



Evaluation of rootstocks for the South African Table Grape Industry

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Objectives/Aims

Evaluate the adaptability of new rootstocks in different conditions

- Climatic
- Growth

Identification of superior rootstocks



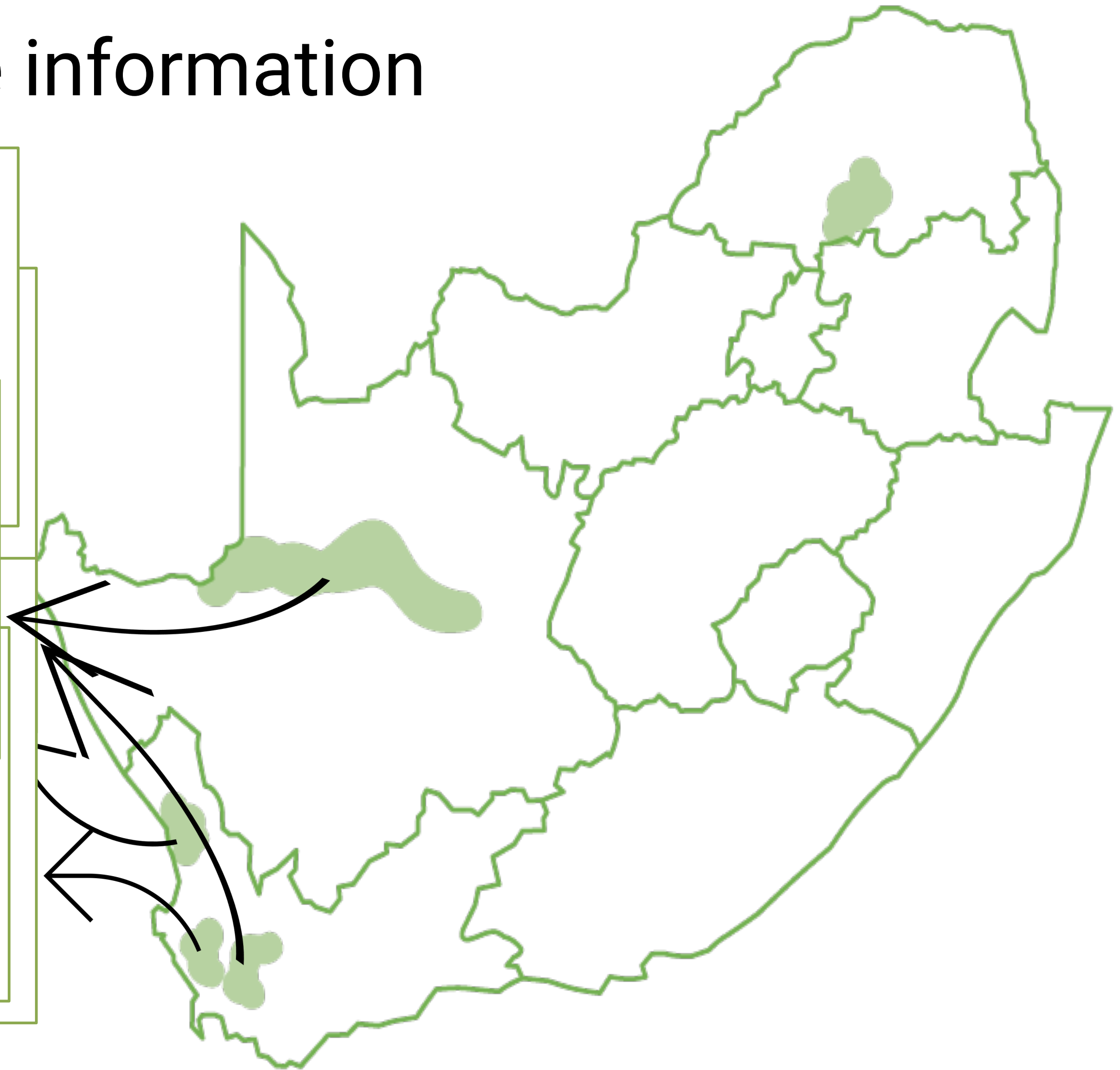
Site information

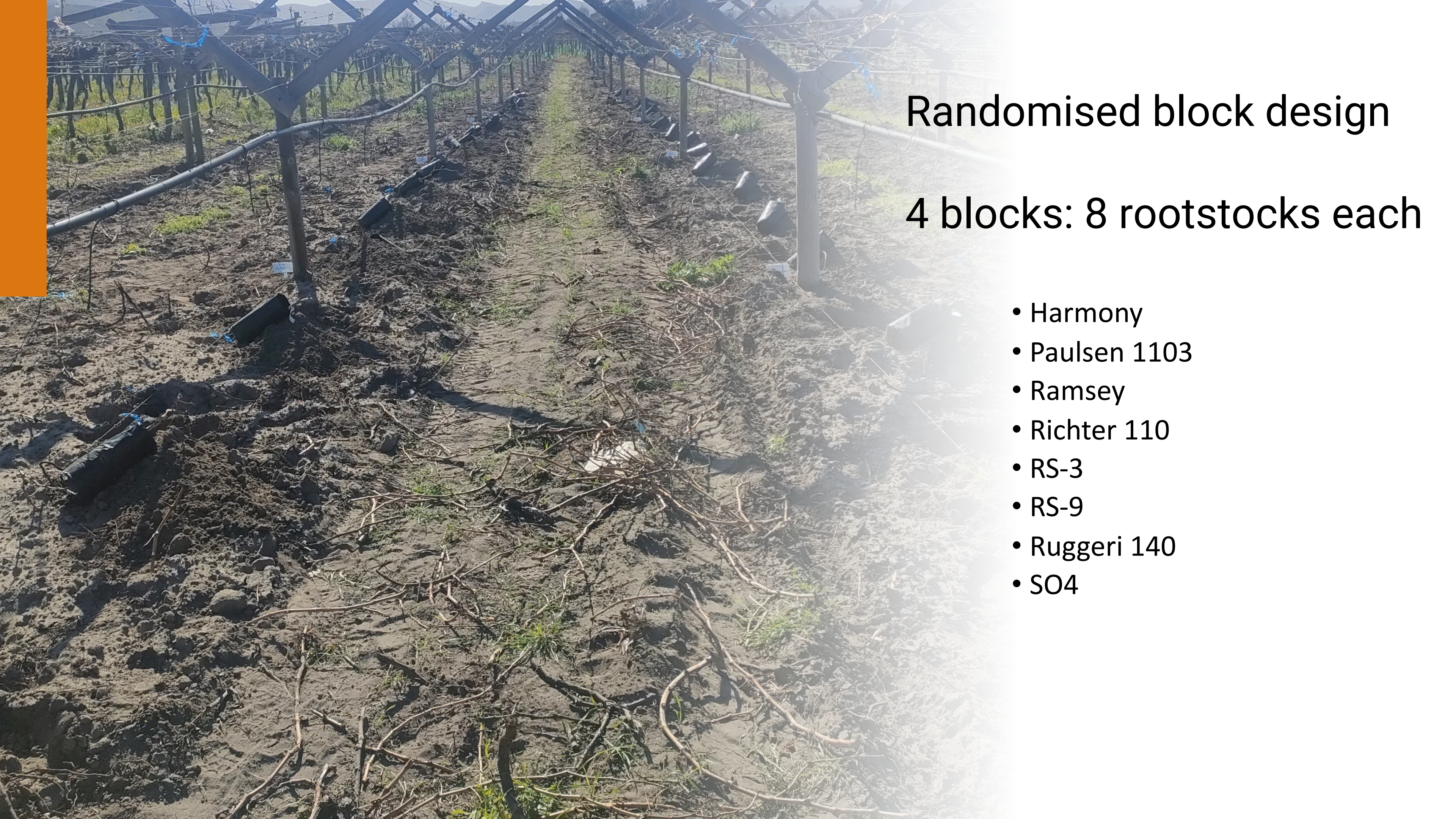


Buffelskraal
Sable Seedless
Double gable
Drip Irrigation

Yarona
Thompson Seedless
Double gable
Micro Sprinklers
Northeast-Southwest

Seedless
Double gable
Drip Irrigation
North-South





Randomised block design

4 blocks: 8 rootstocks each

- Harmony
- Paulsen 1103
- Ramsey
- Richter 110
- RS-3
- RS-9
- Ruggeri 140
- SO4

Data collection

Vegetative characteristics:

- Shoot weight
- Scion: rootstock diameter
- Earliness of bud break
- Evenness of bud break
- Vigour
- Canopy density

Reproductive characteristics:

