

A potted vine model to facilitate the understanding of Pinot noir yield-quality seesaw according to root growing conditions

Olaf J. Schelezki¹, Romy Moukarzel¹, Scott M. Gregan¹, Mike C. Trought¹, Brian Jordan¹, and Amber K. Parker¹

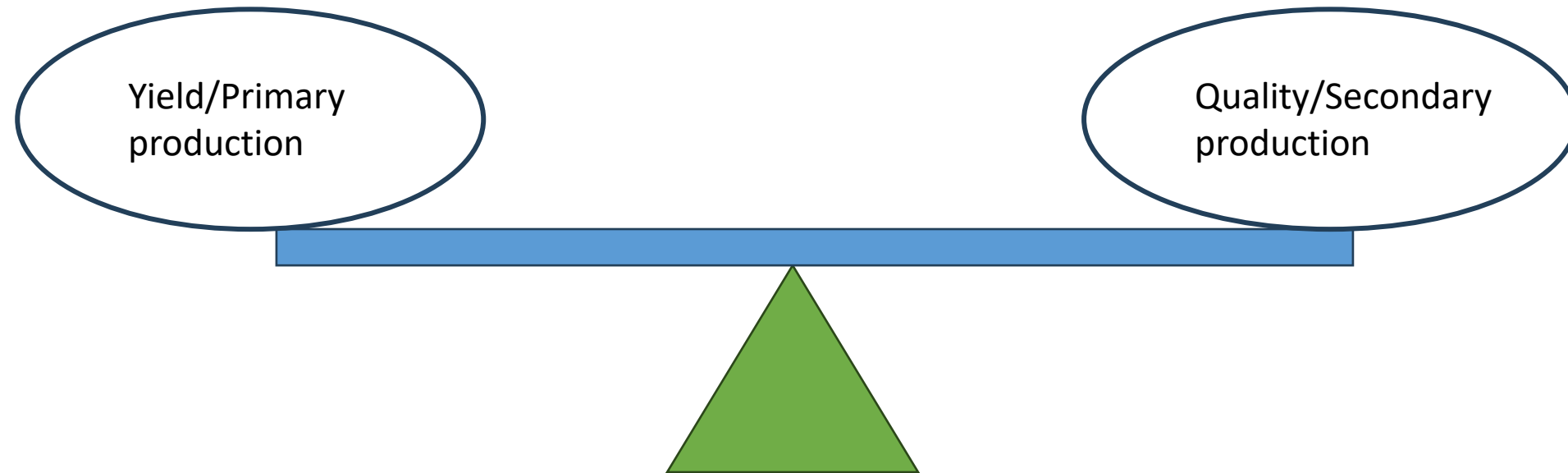


