

Evaluation of cultivar susceptibility to powdery scab in field trials in South Africa

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Denkeleiers • Leading Minds • Dikoaopolo tsa Dihlathe

“Confidence is the feeling you sometimes have before you fully understand the situation.”

Unknown

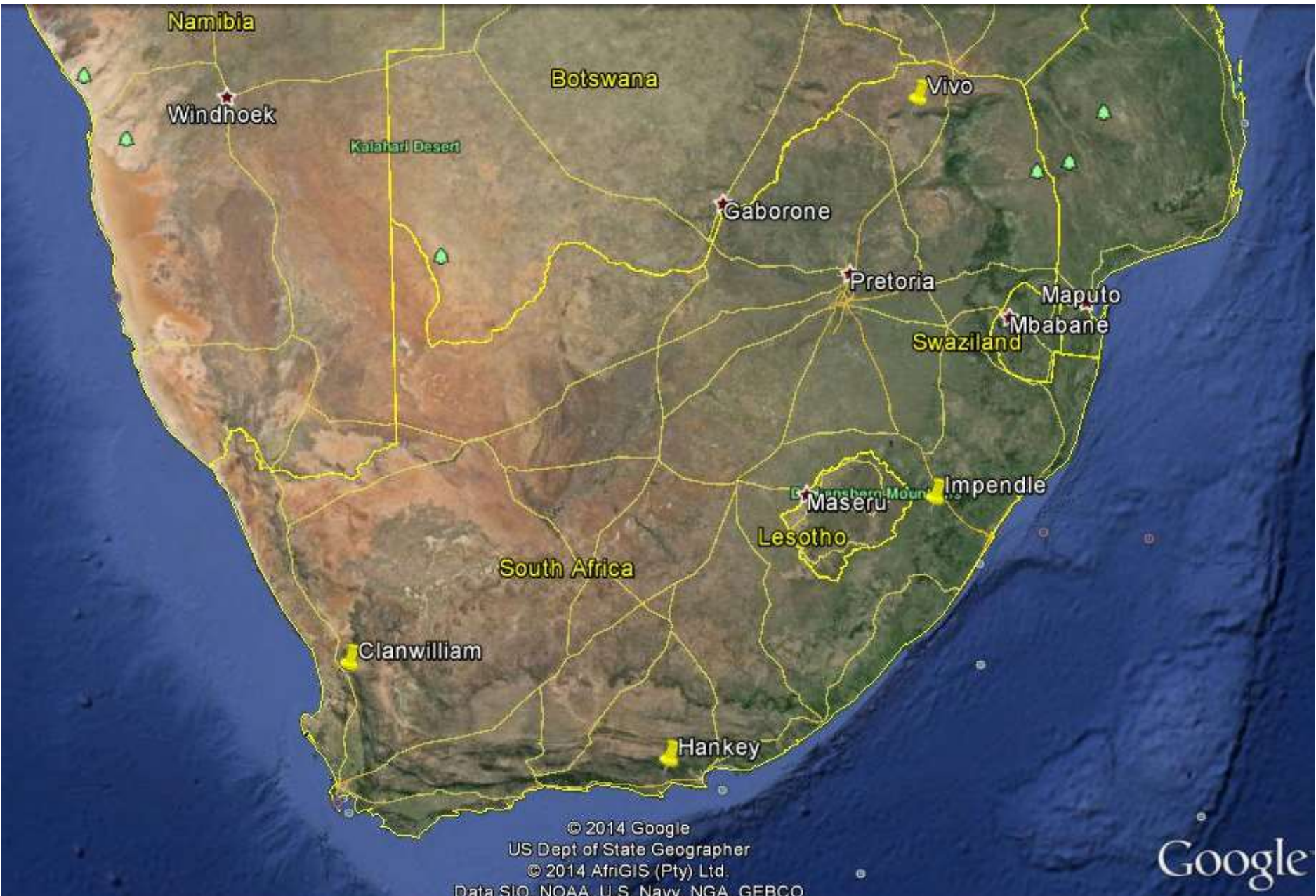


Field trials

- 5 field trials planted from 2011 – 2013
- Planted in naturally contaminated fields on commercial farms in four different locations
- Total of 23 cultivars, not all in every trial
- Four repetitions, blocked

Road																				
	1	2	3	4	5	6	7	8	9	10	6	10	5	3	9	8	7	1	2	4
5m width																				
50m length																				
	9	5	3	6	8	10	4	1	2	7	8	7	1	10	3	5	6	9	4	2

Cultivar	Location	Location	Location	Location	Location
Almera		KZN 2012	Sandveld 2012	Hankey 2013	
Avalanche		KZN 2012	Sandveld 2012	Hankey 2013	
BP1	KZN 2011	KZN 2012		Hankey 2013	
Challenger	KZN 2011				
Diva					Vivo 2013
Electra		KZN 2012	Sandveld 2012		
Elmondo					Vivo 2013
Eos					Vivo 2013
Fianna	KZN 2011	KZN 2012	Sandveld 2012	Hankey 2013	Vivo 2013
Harmony	KZN 2011	KZN 2012			
Kikko		KZN 2012	Sandveld 2012	Hankey 2013	
Konsul	KZN 2011				
Lanorma					Vivo 2013
Marimba			Sandveld 2012	Hankey 2013	
Markies	KZN 2011				
Mondial	KZN 2011	KZN 2012		Hankey 2013	Vivo 2013
Nectar		KZN 2012	Sandveld 2012	Hankey 2013	
Nicola			Sandveld 2012		
Savanna		KZN 2012	Sandveld 2012	Hankey 2013	
Sifra	KZN 2011			Hankey 2013	
Synergy					Vivo 2013
Triomf					Vivo 2013
Valor	KZN 2011	KZN 2012	Sandveld 2012	Hankey 2013	Vivo 2013



Namibia

Botswana

Vivo

Windhoek

Kalahari Desert

Gaborone

Pretoria

Maputo

Mbabane

Swaziland

Impendle

Maseru

Lesotho

South Africa

Clanwilliam

Hankey

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Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google



Rating scale – root galls

(www.spongospora.ethz.ch/LaFretaz/scoringtablegalls.htm)

Root galling per plant:

