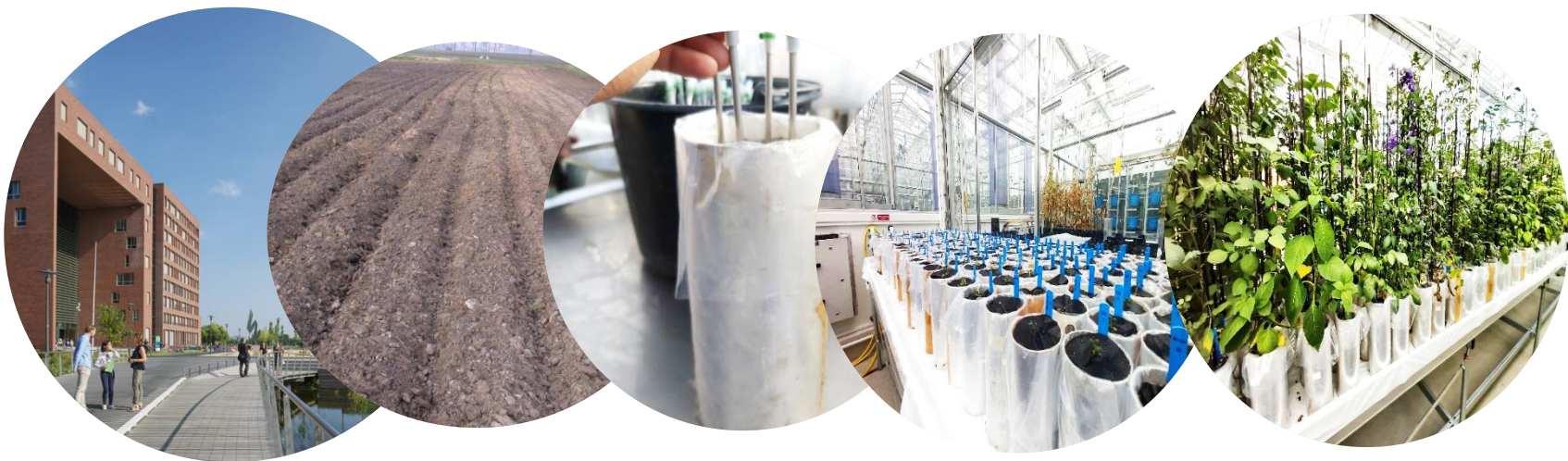
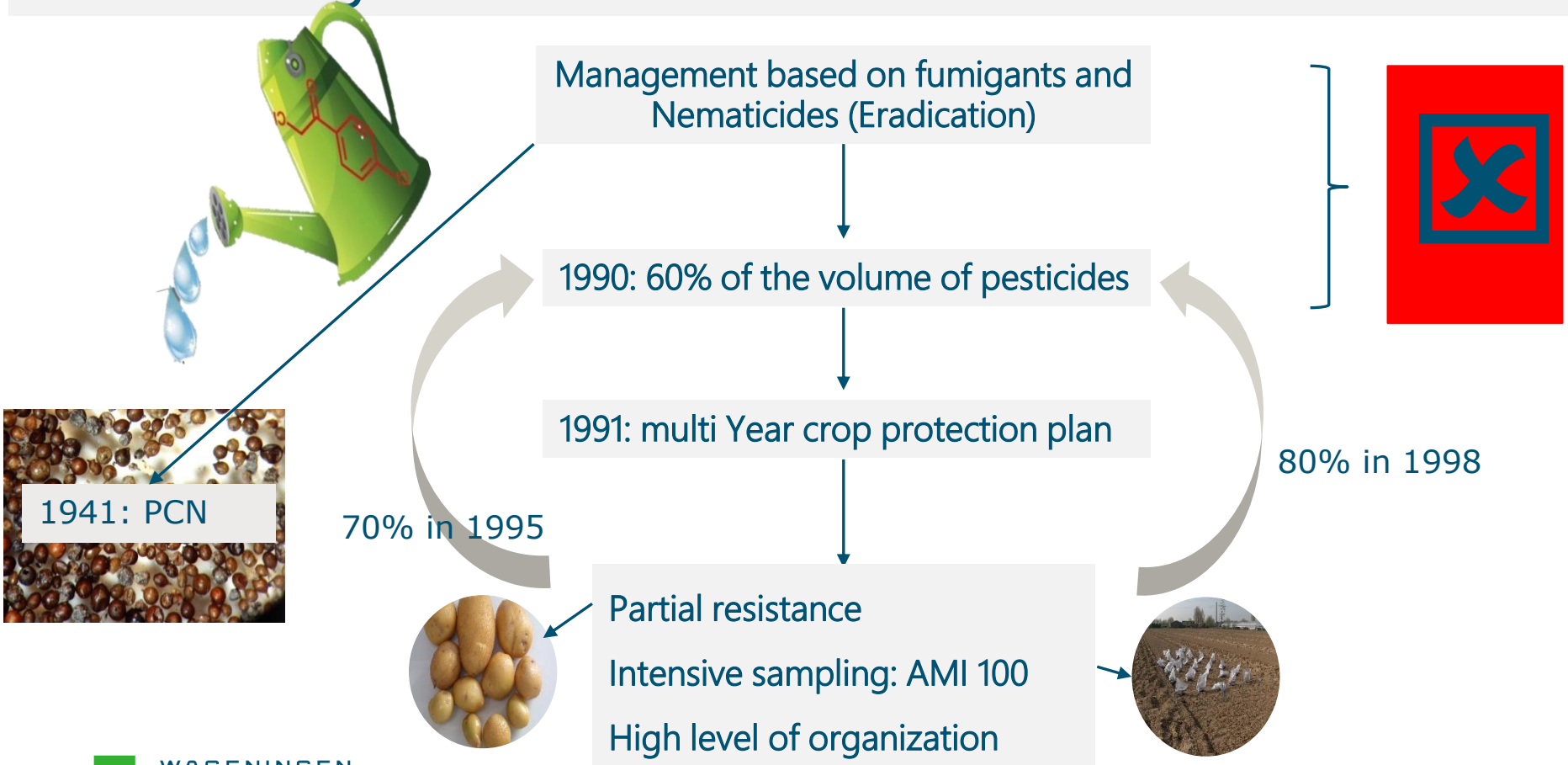


