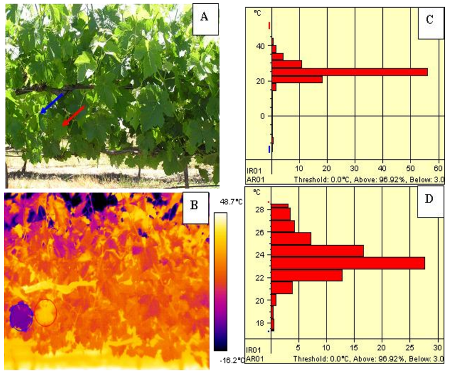
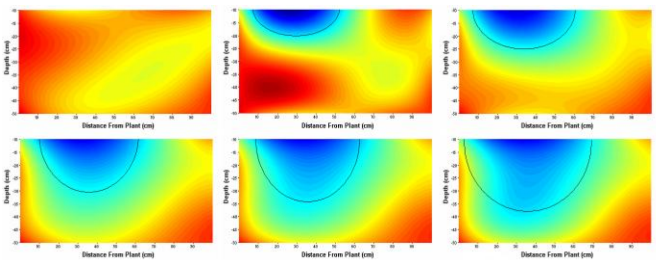


Understanding Shiraz berry shrivel and links to berry quality



Dr Sigfredo Fuentes
Lecturer in Wine Science
International Coordinator VoF

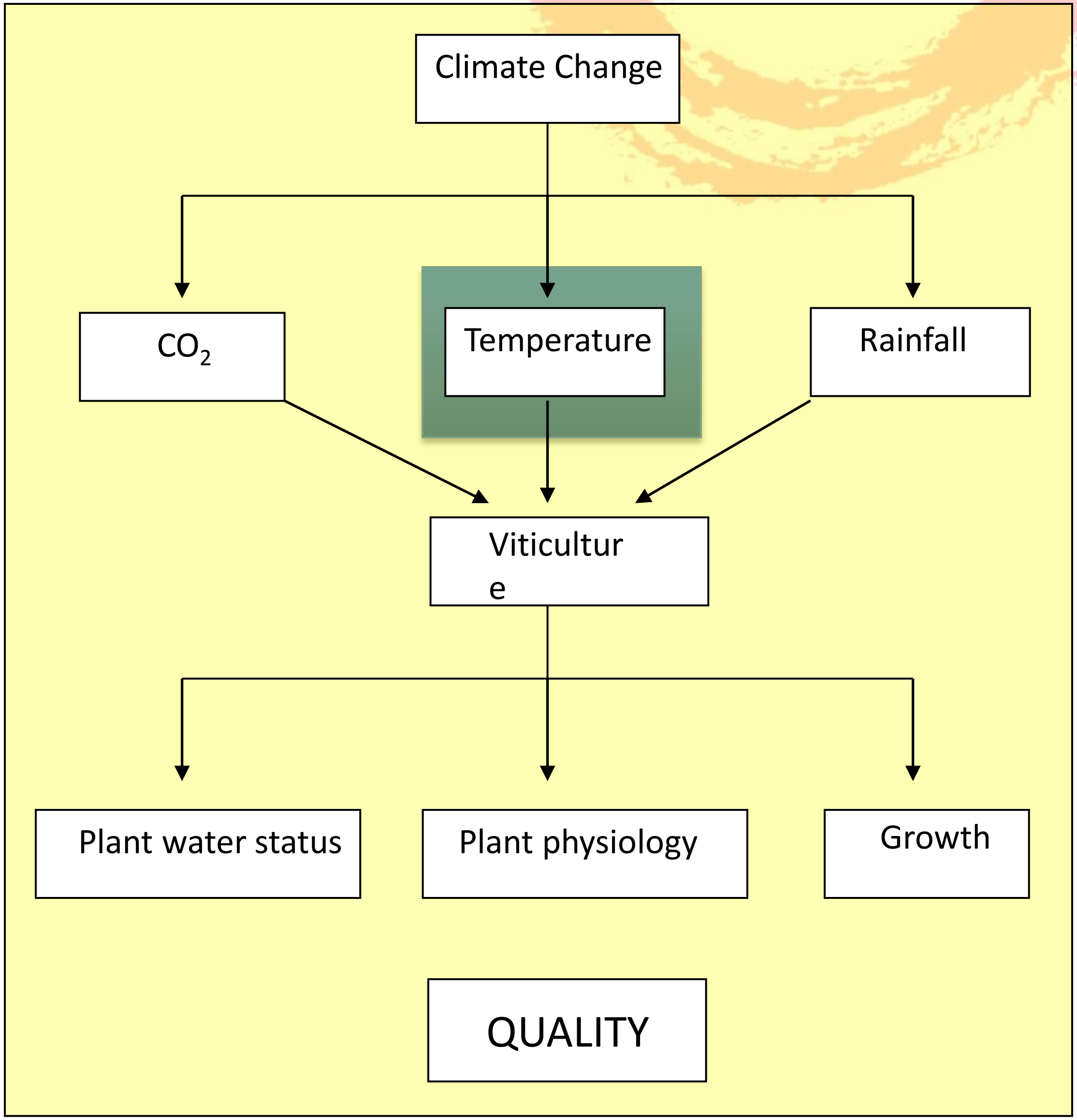
THE UNIVERSITY OF MELBOURNE

Melbourne School of
Land and Environment

VoF

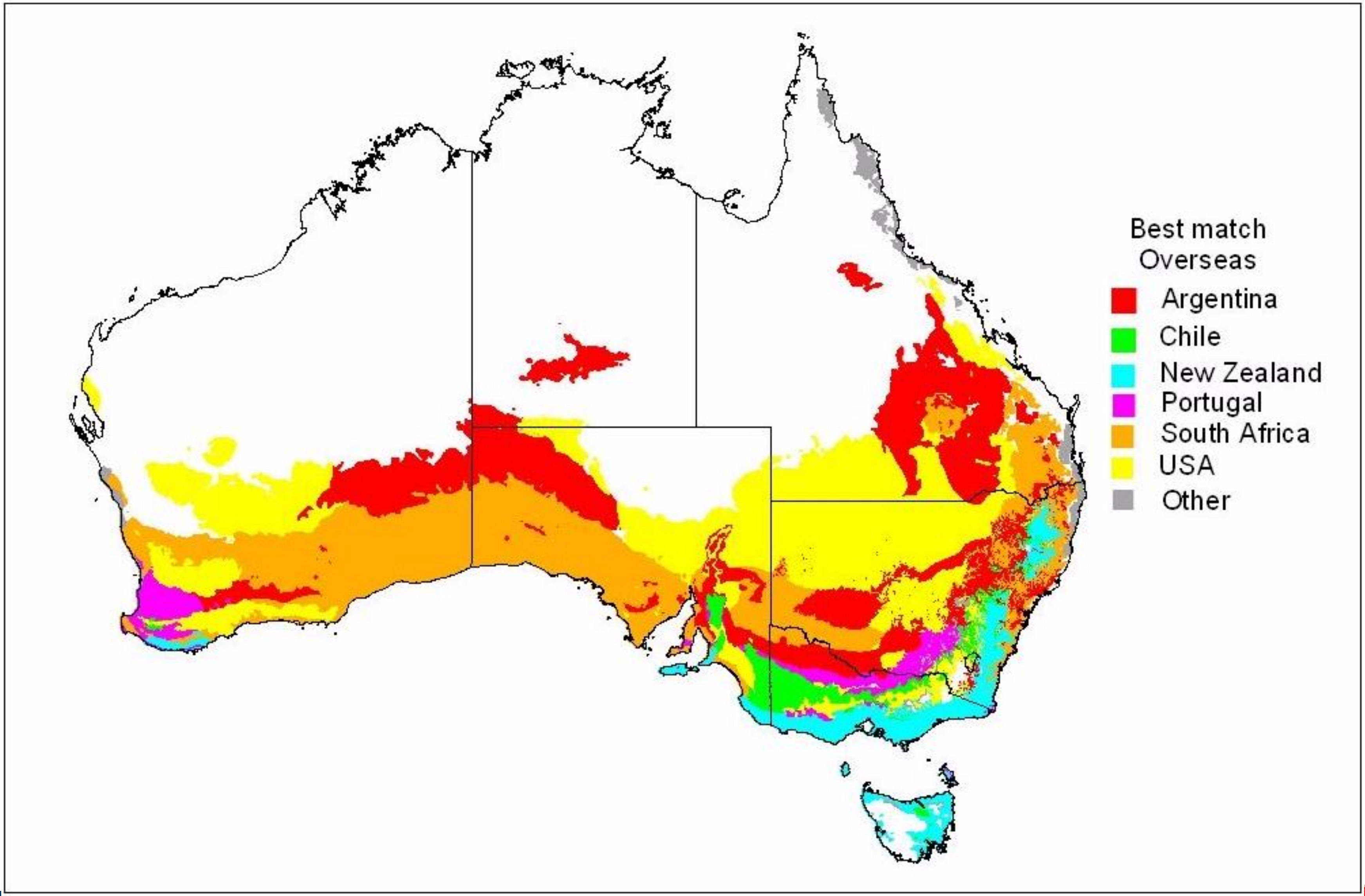
The Vineyard of The Future initiative:

