

Plant & Food
RESEARCH

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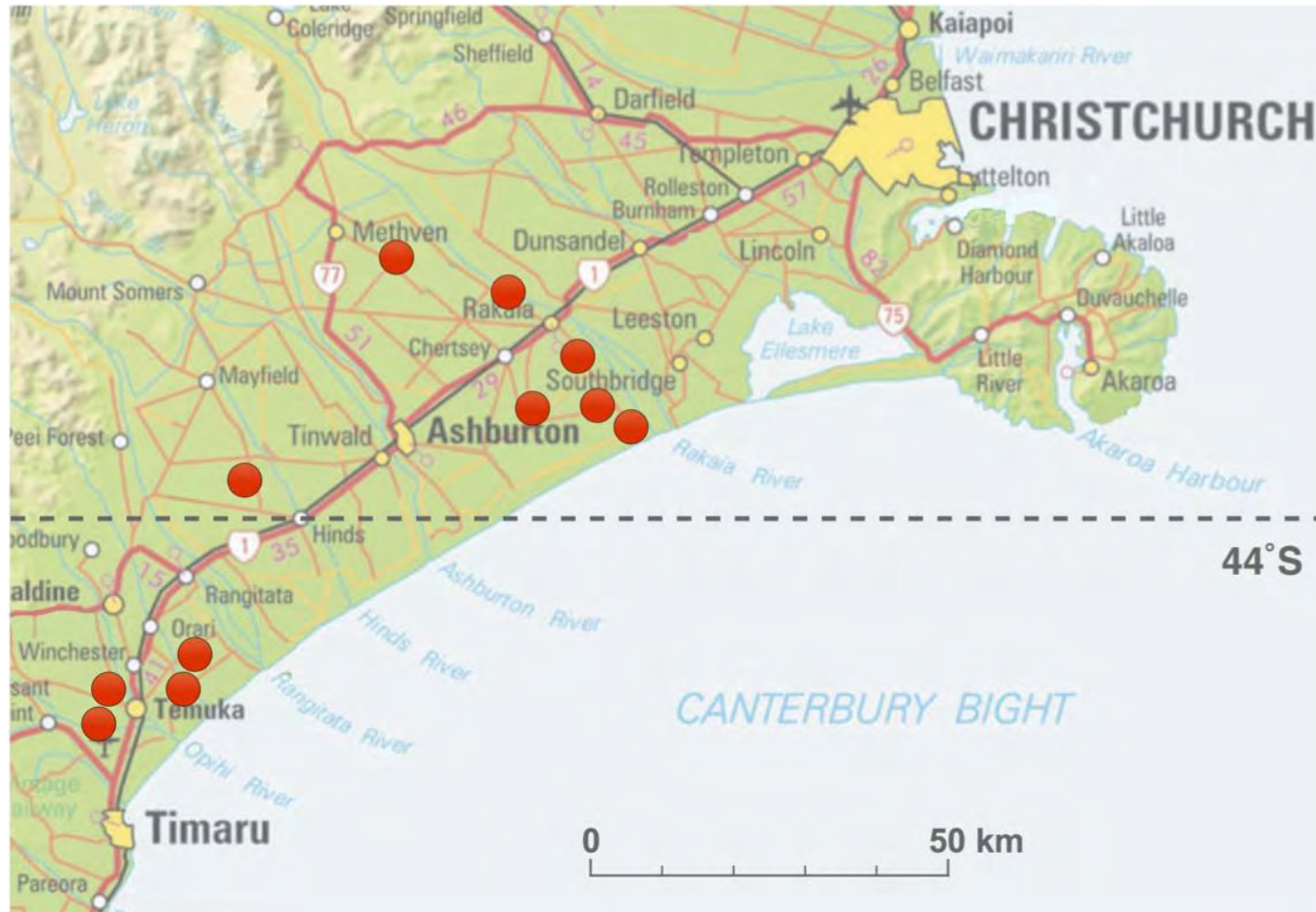
Plant & Food potato physiology and agronomy 26 August 2014

Presented at grower workshop in Ashburton

Latest work

- » 2012-13 — Field survey of 11 commercial potato crops to determine yield loss factors
- » 2013-14 — Field trial to isolate and quantify disease effects
- » 2013-14 — Field trial to compare yield potential from G1-G5 RB and Innovator
- » Juliano Oliviera – physiological seed age, PhD complete.