Standard scoring scale

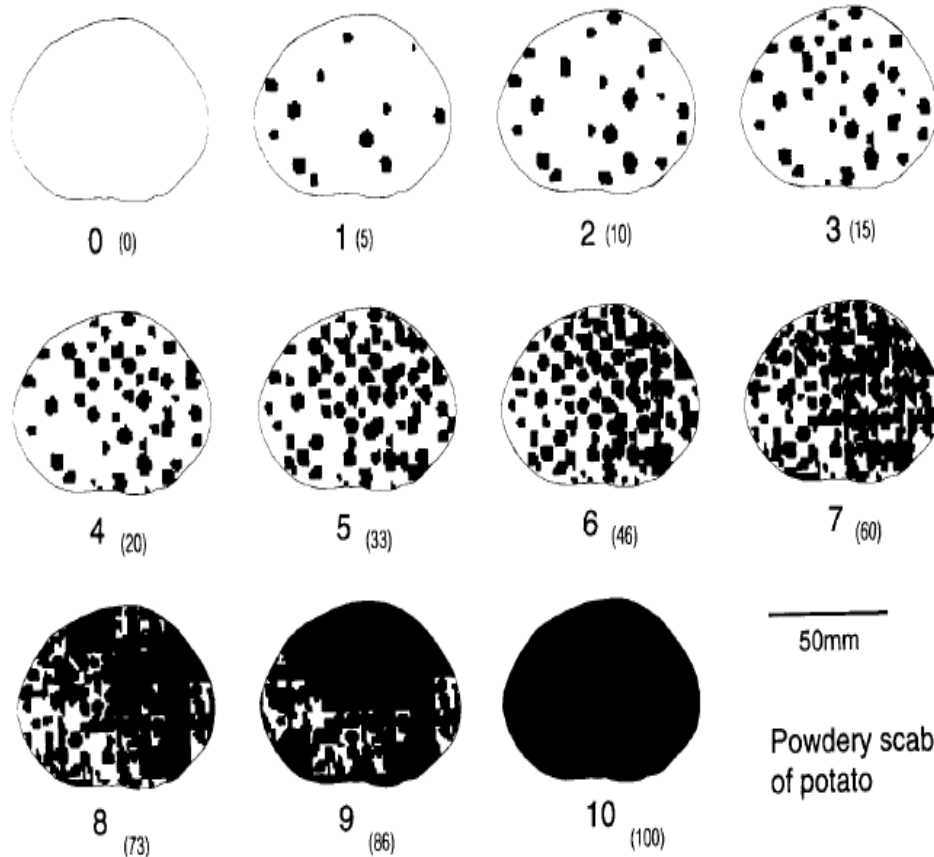
- 0 = no galls
- 1 = 1-2 galls
- 2 = 3-10 galls
- 3 = >10 galls, mostly clusters
- 4 = many galls, regularly distributed

(Sampled 6 weeks after emergence)

Disease index was calculated for each treatment by multiplying disease incidence with mean disease severity (Houser & Davidson, 2010)







Disease index was calculated for each treatment by multiplying disease incidence with mean disease severity (Houser & Davidson, 2010)

Rating scale – tuber lesions

(Falloon *et al.*, 1995)

