Role of *Rhizoctonia solani* AG 3-PT inoculum source on disease development on potatoes in South Africa

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DEPARTMENT OF PLANT AND SOIL SCIENCES

Potato Pathology
Programme @ UP

eapr
european association for potato research


(A. Pitman, New Zealand)
Rhizoctonia solani
Muzhinji *et al.* 2017 Plant Disease

BACKGROUND

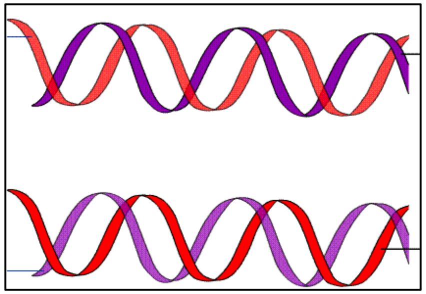
- Inoculum: seed tuber- and/or soil-borne **sclerotia or mycelium**
  - **Basidiospores** during crop closure >> sexual reproduction >> polycyclic nature of disease
- Role of **soil- vs seed tuber-borne inoculum** in disease development: Contentious issue
- **Mark-release-recapture experiments** can provide answers
  - Allow tracking of inoculum sources during disease development >> determine origin of inoculum

Objectives

1. To investigate the contribution of *R. solani* AG 3-PT **seed tuber- and soil-borne inoculum** to disease development

VS

2. To investigate the **evolution** of an experimental population of *R. solani* AG 3-PT under field conditions



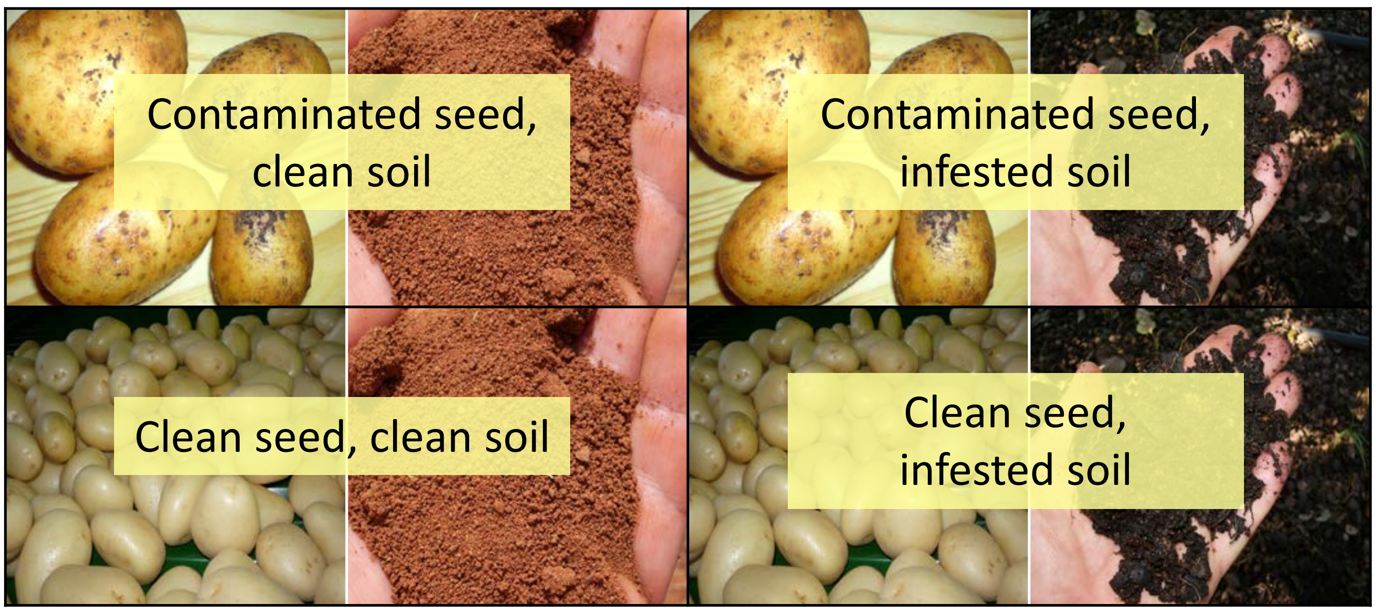
MOTIVATION

The role of each source of inoculum is a contentious issue

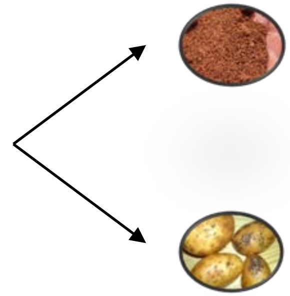
Understanding the contribution of each source of inoculum is an important step in implementing effective **disease management strategies** for *R. solani*