- Bunch: shoot
- Degree of shatter
- Shot berries
- Bunch density
- Yield
- No. of bunches
- Avg bunch weight
- Avg berry weight

Fruit characteristics:

- TSS
- TTA
- TSS: TTA

Genotypic variability

Characteristic	p Genotype	p Environment	p G x E	p G x E x Y
Shoot weight (kg)	<0,0001	<0,0001	<0,0001	0,609
Yield (kg)	<0,0001	<0,0001	<0,0001	0,002
Bunch weight (g)	<0,0001	<0,0001	<0,0001	<0,0001
Berry weight (g)	<0,0001	<0,0001	<0,0001	0,521



MET AMMI Stability values

Shoot weight (kg)		
Genotype	Mean	ASV
Ruggeri 140	2,313	0,476
Ramsey	2,392	0,782
Paulsen 1103	2,061	1,143
SO4	2,095	1,457
Richter 110	1,707	1,549
Harmony	2,499	1,791
RS-3	2,052	1,945
RS-9	1,963	3,428
G x E <i>p</i> value		<0,001
IPCA 1 <i>p</i>		<0,001
IPCA 2 <i>p</i>		0,168

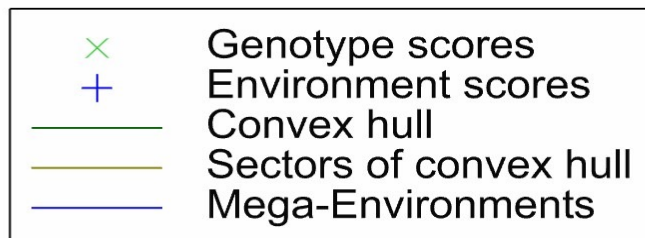
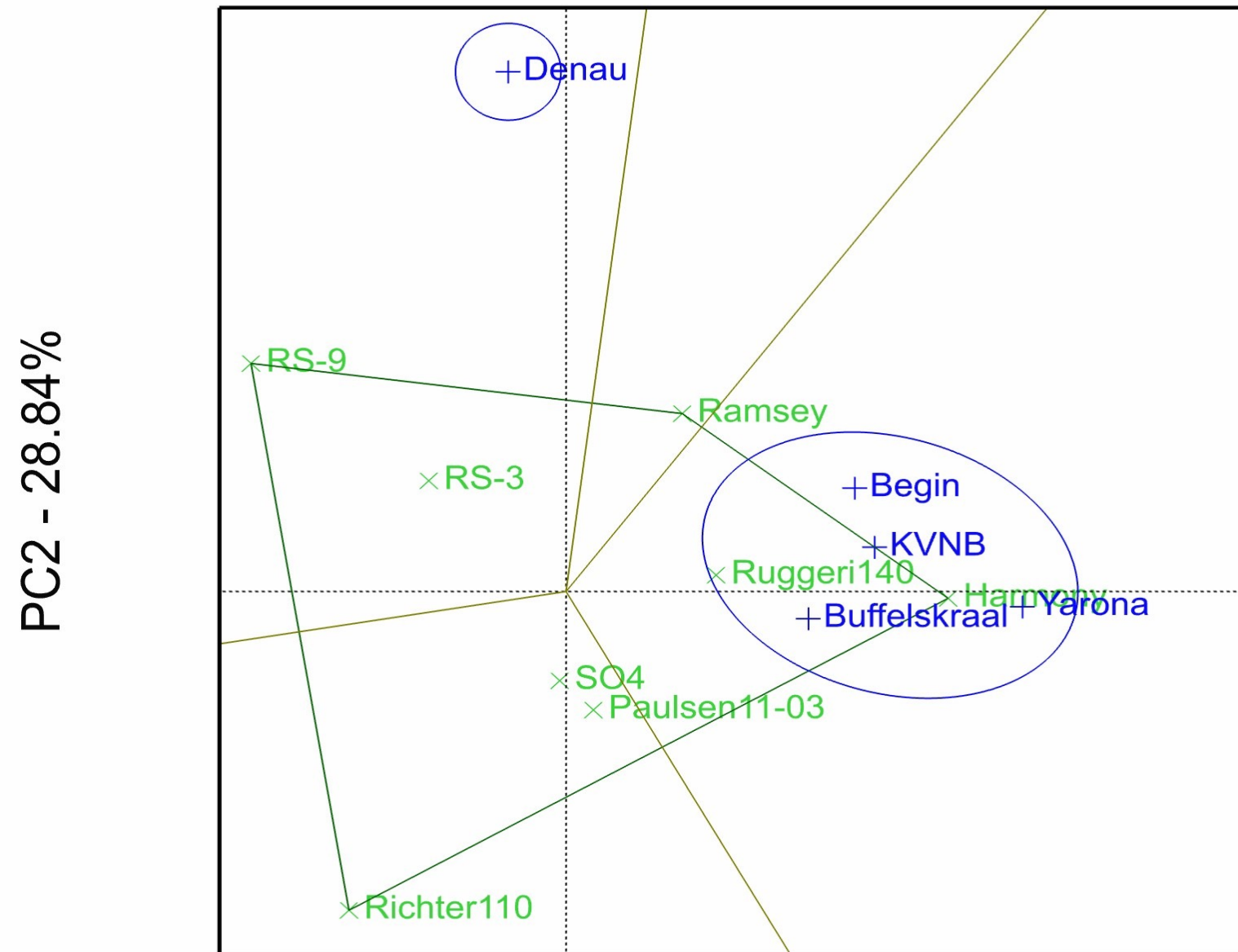
Ruggeri 140 showed the most stability across environments over two seasons. This however, does not mean that it was the best performer.

