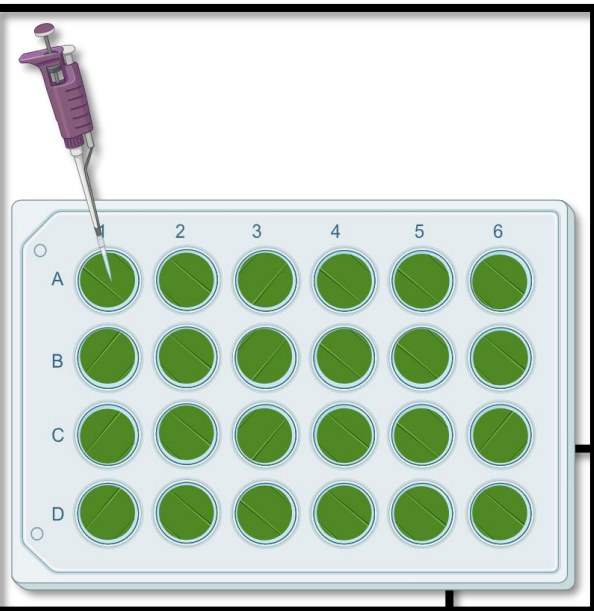


# High-Throughput Virulence Assessment Using Detached Leaf Disc Assays: Validation through Whole Plant Phenotyping



**Bicko S. Juma**, Olga A. Oxholm, Jack Vossen, Kim H. Hebelstrup,  
and Isaac K. Abuley

Department of Agroecology  
Aarhus University, Denmark

**EuroBlight**, 18<sup>th</sup>-21<sup>st</sup> May 2026, University of Vigo, Ourense, Spain



DEPARTMENT OF AGROECOLOGY

AARHUS UNIVERSITY

EUROBLIGHT 2026  
20. MAY 2026

BICKO STEVE JUMA  
PHD CANDIDATE

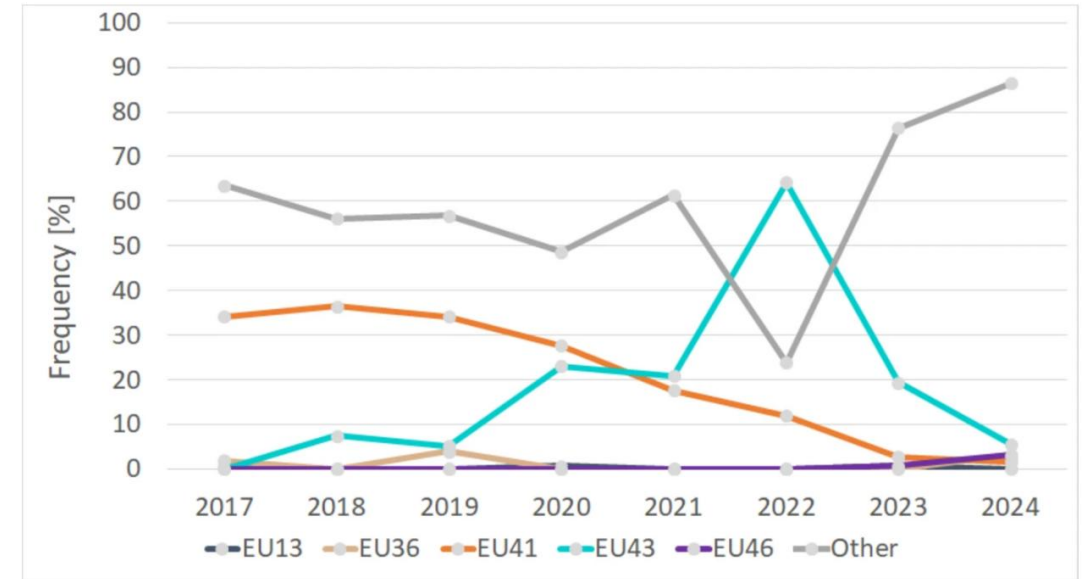


# Rapid *P. Infestans* Virulence Analysis: Why Detached Leaf Disc Assay (DLDA)?

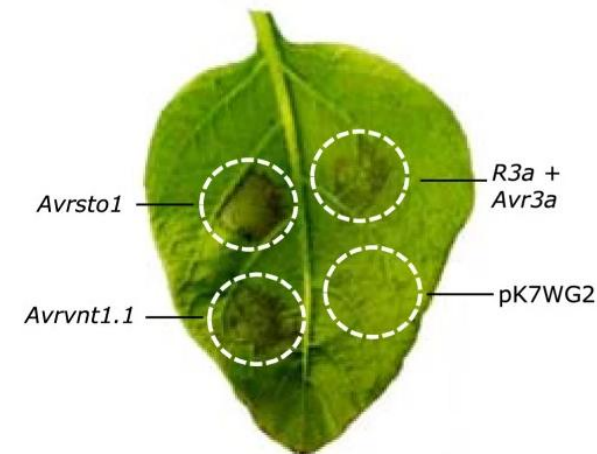
- Rapid evolution of *P. infestans*
  - ✓ Emergence of new clonal lineages
- Need for fast and scalable virulence screening tools