Heronvale, Impendle KZN 2011

Sept 2011 – March 2012



Planting Sept 2011



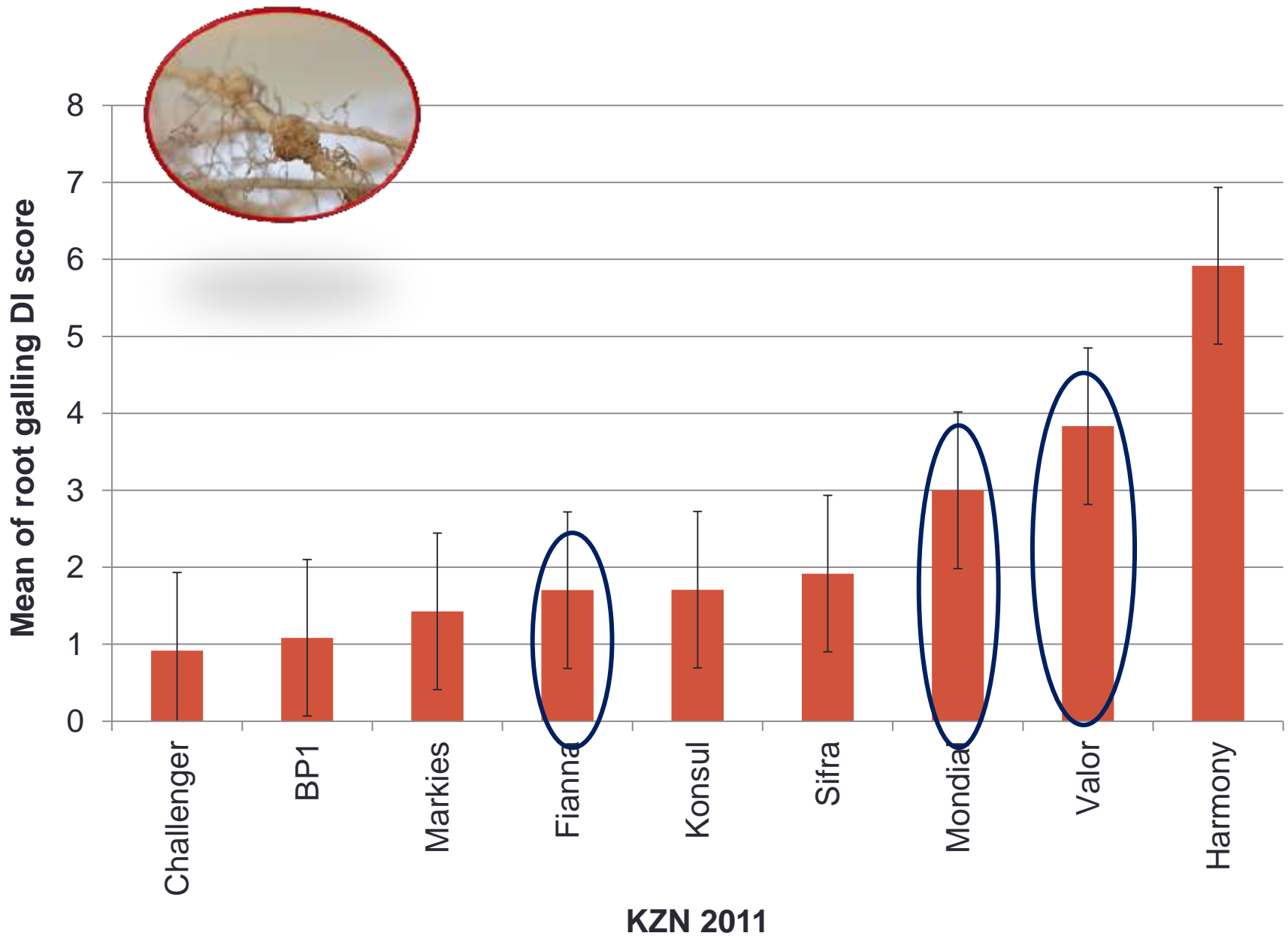
10 cultivars; 4 reps each



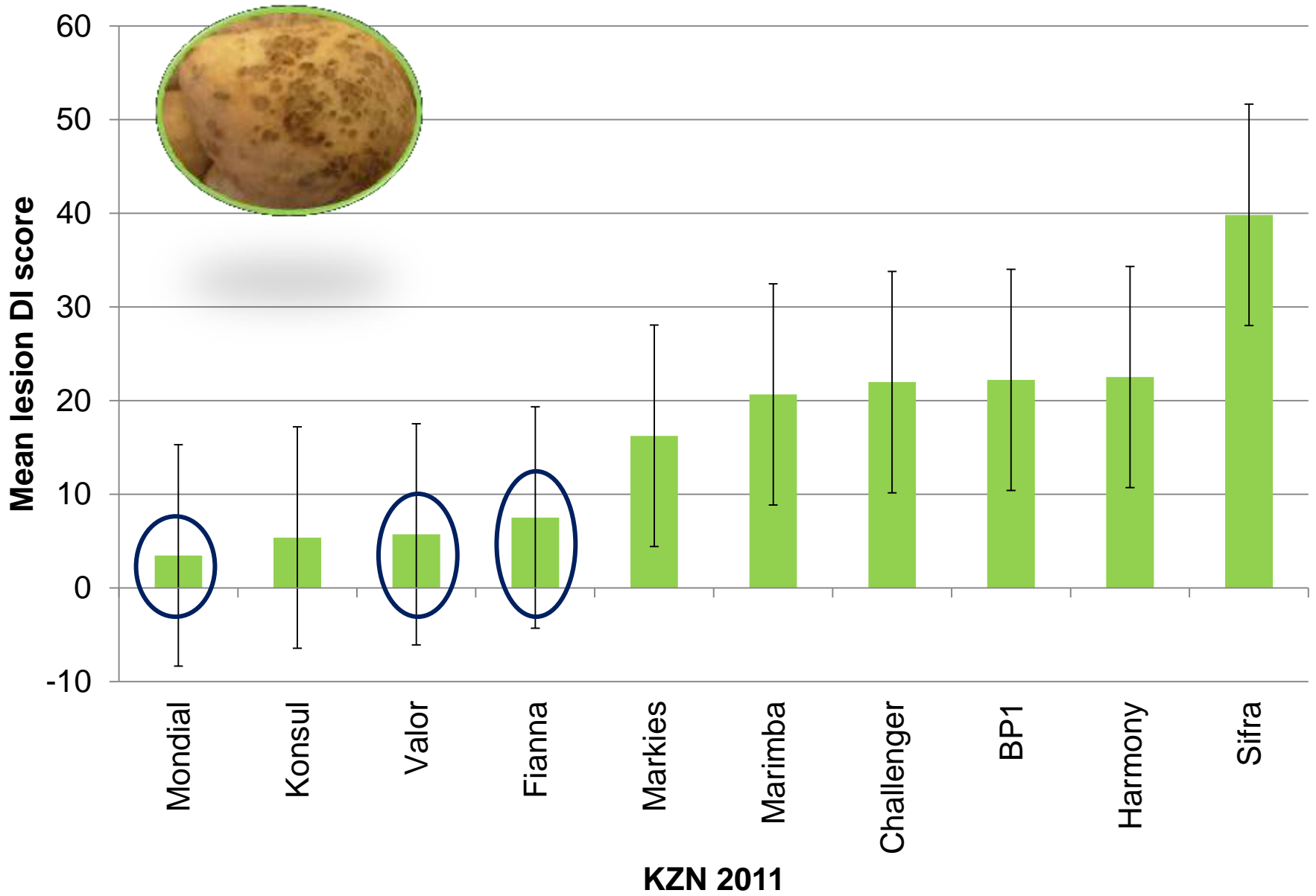
**Gall sampling Oct 2011;
3 plants per block (total 120)**



**Lesion evaluation March 2013;
50 tubers per block (total 2000)**



Mean index of root galls on cultivars planted at Heronvale (Sept 2011 – March 2012); $p=0.284$ NS



Mean disease index of tuber lesions on cultivars planted at Heronvale (Sept 2011 – March 2012); $p=0.257$ NS