Berry weight (g)		
Genotype	Mean	ASV
RS-9	6,422	0,198
Richter 110	6,839	0,383
Ruggeri 140	7,219	0,597
Paulsen 1103	6,918	0,647
RS-3	6,824	0,764
SO4	7,145	1,010
Ramsey	7,210	1,043
Harmony	6,692	1,086
G x E <i>p</i> value		0,068
IPCA 1 <i>p</i>		0,027
IPCA 2 <i>p</i>		0,123

RS-9 was the most stable over two seasons. This shows that RS-9 consistently produced the smallest berries across environments.

GGE biplot

ShootWeight Which one wins where



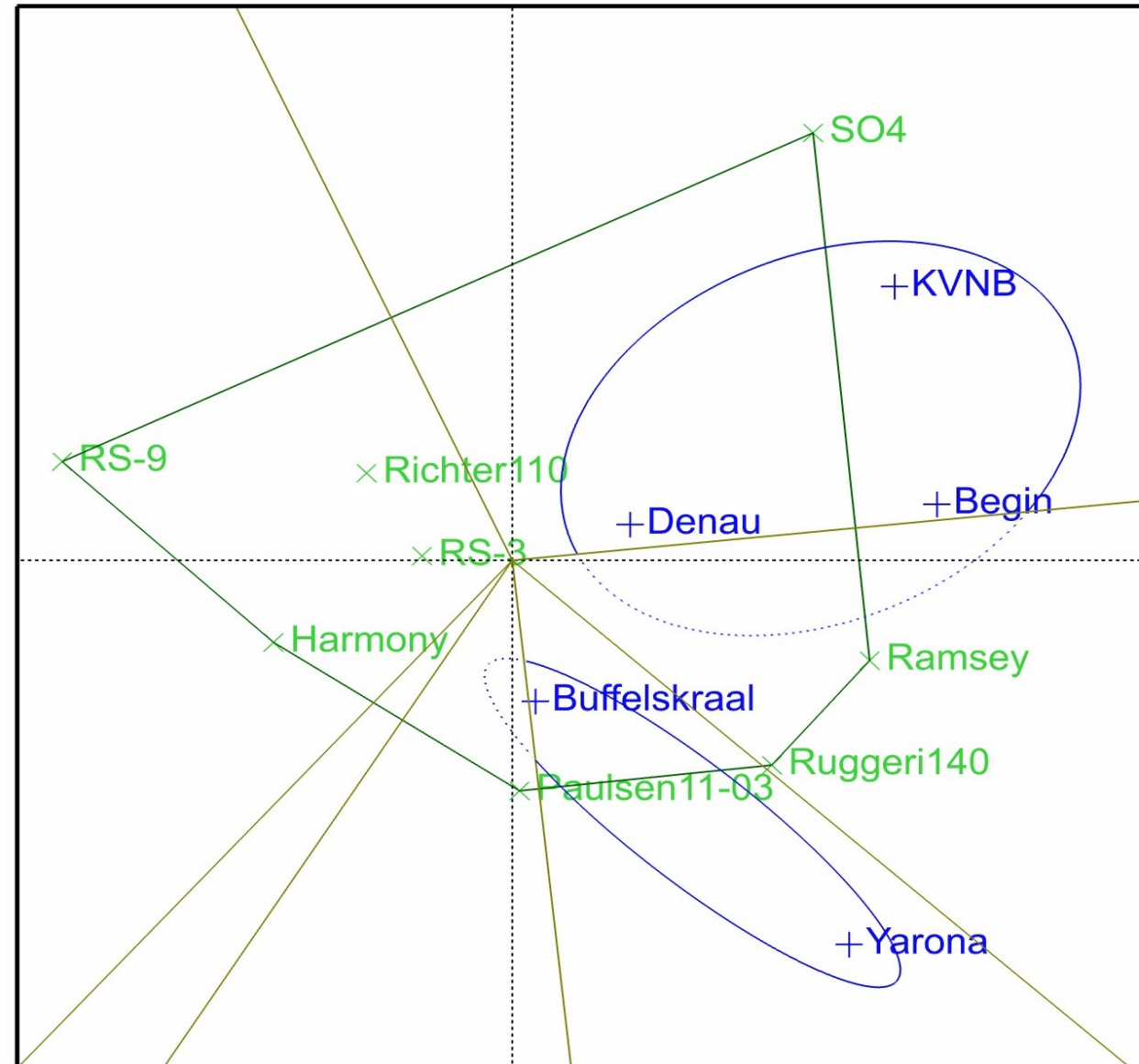
AMMI table

Environment	Mean	1	2	3	4
KVNB	2,167	Harmony	SO4	Ramsey	Ruggeri 140
Yarona	1,243	Harmony	Ruggeri 140	Paulsen 1103	Ramsey
Begin	2,199	Harmony	Ramsey	SO4	Ruggeri 140
Buffelskraal	1,160	Harmony	Ruggeri 140	Ramsey	Paulsen 1103
Denau	3,908	RS-9	Ramsey	RS-3	Ruggeri 140

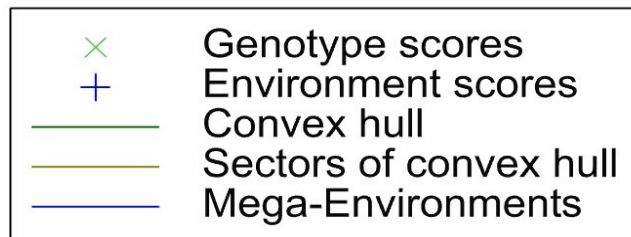
GGE biplot

BerryWeight Which one wins where

PC2 - 22.18%



PC1 - 57.92%



AMMI table

Environment	Mean	1	2	3	4
Buffelskraal	4,256	Ruggeri 140	Paulsen 1103	Harmony	RS-3
Denau	6,925	RS-3	Harmony	Ruggeri 140	SO4
