Manipulating Pinot Noir expression in the winery through novel wine making practices

Bob Dambergs

"Perfecting Pinot Noir"

15th AWITC Workshop 1

Understanding grape and wine tannins

The Australian Wine Research Institute

Grape tannins

- colourless polymeric polyphenols
- precipitate proteins ⇒ astringent

Red wine tannins

- grape tannins & modified tannins
- plus oak-derived hydrolysable tannins & oenotannins
- include also pigmented tannins (pigmented polymers)

Grape to wine colour conversion

The Australian Wine Research Institute

Winemaking and Aging

Tannin and Anthocyanins

Anthocyanins

- Colour in grapes and young wine
- Unstable
- Do not last long in wine

Pigmented polymers

- Colour in wine
- Tannins with anthocyanin
- Important for long-term colour stability

No free anthocyanins in old wines- pigmented tannins dominate colour

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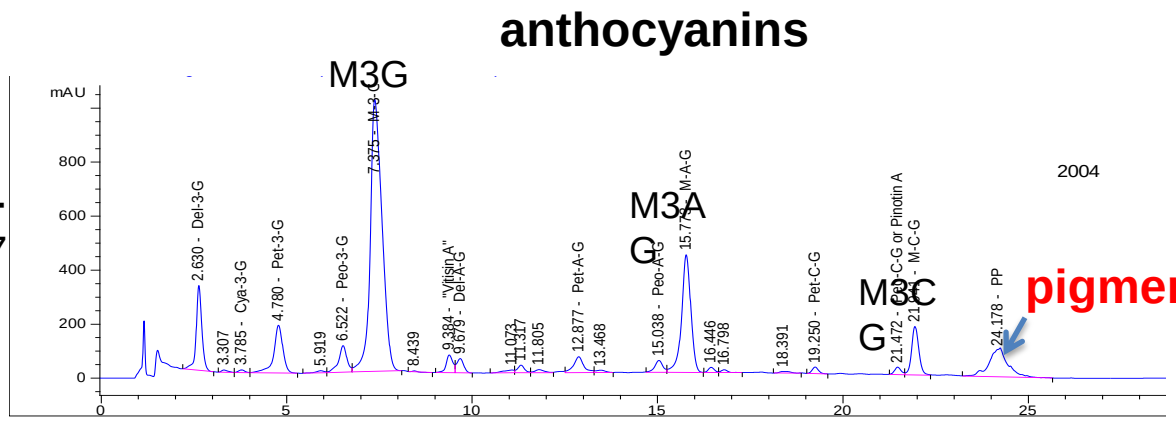
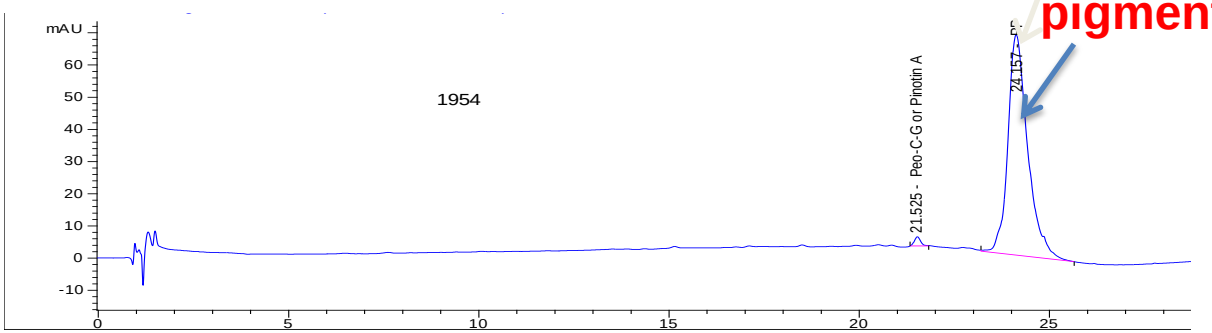
Vintage 2004
col dens 11.17
hue 0.70



pigmented tannins

Vintage 1954
col dens 5.50
hue 1.32



pigmented tannins

Predicting wine pigmented tannin potential

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$$[PP] = 0.06\,[M3G] + 0.04\,[T] - 2.88$$

$$R^2 = 0.92$$

PP: pigmented polymers

M3G: malvidin 3-glucoside

T: tannins

Can we compensate for low anthocyanins by boosting tannin to promote pigmented tannin formation?

Tannins – so what?

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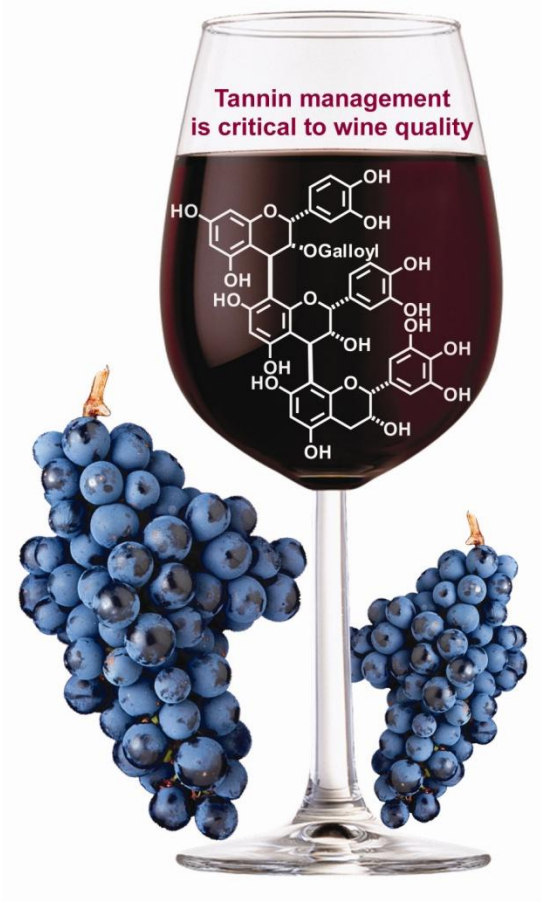
Seeds, skins and stalks of red grapes contain tannins that control

- Browning
- Colour
- Astringency
- Mouth-feel
- Bitterness
- Protection against oxidation
- Quality