Materials and Methods

- University of Pretoria experimental plots
- RCBD
- Treatments: (4 treatments x 4 reps = 16 plots)

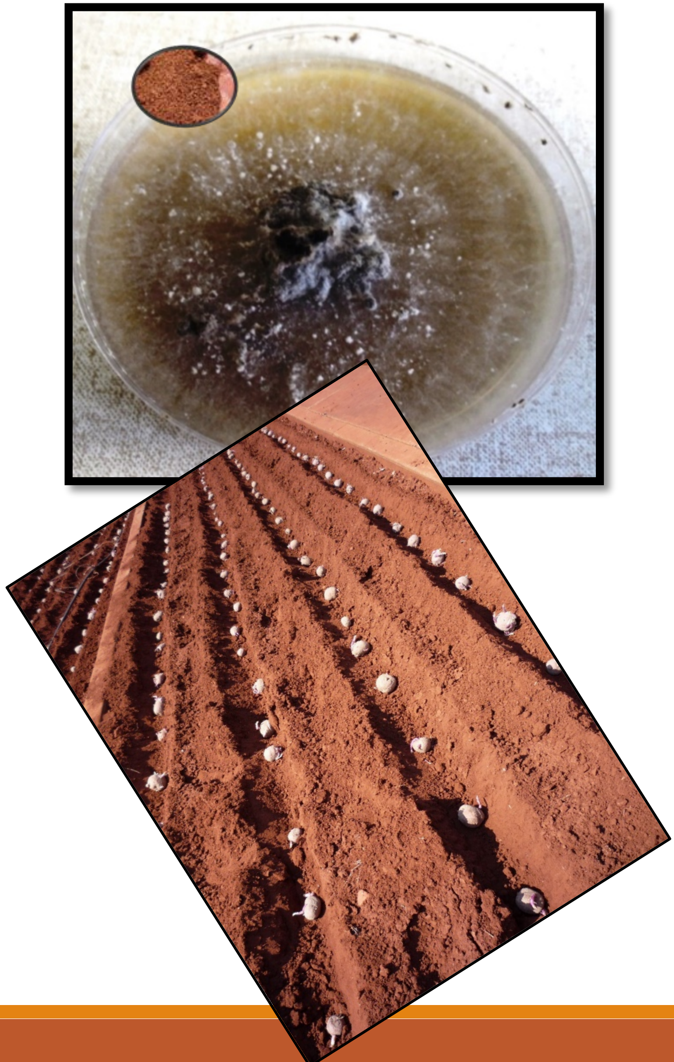


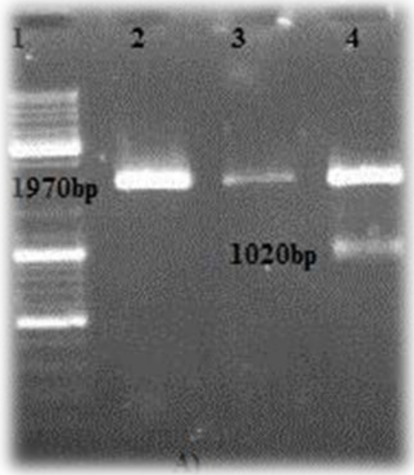
Two distinct MLG groups of *R. solani* AG 3-PT isolates (five isolates per group)