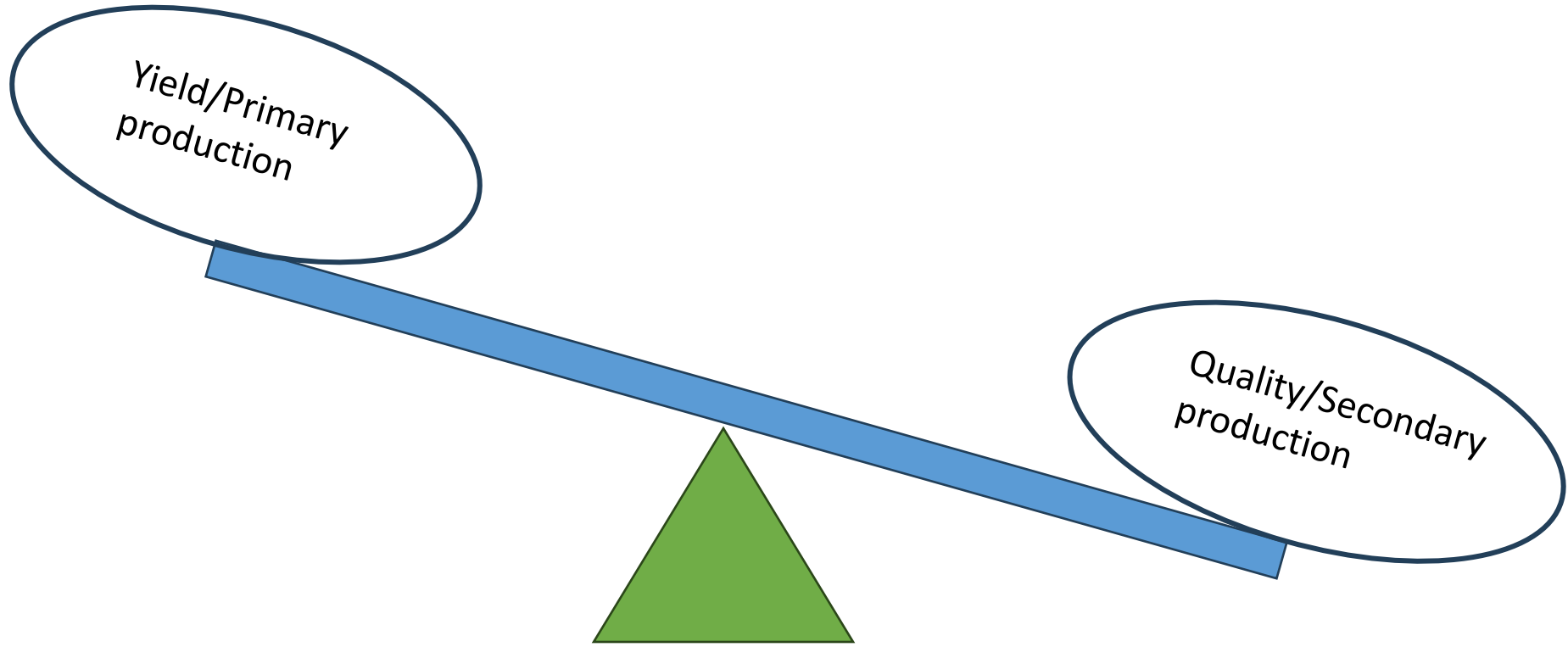
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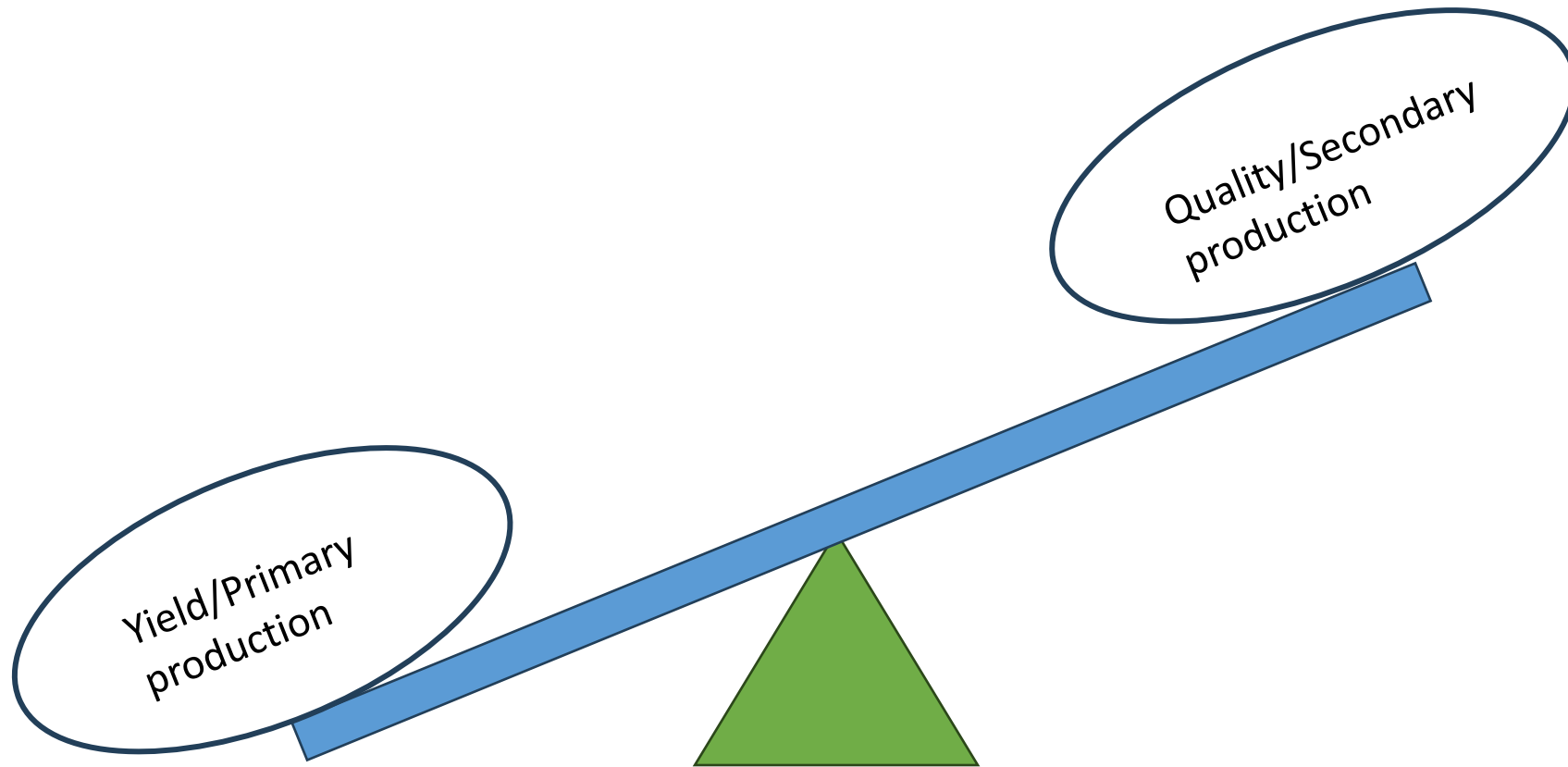