2012-13 — Field survey sites



2012-13 — Field survey approach

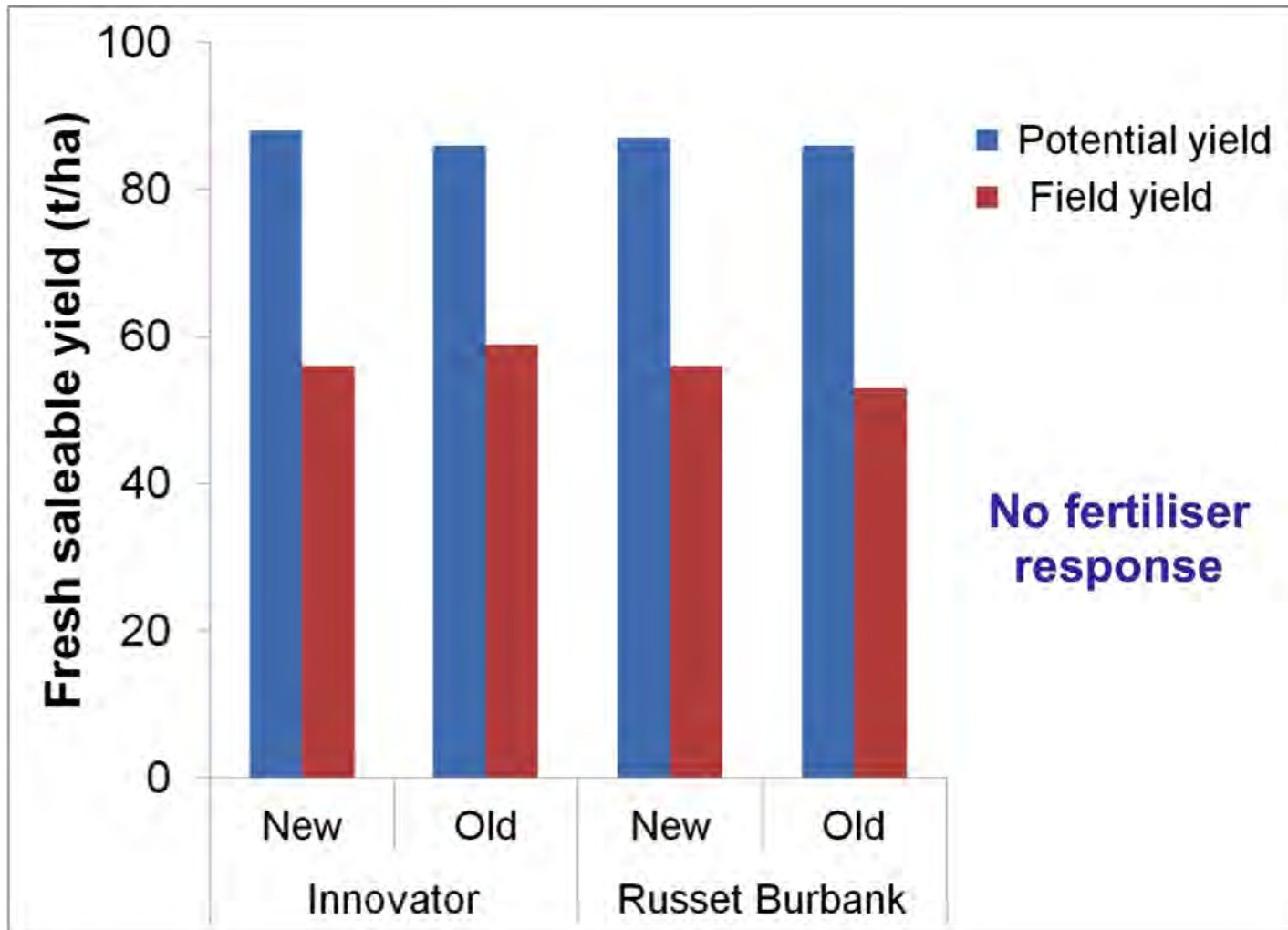
- » 11 Crops — 5 “new ground”, 6 “old ground”
- » ‘Russet Burbank’ (7),
‘Innovator’ (4)
- » Crops assessed
fortnightly
- » Recorded pesticide use
and irrigation schedules