Tannin correlates with commercial quality grading

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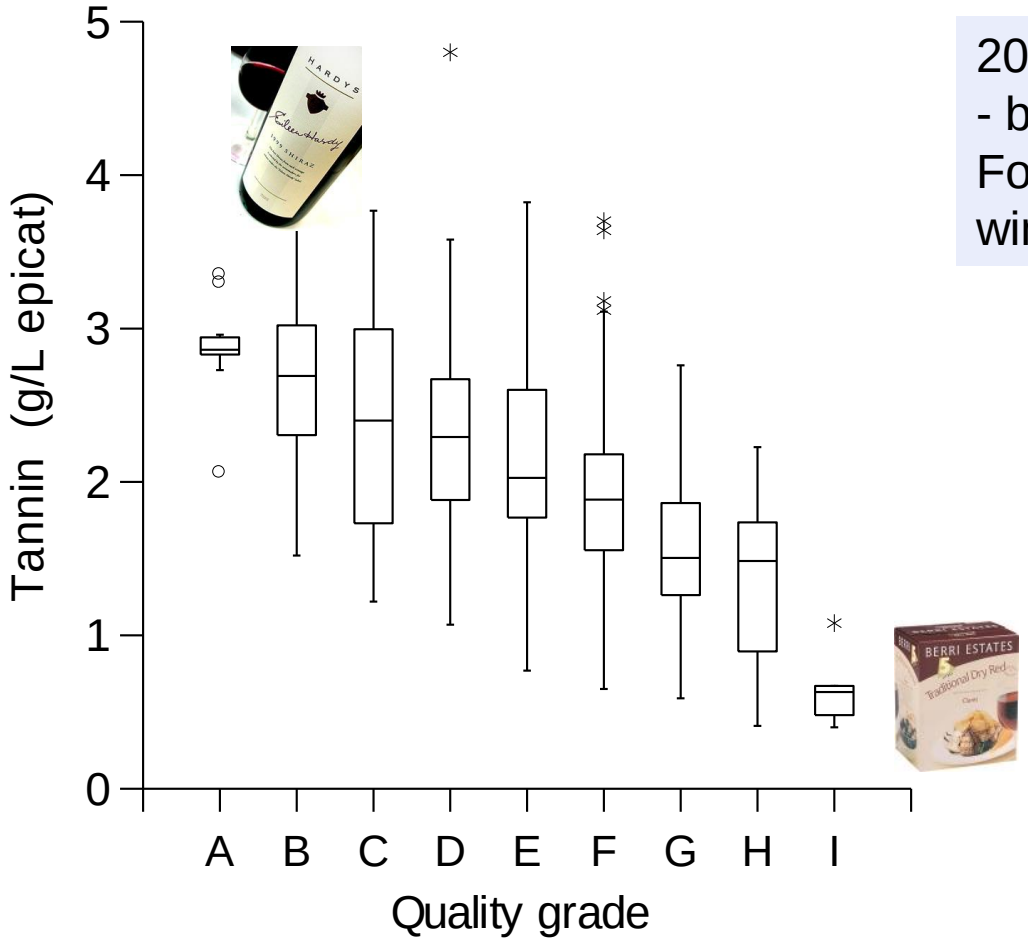
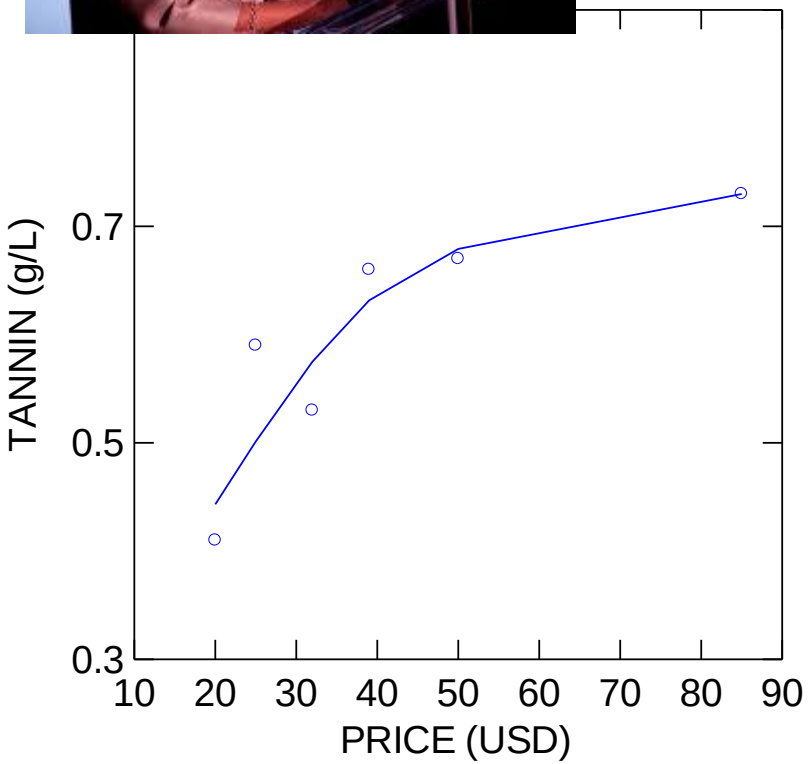


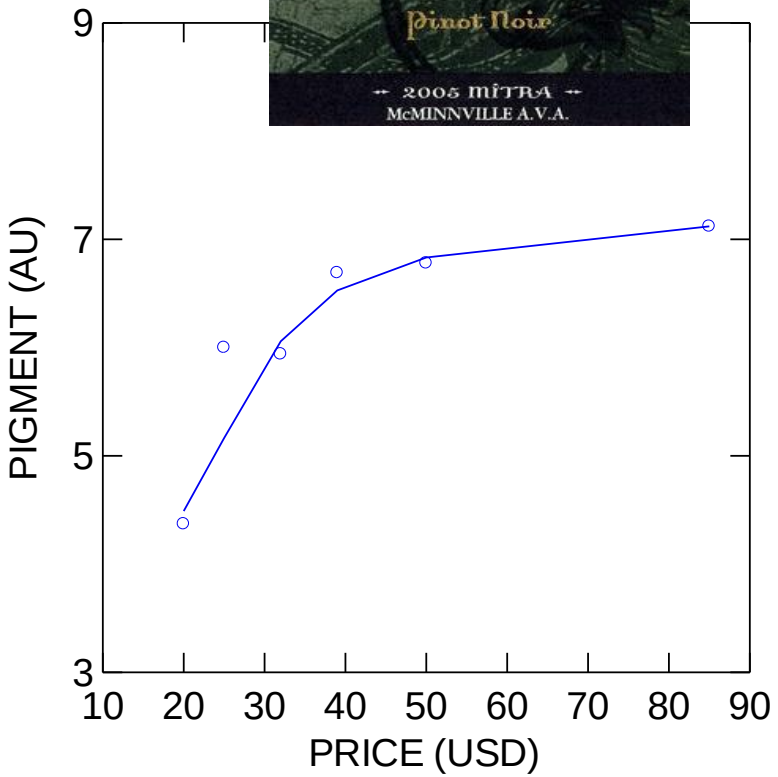
2005-2007 Hardy Shiraz - but also applied to Fosters and Orlando wines