## Limitations of current methods

- Whole plant assays are slow and space-intensive
- Field trials are variable
- Effector assays lack full biological context



Hansen et al., 2014



Jo et al., 2014

# Methods

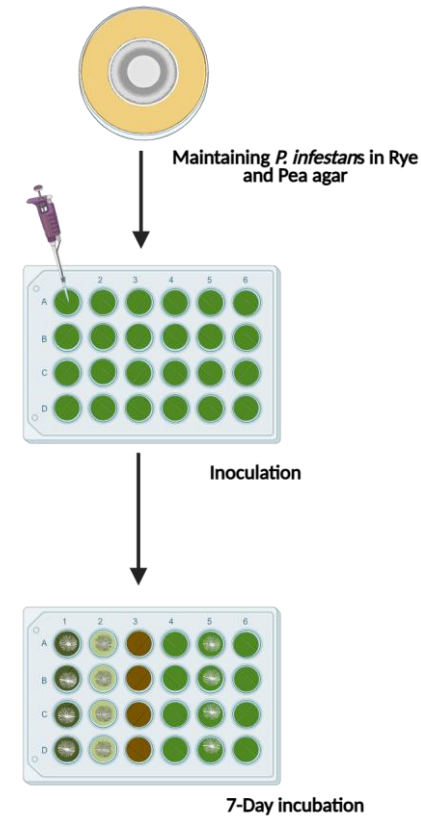
## Isolates

✓ 28 isolates; EU43, EU41, and “other” genotypes

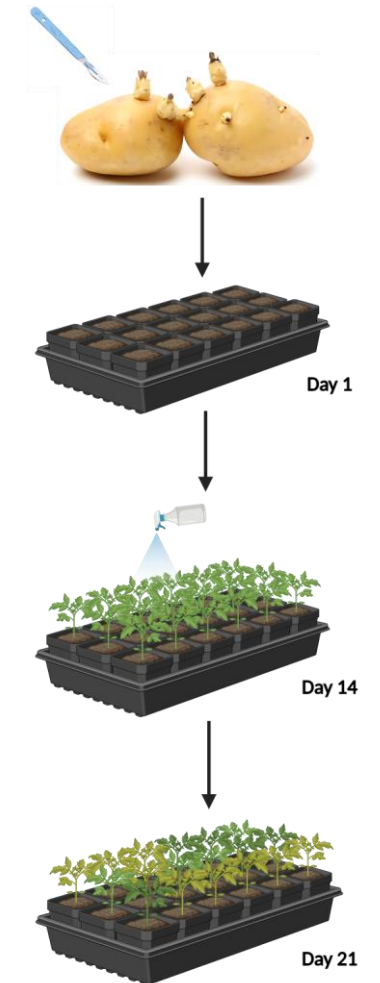
## Plant materials

Variety	Inserted Rpi gene
Desiree	<i>R3b</i>
Desiree	<i>Rpi-sto1</i>
Desiree	<i>Rpi-blb2</i>
Desiree	<i>Rpi-blb3</i>
Desiree	<i>R3a</i>
Desiree	<i>Rpi-vnt1.1</i>
Desiree	<i>Rpi-chc1.1</i>
Desiree	<i>R9a</i>
Russet Burbank	<i>R8</i>
Desiree	Not transgenic
Russet Burbank	Not transgenic
Kuras	Not transgenic
<i>S. americanum</i> 421	Wild relative
<i>S. americanum</i> 424	Wild relative
<i>S. americanum</i> 428	Wild relative