Screening novel source of resistance to the virulent Dutch potato cyst nematode, *Globodera rostochiensis*, from wild potato accessions (project idea)

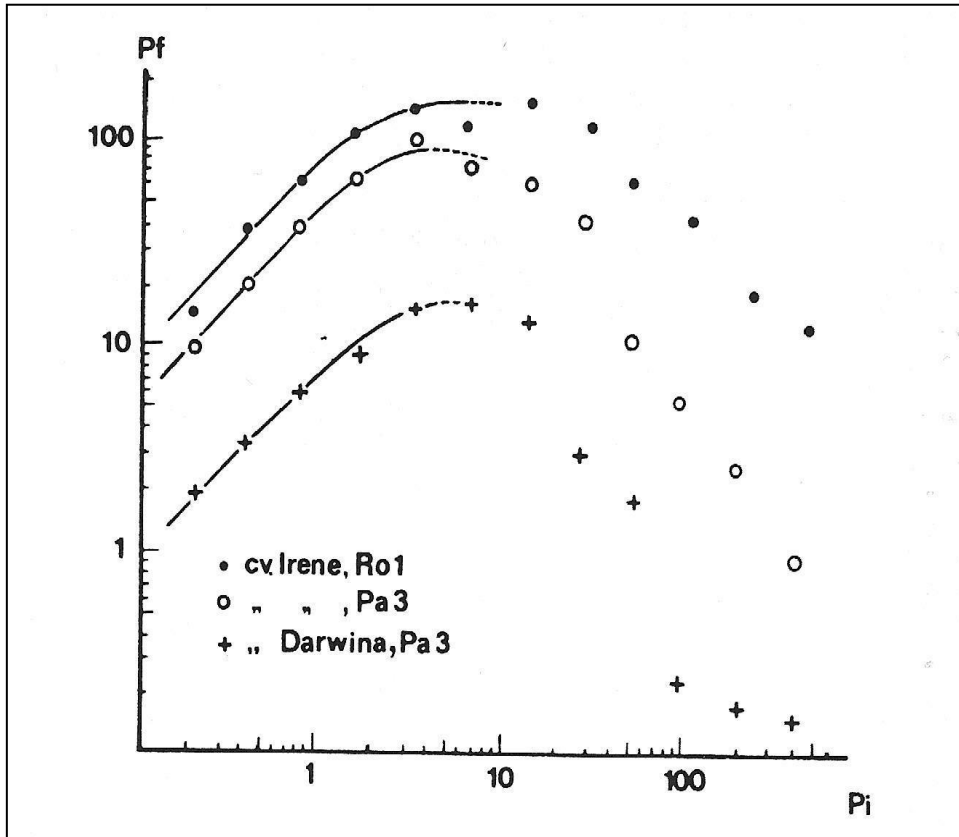
Misghina Goitom Teklu and Jack Vossen



# General background:



# Resistance in 1984 by Seinhorst



Seinhorst, J.W. 1984. Relation between population density of potato cyst nematodes and measured degrees of susceptibility (resistance) of resistant potato cultivars and between this