Die Berg, Clanwilliam Sandveld 2012

June 2012 – December 2012



Planting Aug 2012



10 cultivars; 4 reps each

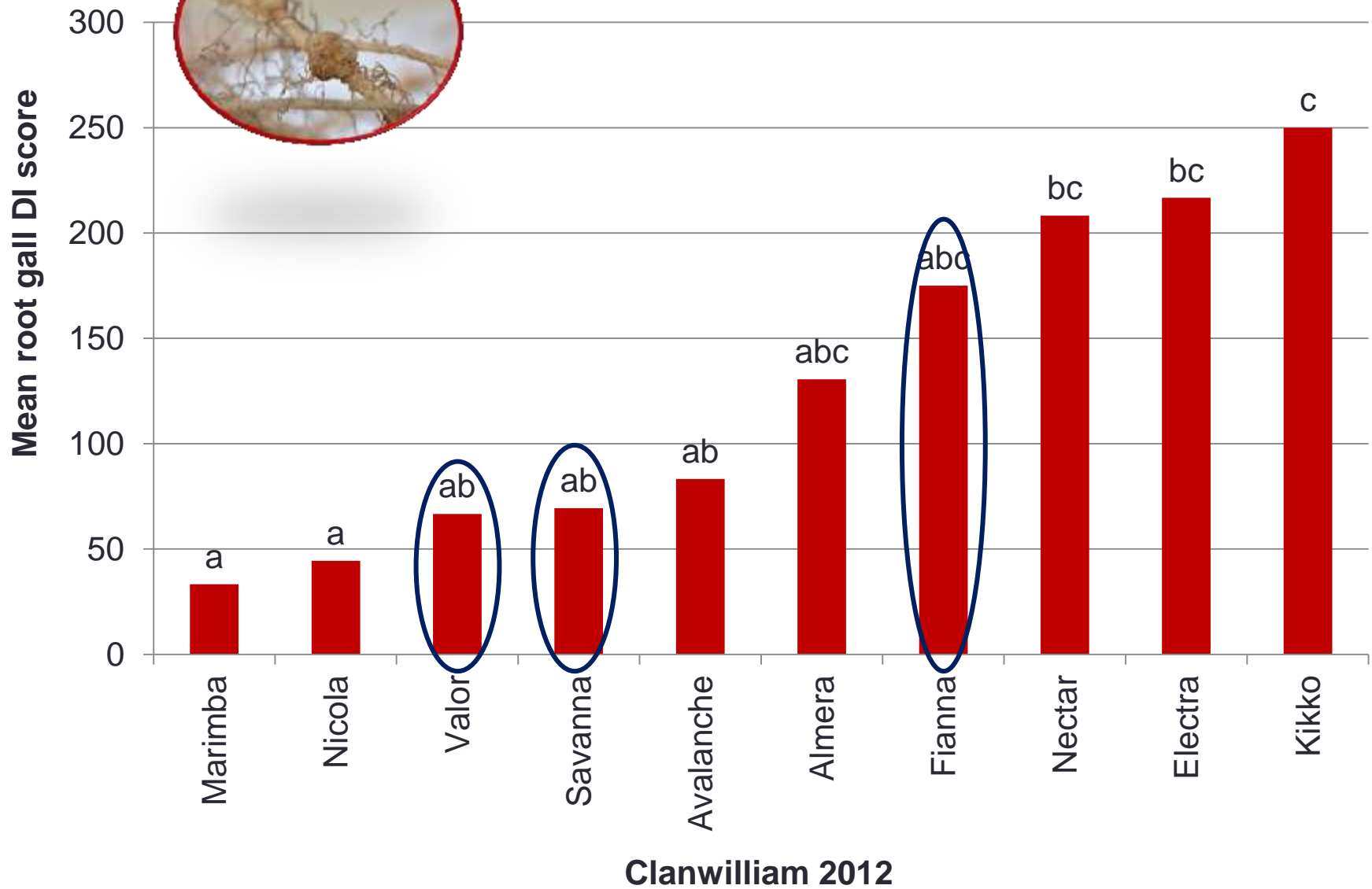


**Gall sampling Sept 2012;
3 plants from each block
(total 120)**

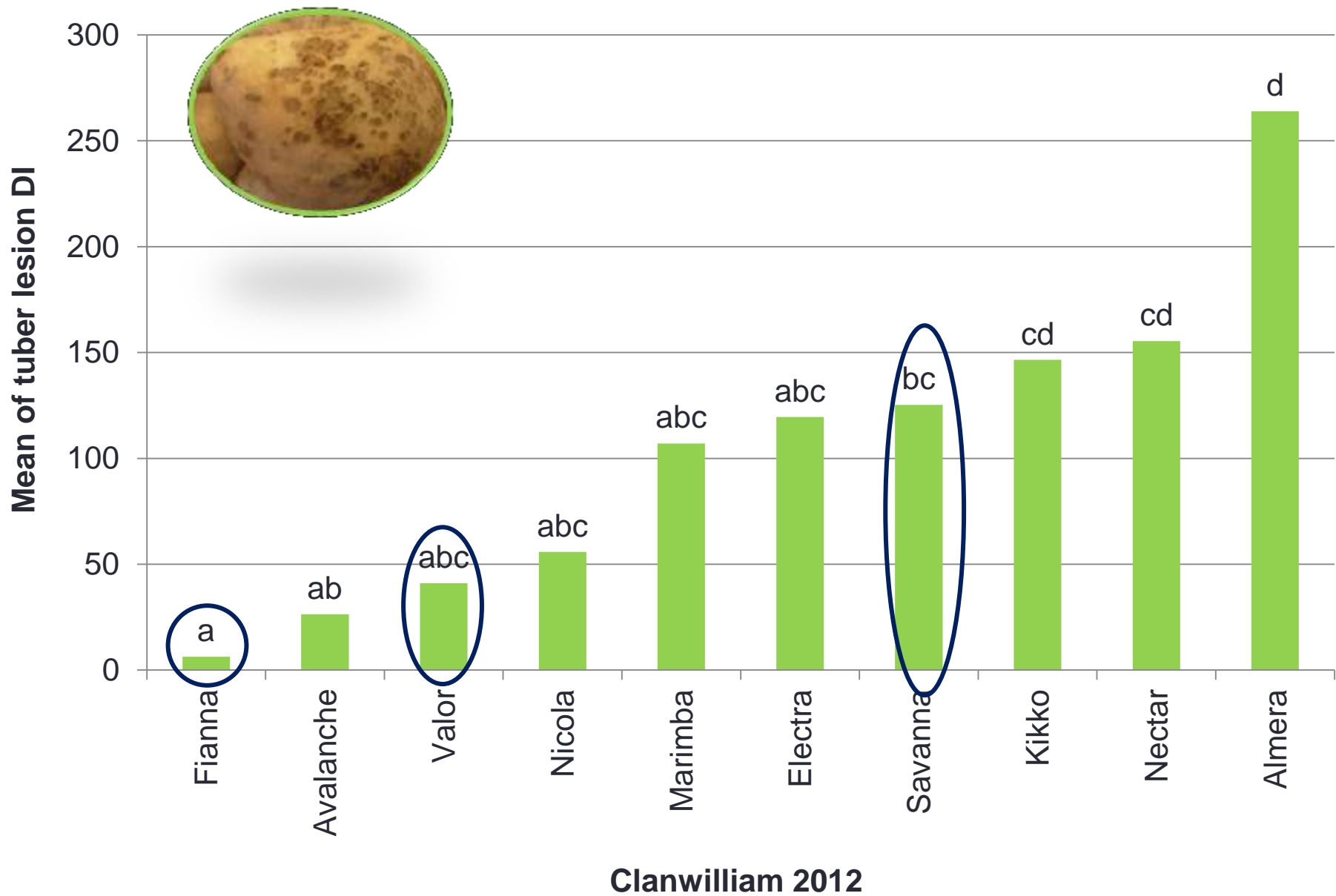


**Lesion evaluation Feb 2013;
50 tubers from each block
(total 2000)**





Mean index of root galls on cultivars planted at Die Berg (June – Dec 2012); $p=0.005$



Mean disease index of tuber lesions on cultivars planted at Die Berg (June – Dec 2012); $p < 0.001$

Heronvale, Impendle KZN 2012

Oct 2012 – March 2013



Planting Aug 2012



12 cultivars; 4 reps each



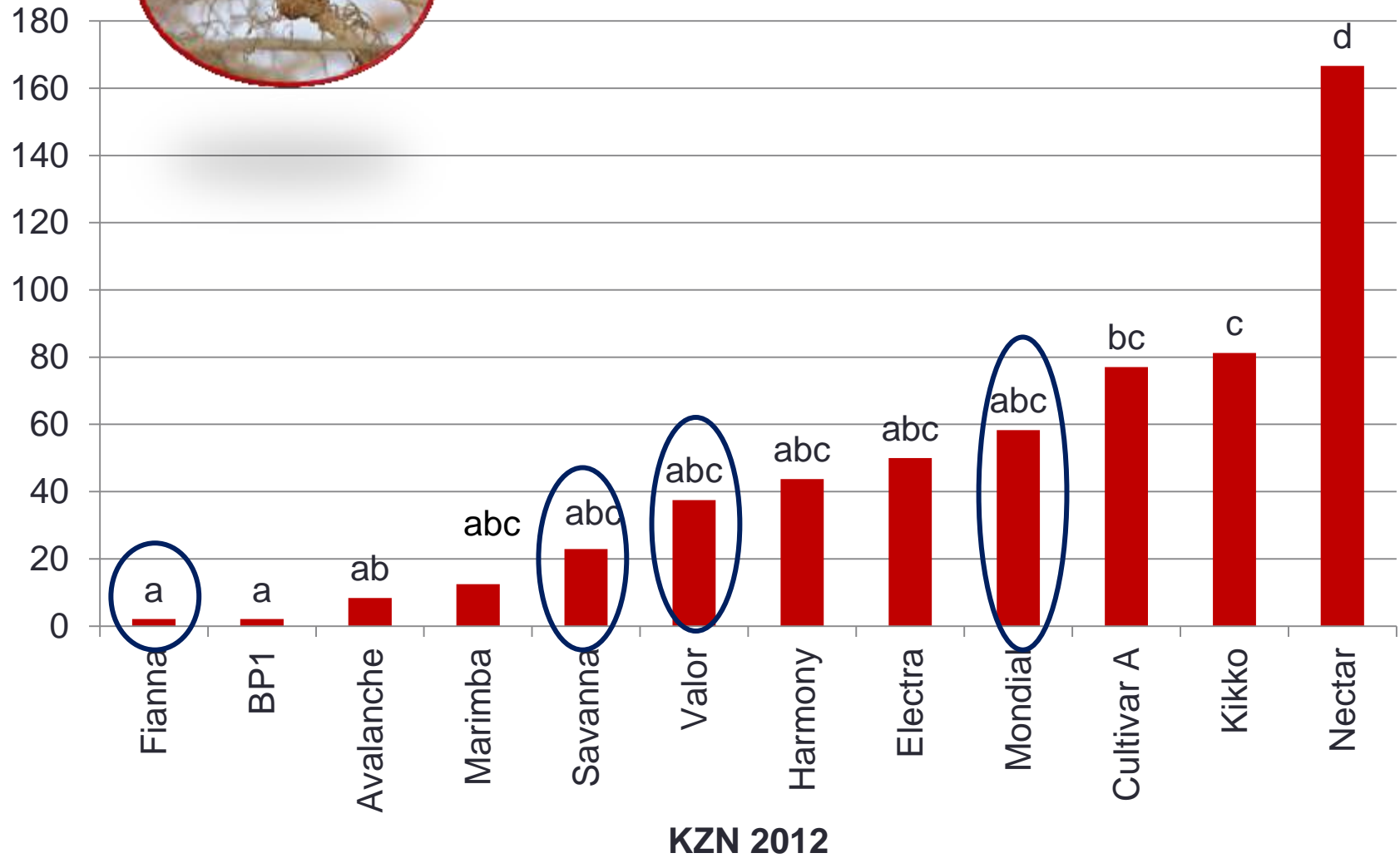
**Lesion evaluation April 2013;
50 tubers from each block (total
2400)**