www.vineyardofthefuture.wordpress.com

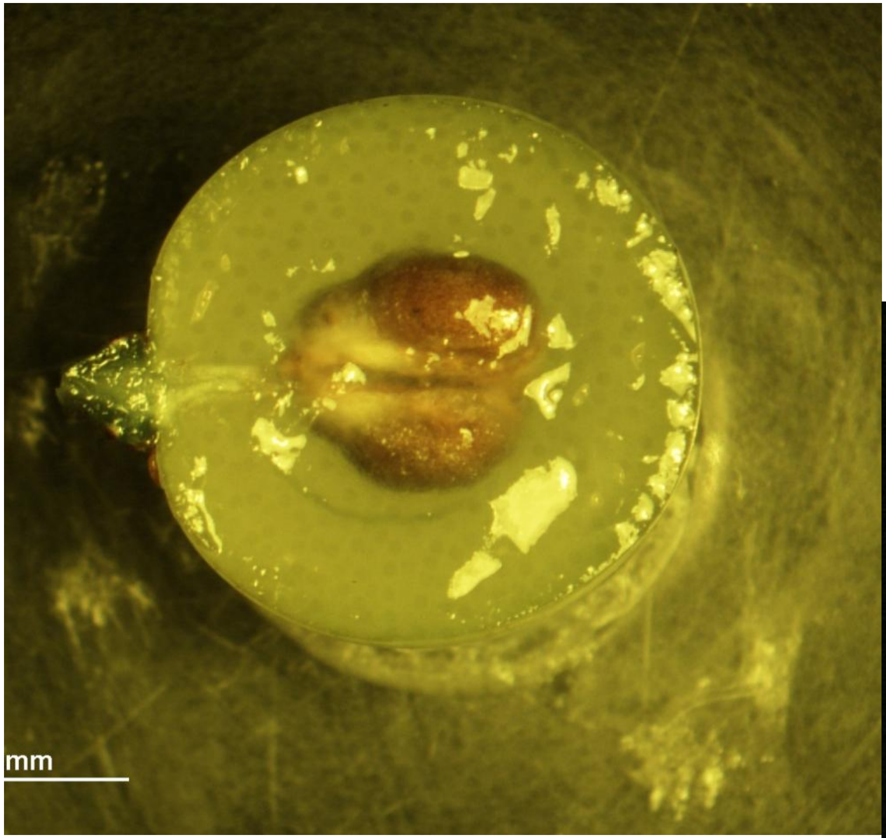

Climate Change
CO_2
Temperature
Rainfall
Viticulture
Plant water status
Plant physiology
Growth
QUALITY

Context:

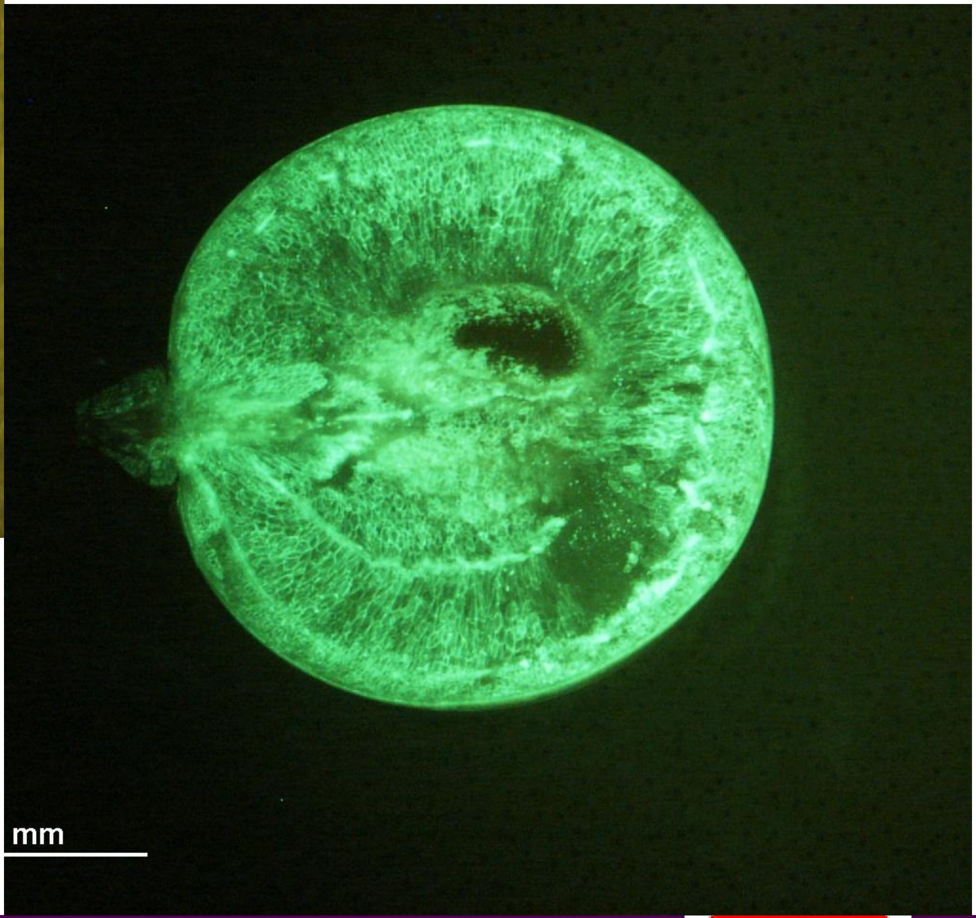
HOMOCLIMES IN AUSTRALIA



Maturity Assessment
Berry Cell Death
Berry shrivel



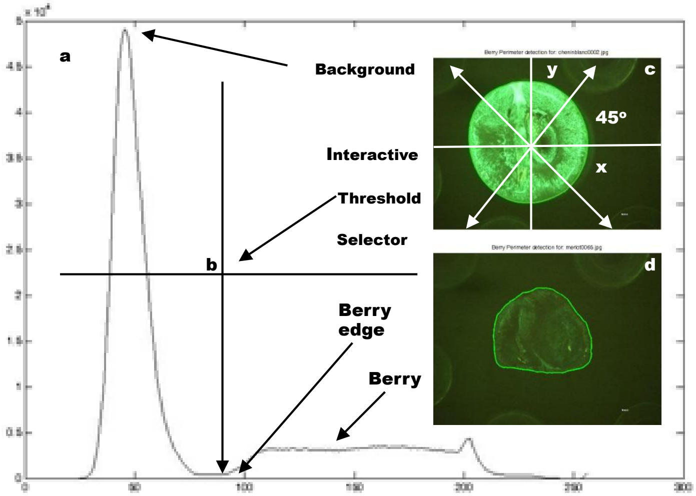
Fluorescein diacetate (FDA)

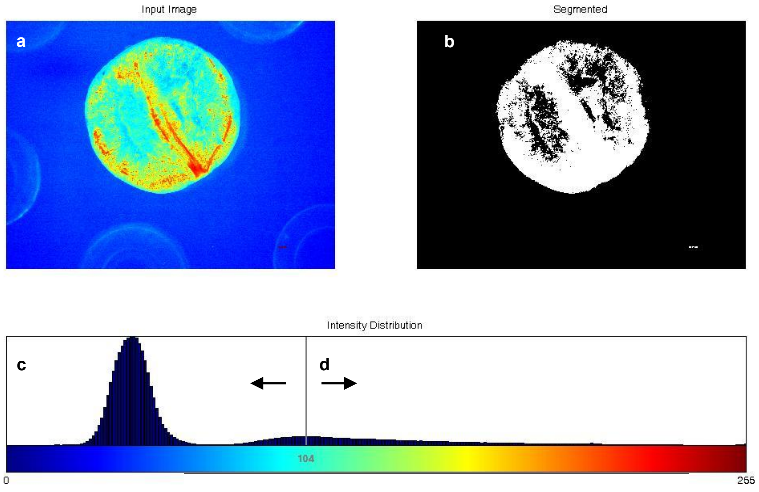


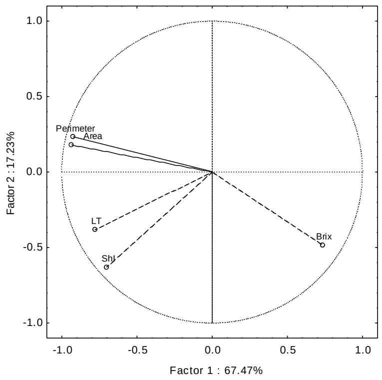
MATLAB :