Tannin and pigment correlate with "quality"

The Australian Wine Research Institute

"One of the ultimate quality indicators is price"
- Jancis Robinson, ICCS Hobart





Tannin, pigment and quality: wine show performance – cluster analysis

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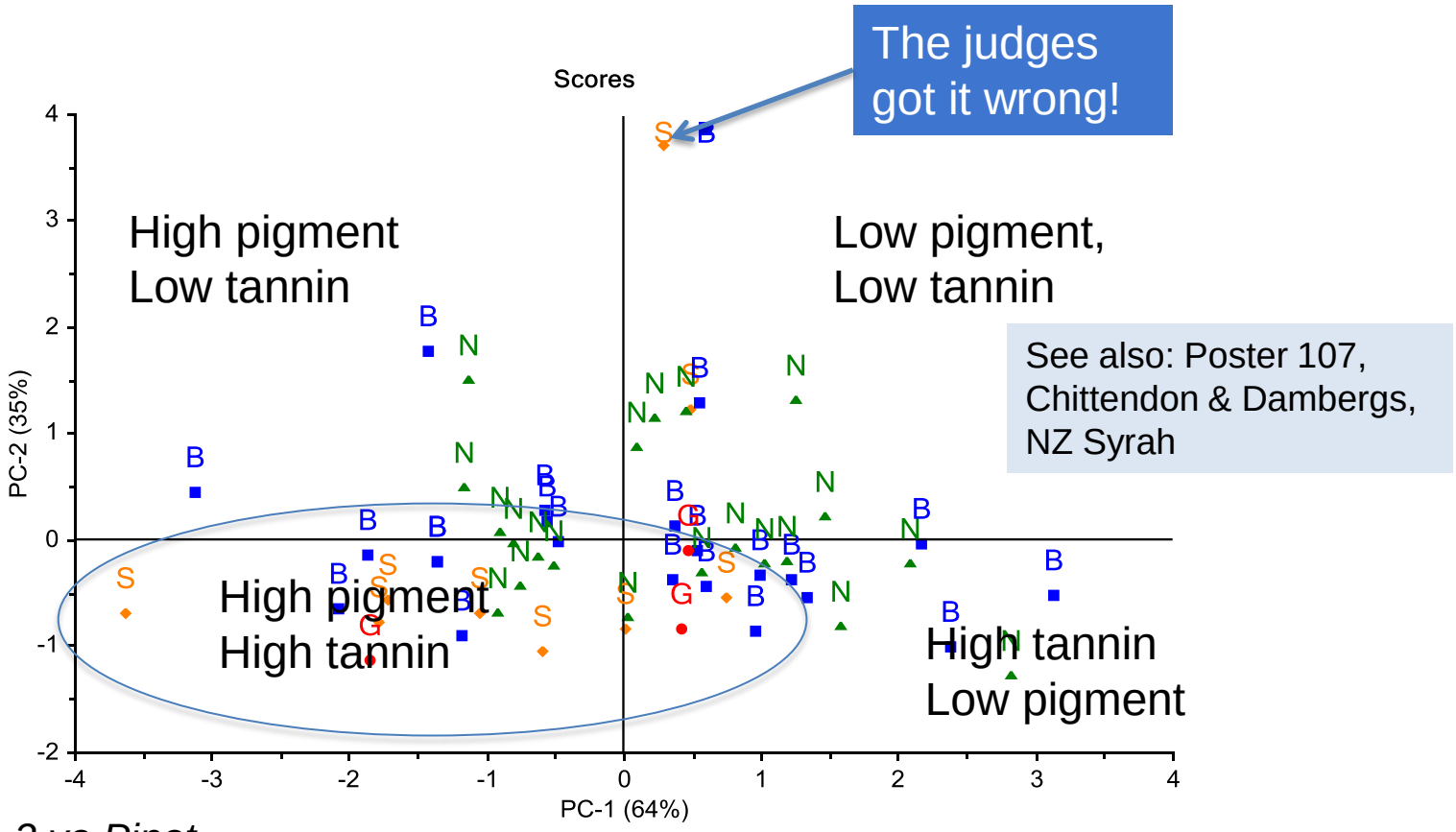