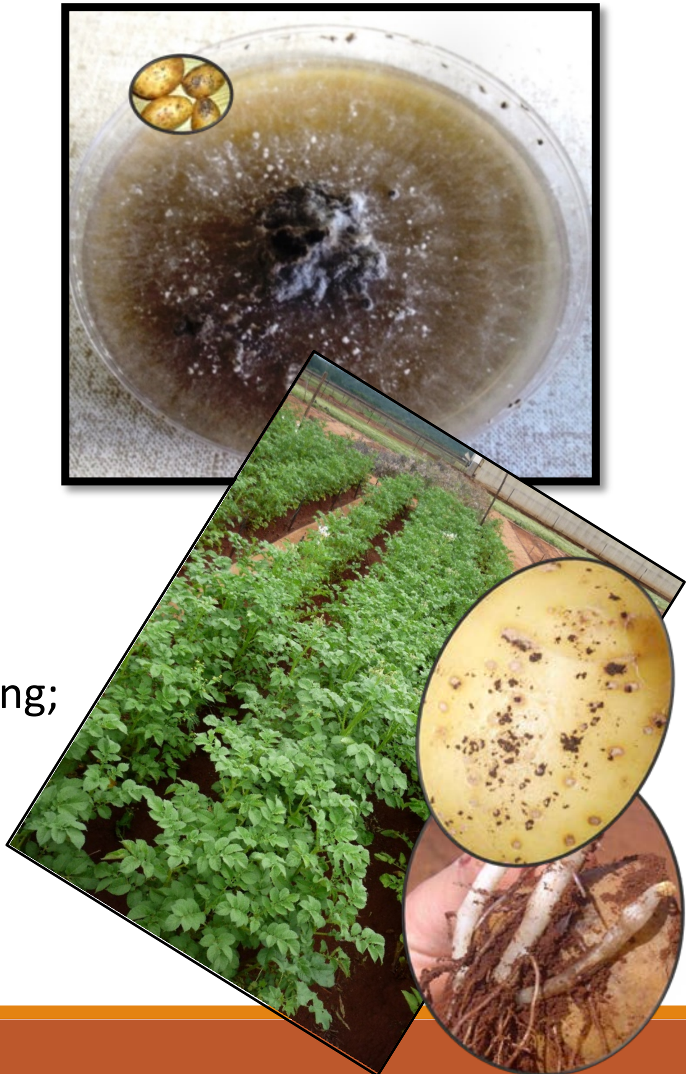


PCR-RFLP profiling

(Ceresini et al. 2002)







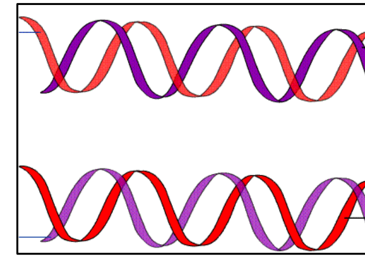
Disease assessments:

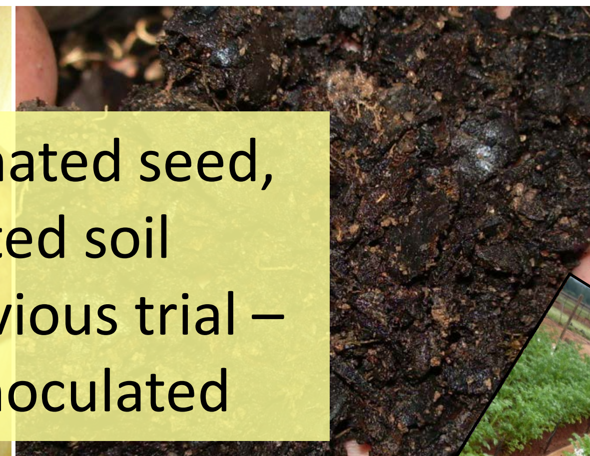
21 & 60 days after planting;

At harvest

Isolations from diseased material

Materials and Methods





Contaminated seed,
infested soil
From previous trial –
not reinoculated

Disease assessments:
60 days after planting;
At harvest
Isolations from diseased material
PCR-RFLP
Microsatellite analysis
(Ferrucho et al. 2009)

Results: Disease index

VS

	Root infection		Stolon canker	
Inoculum source	**2013**	**2014**	**2013**	**2014**
Control	0.0 c*	0.0 c	0.0 d	0.0 d
Soil	14.5 b	10.5 b	8.5 b	15.0 a
Soil and tuber	17.5 a	12.5 a	10.2 a	12.0 b
Tuber	13.0 b	6.0 c	5.0 c	8.0 c

*Duncan's Multiple Range test P = 0.05

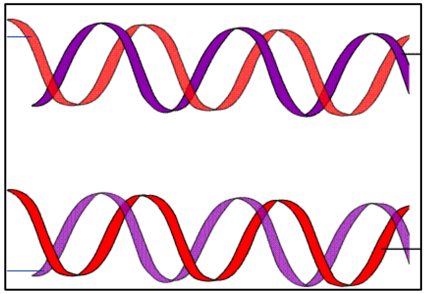
Results: Disease index

VS

	Stem canker		Black scurf	
Inoculum source	**2013**	**2014**	**2013**	**2014**
Control	0.0 d*	0.0	0.0 c	0.0 d
Soil	22.5 c	14.5 c	13.4 b	5.8 c
Soil and tuber	37.0 a	22.5 a	17.6 a	11.3 a
Tuber	29.0 b	17.4 b	12.6 b	7.8 b