Four fertiliser trials — double application rate



Potential and field yield



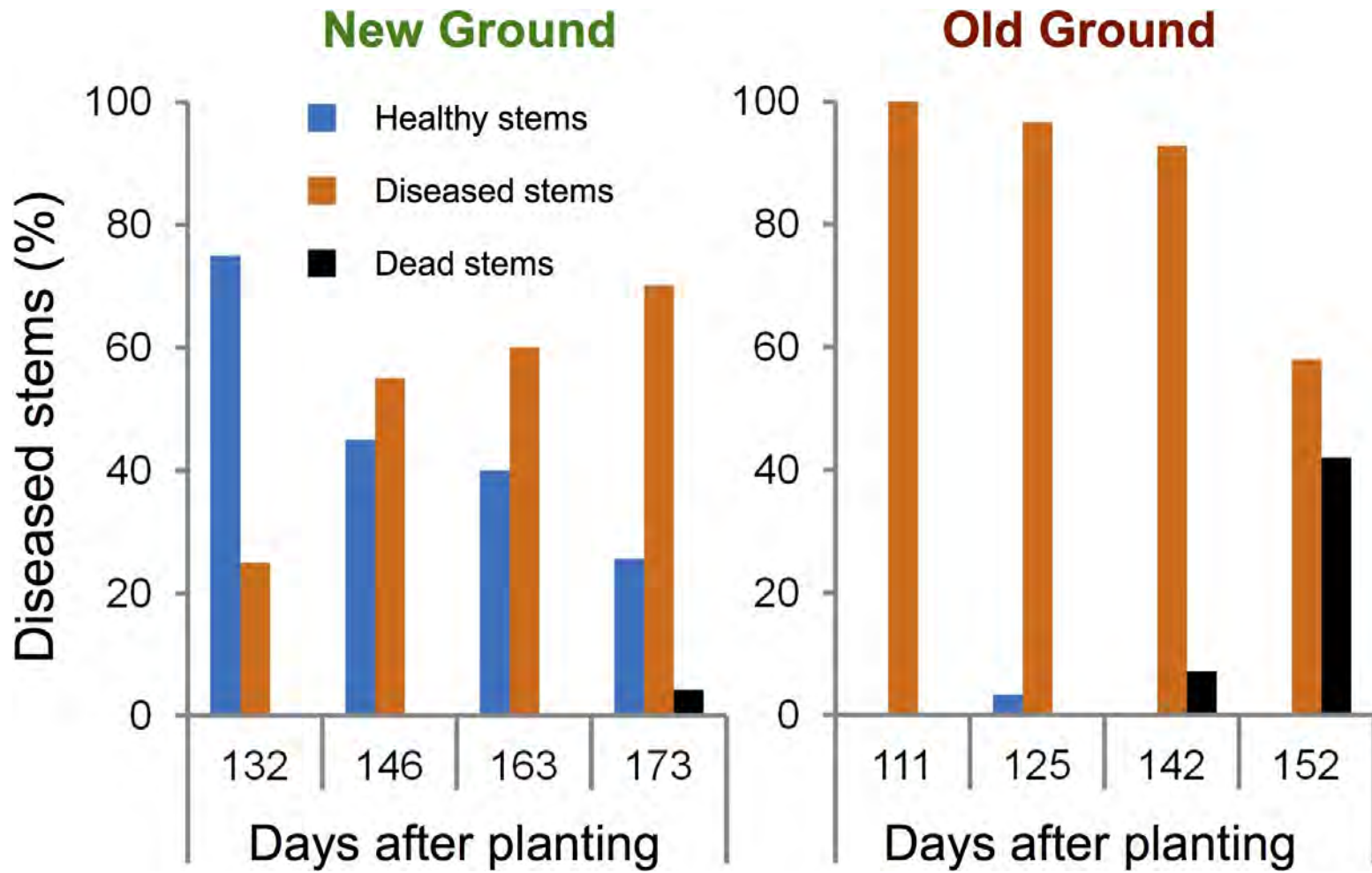
Main factors reducing yield

- » Soil-borne disease
- » Soil compaction — restriction of root growth
- » Poor seed quality
- » Foliar disease
- » Weed competition
- » Irrigation mismanagement

Rhizoctonia stem canker – Found in all crops



Rhizoctonia stem canker incidence



Rhizoctonia stem canker onset

New/old land	Years since potatoes last grown	Dominant land use last 10 yrs	Last crop	Crop emergence to disease onset (wks)
Old	8	Grass	Grass	→ 8
New	>10	Crop	Grass	→ 8
Old	7	Crop	Grass	→ 6
New	>10	Crop	Grass	→ 5
New	>10	Grass	Onions	→ 5
New	>10	Crop	Wheat	→ 5
Old	8	Grass	Wheat	→ 4
Old	5	Crop	Wheat	→ 4
New	>10	Crop	Wheat	→ 3
Old	4	Crop	Onions	→ 2
Old	5	Crop	Wheat	→ 0