See also: Poster 107, Chittendon & Dambergs, NZ Syrah

Class 18, 2 yo Pinot, Tasmanian Wineshow

Best wines have an ideal combination of tannin and pigment

Tannin and pigment analysis correlates with sensory

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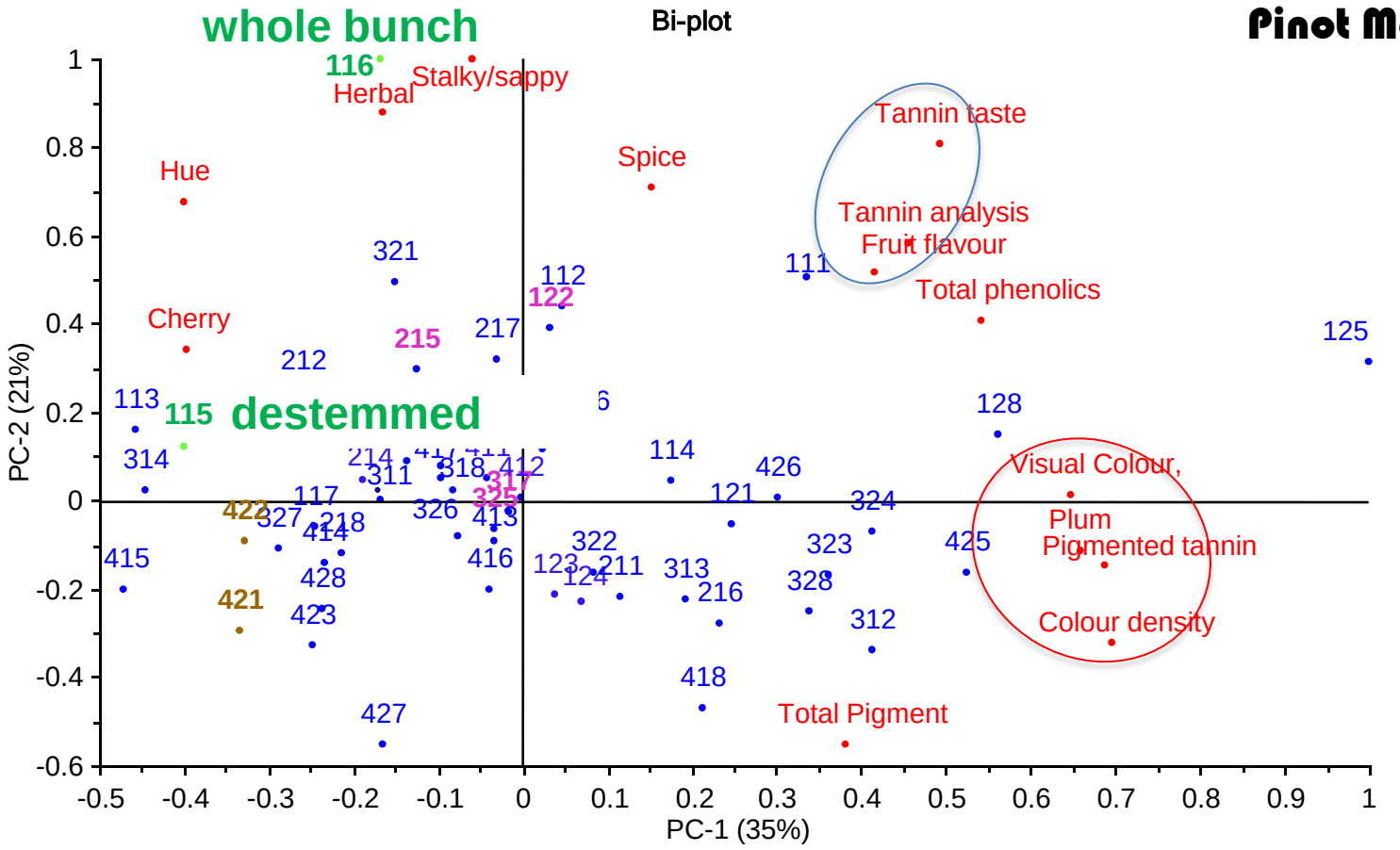
Pinot Massif



"Bob's modified Somers analysis"

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Samples are diluted in a wine-like buffer with

— no additions

— with acetaldehyde added

— with high SO_2 added

- provides control of pH, ethanol to minimise their effects on colour
- samples can be read in 10 mm cuvettes instead of 1 mm
- can be adapted for use in a plate reader spectrophotometer

Simplifed wine analysis

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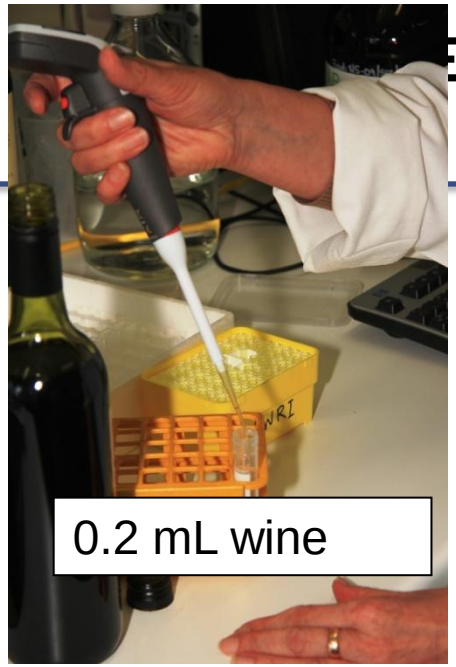
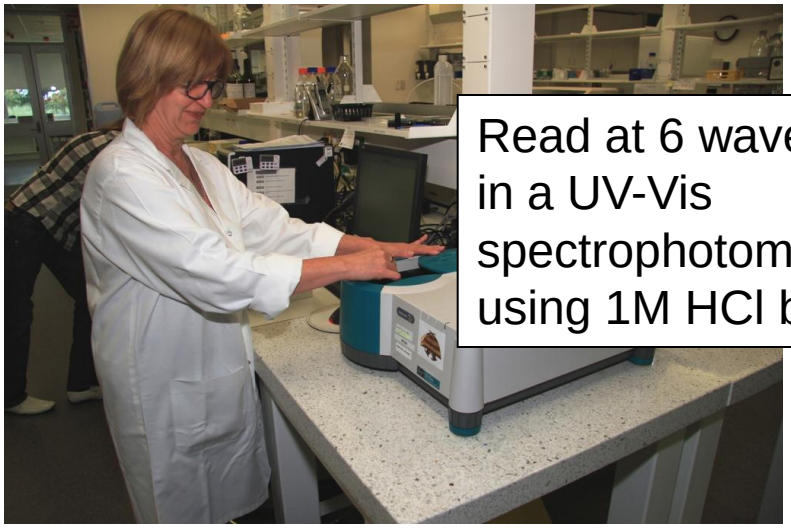
Modified Somers and tannin analysis

- Colour density
- Hue
- Anthocyanin*
- Total pigment*
- Total phenolics*
- Pigmented tannin*
- Total tannin*

**can be analysed with the AWRI Tannin Portal*





Calculate

- Tannin
- Total phenolics
- Total Pigment

Additional calculations

- Requires an extra sample prep (dilution in high SO_2 buffer)
- Free anthocyanin
- Pigmented tannin