density and cyst content in the new generation. *Nematologica* 30: 66-76.

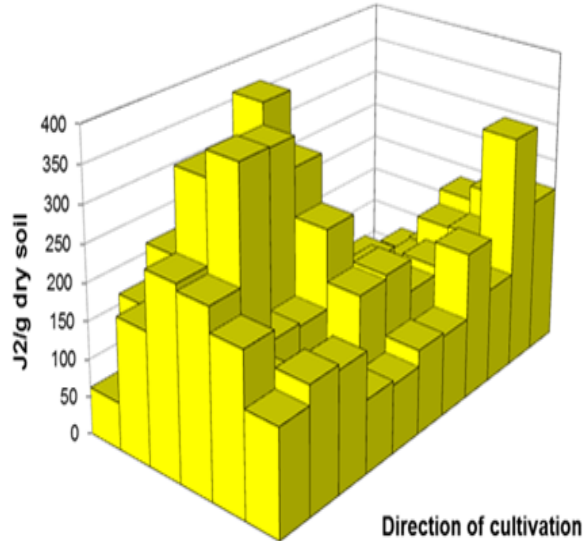
&

Phillips, M.S. 1984. The effect of initial population density on the reproduction of *Globodera pallida* on partially resistant potato clones, derived from *Solanum vernei*. *Nematologica* 30: 57-65.

# Impact of resistance in the last 20-30 years

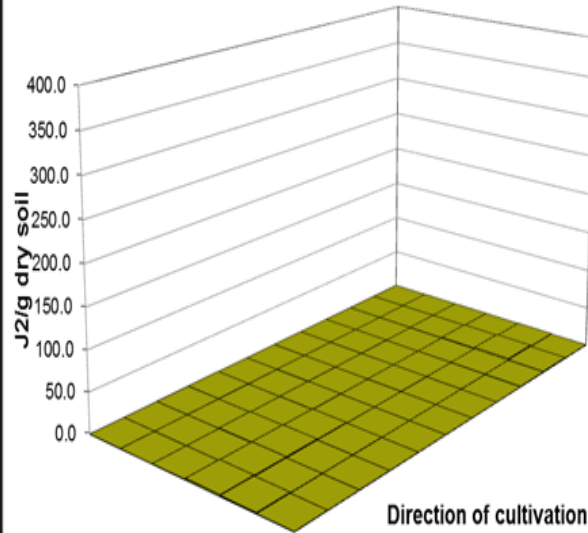
A

F02 (1992)



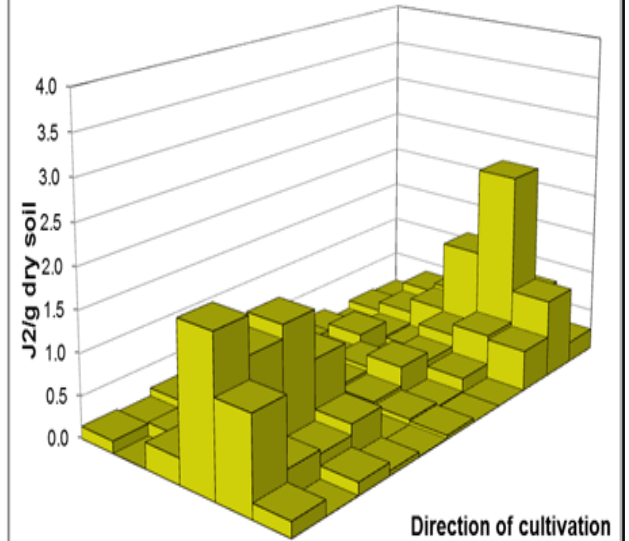
B

F02 (2011)