Codes developed:

- Berry cell death using fluorescence microscopy (MATLAB)



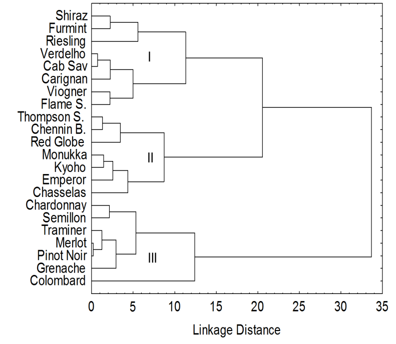




PCA

Cluster Analysis

Fuentes et al. 2010



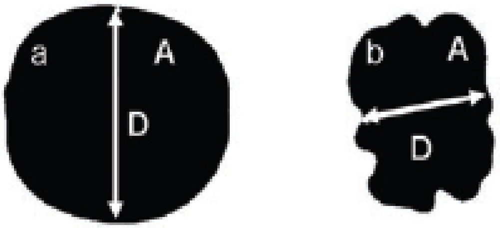
MATLAB :

Codes developed:

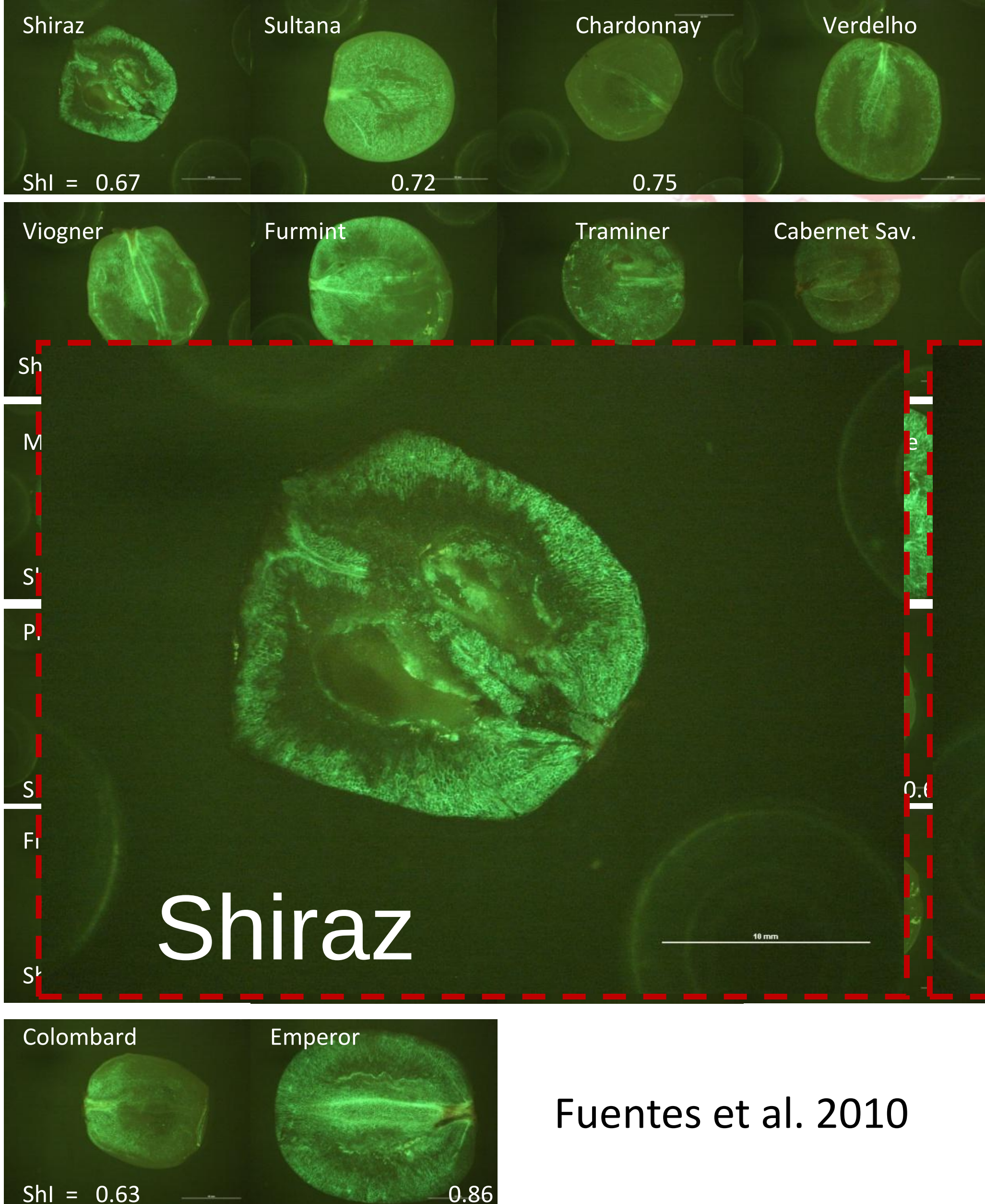
- Berry cell death using fluorescence microscopy (MATLAB)

$$ShI = \frac{R - R_{\min}}{R_{\max} - R_{\min}}; \qquad R = \frac{A}{P}$$

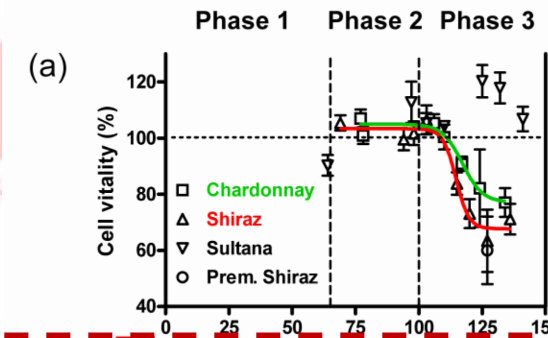
(shrivelled berry) $0 > ShI < 1$ (turgid berry)