Rhizoctonia stem canker onset

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Spongospora root galls

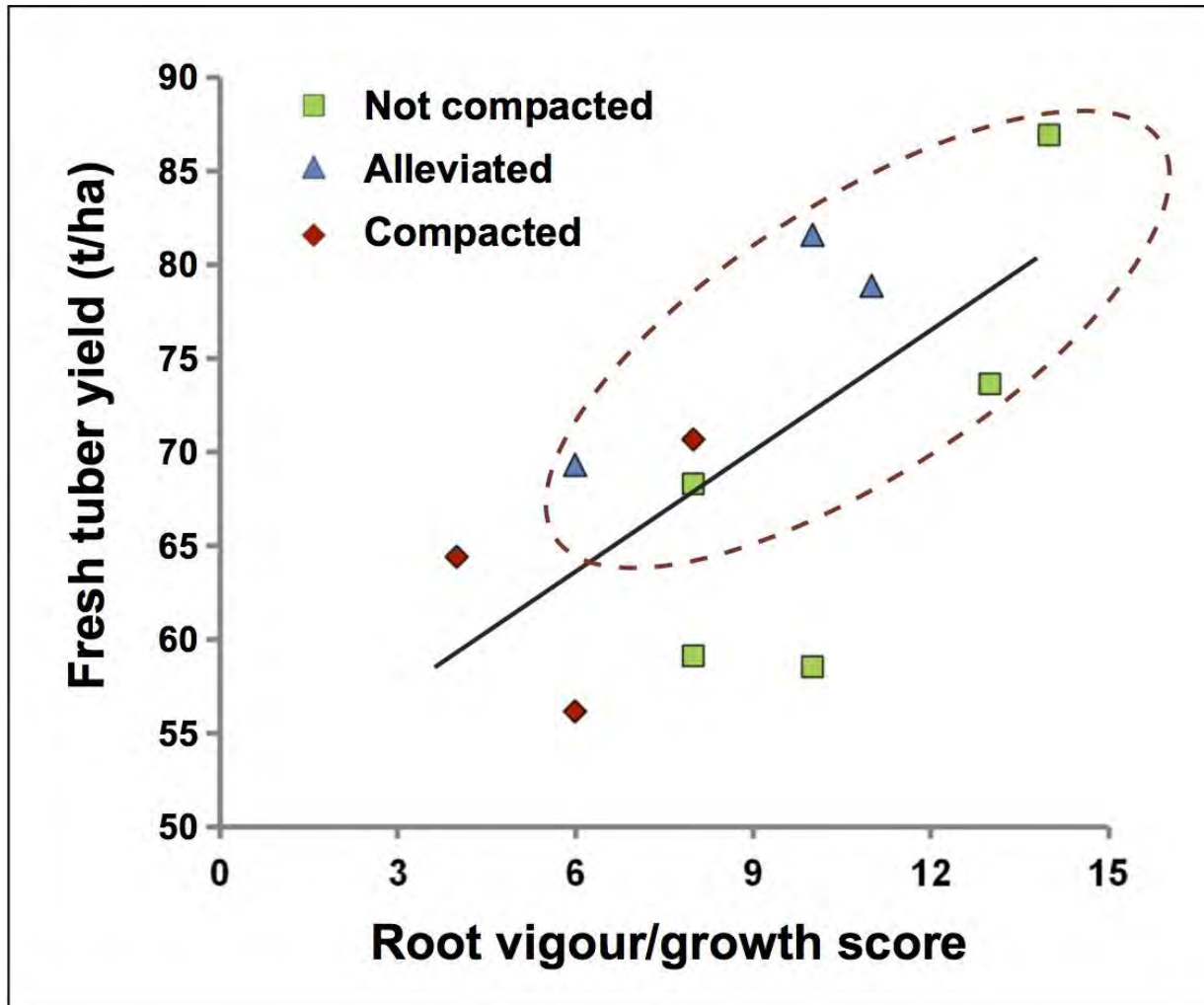


Spongospora root galls