## Detached Leaf Disc Assay

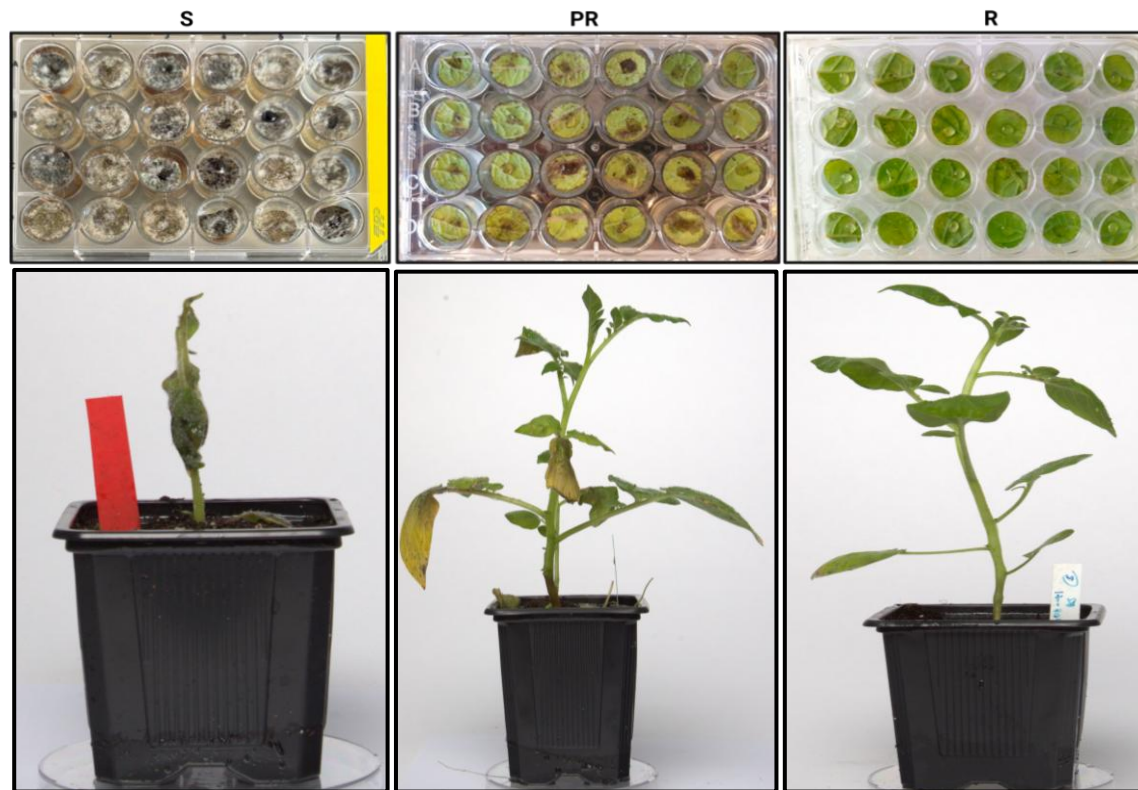


## Whole Plant