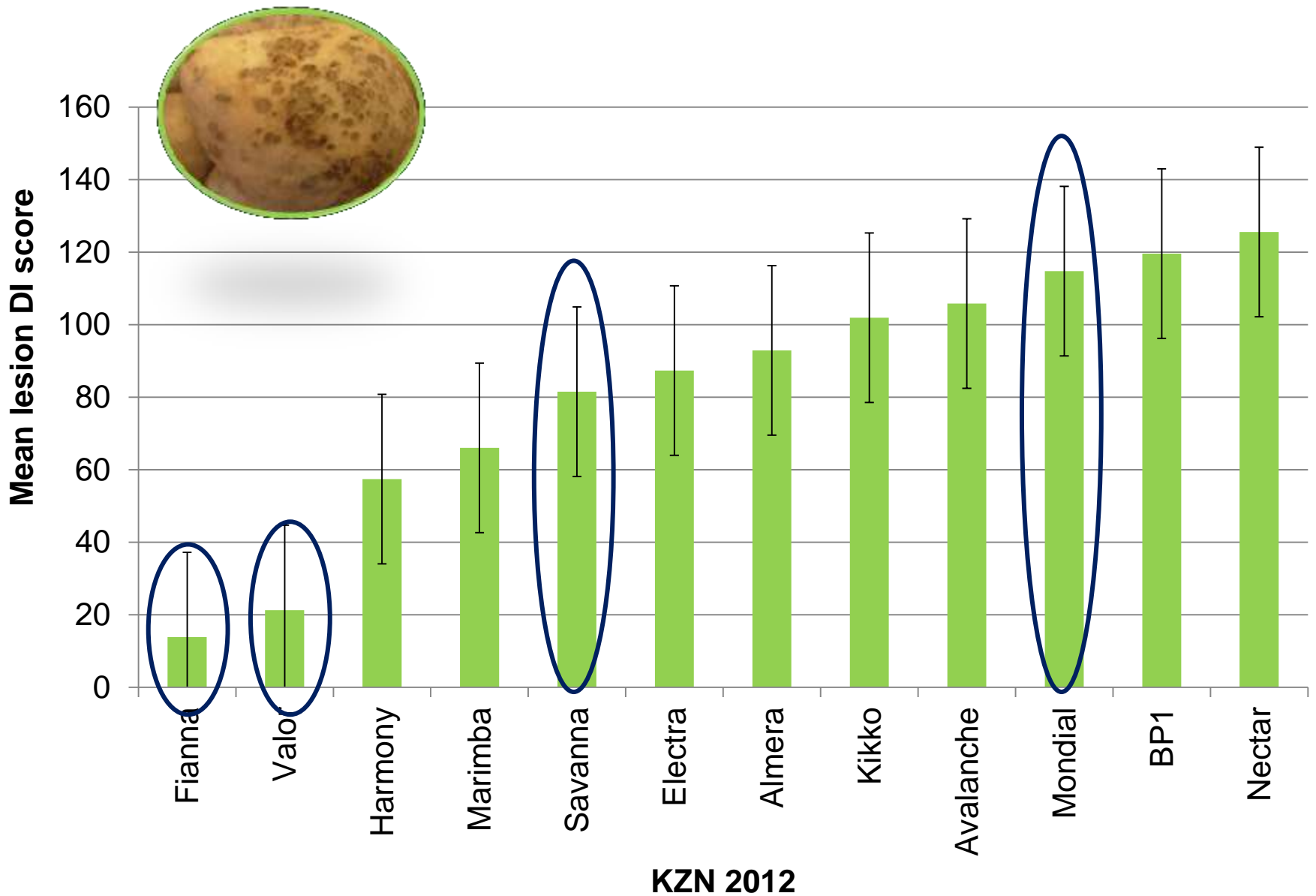
POWERSHOP SCAN

Block	Cultivar	Rep	Lesion Score
1	1	1	1
1	1	2	1
1	1	3	1
1	1	4	1
1	2	1	1
1	2	2	1
1	2	3	1
1	2	4	1
1	3	1	1
1	3	2	1
1	3	3	1
1	3	4	1
1	4	1	1
1	4	2	1
1	4	3	1
1	4	4	1
1	5	1	1
1	5	2	1
1	5	3	1
1	5	4	1
1	6	1	1
1	6	2	1
1	6	3	1
1	6	4	1
1	7	1	1
1	7	2	1
1	7	3	1
1	7	4	1
1	8	1	1
1	8	2	1
1	8	3	1
1	8	4	1
1	9	1	1
1	9	2	1
1	9	3	1
1	9	4	1
1	10	1	1
1	10	2	1
1	10	3	1
1	10	4	1
1	11	1	1
1	11	2	1
1	11	3	1
1	11	4	1
1	12	1	1
1	12	2	1
1	12	3	1
1	12	4	1

Mean root galling DI scores



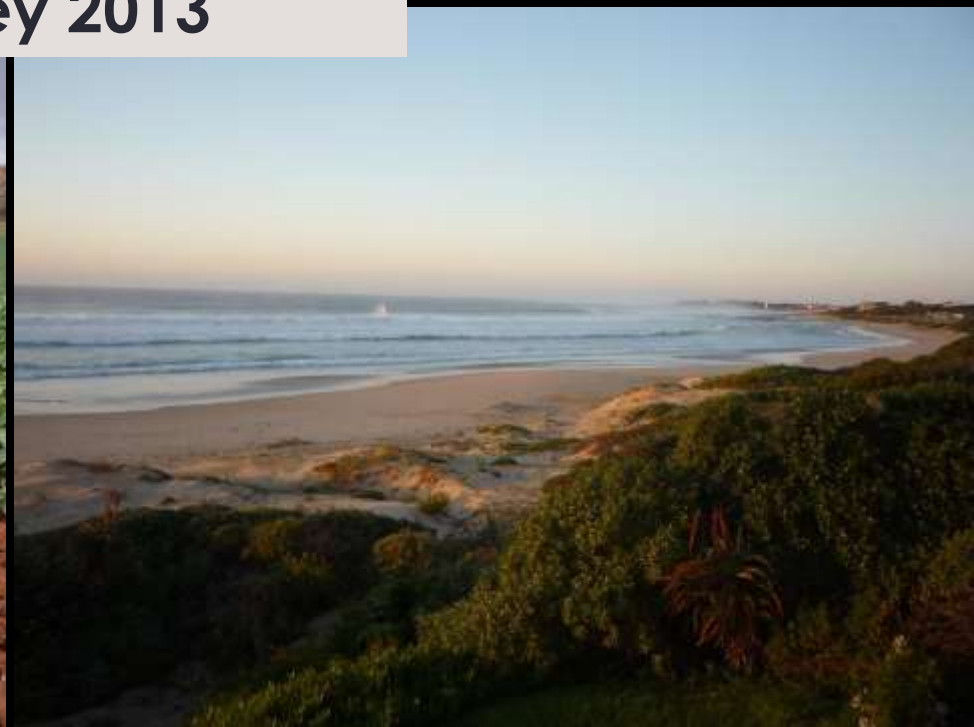
Mean index of root galls on cultivars planted at Heronvale (Sept 2012 – March 2013); $p < 0.001$