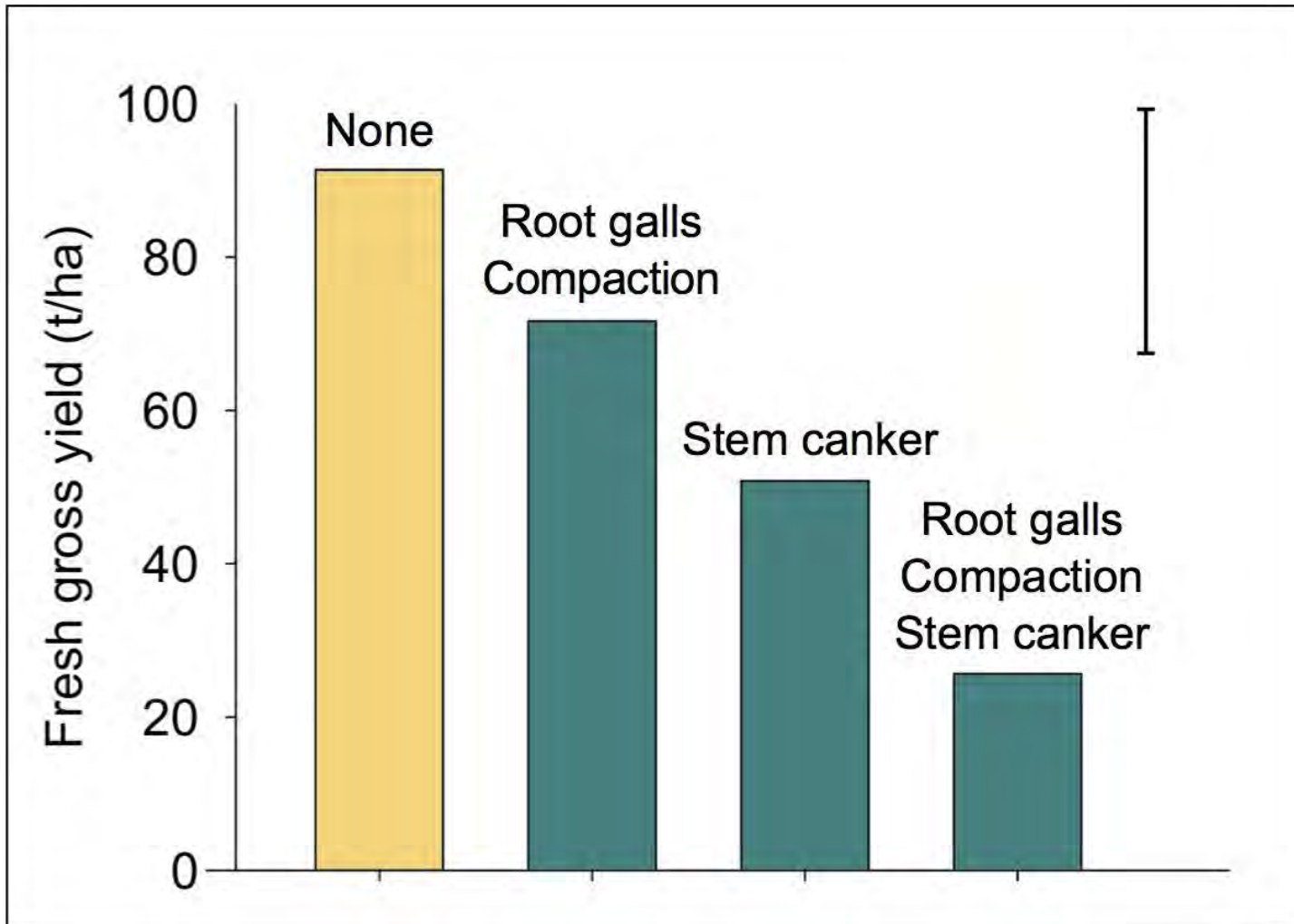
- » Root galls in 6 of the 11 crops
- » 5 of the 6 in old ground
- » This disease associated with old ground