Assay

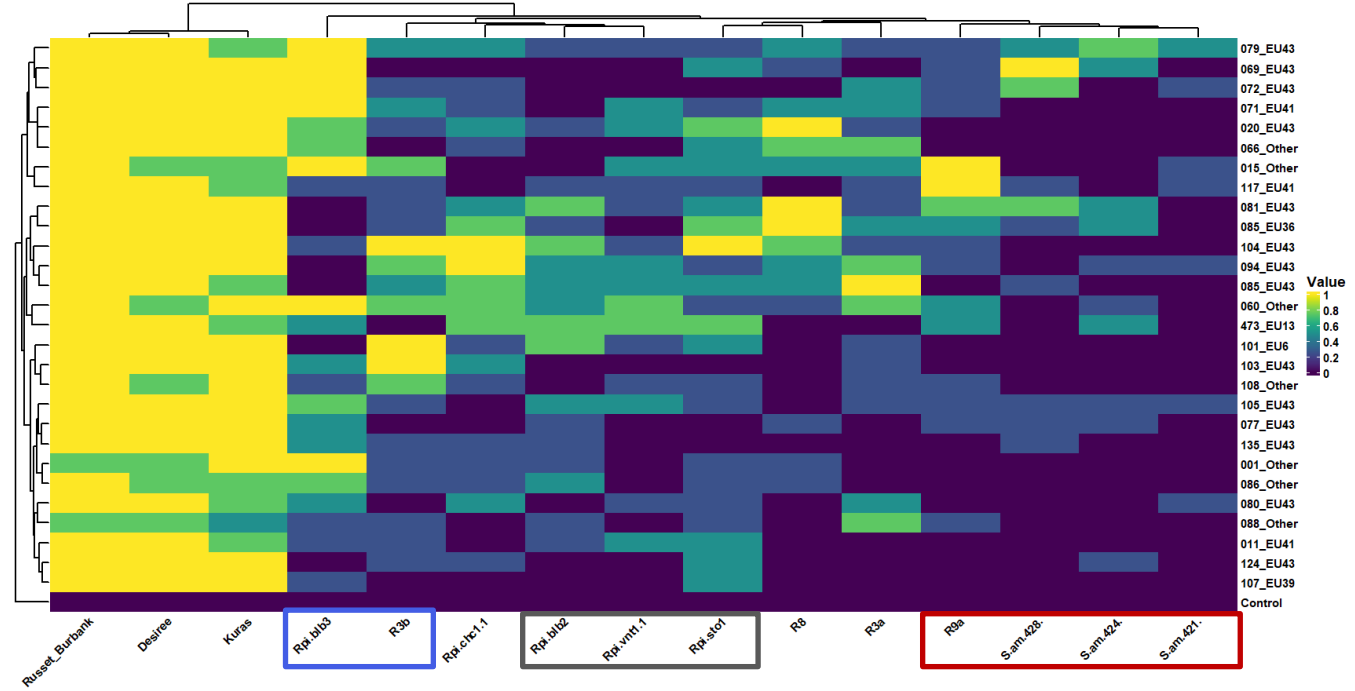
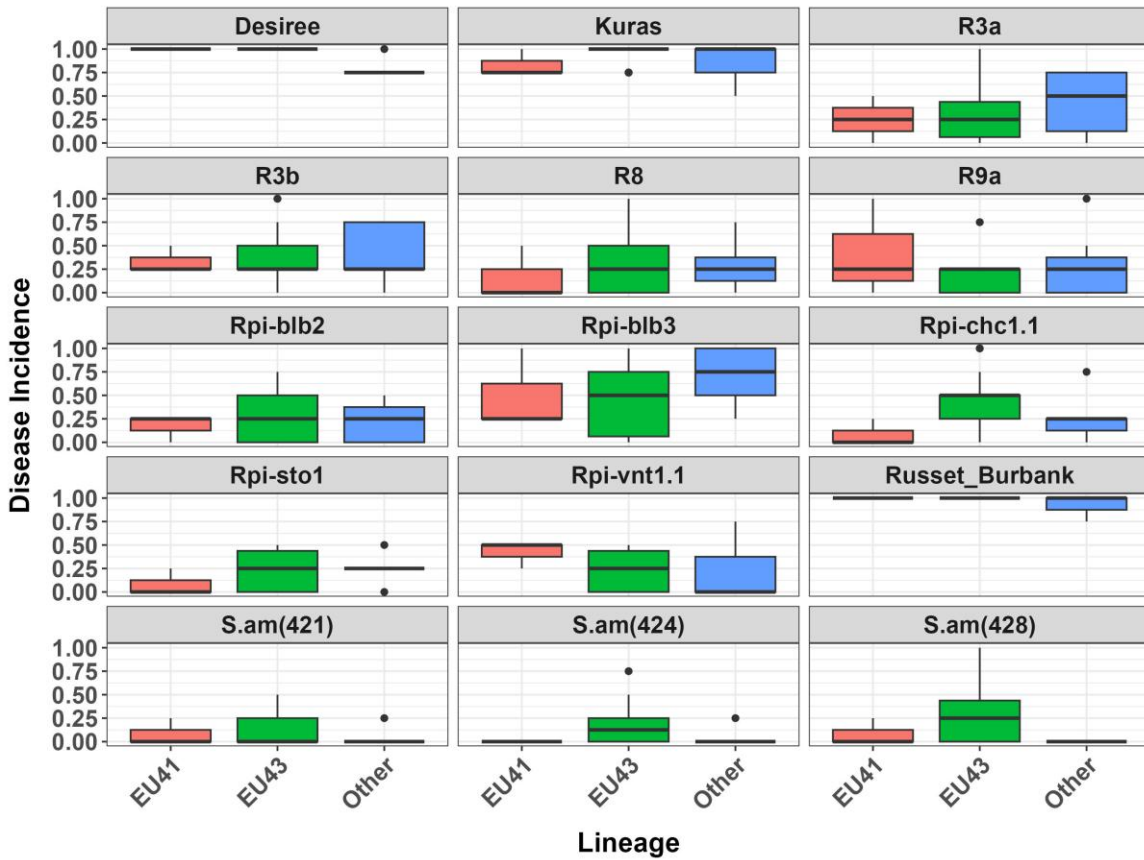