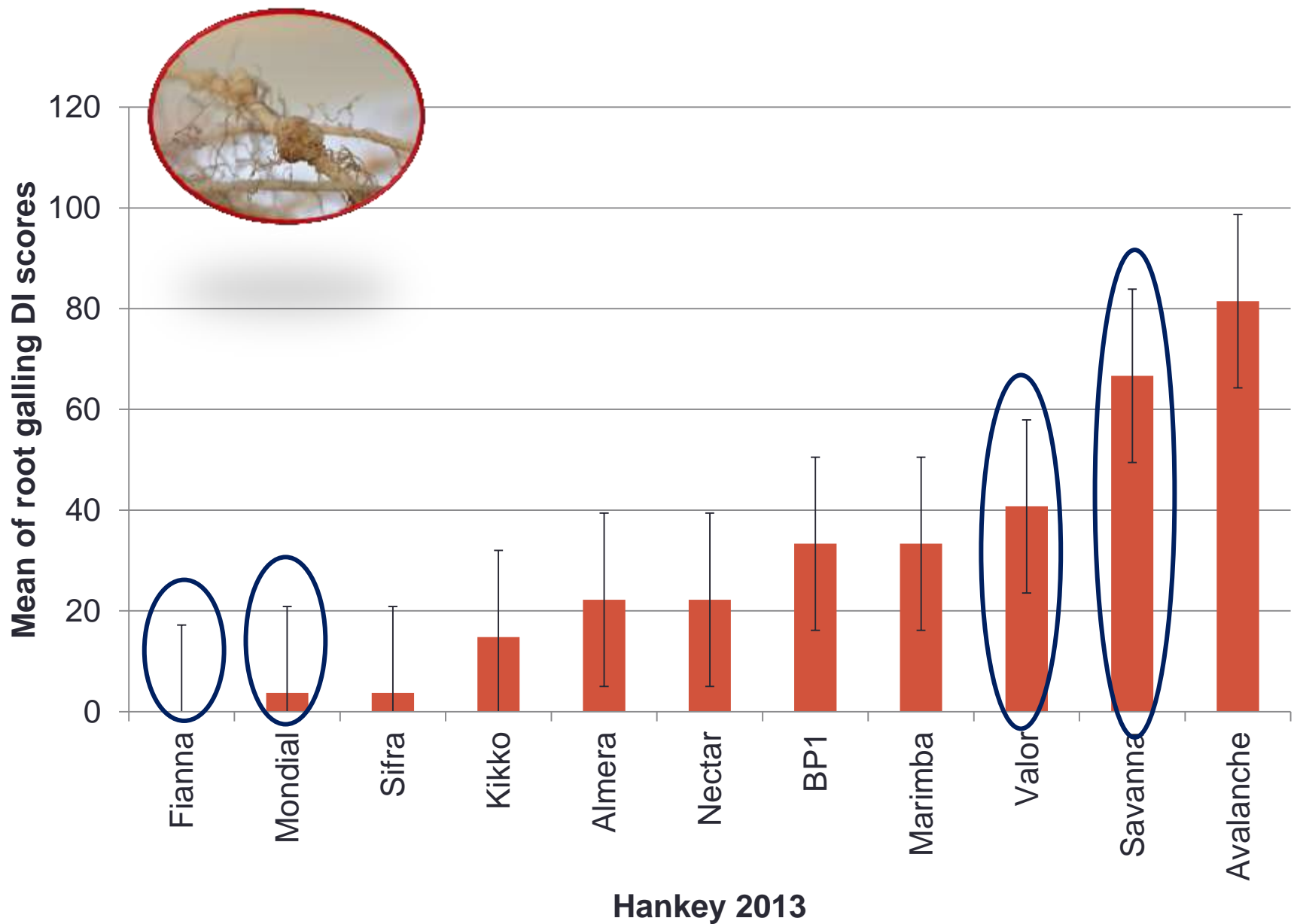


Mean disease index of tuber lesions on cultivars planted at Heronvale (Sept 2012 – March 2013); $p=0.023$ NS