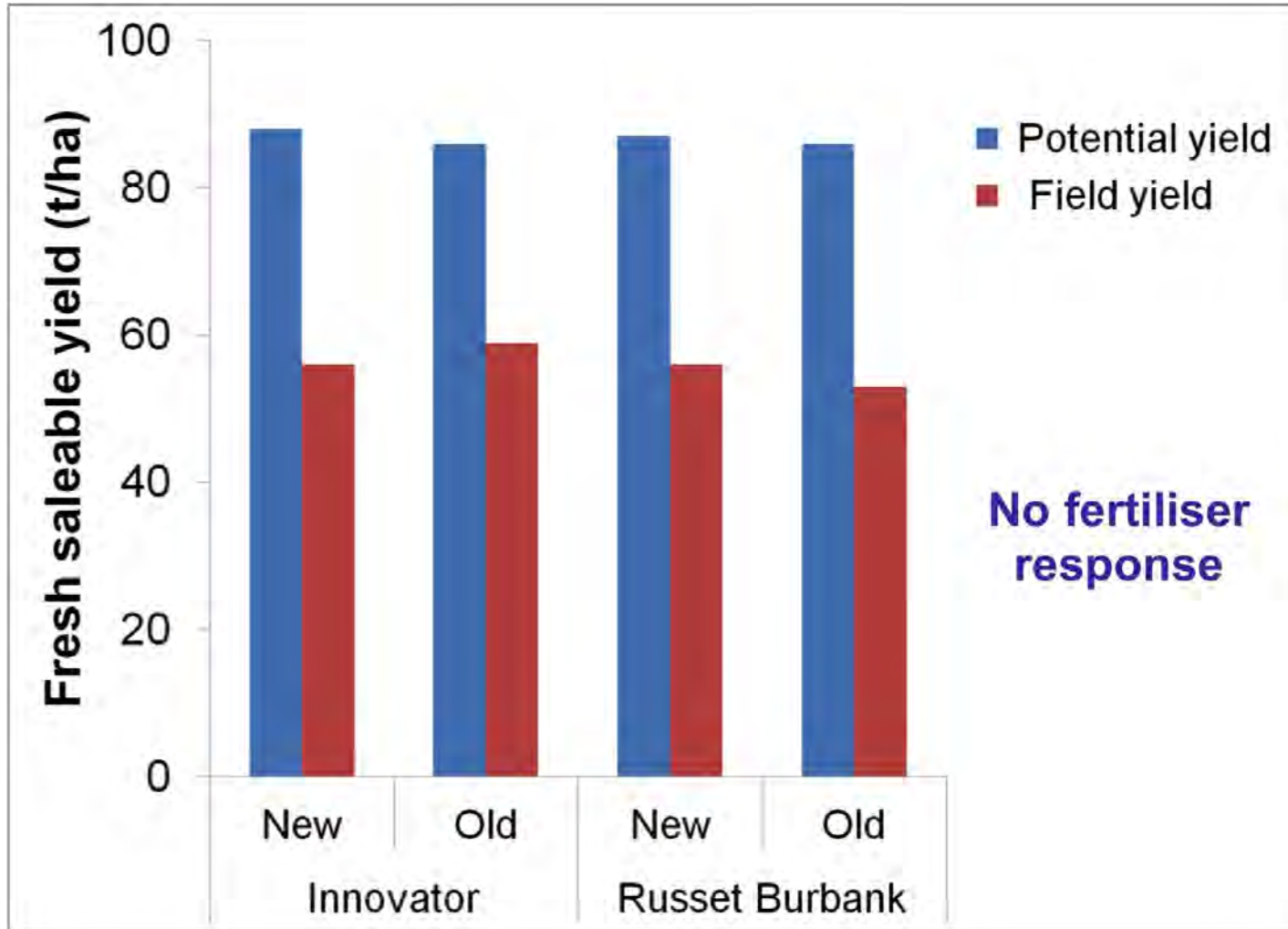
Yield vs root growth / vigour



Factors limiting yield in selected plants



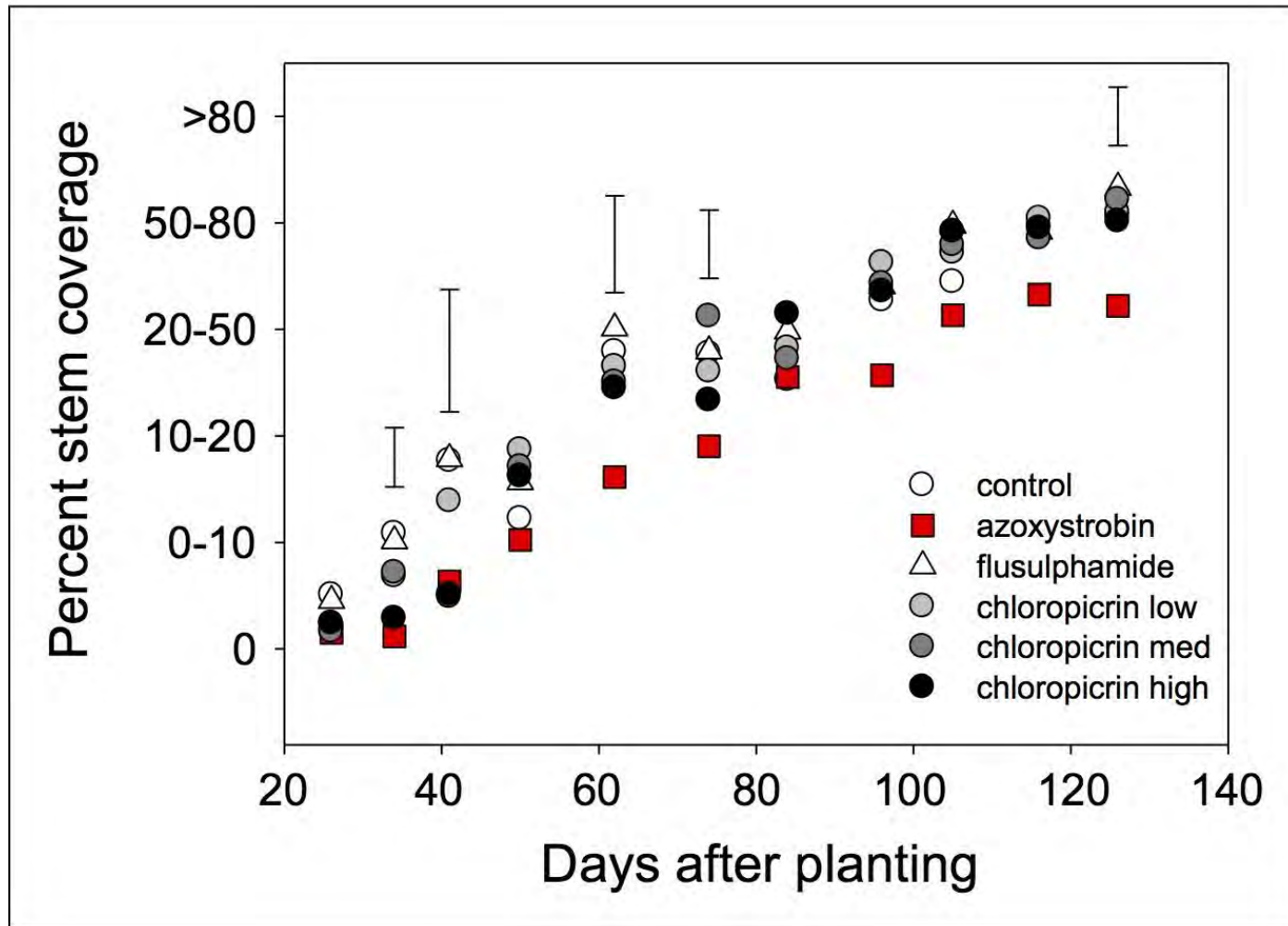