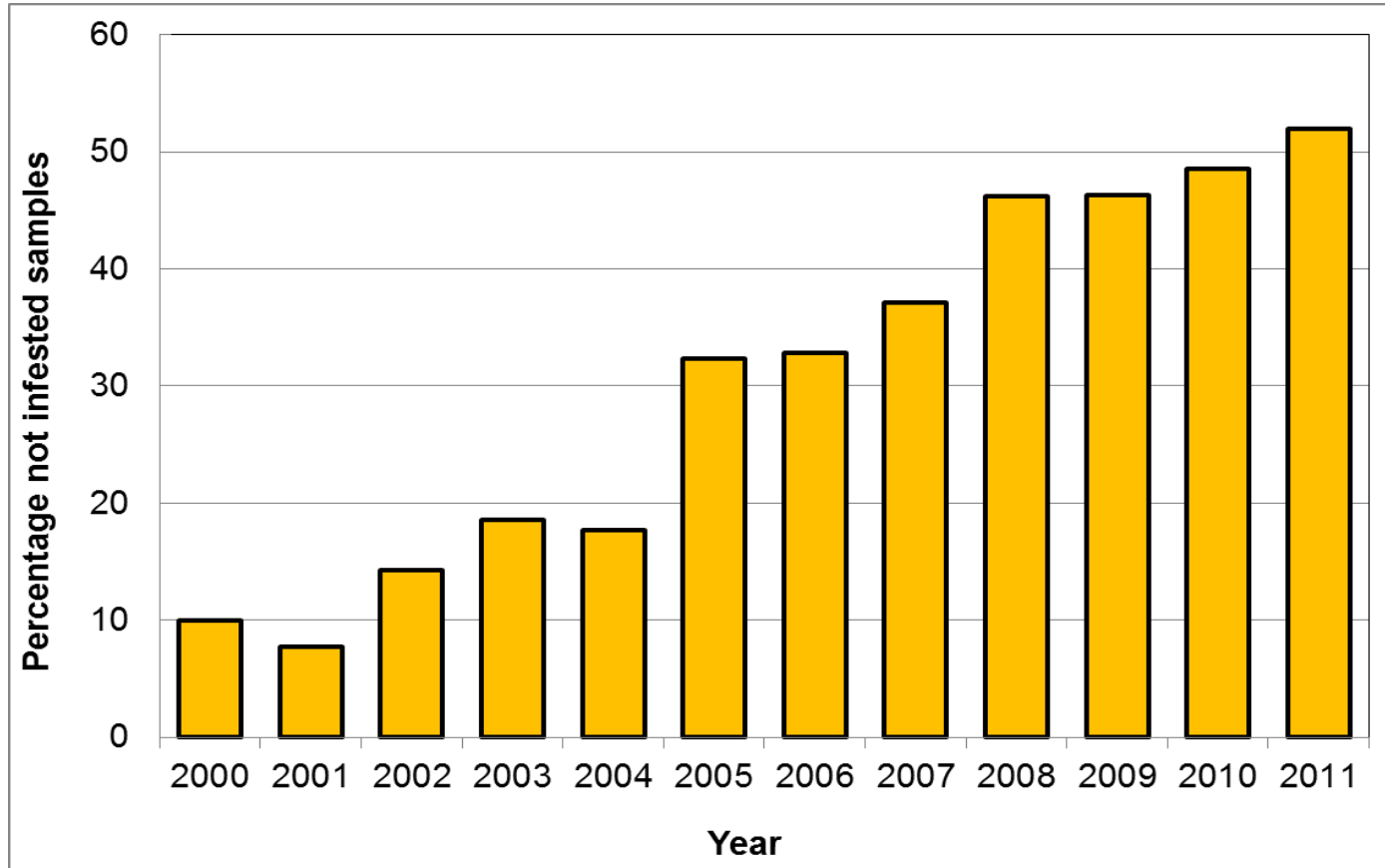


C

F02 (2011)



# Monitoring clean fields from PCN after growing PR



# Current challenges (Virulence and banning of fumigants)

- The emergence of virulent populations of *G. pallida*

- Emsland in 2014
- Followed by virulent Dutch population along the boarder with Germany.