Yarona	3,577	Ruggeri 140	Paulsen 1103	Ramsey	SO4
KVNB	11,264	SO4	Ramsey	Richter 110	Ruggeri 140
Begin	8,520	Ramsey	Ruggeri 140	SO4	Paulsen 1103

Harmony

Richter

Within Environment Genotypic Variability

Characteristic	Begin	Buffelskraal	Denau	KVNB	Yarona
Shoot weight (kg)	< 0,0001	0,1614	0,0001	< 0,0001	< 0,0001
Yield (kg)	< 0,0001	0,412	< 0,0001	< 0,0001	< 0,0001
Bunch weight (g)	< 0,0001	0,090	0,001	< 0,0001	< 0,0001
Berry weight (g)	< 0,0001	0,969	< 0,0001	0,063	0,001

- NORTHERN PROVINCES
- ORANGE RIVER
- OLIFANTS RIVER
- BERG RIVER
- HEX RIVER



Begin Boerdery Sweet Celebration™



Rootstock	Shoot weight (kg)	Yield (kg)	Avg bunch weight (g)	Avg berry weight (g)
Harmony	0,51 cd	5,12 ef	428,9 c	6,80 cd
Paulsen 1103	1,57 a	7,21 cd	528,4 a	7,82 b
Ramsey	0,40 de	13,88 a	497,8 ab	6,50 d
Richter 110	0,36 de	6,10 de	414,9 c	7,64 b
RS-3	0,52 cd	3,21 g	479,1 b	7,53 b
RS-9	0,67 c	4,59 f	418,3 c	7,16 c
Ruggeri 140	0,29 e	10,45 b	452,8 bc	8,62 a
SO4	0,89 b	8,31 c	536,8 a	8,41 a
<i>p</i> - value (ANOVA)	<0,0001	<0,0001	<0,0001	<0,0001