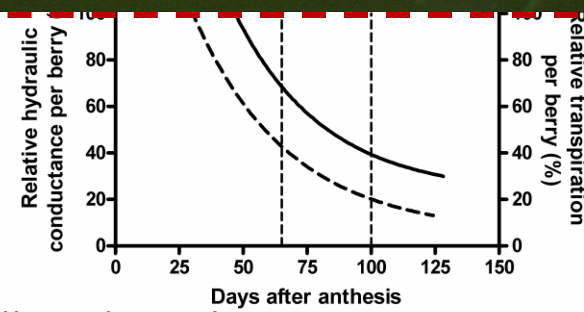


ShI = 0.98 ShI = 0.27

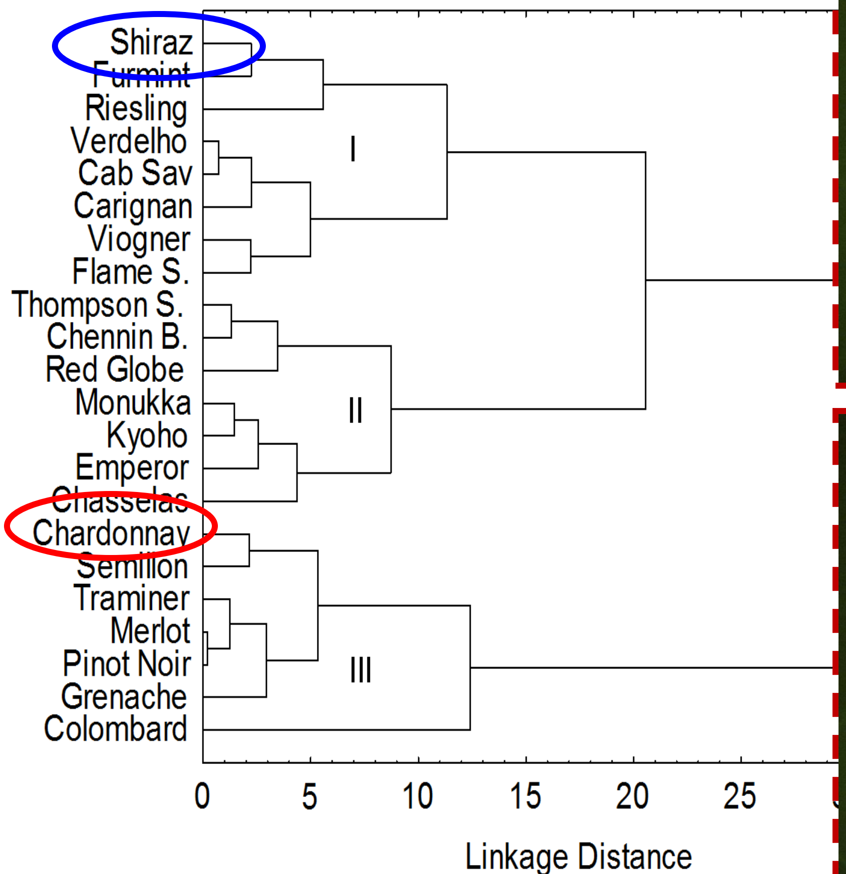


Fuentes et al. 2010





Tilbrook et al. 2008

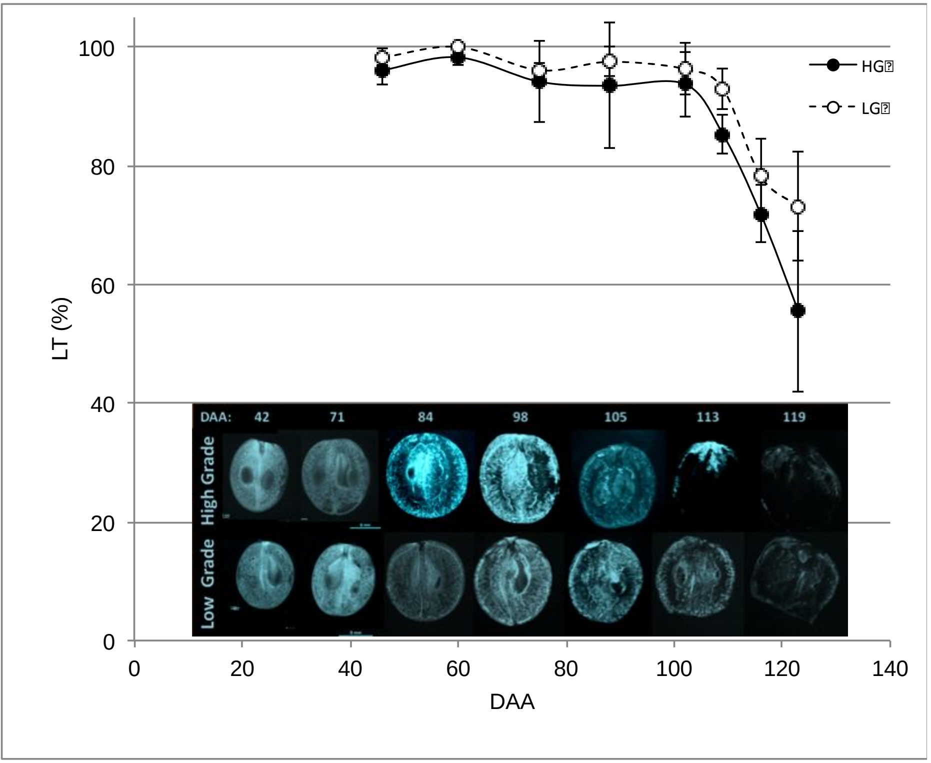

Shiraz
Furmint
Riesling
Verdelho
Cab Sav
Carignan
Viogner
Flame S.
Thompson S.
Chennin B.
Red Globe
Monukka
Kyoho
Emperor
Chasselas
Chardonnay
Semillon
Traminer
Merlot
Pinot Noir
Grenache
Colombard
I
II
III
0
5
10
15
20
25
Linkage Distance


Shiraz

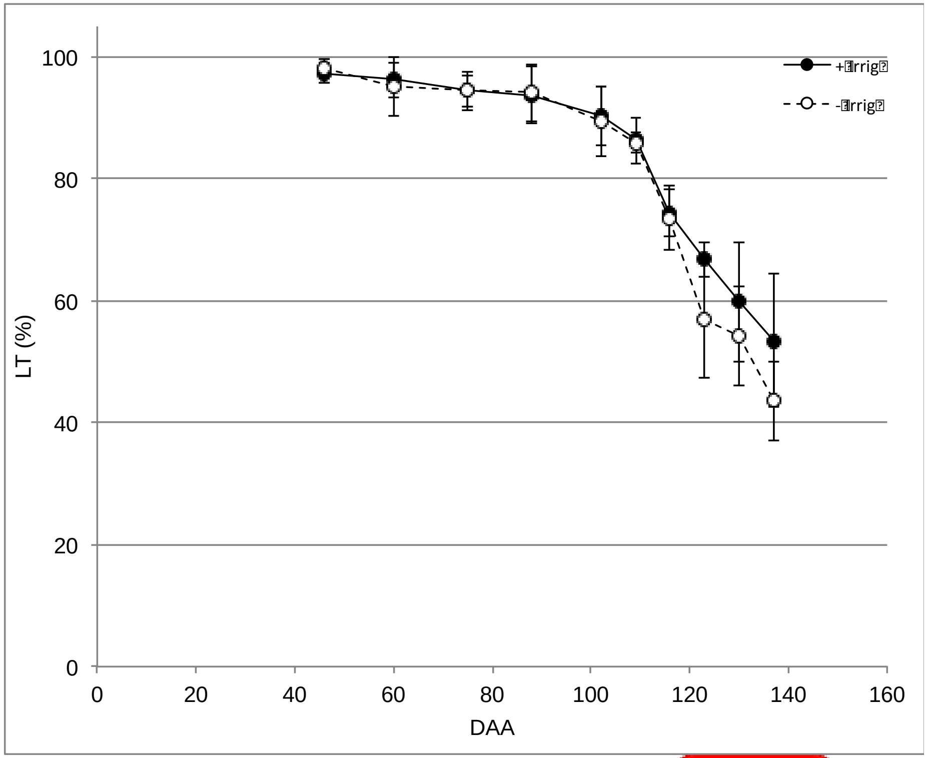

Chardonnay

Berry cell death in management - irrigated / drought Experiments (Shiraz)