# Phenotypic contrast

- ✓ Susceptible: full sporulation
- ✓ Partial resistant: restricted lesions
- ✓ Resistant: no lesions



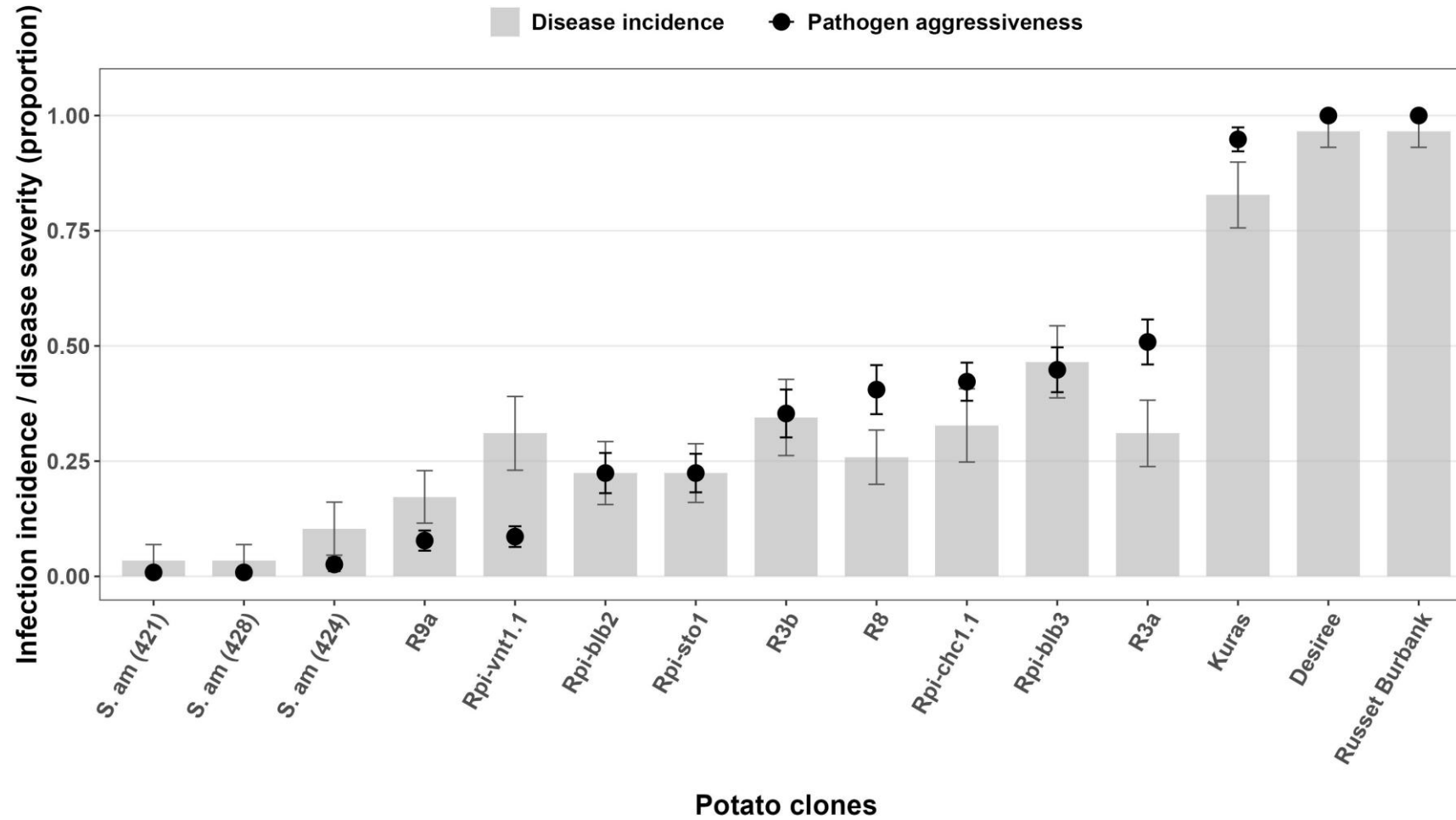
# Detached Leaf Disc Assay



## Resistance patterns

- ✓ Strong: *S. americanum*, *Rpi-vnt1.1*, *Rpi-blb2*, *R9a*
- ✓ Weaker: *R3a*, *Rpi-blb3*