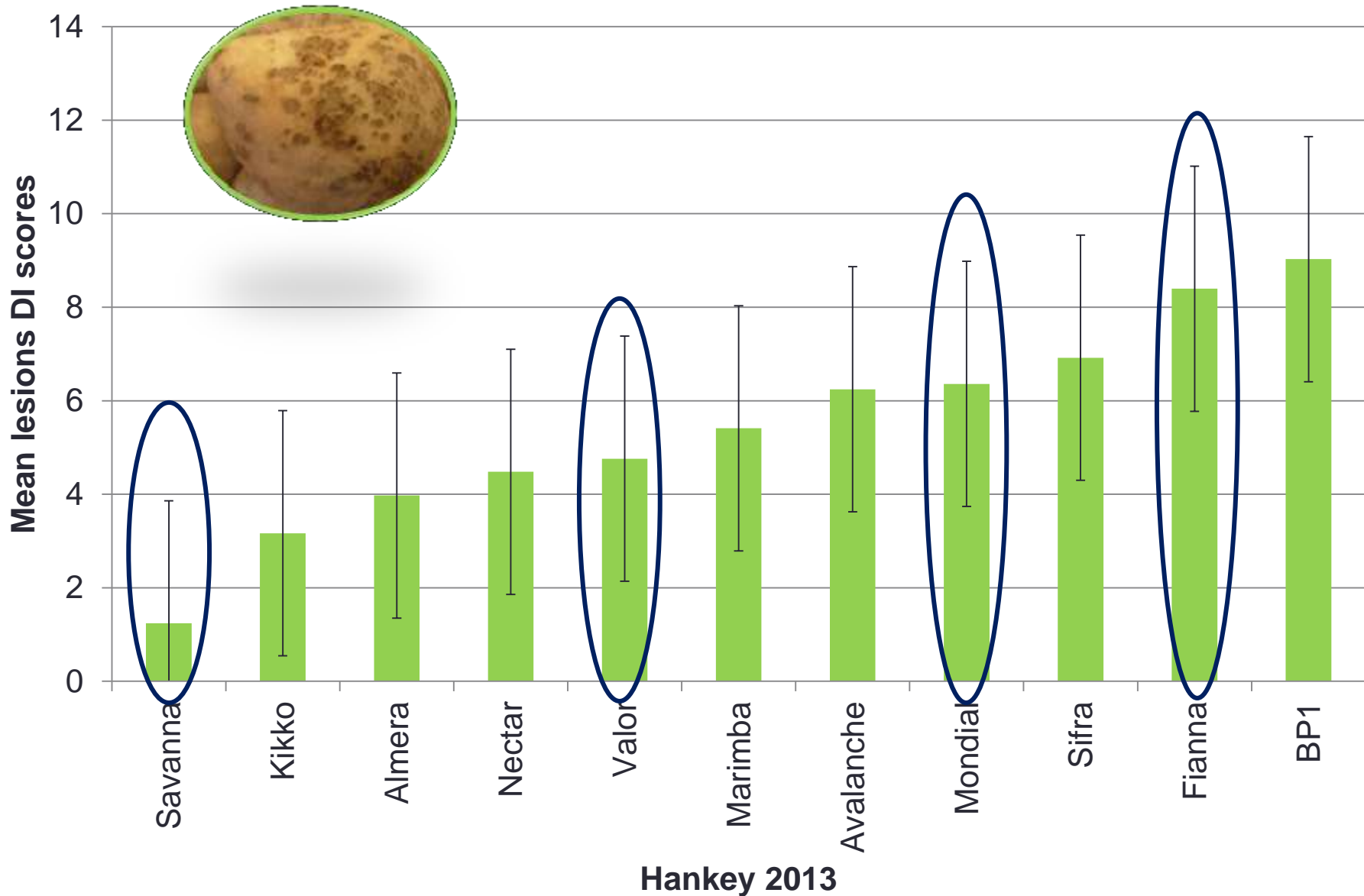


Hankey 2013





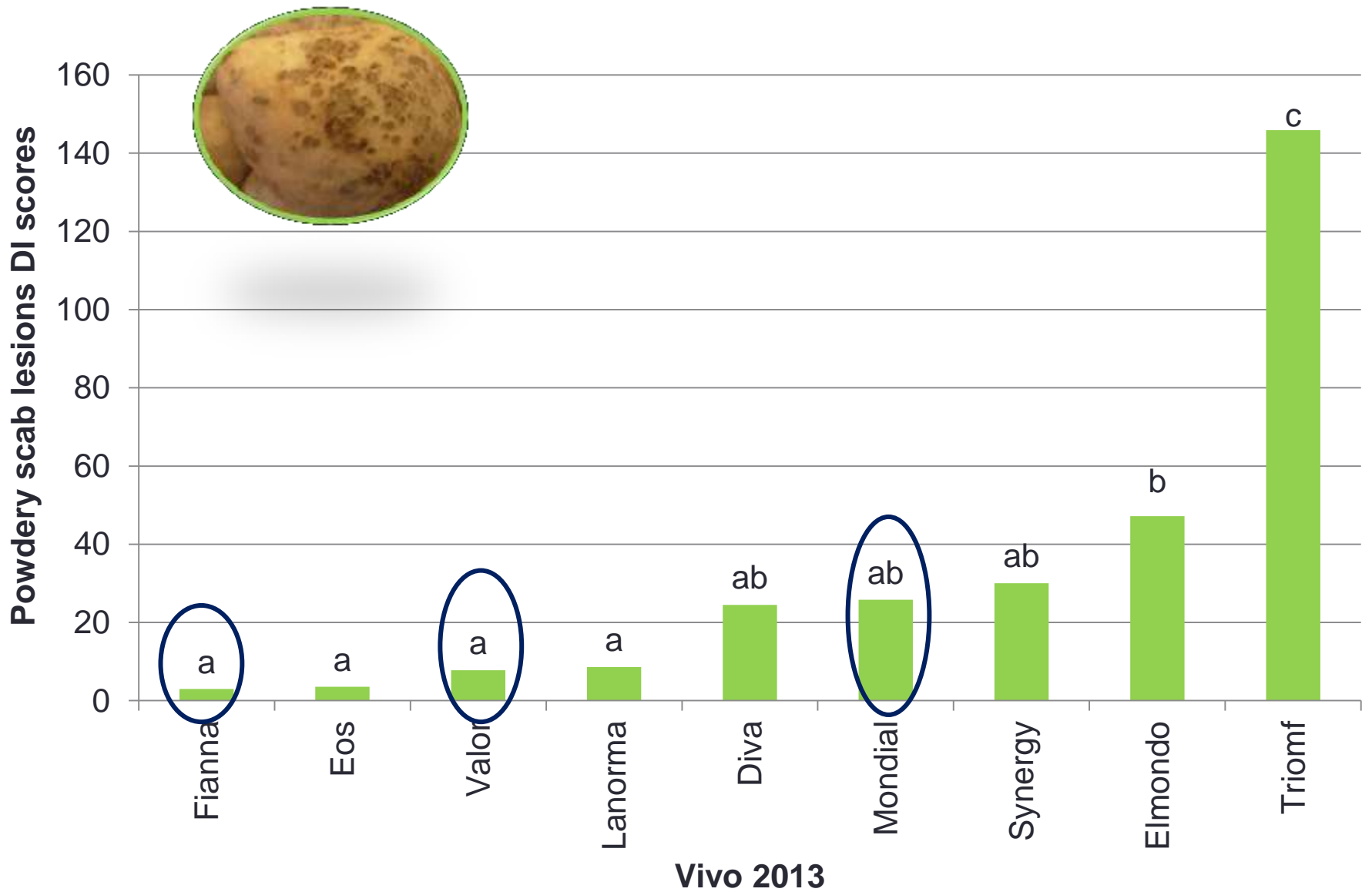
Mean index of root galls on cultivars planted in Hankey (June 2013 – Dec 2013); $p=0.055$ NS



Mean disease index of tuber lesions on cultivars planted in Hankey (June 2013 – Dec 2013); $p=0.671$ NS