Denau Crimson Seedless



Rootstock	Shoot weight (kg)	Yield (kg)	Avg bunch weight (g)	Avg berry weight (g)
Harmony	0,30 b	8,22 c	663,2 ab	6,27 a
Paulsen 1103	0,70 a	10,81 b	537,0 d	4,92 c
Ramsey	0,39 b	4,80 d	681,4 ab	5,10 bc
Richter 110	0,30 b	10,55 b	663,5 ab	4,37 d
RS-3	0,41 b	14,98 a	728,1 a	5,31 b
RS-9	0,60 a	5,39 d	593,3 bcd	4,27 d
Ruggeri 140	0,32 b	5,53 d	550,3 cd	4,54 d
SO4	0,37 b	6,40 cd	638,1 bc	6,26 a
<i>p</i> - value (ANOVA)	0,0001	<0,0001	0,0011	<0,0001

KVNB

AutumnCrisp®

Rootstock	Shoot weight (kg)	Yield (kg)	Avg bunch weight (g)	Avg berry weight (g)
Harmony	1,43 cd	15,12 a	698,6 a	10,73 abc
Paulsen 1103	1,65 c	10,60 bc	449,6 e	9,99 bc
Ramsey	2,00 b	14,03 ab	582,7 bc	10,60 abc
Richter 110	0,93 fg	8,24 c	546,9 cd	9,83 c
RS-3	1,26 de	16,10 a	606,5 abc	10,99 ab
RS-9	1,04 ef	6,71 c	454,6 de	9,76 c
Ruggeri 140	0,76 g	8,38 c	528,6 cde	10,74 abc
SO4	2,36 a	17,84 a	655,5 ab	11,16 a
<i>p</i> - value (ANOVA)	<0,0001	<0,0001	<0,0001	0,0625



Yarona Thompson Seedless

Rootstock	Shoot weight (kg)	Yield (kg)	Avg bunch weight (g)	Avg berry weight (g)
Harmony	1,23 ab	1,88 d	198,5 c	3,74 ab
Paulsen 1103	1,21 abc	6,47 b	282,1 b	3,80 ab
Ramsey	1,29 a	11,16 a	487,2 a	4,15 a
Richter 110	0,71 c	1,62 d	193,1 c	3,47 bc
RS-3	1,08 abc	4,33 bc	318,4 b	3,63 ab
RS-9	0,74 bc	2,65 cd	181,9 c	2,95 c
Ruggeri 140	1,48 a	5,27 b	187,5 c	4,09 a
SO4	1,05 abc	5,94 b	250,4 bc	3,22 bc
<i>p</i> - value (ANOVA)	<0,0001	<0,0001	<0,0001	0,0013



Summary

Shoot Weight:

- ✓ R110 performed poorly in all environments, while P1103 reflected consistently in the top 4 range
- ✓ P1103 was highest at Begin and Denau
- ✓ Ru140 was highest at Buffelskraal and Yarona, whereas it was lowest at Begin and KVNB

Yield:

- ✓ RS-9 was a poor performer throughout the environments, being in the bottom 3
- ✓ RS-3 was in the top 3 at Buffelskraal, KVNB and Denau
- ✓ Ramsey was highest at Begin as well as Yarona
- ✓ SO4 reflected in the top 3 at Begin, Yarona and KVNB
- ✓ P1103 was in the top 2 at Denau, Yarona and Buffelskraal

Bunch Weight:

- ✓ RS-9 was a poor performer throughout all environments

Conclusion

- ✓ Due to MET analysis, G x E interactions were expected
- ✓ The use of AMMI analysis across environments indicates stability of genotypes, or lack thereof
- ✓ Using GGE analysis, best performing genotypes are indicated in association with different environments
- ✓ The AMMI and GGE analyses support each other
- ✓ New rootstock genotypes can outperform traditional rootstocks depending on environment and/or scion
- ✓ The project is ongoing, awaiting 2 harvest seasons' data
- ✓ Variability between and across seasons to be investigated



THANK YOU

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