The problem with Pinot phenolics

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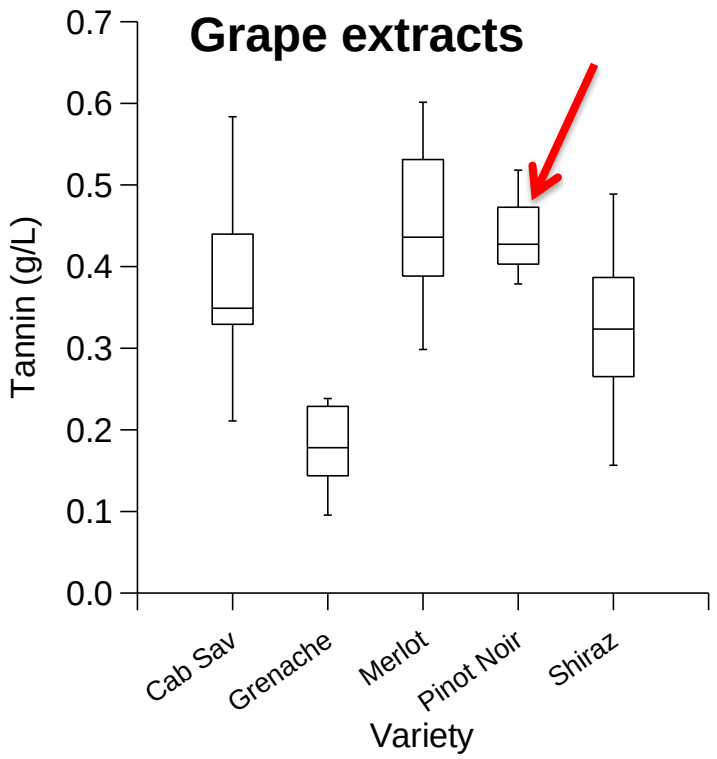
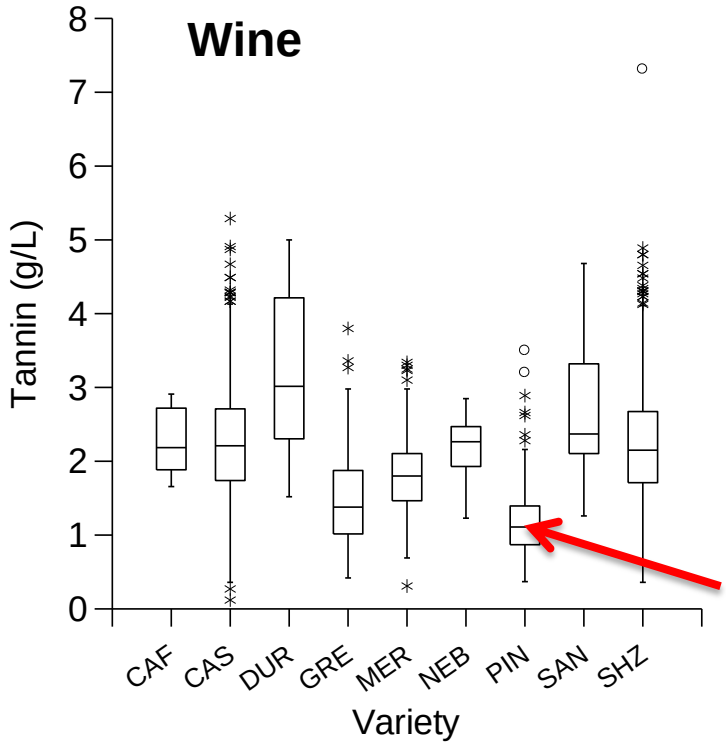
Low total anthocyanins

No acylated or coumarylated anthocyanins

Grapes have high tannin but it's mostly seed tannin

Wines have relatively low tannin and colour





Optimising phenolic development during red wine maceration

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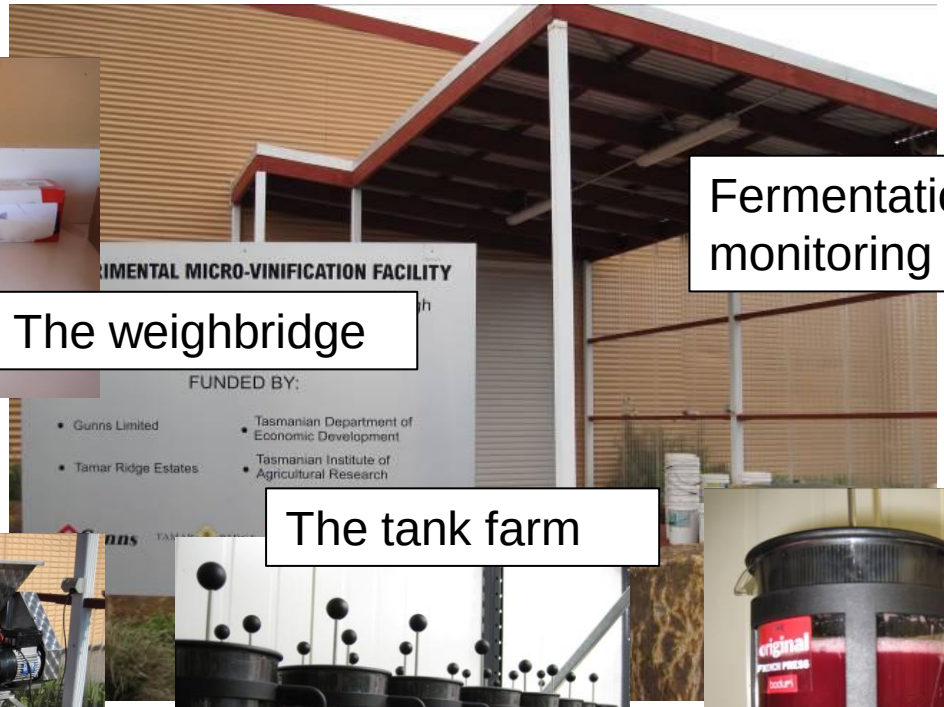
Need to synchronise

- extraction of anthocyanin
- extraction of tannin (skin, seeds and stems?)
- availability of active yeast metabolites
- promotion of anthocyanin/tannin reactions to form stable pigments

Small-lot winemaking

The weighbridge



Fermentation monitoring

The crusher/destemmer

The tank farm

The Bodum fermenter/filter/press

Experimental winemaking treatments

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- Control
- Cold macerate 4 days at 4 ° C
- Extended post-ferment maceration (45 days)
- 20% juice runoff before fermentation
- 20% juice runoff , returned in 2 stages near end of ferment
- Stems added back
- Oak powder added
- all innoculated with RC212
- submerged cap ferments, 28° C