Potential and field yield



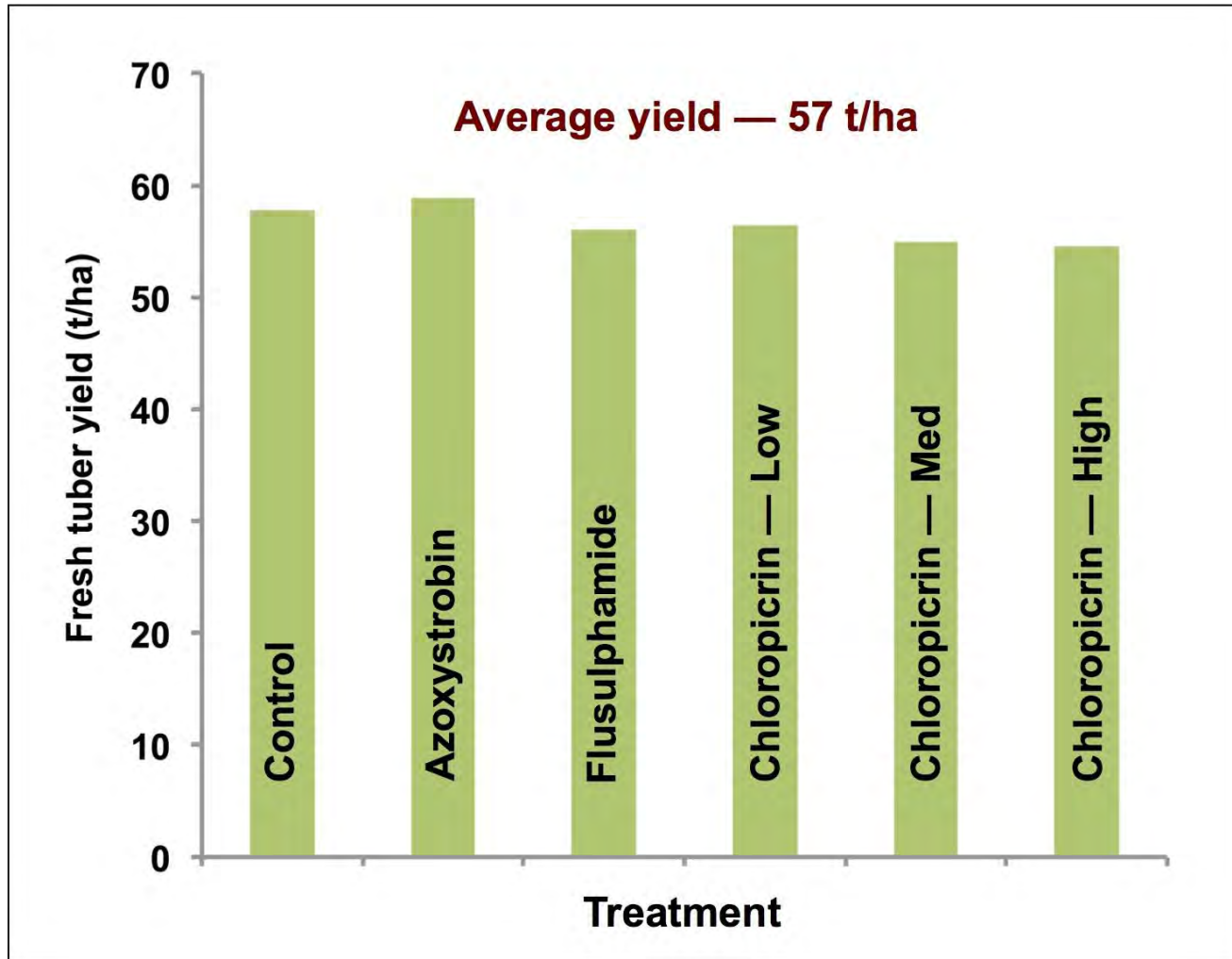
Fumigation — First time for potatoes in Canterbury