Same management, soil differences



Differences in water application

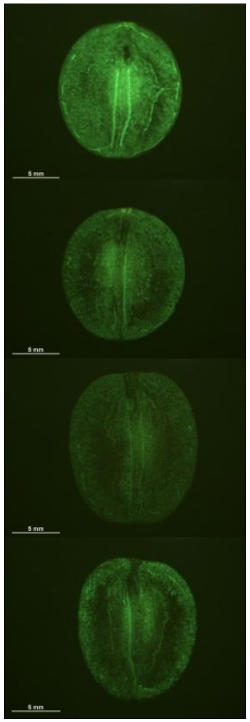


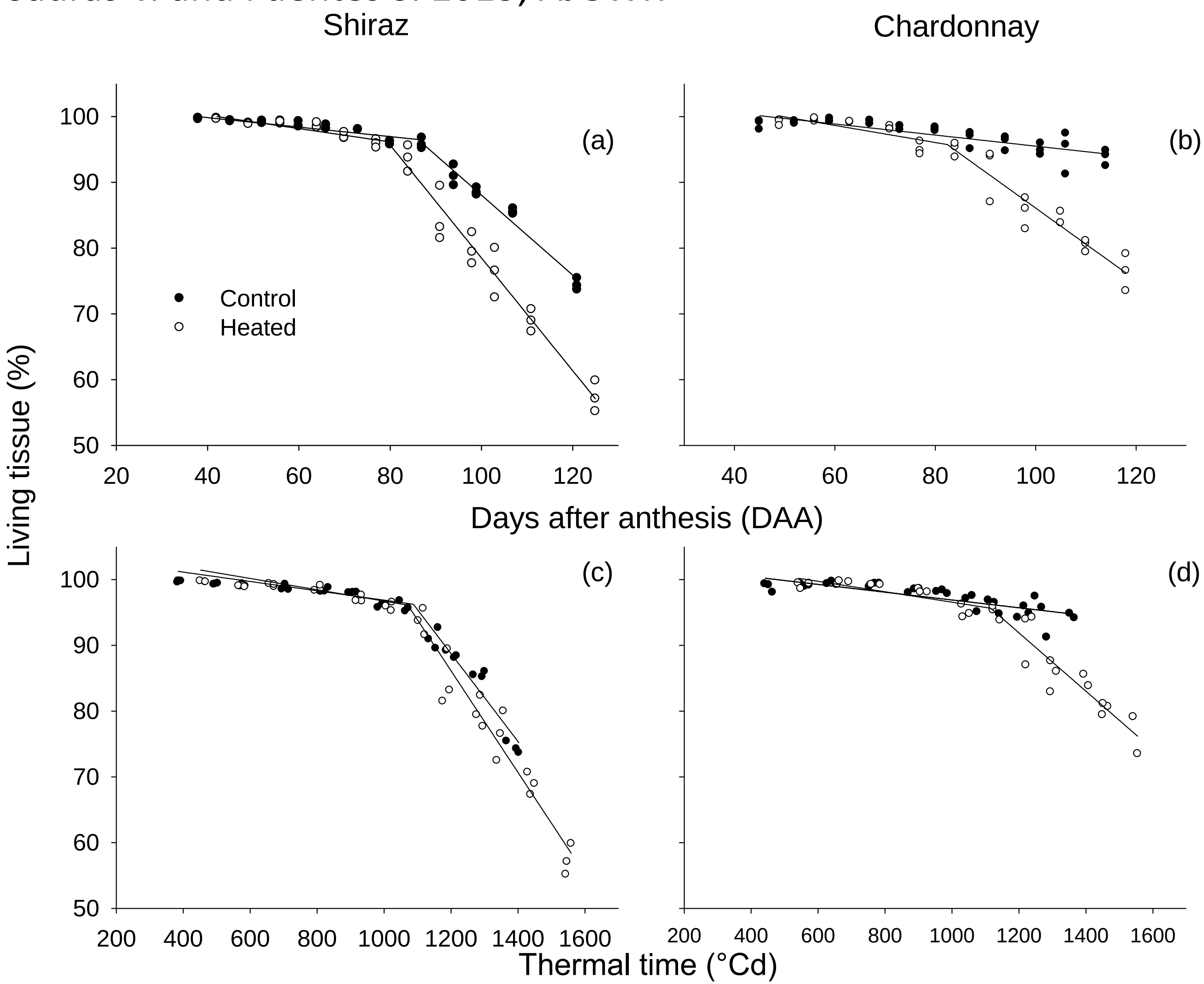
Increased Temperatures Experiment: Nuri (SA)

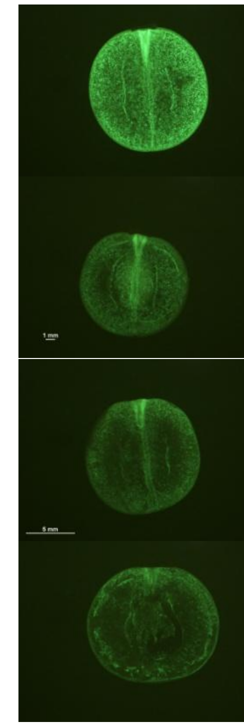
University of Adelaide - SARDI

❑ Onset and rate of cell death

Bonada M., Sadras V. and Fuentes S. 2013; AJGWR



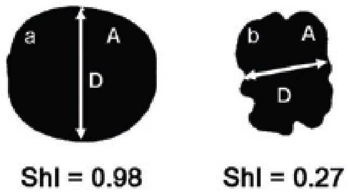




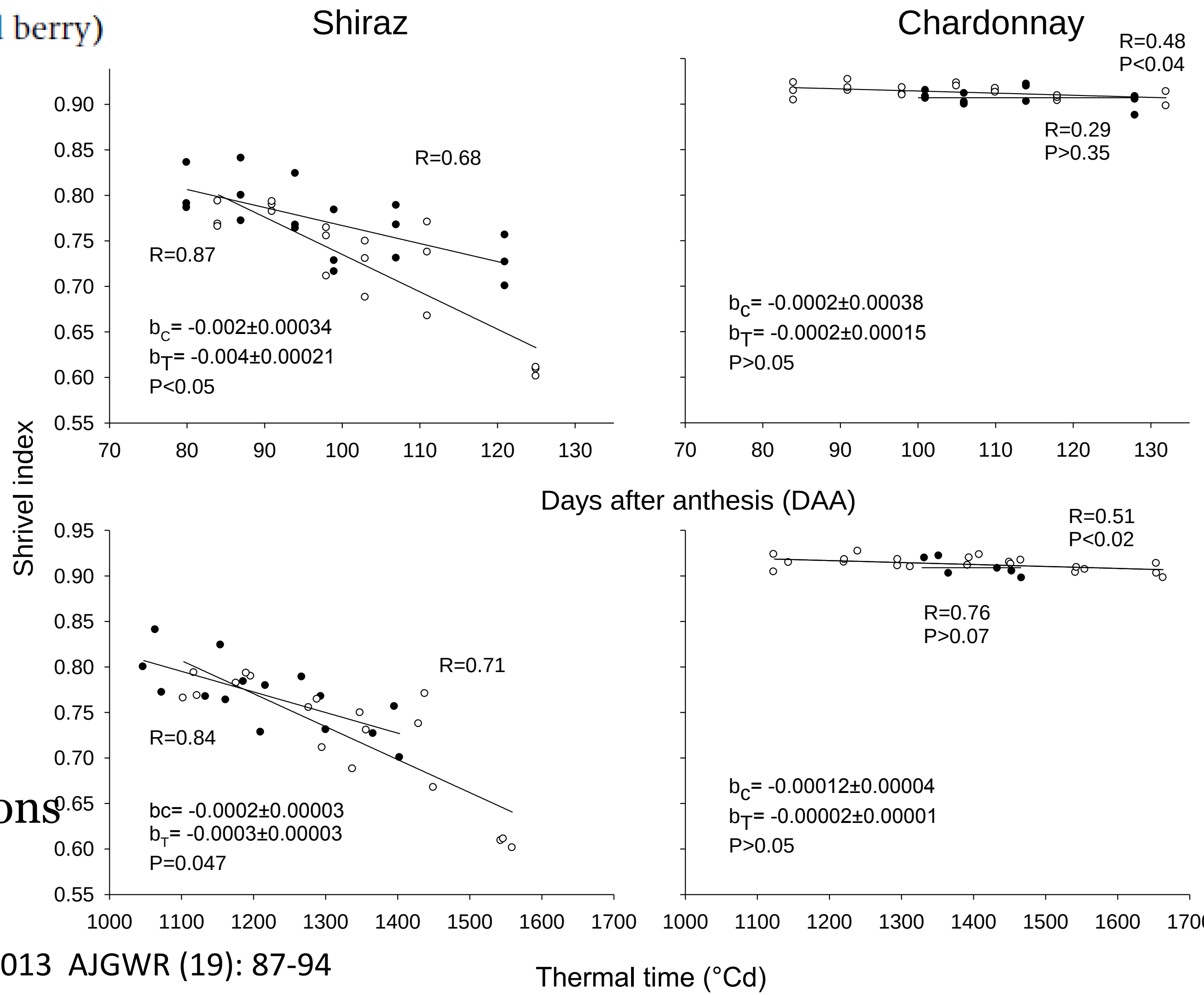
Berry Shrivel

$$ShI = \frac{R - R_{\min}}{R_{\max} - R_{\min}}; \qquad R = \frac{A}{P}$$

(shrivelled berry) $0 > ShI < 1$ (turgid berry)