- The same problems are now observed with *G. rostochiensis* in almost all starch growing areas of potatoes.

The image shows two screenshots of Dutch news articles from the website 'Aardappelmoetheid rukt weer op'. The top screenshot is titled 'Aardappelmoetheid rukt weer op' and features a sub-headline 'Een partij pootgoed verdient meer aandacht'. The article discusses the resurgence of potato late blight (AM) and the challenges of managing it, particularly in relation to fumigation. It mentions that fumigation is still necessary to protect potatoes from AM, but it is becoming more difficult due to the emergence of more resistant strains. The article also notes that fumigation is becoming more expensive and that growers are looking for alternative ways to manage the disease.

The bottom screenshot is titled 'Aardappelmoetheid (AM) nog lang niet opgelost' and features a sub-headline 'Een partij pootgoed verdient meer aandacht'. This article discusses the challenges of managing AM in the Netherlands, particularly in relation to the use of fumigants. It notes that the use of fumigants is becoming more difficult due to the emergence of more resistant strains and that growers are looking for alternative ways to manage the disease. The article also mentions that the use of fumigants is becoming more expensive and that growers are looking for alternative ways to manage the disease.

# Options for Dutch growers

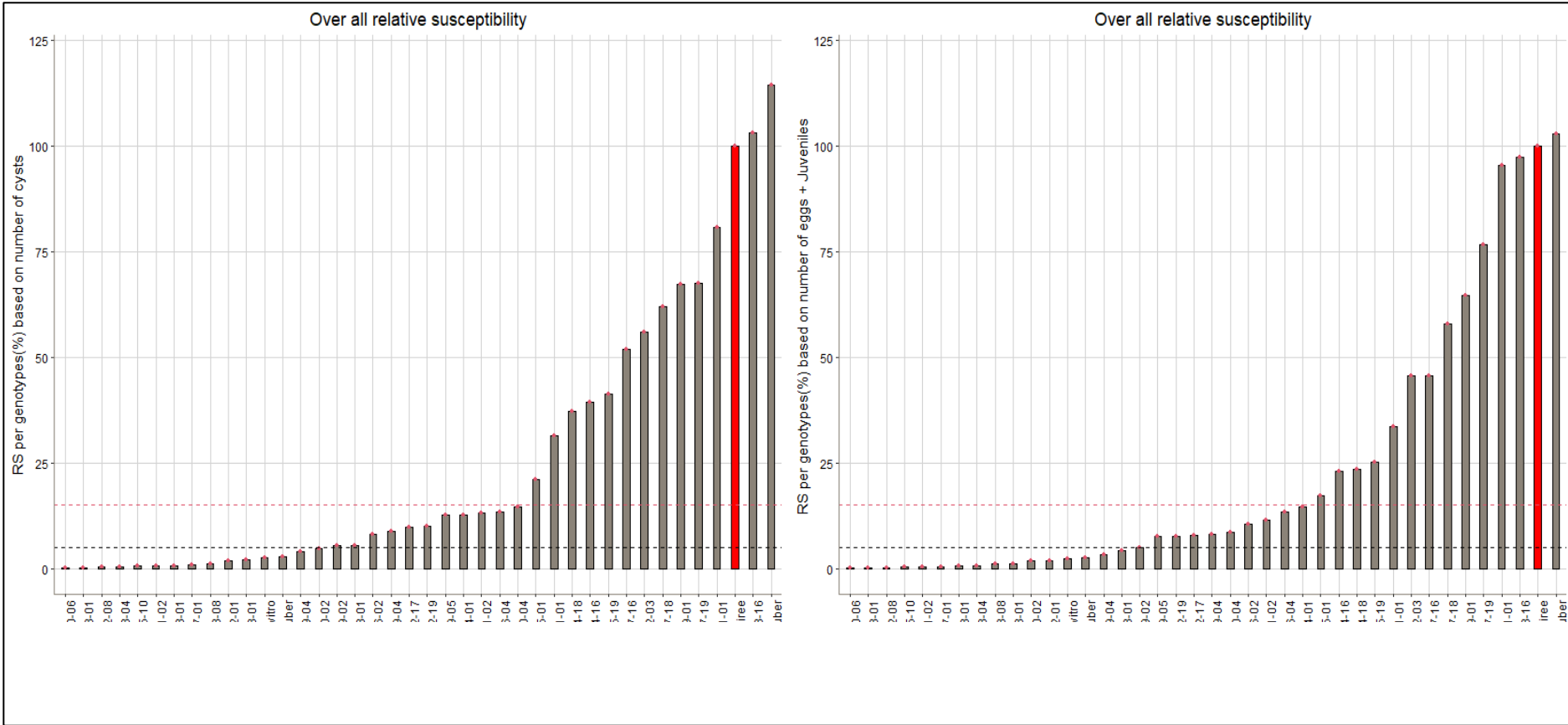
- Prevention of introduction and spread (not guaranteed).
- Use of tolerant cultivars
  - The use of tolerant cultivar is hampered both by the currently used methodology and the fact that a breeding program for tolerance is far more complicated compared to obtaining resistance.
- Timely to start for searching novel resistance ✓