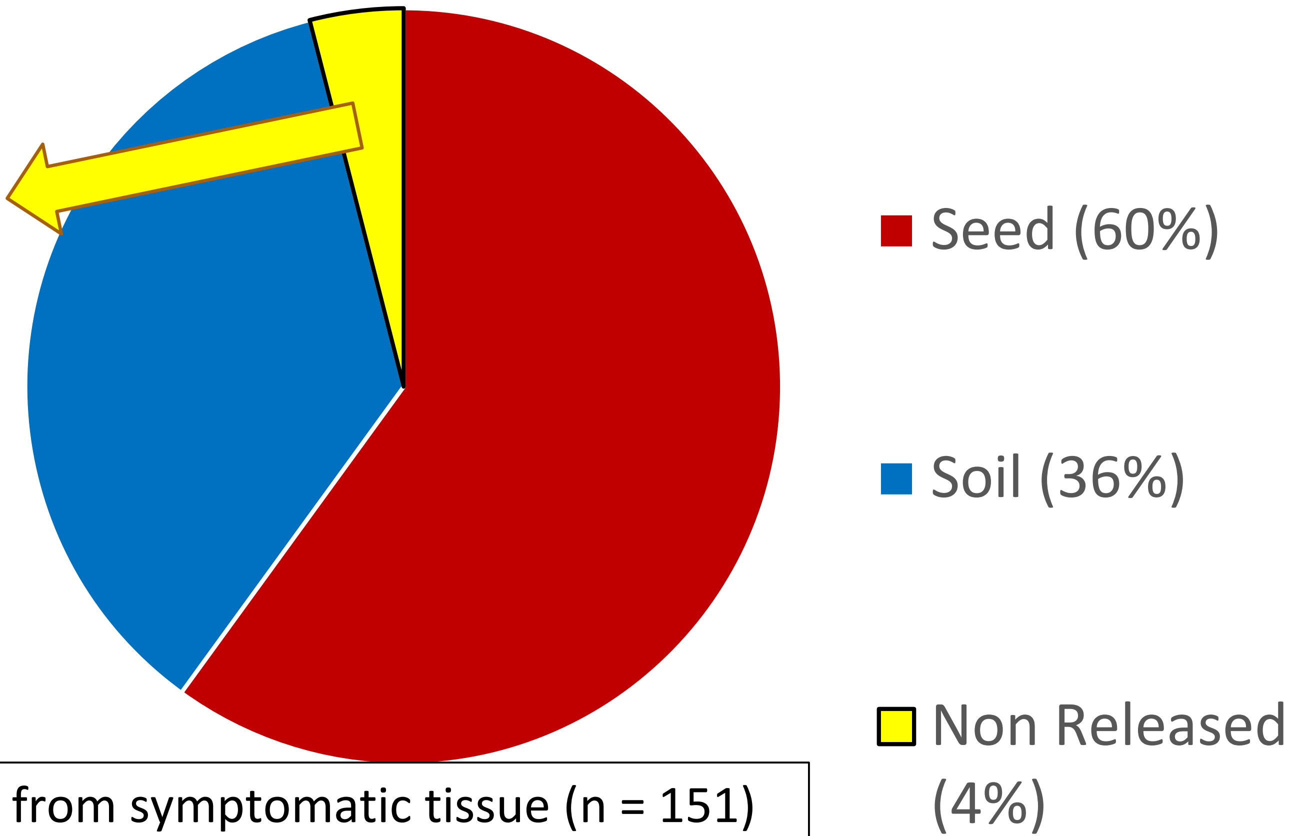
*Duncan's Multiple Range test P = 0.05

Results

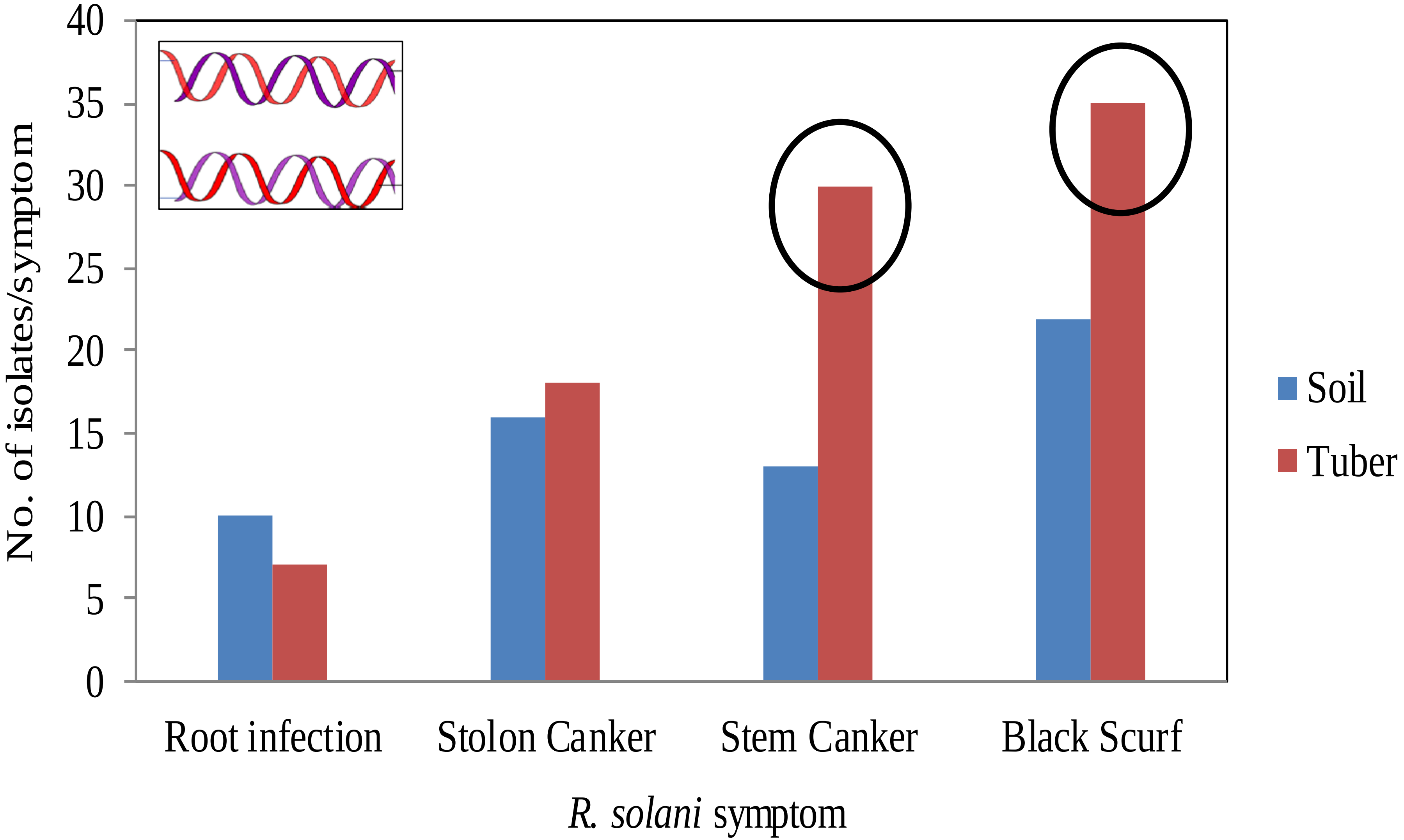


Isolated from plants in plots inoculated with both seed and soil-borne inoculum

Suggests recombination in field



Genotypes of isolates from symptomatic tissue (n = 151)



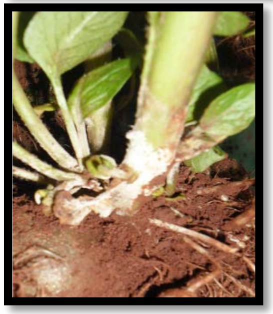
PCR-RFLP genotyping to correlate isolates obtained from symptoms to inoculum source

Conclusions

VS

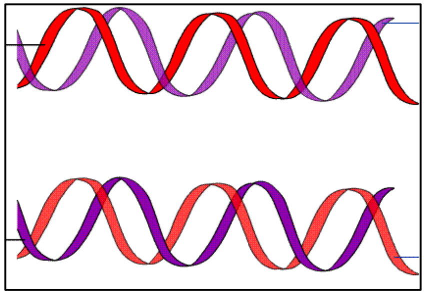
Black scurf: **Seed-borne** inoculum more important

Root & stolon infection: **Soil- and seed-borne** inoculum equally important



Stem canker: **Seed-borne** inoculum more important

Conclusions



Recombination may occur in field under conducive environmental conditions >> gradual **increase in genetic diversity**

Production of **basidiospores** >> initial inoculum

May gradually result in **changes in genetic structure** of field populations from year to year

Ensure the use of **pathogen-free seed tubers** to eliminate seed-borne inoculum and the introduction of new genotypes of *R. solani*
Apply to control measures to **limit development of sexual phase** in field

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BSPP

NRF

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