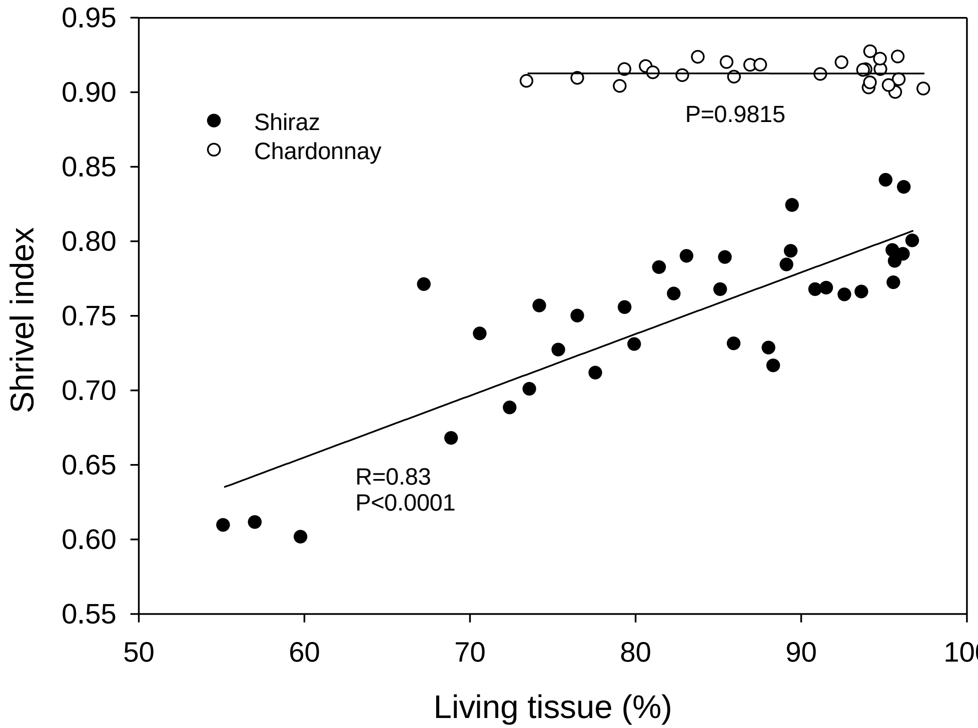


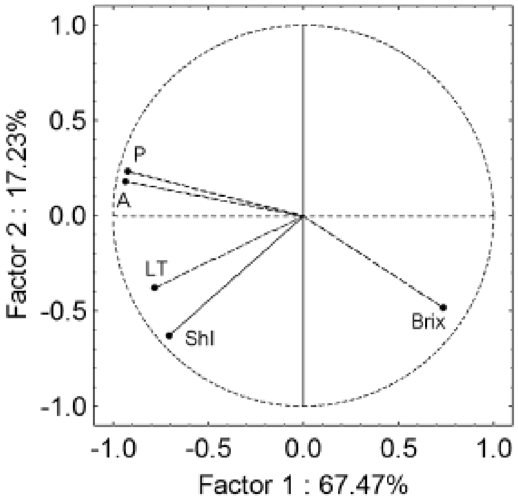
- No temperature effect for Chardonnay
- Shrivelling in Shiraz under warmer conditions



Bonada M., Sadras V. and Fuentes S. 2013 AJGWR (19): 87-94

❑ Berry shriveling





Two possible hypotheses:

1. Cell death and shrivel are not functionally linked

2. Cell death is necessary but not sufficient for shrinkage to occur

Source: Fuentes et al. 2010

Bonada M., Sadras V. and Fuentes S. 2013 AJGWR (19): 87-94

Smoke taint experiment

(Kerry Wilkinson, Roberta De Bei, Sigfredo Fuentes, Stephen Tyerman):

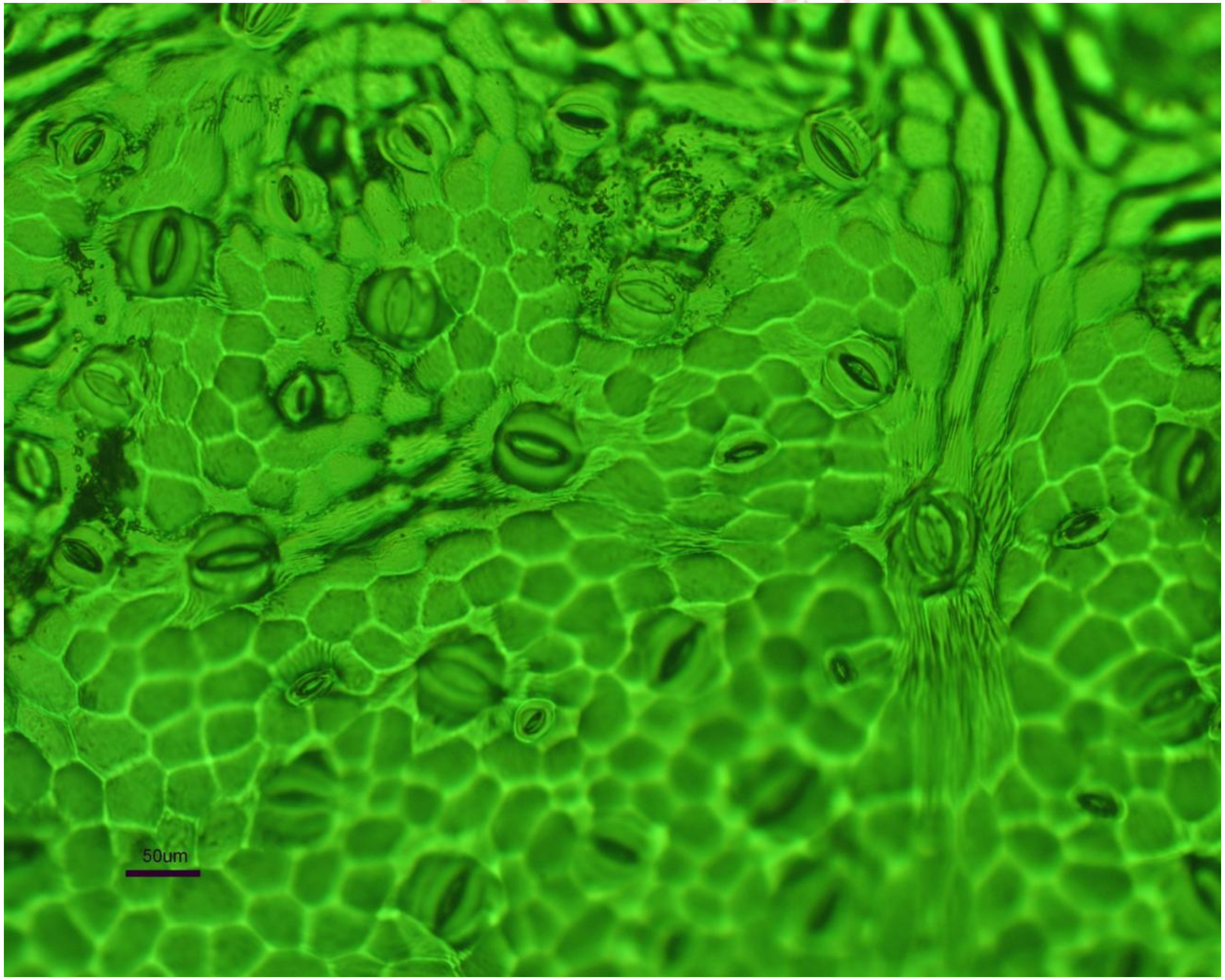
THE UNIVERSITY of ADELAIDE

SCHOOL OF AGRICULTURE, FOOD AND WINE

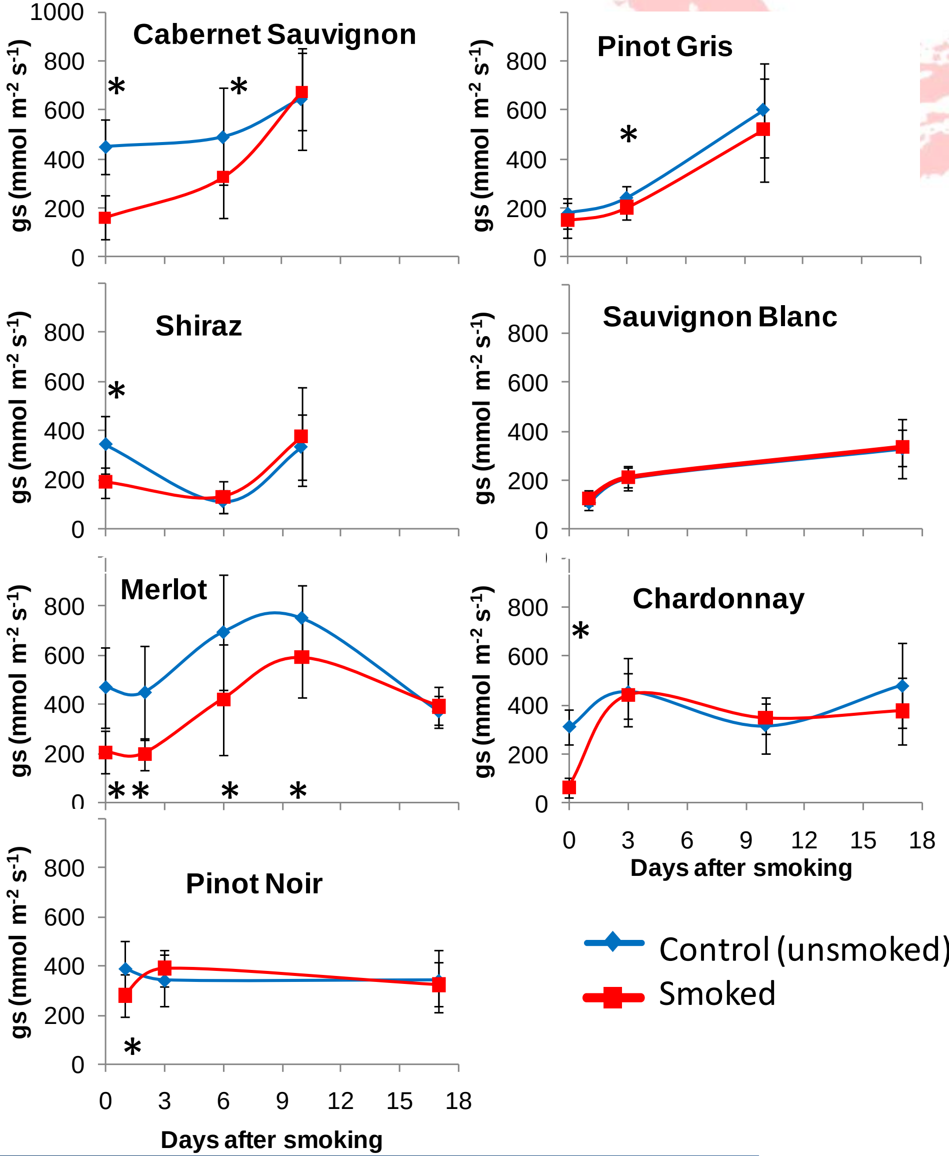
- **Coombe Vineyard (Adelaide)**
- **7 grapevine cultivars**