Vivo





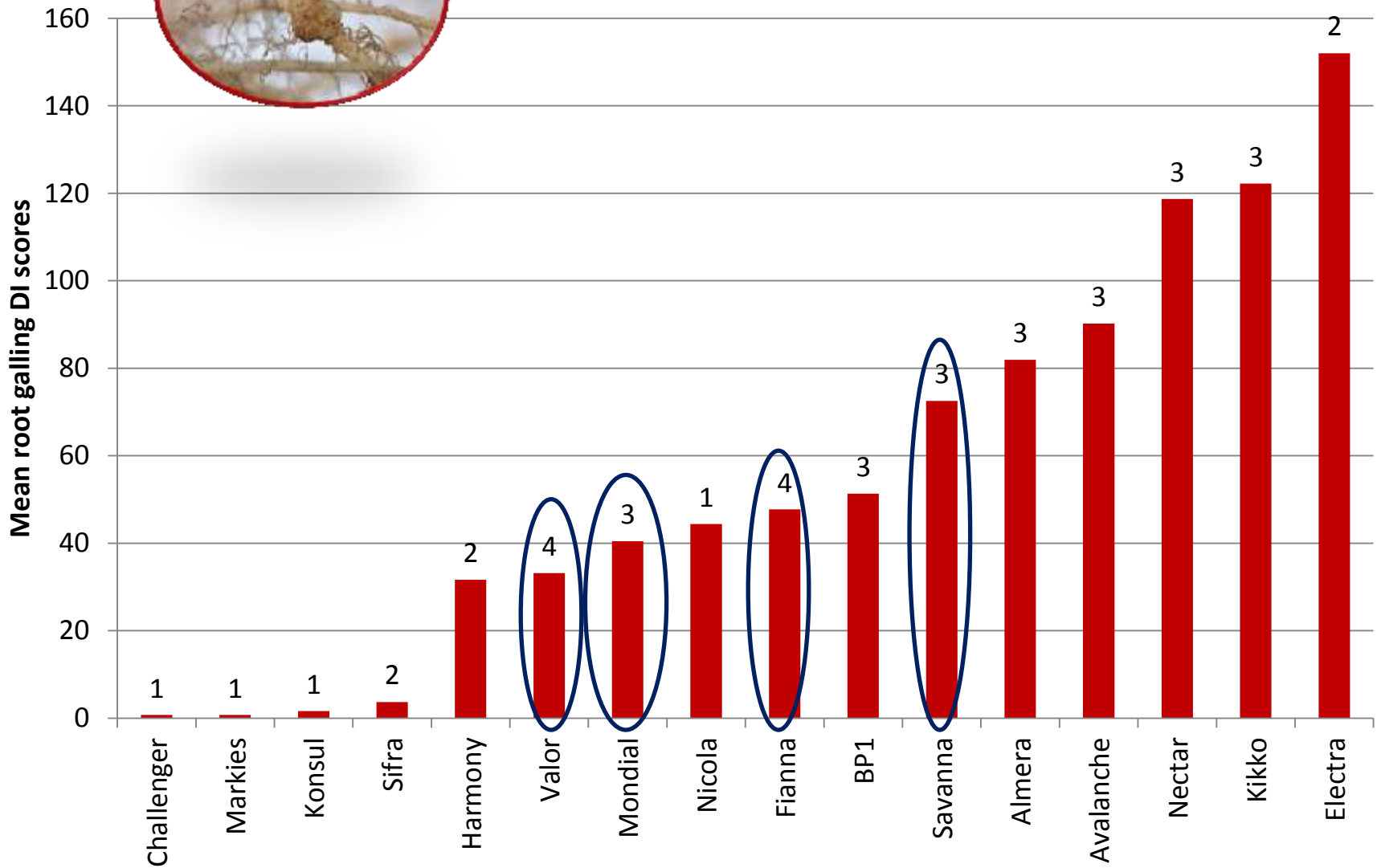
Mean disease index of tuber lesions on cultivars planted in Vivo (August 2013 – Feb 2014); $p < 0.001$

“If we knew what it was we were doing, it would not be called research, would it?”

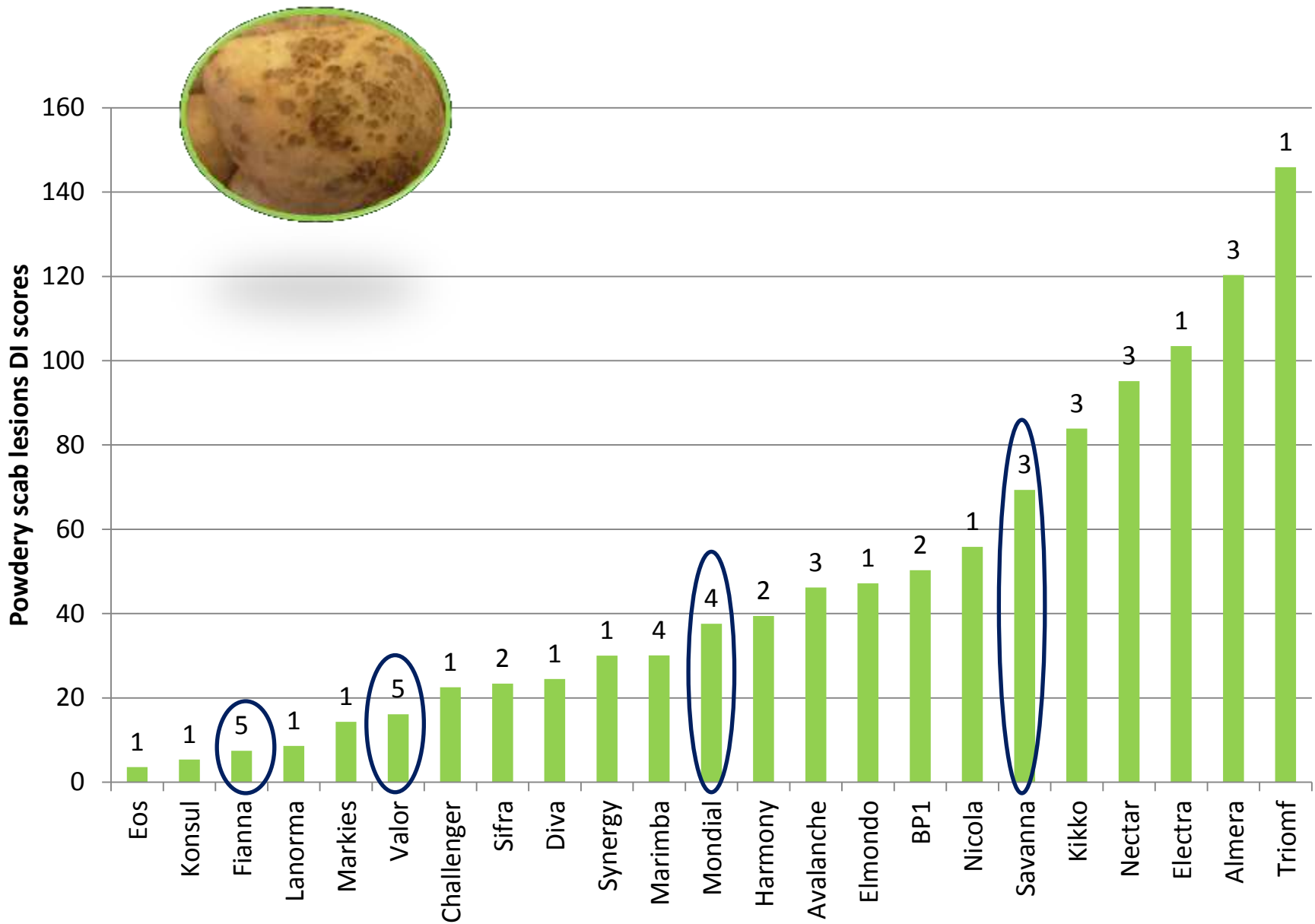
Albert Einstein

...

Summary



Root gall disease indices for cultivars tested in four powdery scab field trials. Numbers above bars indicate the number of trials the cultivar was planted in out of the four.



Tuber lesion disease indices for cultivars tested in five powdery scab field trials. Numbers above bars indicate the number of trials the cultivar was planted in out of the five.

Discussion

Results from our trials are consistent with those of Merz *et al.*, (2012) and others:

- No relationship between root and tuber susceptibility
- **Important to assess root galls to determine inoculum build-up in soil and effect on plant**
- Small amount of initial inoculum in soil can result in high disease severity at harvest, under favourable environmental conditions
- Inconsistencies in results are due to variations in environment, agricultural practices, pathogen population or a combination of these factors
 - Genotype x environment interaction
 - Between-year differences
 - Time of tuber development
 - Patchy distribution of pathogen in soil

Acknowledgements

- **Funding:**
 - Potatoes SA
 - THRIP
- **Students in PPP**
- Growers
- Chemical companies
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