Tannin can be manipulated during fermentation

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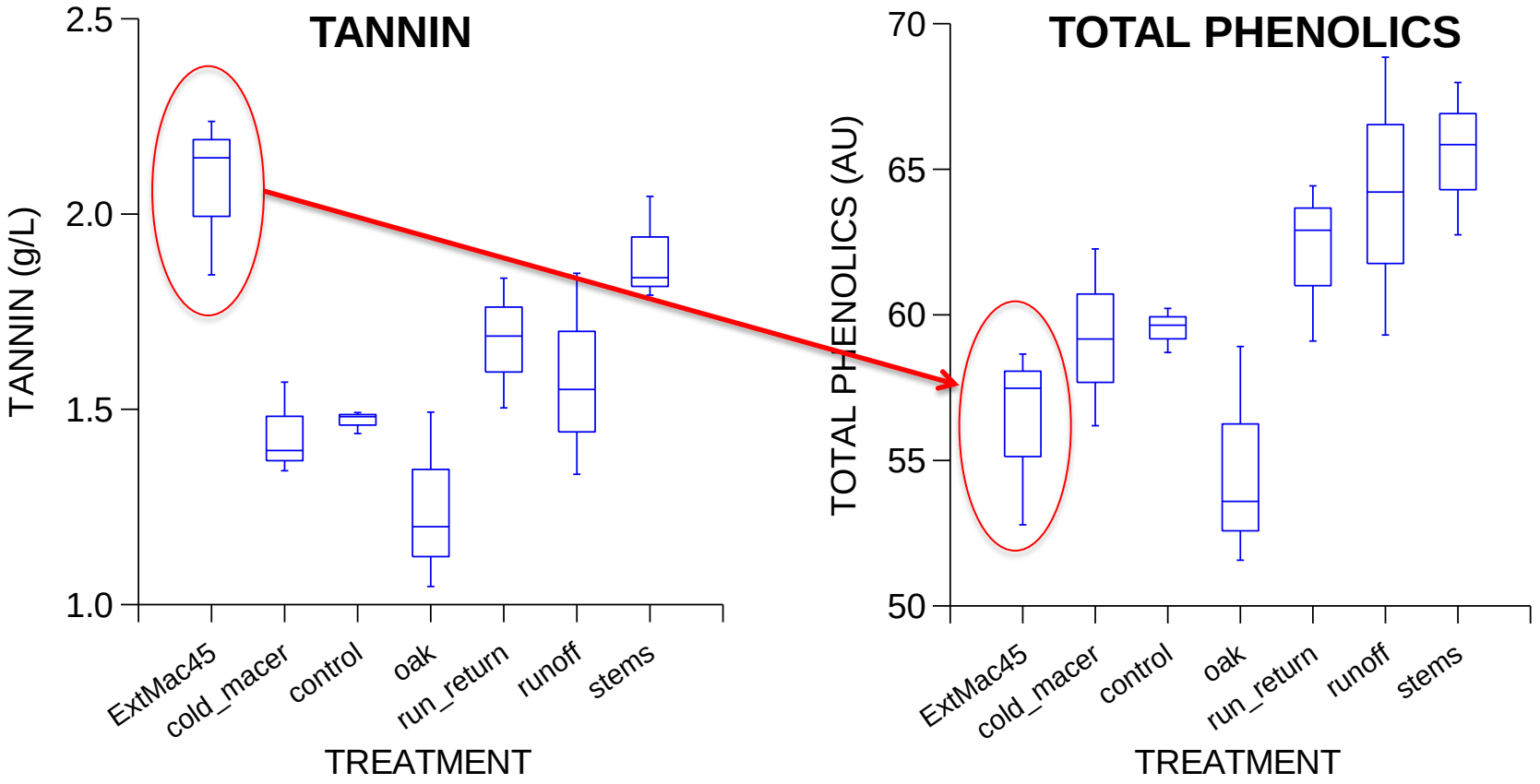

Not equivalent to tannin !!

