

## PCN – a global perspective







John Jones

## **History of PCN**



#### **PCN originated in South America**

Co-evolved with Solanaceous plants

#### Introduced into Europe ~1850

> Breeding material for late blight resistance after the Irish famine

## **History of PCN**



#### **PCN originated in South America**

Co-evolved with Solanaceous plants

#### Introduced into Europe ~1850

> Breeding material for late blight resistance after the Irish famine

#### Europe has acted as a secondary distribution centre

Seed potato

## **Current global distribution of PCN**

PCN is present in all major potato growing regions in the world

*G. rostochiensis* is more widespread than *G. pallida* 



G. rostochiensis

It is still critical to prevent new introductions of PCN, particularly from S. America

Virulence characteristics



Source: EPPO Global database

G. pallida

## New outbreaks of PCN are still occurring

Quarantine rules are in place that are designed to prevent spread of PCN

In spite of these there have been a number of new PCN discoveries in important potato growing areas

- ➤ USA Idaho (G. pallida)
- China (G. rostochiensis)
- East Africa (primarily *G. rostochiensis,* various countries)

#### All of these have the same characteristics as European PCN

- > We can tell this from genotyping and virulence characteristics
- We are still the main distributors of PCN

How are these being tackled?

## G. pallida in Idaho

# Idaho is a huge producer of potato> \$1bn sales in 2022

### Identified in 18 fields in Idaho in 2006 after routine inspections

 2 sites initially, further sampling identified additional infested fields

## Eradication programme put in place

- Quarantine of infested fields
- Extensive fumigation with methyl bromide
- > Trap crops
- International advisory group & research consortium



Globodera Alliance

## G. pallida in Idaho

## Eradication programme put in place

- Quarantine of infested fields
- Extensive fumigation
- > Trap crops
- International advisory group & research consortium

# Producers grew susceptible potato after "eradication"

Strong preference for Russet varieties

### Re-emergence of G. pallida

Even after sampling gave clear results

# *G. pallida* resistance included in local breeding programmes

First resistant Russet varieties available





## **PCN in China**

# China is now the world's largest potato producer

- Identified as a key crop for food production in the country
- Food and cash crop

### PCN detected between 2019 and 2022

- Sichuan & Yunnan provinces (2019)
- Guizhou province (2022)

To date all samples identified are *G. rostochiensis* (Ro1)

Further surveys underway and management programme being developed

Some cultivars used in China have H1



## **PCN in East Africa**



#### PCN identified as present in several countries

- Kenya G. rostochiensis and G. pallida (one site)
- Uganda G. rostochiensis
- Rwanda G. rostochiensis

## Potato in Kenya

### Second most important crop

- ➤ 160,000 Ha
- ➢ High altitude
- Food and cash crop
- Mainly smallholder farmers

### 2 crops are grown each year

- Aligned with rainy seasons
- Almost no rotation

### Yields are declining







## **Drivers for variety choice**

#### No dormancy

- No cold storage
- Desire to replant almost immediately after harvest

#### **Cooking time**

- Women want to minimise time spent cooking
- Women don't want to use more fuel than they have to

#### Taste & marketability

#### Shangi is the dominant variety

- Zero dormancy
- Cooks very quickly
- Introduced in 2012
- Now used on ~80% of smallholder land

Resistant varieties are not used, even though they are widely available (*e.g* Jelly, Manitou)



## Potato Cyst Nematodes in Kenya

### A recent introduction but has spread widely

- No resistance in Shangi
- Present in all potato growing regions

# Almost all the PCN present in Kenya is *G. rostochiensis*

Analysis of field samples from across Kenya

Red – *G. rostochiensis* Yellow – *G. pallida* 

Green – Other CN



## The impacts of PCN in the region

Individual growers

Reduced yields



#### **Ecological**

Deforestation



## A stroke of good fortune.....

Joint work between JHL and Greenvale AP resulted in advanced lines from a cross between *Solanum phureja* and a *tuberosum* line containing H1

### S. phureja

- Low dormancy
- Quick cook time
- Good taste and nutritional properties

### S. tuberosum line

PCN resistance

Potential combination of traits favoured by Kenyan growers and PCN resistance







## Field trials and farmer attitude surveys

# The new lines performed well in the field in Kenya

- > Yielded well under disease pressure
- Controlled PCN present in the field

# The lines performed well in taste and cooking tests

Included women's groups

Barriers to uptake were investigated

- Availability of and access to seed
- Risk aversion (ability to sell, yield)

**Currently preparing for National List** Trials





### The lines offer a combination of resistance and grower acceptability

## Summary & acknowledgements

PCN is present in all major potato growing regions in the world

# Recent outbreaks in important production areas

- China
- East Africa
- ≻ Idaho

# Resistance is the key to defeating PCN but it must be in varieties growers want to use

As true for Kenya as it is for the US and the UK!





Of BBSRC Impact Acceleration Accounts