“In order to spend on one side, nature is forced to economize on the other side” J.W. Goethe

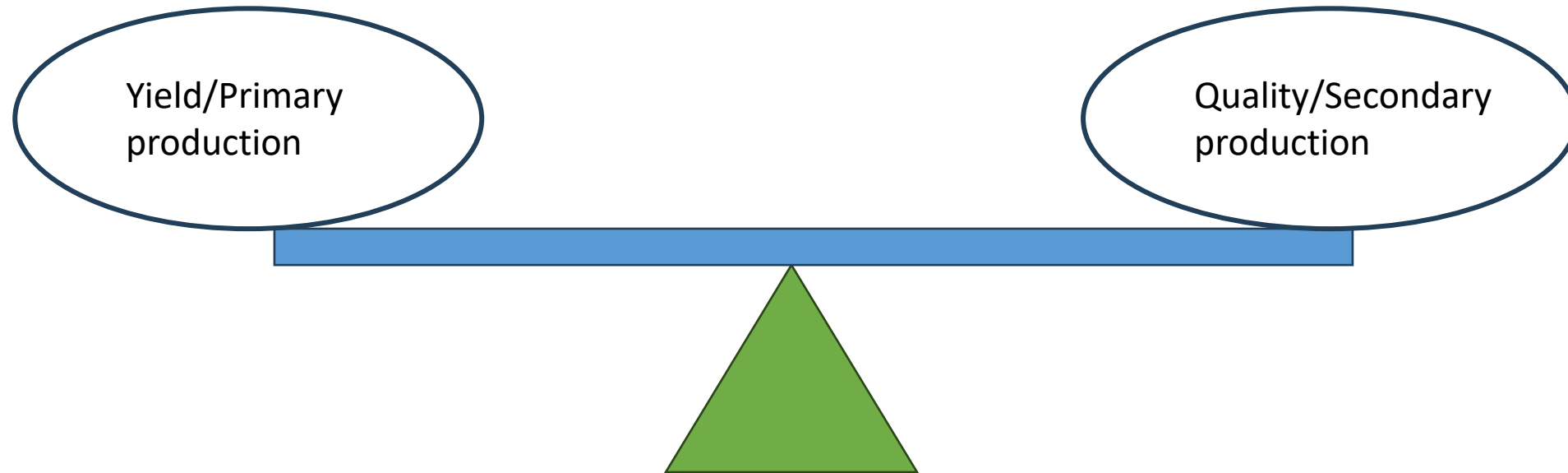








“Pinot Project” Growing returns through dissociating quality from productivity in NZ Pinot noir production.



Yield/Primary
production

Quality/Secondary
production

“Allocation and Partitioning”

Root as competing sink/source



Research aims

- Examine the effect of pot volume and soil texture on Pinot Noir vine balance and berry composition through manipulating the root growth environment
- Evaluate the influence of laterals as competing source/sink in combination with root volume



Methodology – Vine setup

Pinot noir Abel/3309c



- Potted vines
- Glasshouse
- 2018/19 Mullins vines clone 10/5
- 2020/21 Abel+3309c, laterals removed

Methodology - Measurements

2018/19 and 2020/21

- Dry weight of roots, shoots, leaves
- Leaf area
- Bunch weights
- Brix

2020/21 only

- TA
- Primary and secondary metabolites



Yield and LA parameters

Pot volume	% Gravel	Yield (g)		LA (m ²)	
		2018/19	2020/21	2018/19	2020/21
7.5 L	0%	92.4	96.3	0.33	0.30 a
7.5 L	50%	46.2	77.8	0.27	0.29 bc
4 L	0%	59.1	94	0.18	0.23 bc
4 L	50%	50.6	93.6	0.17	0.15 b
p-value		0.302	0.65	0.382	0.022