An example of rapid colour stabilisation

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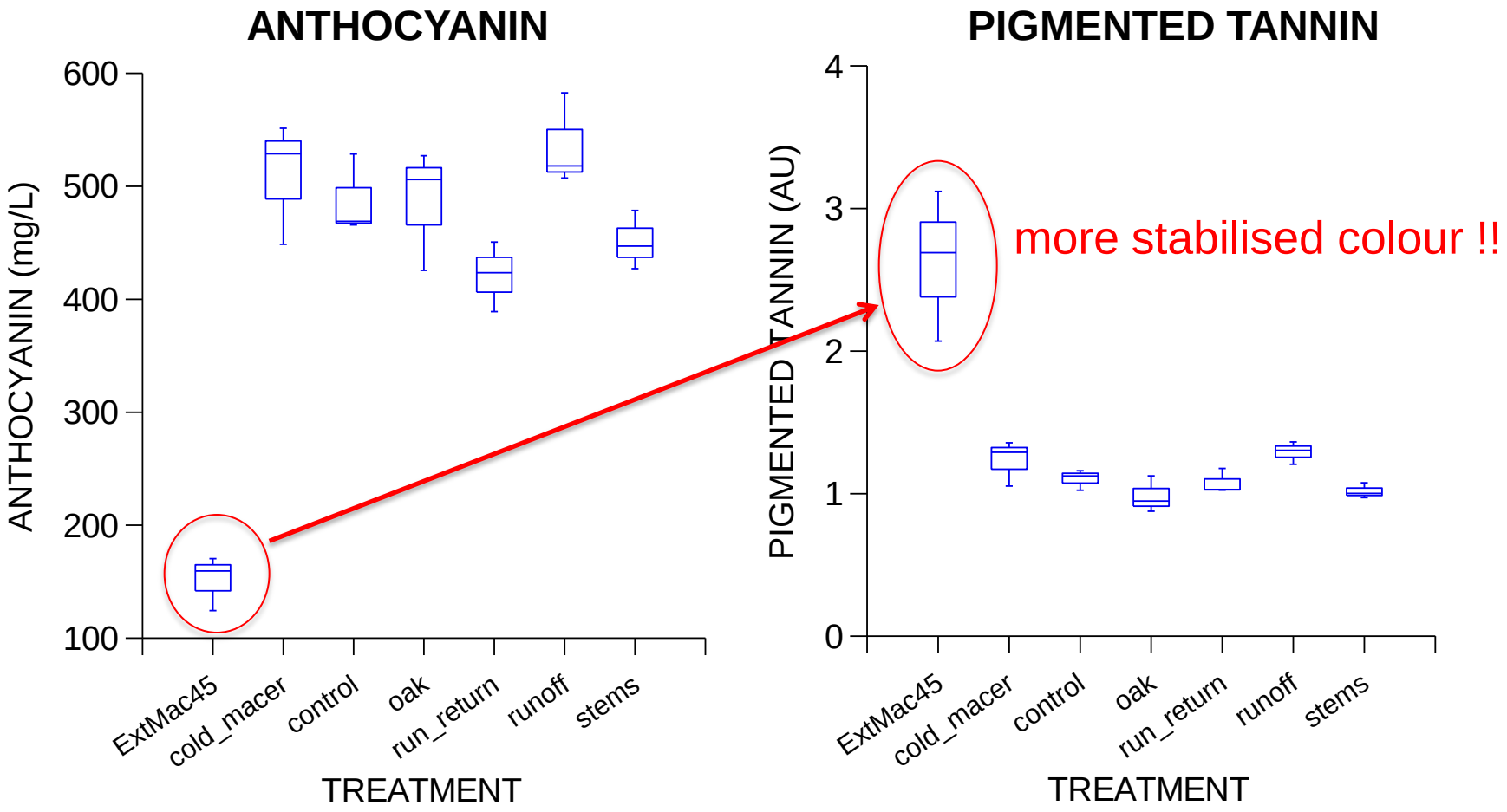
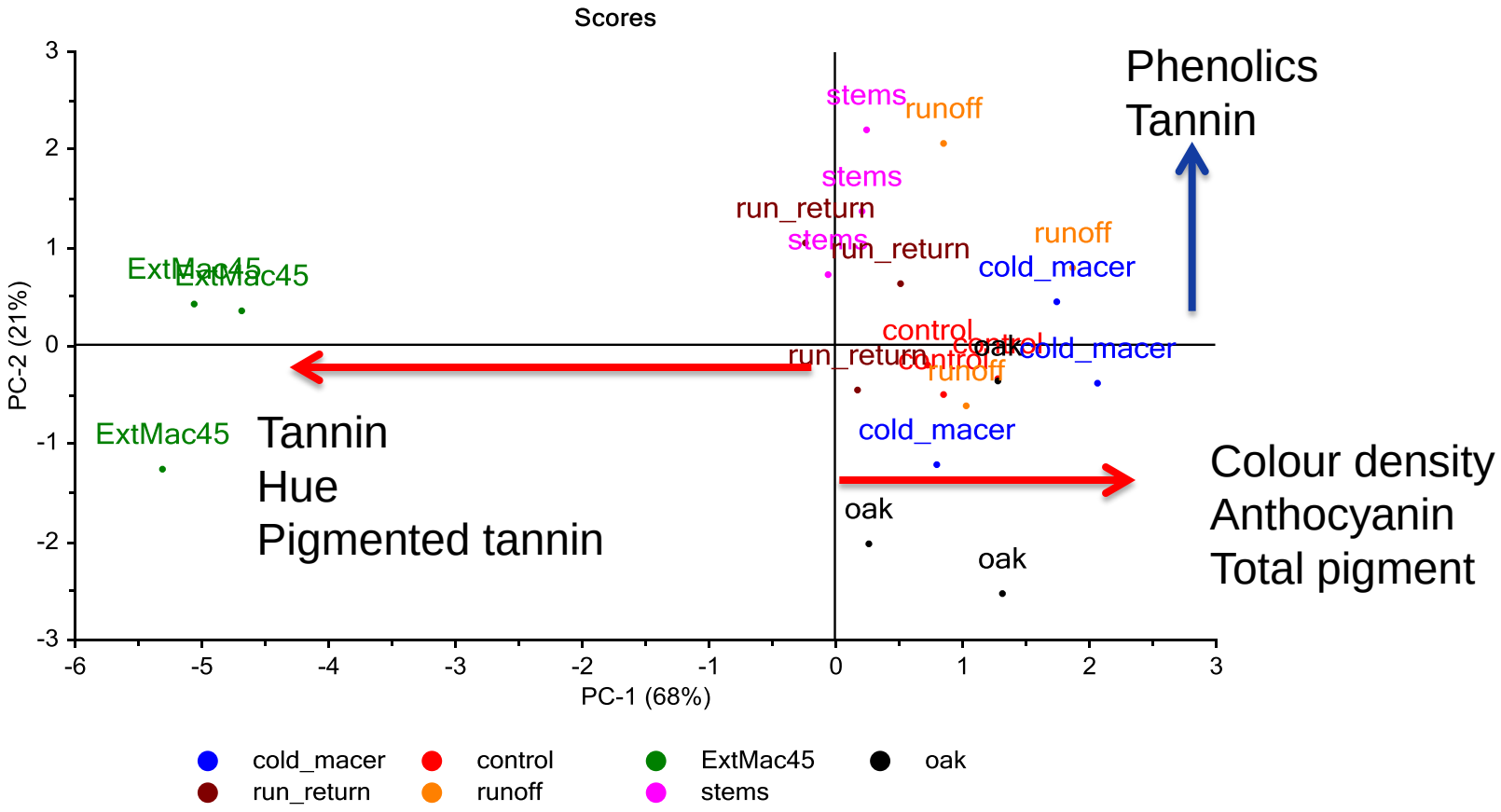


Cluster analysis (PCA)- all samples



Moving it to the next level

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RC 212 control
EC1118
Bayanus: AWRI 1176, AWRI 1375
Hybrids: AWRI Fusion, AWRI 1503
TD+ 1118
Carbonic maceration
White skins
Cold soak, then wild ferment
Cold soak, wild primary, delayed wild malo
Co-fermentation with Pinot Gris or GT
Stalks
Transfusion (run off juice and return near end of ferment)

ICCS Workshop 2-
"Taming the Pinot noir terroir"
with Nick Glaetzer and Jenny Bellon