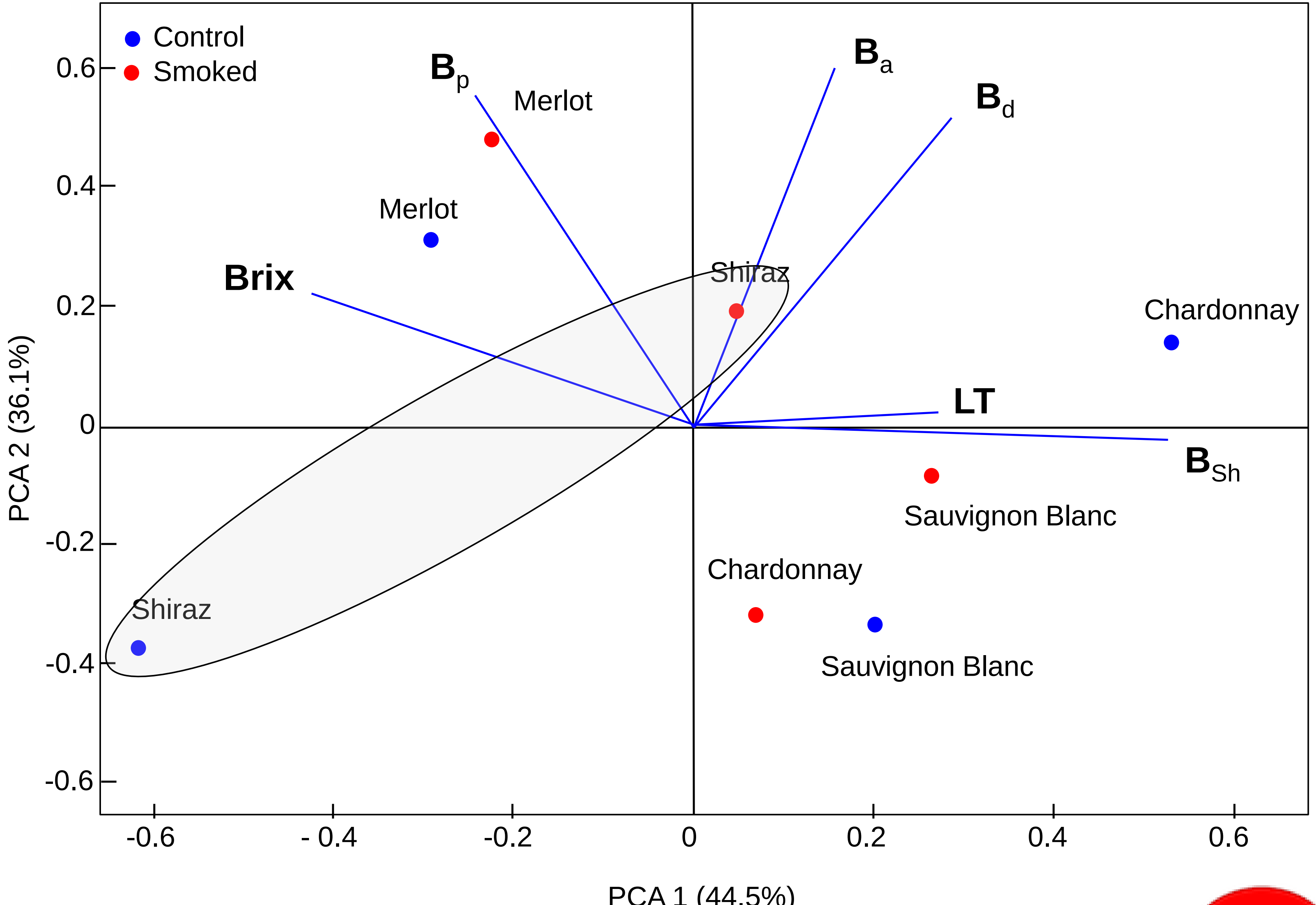
Principal component Analysis:

Canopy conductance

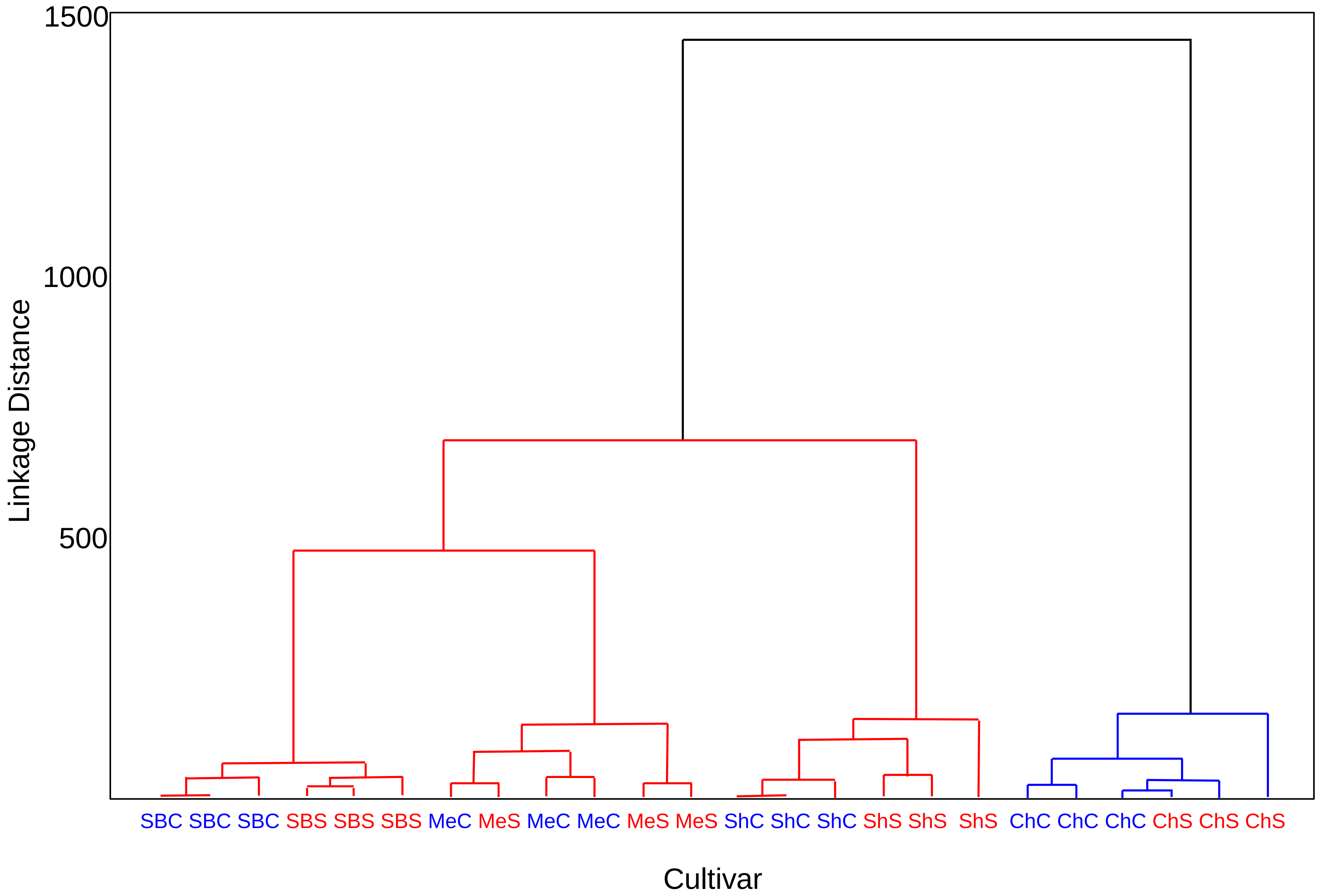


Smoke taint experiment





Control
Smoked
B_p
Merlot
Merlot
Brix
B_a
B_d
Shiraz
Chardonnay
LT
B_Sh
Sauvignon Blanc
Chardonnay
Sauvignon Blanc
Shiraz
PCA 2 (36.1%)
PCA 1 (44.5%)
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.6
- 0.4
-0.2
0
0.2
0.4
0.6