- No yield differences
- Differences in LA
- No differences in LA:FW

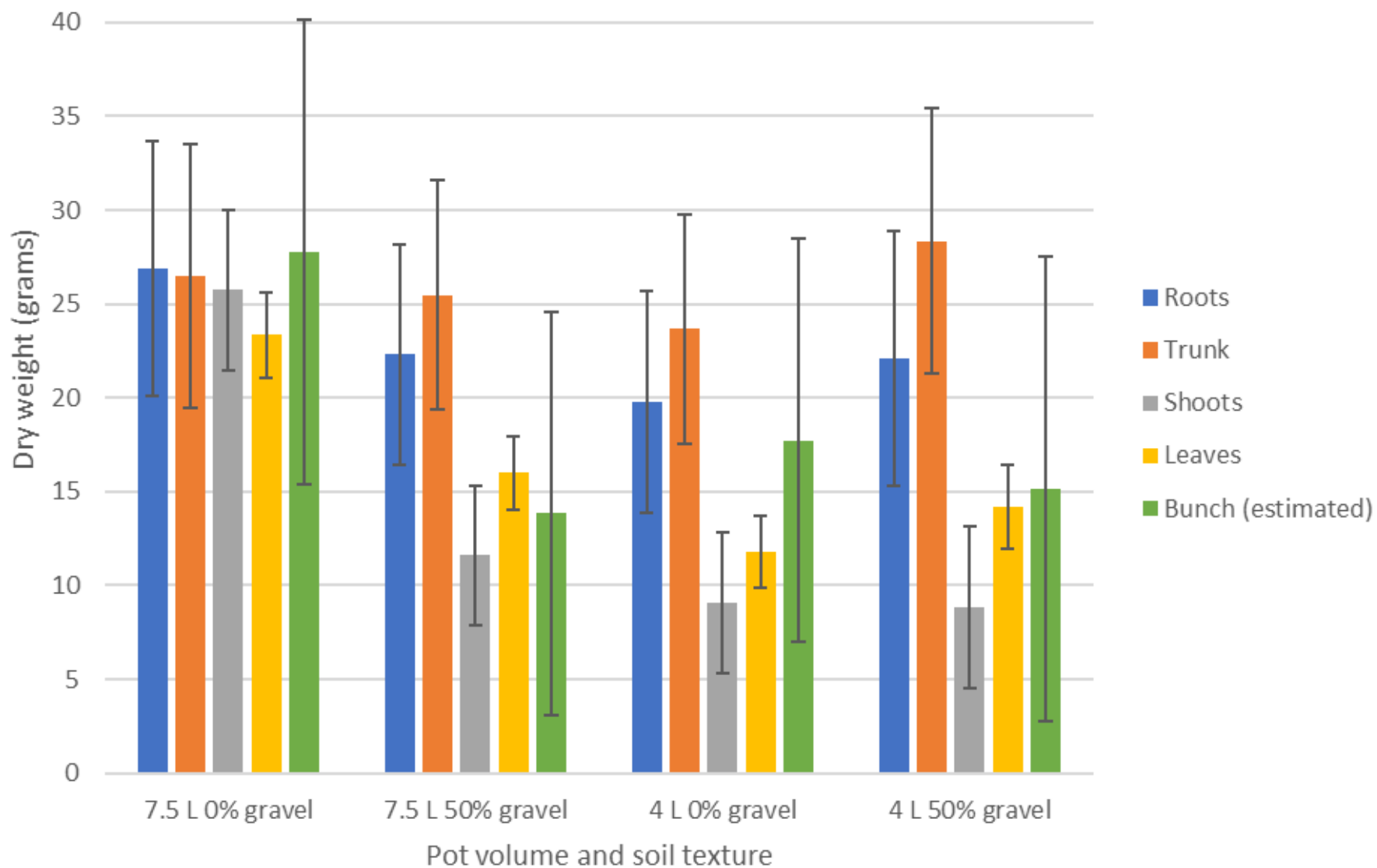


Basic grape quality parameters

Pot volume (L)	% Gravel	Total soluble solids (°Brix)		Titratable acidity (g/L)
		2018/19	2020/21	2020/21
7.5	0	21.1	20.6	17.3 b
7.5	50	22	20.7	14.1 a
4	0	20.9	20.8	13.3 a
4	50	21.8	19.8	14.2 a

