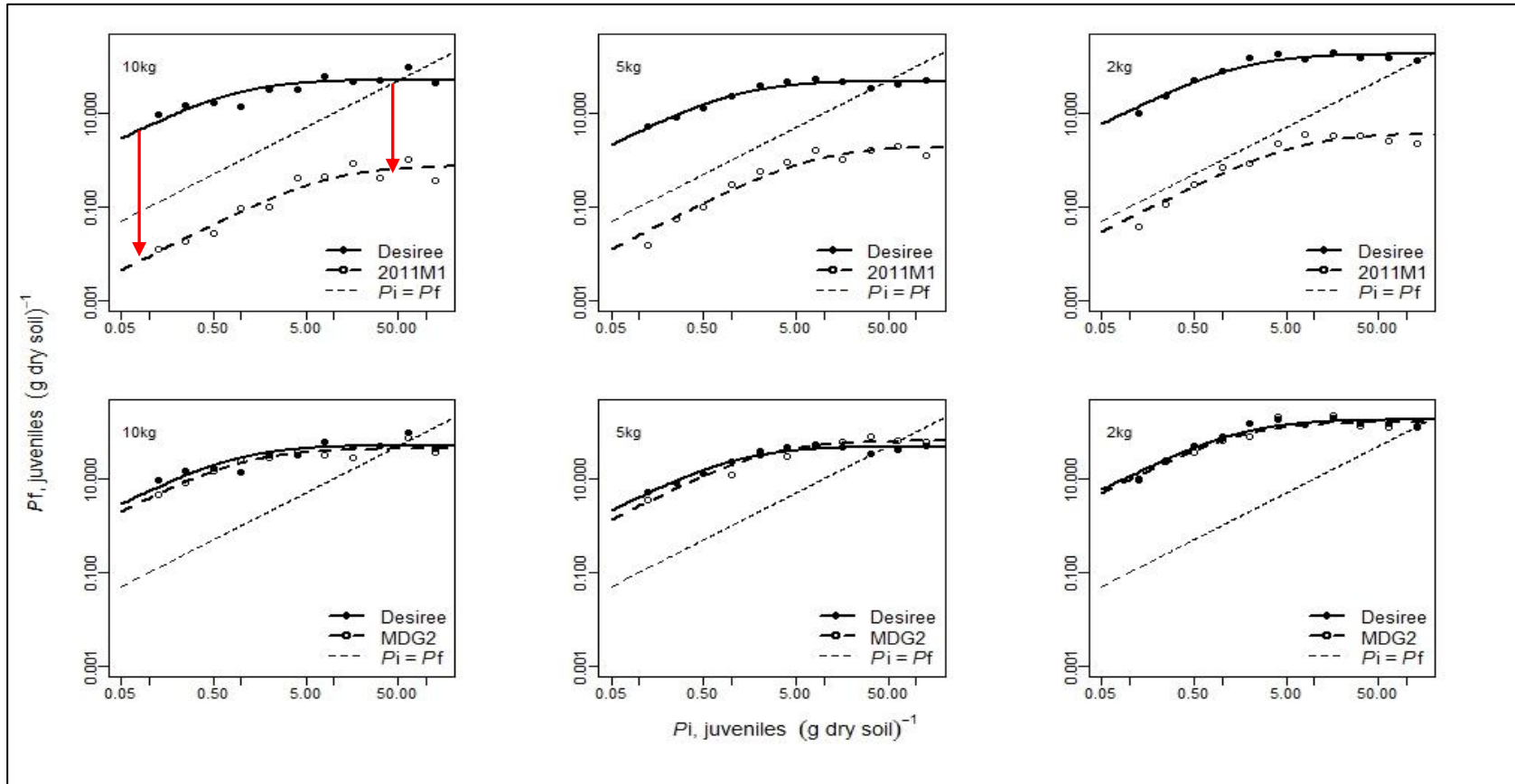

- 31 published experiments
- 5 unpublished
- 13 tylenchid

Yeld loss for caused by *M. chitwoodi*

Relative fresh tuber weight at different pot sizes
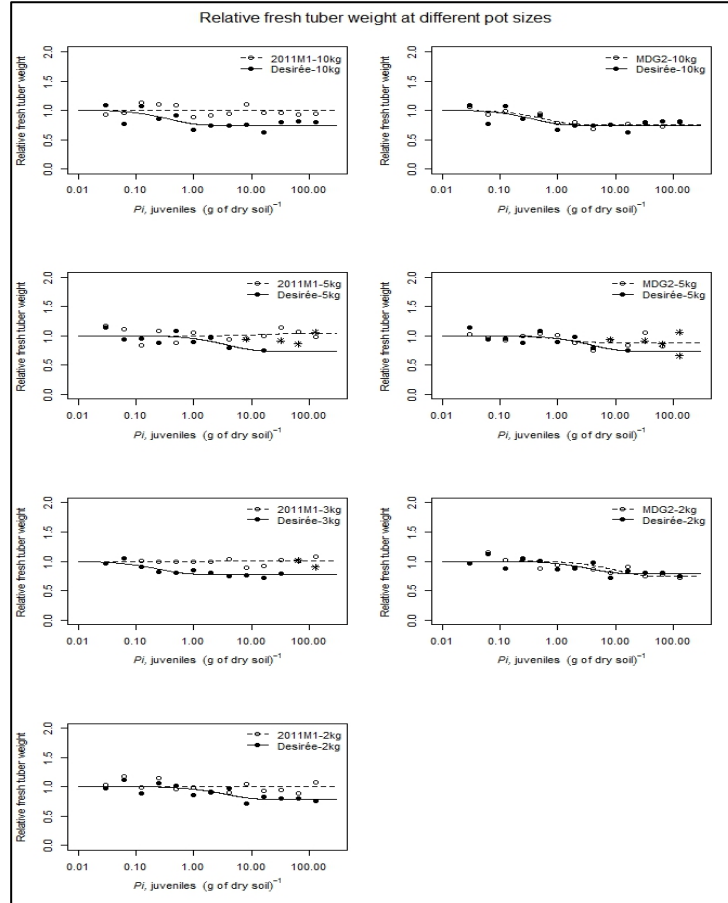
- Proven for *M. chitwoodi*
- parameters are consistent over pot size!

Planning and organization (2023-2024)

Year	Activity
2023	Multiplication of inoculum
2024	Start of the experiment
2024	Data analysis and writing the SOP

WAGENINGEN
UNIVERSITY & RESEARCH

Budget break down: 35 K

S.No	A	Reps	Potsize (10, 5, 2 kg)	Cultivar	Total nr of pots	Costs per pot	Total
1	0	10	3	1	30	€60	€1.800
2	0.125	10	3	1	30	€60	€1.800
3	0.25	10	3	1	30	€60	€1.800
4	0.5	10	3	1	30	€60	€1.800
5	1	10	3	1	30	€60	€1.800
6	2	10	3	1	30	€60	€1.800
7	4	10	3	1	30	€60	€1.800
8	8	10	3	1	30	€60	€1.800
9	16	10	3	1	30	€60	€1.800
10	32	10	3	1	30	€60	€1.800
11	64	10	3	1	30	€60	€1.800
12	128	10	3	1	30	€60	€1.800

S.No	Activity	k (€)
1	Vermenigvuldiging van inoculum	€5
2	Begeleiding	€7.5

WAGENINGEN
UNIVERSITY & RESEARCH

Thank you for your attention!