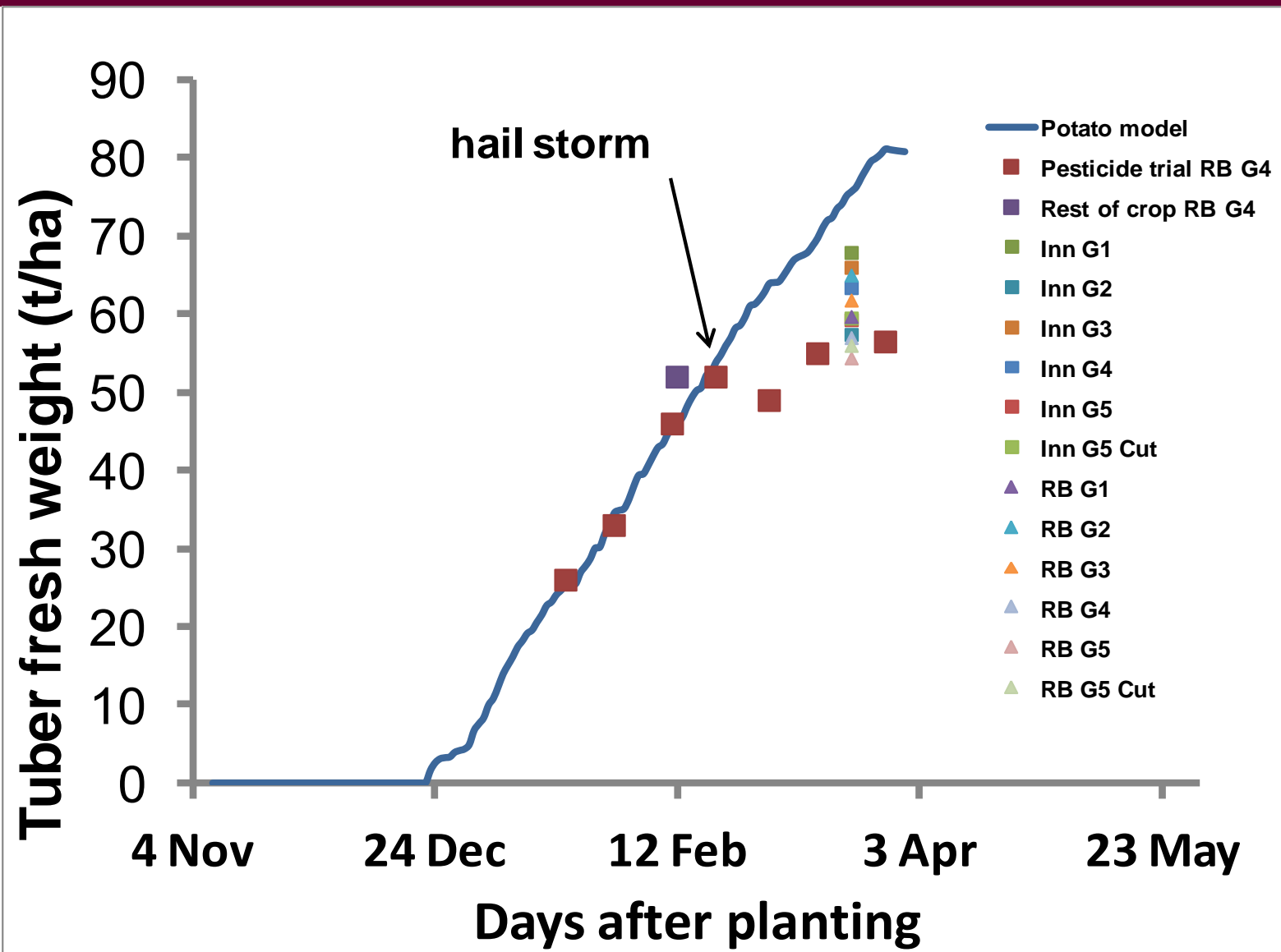
Rhizoctonia stem canker severity



Final yields



Pesticide and generation trials – final yield



Juliano's PhD – Understanding the effect seed physiological age on yield and yield distribution.

- » Locally bred and grown cultivars used - issues
- » Bondi – high yields but tubers too large.
- » Fraser – high quality crisp, resistant to cold induced sweetening but low yields.
- » Winter seed storage usually 2-4 °C March to September.
- » Storage requirements vary with cultivar.

Juliano's PhD - Manipulating seed physiological age

- » Non-limiting conditions for Bondi, Fraser and RB to benchmark growth and development under usual storage conditions.
- » Range of storage regimes: ground, shed, chiller
- » Warm up: 1 month and 3 month
- » Sprouts on sprouts off.
- » To test outer limits, lab expt with a wide range of storage temperatures (4-20°C) and time periods (3 Aug planting-8 months Jan planting)

Juliano's PhD — Main findings

- » Benchmark expt: Bondi 66 t/ha, Fraser and RB 52 t/ha, same canopy development and growth but different radiation use efficiency.
- » Bondi also had high sink strength, but Fraser low, and with long stolons which delayed tuber initiation.
- » Sprout removal increased stem number (Bondi +1 stem)
- » Apical dominance patterns different
- » Storage expts: temperature accumulation 200-2000 °Cd but no difference in plant establishment or tuber size distribution (potential savings in storage costs).

Juliano's PhD – Main findings

- » Bondi final tuber size could be manipulated by increasing stem number:
 - Store at ambient temp over winter (cost reduction!)
 - grow early seed crops (eg Pukekohe)
 - or use ethylene, giberellic acid
- » Fraser – yields will always be limited by low sink strength, long stolons. Remediation probably not possible.
- » Try and breed for high radiation use efficiency and short stolons.

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Future

- » Monitoring high producing crops
- » SFF disease, soil compaction, biofumigation?
- » Continuation of seed phys age work.
- » N leaching under veg crops (incl potatoes) SFF already underway.
- » Fungicide resistance worry
- » Look at different cultivars?