- No difference in TSS
- Lower TA with root restriction

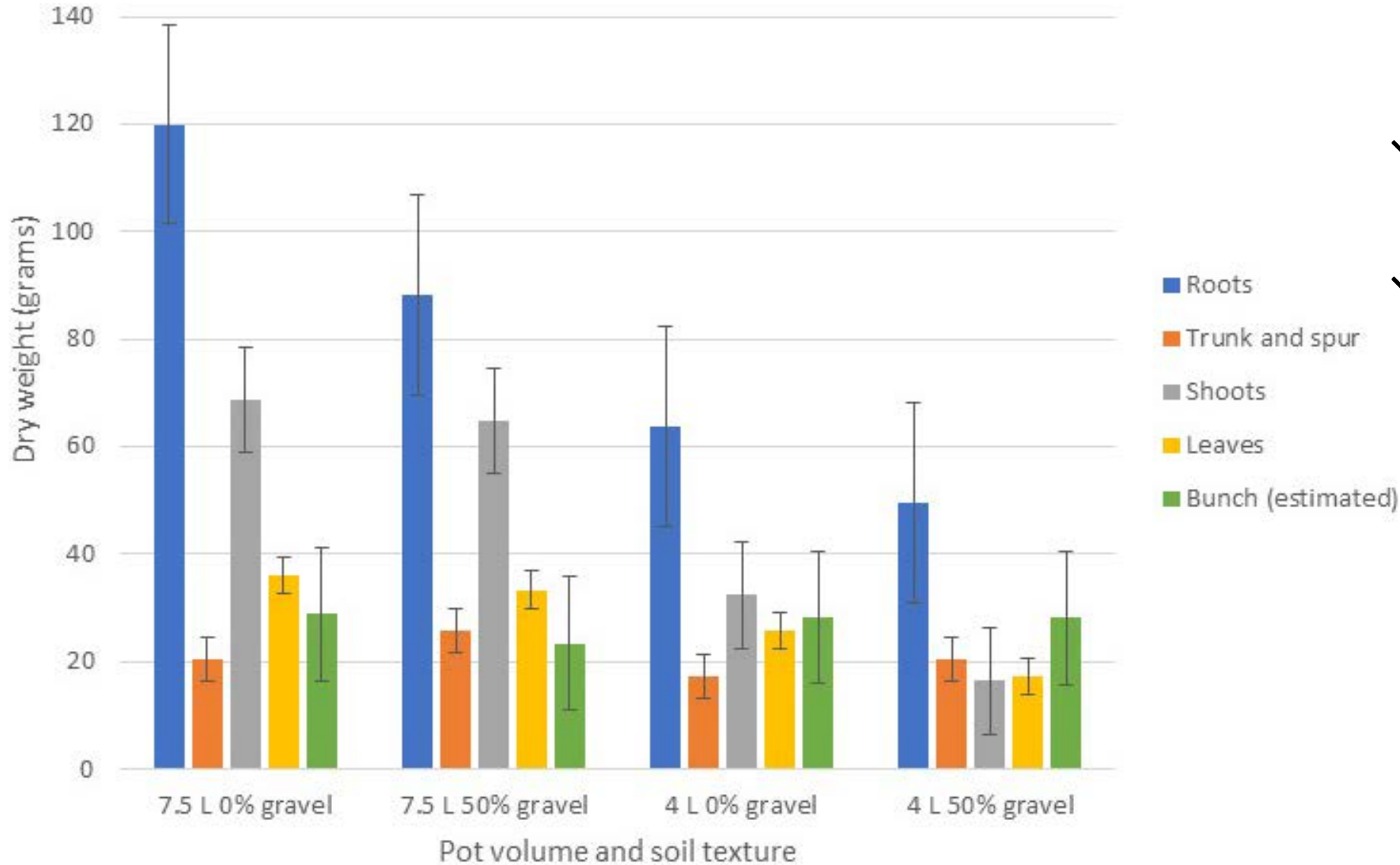
Dry weight accumulation 2018/2019, with laterals



- ↓ Total shoot dry weight
- ↓ Total leaf dry weight
- ↓ Root dry weight less effected



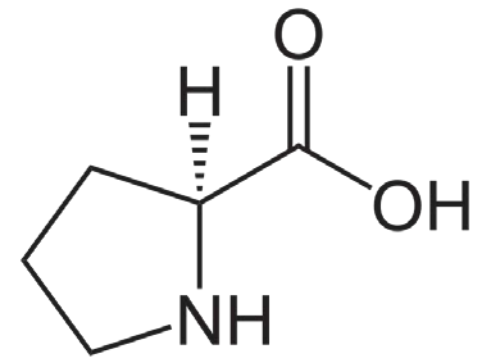
Dry weight accumulation 2020/2021 without laterals



↓ Roots: more pronounced decline
↓ Shoots and leaves

All while yield and TSS remained similar across treatments.

Primary Metabolites: Amino acids



No differences in amino acid profiles observed

Secondary Metabolites: Phenolic compounds

Phenolic compound	Pot volume (L)	% Gravel	Mean (mg/g)	p-value
Quercetin	7.5	0	0.008	0.04
	7.5	50	0.012	
	4	0	0.013	
	4	50	0.009	
Catechin	7.5	0	0.373	0.041
	7.5	50	0.516	
	4	0	0.708	
	4	50	0.59	
Total phenolics	7.5	0	1.602	0.005
	7.5	50	2.092	
	4	0	2.378	
	4	50	2.129	
Total anthocyanins	7.5	0	0.742	ns
	7.5	50	0.825	
	4	0	0.837	
	4	50	0.664	

- ↑ Generally increasing with root restriction
- Despite absence of water deficit or temperature differences