# Current trend and relevance

- **HIP-BB3.2:** Almost there in finding the resistance to virulent *G. pallida* population (2019 – 2024).
  - Molecular characterization of the virulent population is studied by the **Pallifit** project (2017 -2021).
  - Similarly, now molecular characterization of the virulent population of *G. rostochiensis* is in study by the **Rostofitt** project (from 2020 – 2025).
- It is timely now to start screening for novel resistance to the virulent *G. rostochiensis* population.
- The independent initiation of the parallel projects is expected to help combat the virulent PCN populations using novel resistance source from wild potato genotypes.



# HIP: Resistance against virulent *G. pallida*

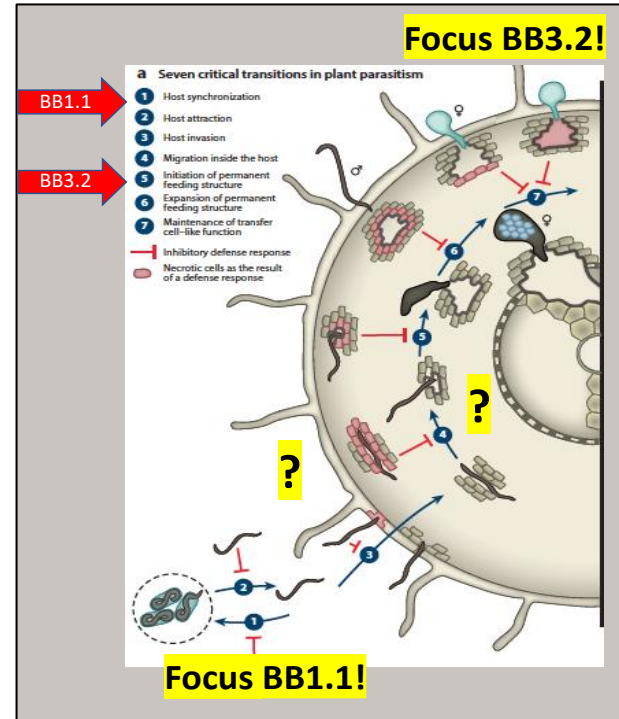


# Objectives:

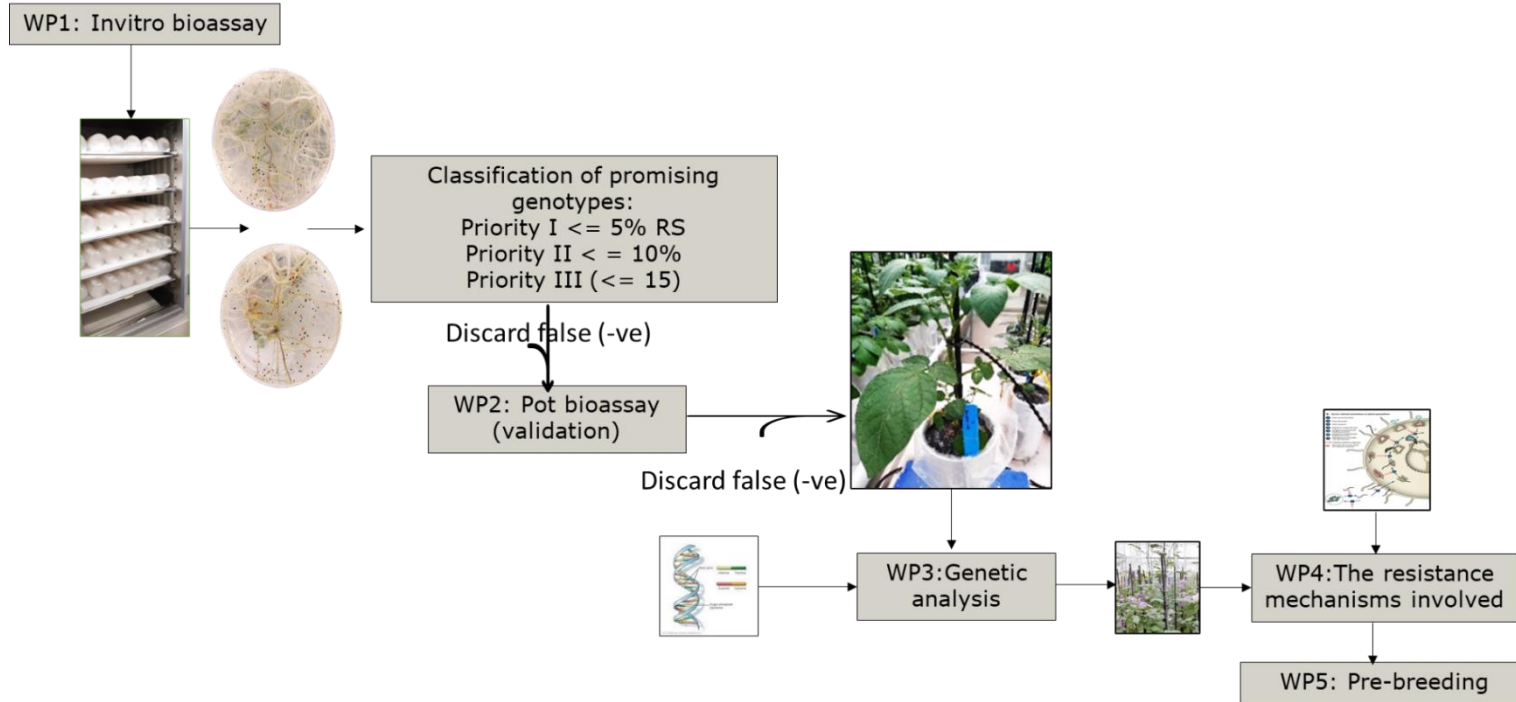
- I. Screening, of ~ >300 Solanum section Potato genotypes.
- II. Validation of the 20 – 40 most promising resistances in a pot experiment.
- III. Crossing with susceptible *S. tuberosum* genotypes.
- IV. Phenotyping and profiling the genetic basis of the resistance using SNP discovery and detection technology.
- V. Resistance mechanisms of selected resistant genotypes to make an inventory of the resistance sources and to select for introgression breeding.
- VI. Introgression breeding:
  - The selected genotypes from objective *v* and the molecular markers from objective *iv* will be used.

# Organization of the research

- WP1: Rigorous high throughput *in vitro* screening:
  - At least 4 populations
- WP2: Pot validation experiments (bioassays).
- WP3: Genetic analysis of resistance.
- WP4: The resistance mechanisms involved:
- WP5: Pre-breeding



# Research strategy: Work flow



# WUR: Budget

Activity	2024	2025	2026	2027	2028	Total
WP1	100	100				200
WP2		100	100			200
WP3		60	100	80		240
WP4				100	100	200
WP5			in kind	in kind	in kind	
<b>Total</b>	100	260	200	180	100	840

# Budget break down:

Activity	2024 May- Dec	2025	2026	2027	2028 April	Jan Total
Companies (cash)	35	70	70	70	35	280
Companies (in kind)	20	20	90	90	60	280
TKI	65	190	130	110	65	560
Total	120	280	290	270	160	1120

Thank you for your attention!