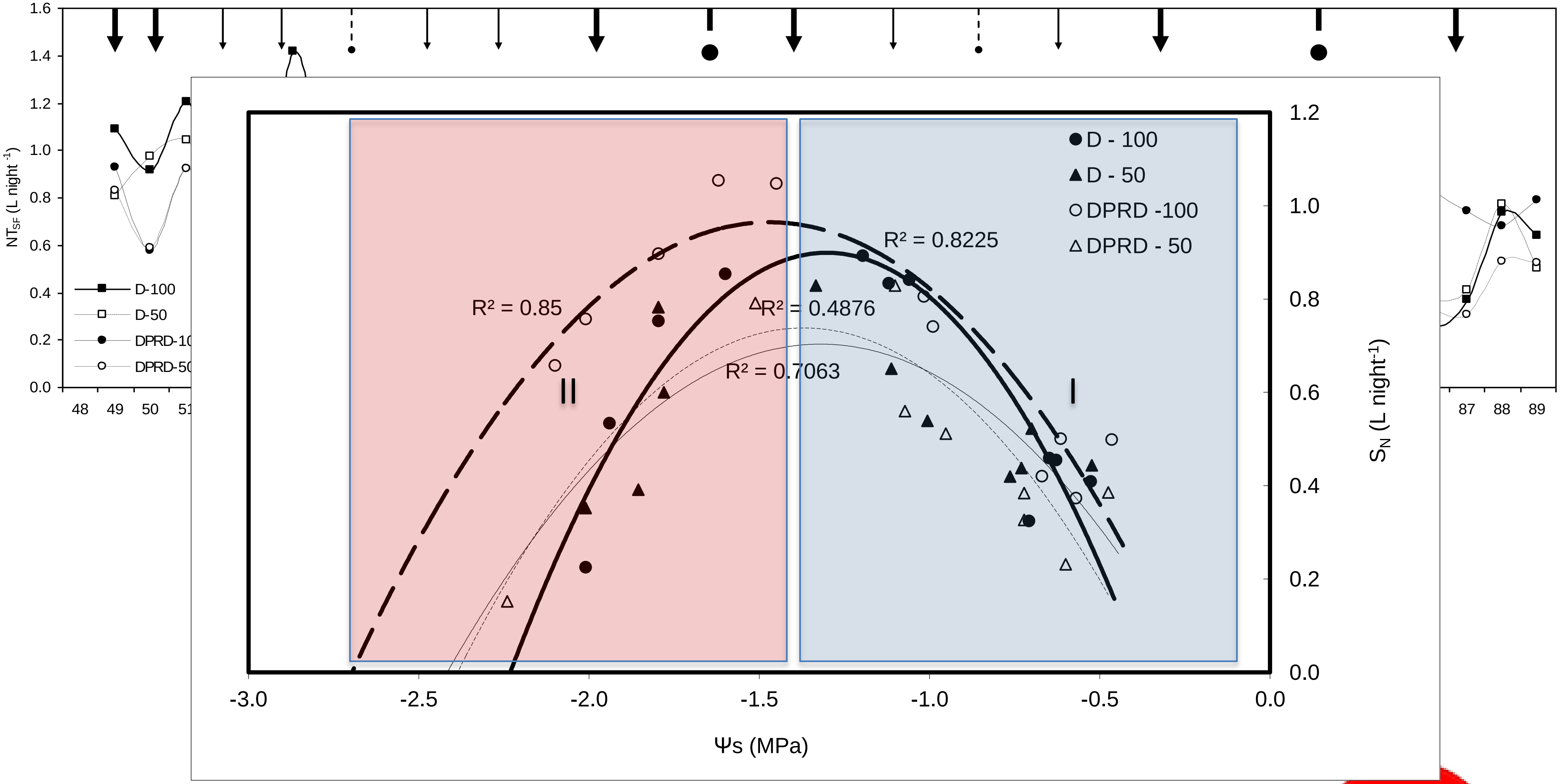
1500
1000
500
Linkage Distance
SBC SBC SBC SBS SBS SBS MeC MeS MeC MeC MeS MeS ShC ShC ShC ShS ShS ShS ChC ChC ChC ChS ChS ChS
Cultivar

Nocturnal transpiration / refill

Nocturnal sap flow output: Shiraz

Benalla VIC

Fuentes et al. 2014 Agricultural Water Management



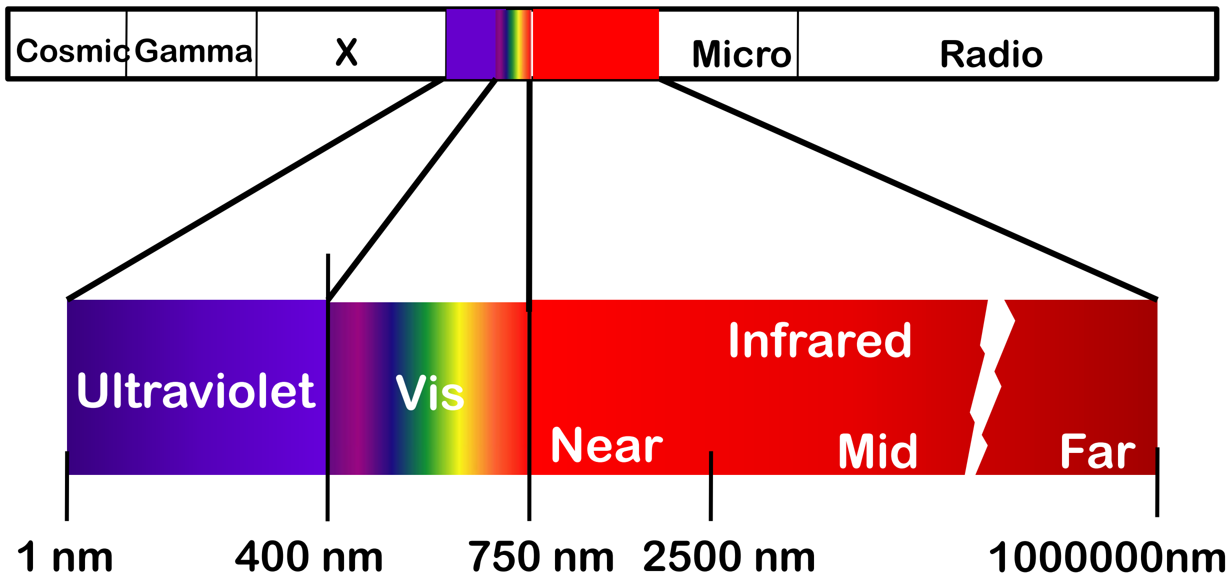
Plant Based Instrumentation

NIR: Near Infrared

62 Measure of grapevine water potential using NIR *Australian Journal of Grape and Wine Research* **17**, 62–71, 201

Non-destructive measurement of grapevine water potential using near infrared spectroscopy

R. DE BEI[1], D. COZZOLINO[2], W. SULLIVAN[1], W. CYNKAR[2], S. FUENTES[1], R. DAMBERGS[3], J. PECH[4] and S. TYERMAN[1]



Acknowledgements

Viti Group:

SCHOOL OF AGRICULTURE, FOOD AND WINE
THE UNIVERSITY of ADELAIDE

Prof. Steve Tyerman
Dr Roberta De Bei
Wendy Sullivan

Students:

Marcos Bonada (MSc)
Luciano Caravia (PhD)
Ta Nguyen (PhD)

Funding bodies:

gwrdc
GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

wine 2030 Research Network

Australian Government
Australian Research Council

TREASURY WINE ESTATES

WYNNS COONAWARRA ESTATE
THE ESTATE THAT MADE COONAWARRA FAMOUS

THE UNIVERSITY OF MELBOURNE
Melbourne School of Land and Environment

VoF