Conclusions

- Changing the yields by modifying size of roots was difficult
- Laterals, if present, contributed to a greater proportion of vegetative growth in larger pot volumes compared to smaller pots
- Vines maintained yield, and primary and secondary metabolism under restricting rooting conditions in this potted vine trial
- Potted vines provide a platform for further research



More information:

- BRI Pinot programme reports (**RA 2.2.**, 2.3, and 2.4)
- OenoOne Submission “Lateral Shoot Growth, Root Restriction, Soil Texture and alter vine balance and ripening of Pinot noir”



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EDITED BY
Isabel Lara,
Universitat de Lleida, Spain

REVIEWED BY
Antoni Sanchez-Ortiz,
University of Rovira i Virgili, Spain
Olfa Zarrouk,
Smart Farm CoLab (SFCOLAB), Portugal

*CORRESPONDENCE
Romy Moukarzel
✉ romy.moukarzel@lincoln.ac.nz

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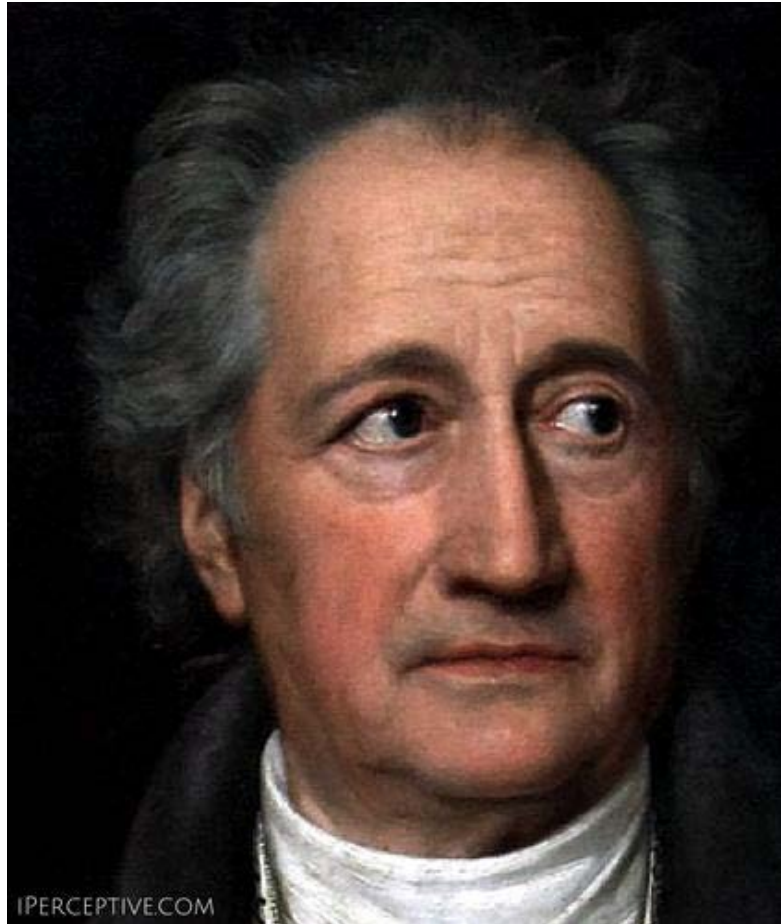
Bunch microclimate influence amino acids and phenolic profiles of Pinot noir grape berries

Romy Moukarzel^{1*}, Amber K. Parker¹, Olaf J. Schelezki¹,
Scott M. Gregan² and Brian Jordan¹

¹Department of Wine, Food and Molecular Biosciences, Lincoln University, Lincoln, New Zealand,

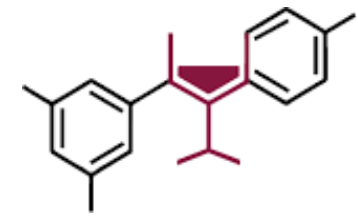
²Ministry of Primary Industries, Christchurch, New Zealand





“Life is too short to drink bad wine”
J.W. Goethe

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Romy Moukarzel, Scott Gregan, Suzanna Post, Brent Richards
Anish Shah, Stephen Stillwell