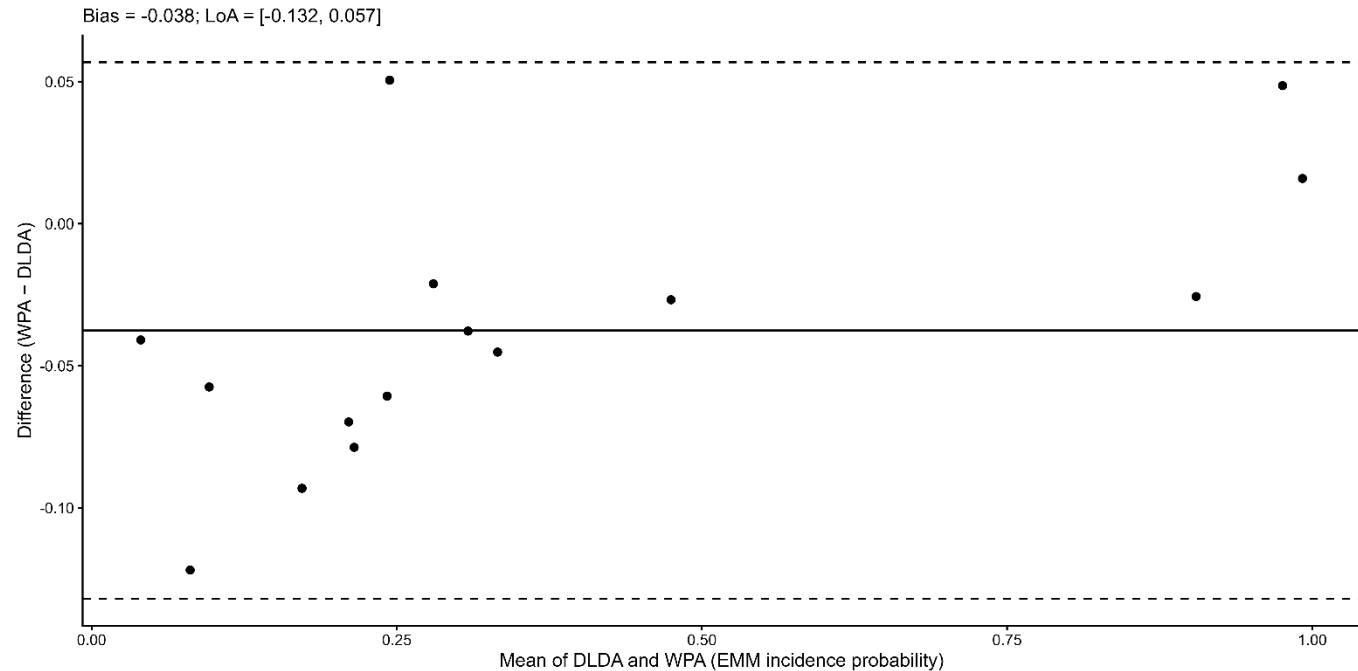
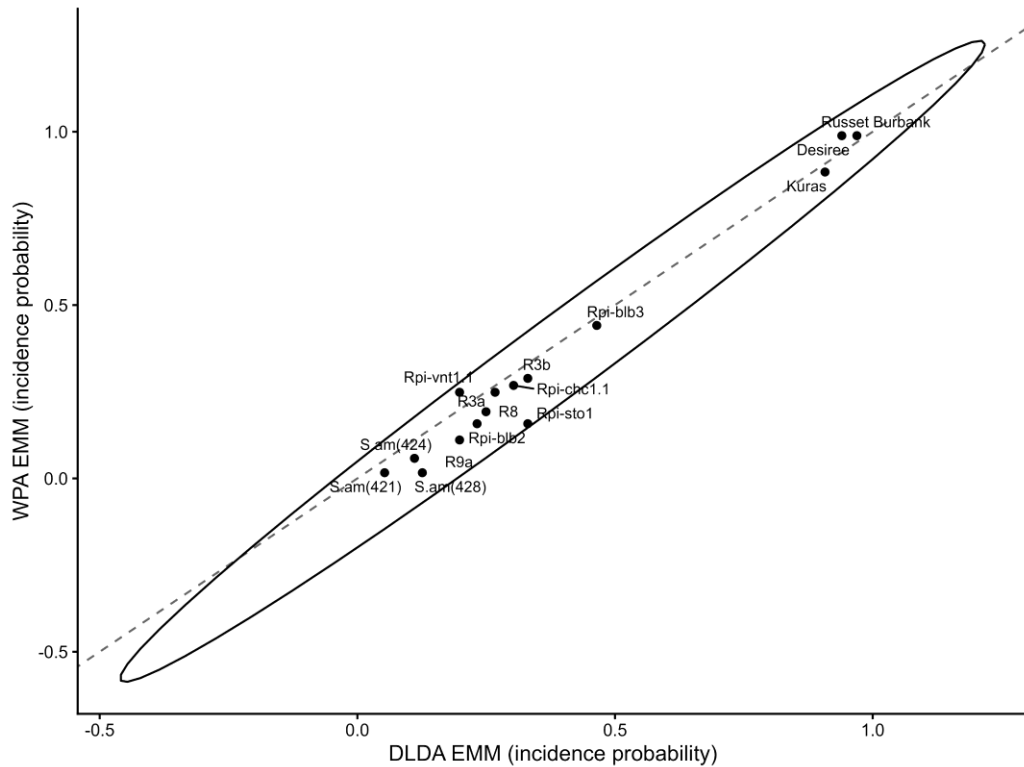
# Whole Plant Assay



# DLDA vs WPA validation

✓ Lin's concordance coefficient analysis, Spearman's correlation and Bland-Altman analysis

Measurement	CCC (pc)	Precision (p)	Accuracy (C.b)	95% CI
DLDA vs WPA	0.983	0.993	0.991	0.978 – 0.995



# Key Message

- ✓ DLDA is fast, scalable, and accurate
- ✓ Equivalent to whole plant assays
- ✓ Ideal for large-scale screening



# Acknowledgements



Kim H. Hebelstrup



Isaac K. Abuley



Olga A. Oxholm



Jack Vossen



EUROBLIGHT 2026  
20. MAY 2026

BICKO STEVE JUMA  
PHD CANDIDATE