15th AWITC
Poster 111, Glaetzer et al
Poster 110, Magyar et al

Taming tannin

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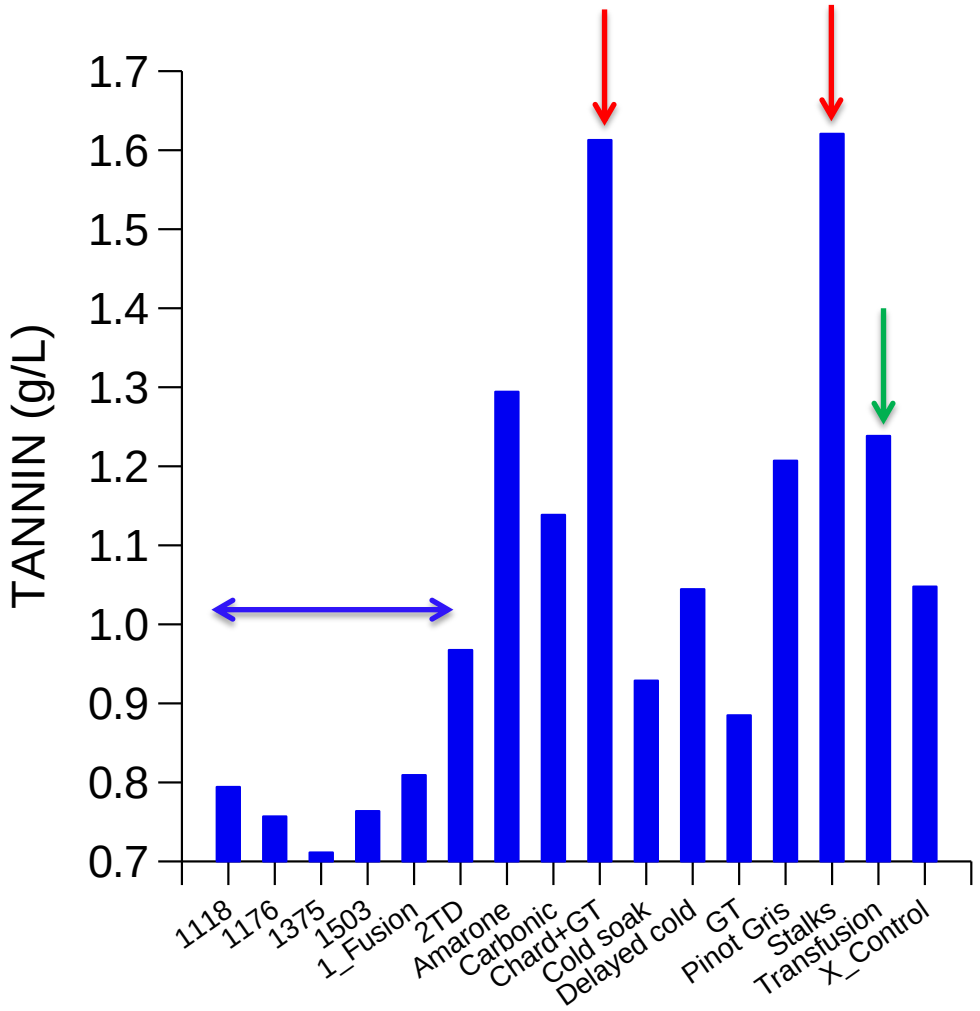

- White skins or stalks added had the highest tannin
- Alternative yeasts lower than RC212
- Transfusion higher than control

Taming pigmented tannin

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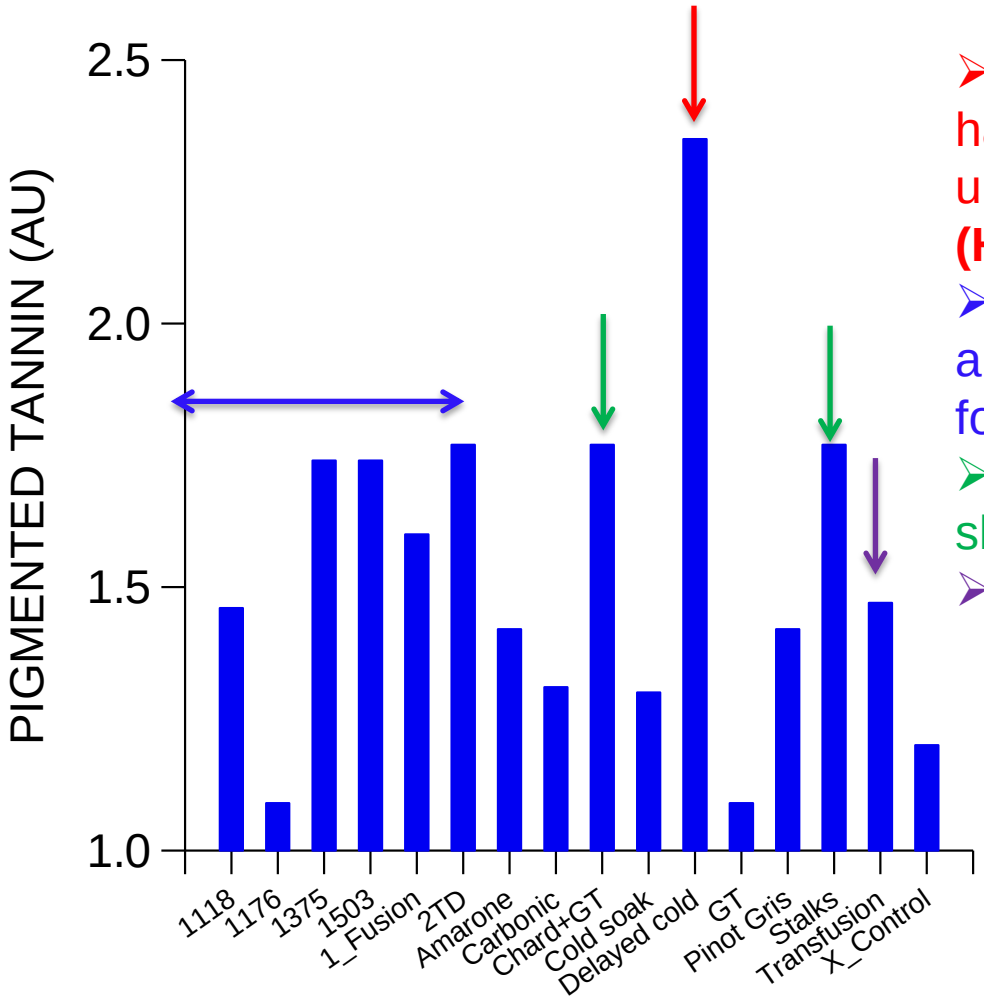

- Cold soak/delayed malo had highest but it was an unusual plummy colour **(Hue_SO_2 !!)**
- Elevated with most alternative yeasts except for 1176
- Elevated when white skins and stalks added
- Elevated with transfusion

The ratio of pigmented tannin and total tannin

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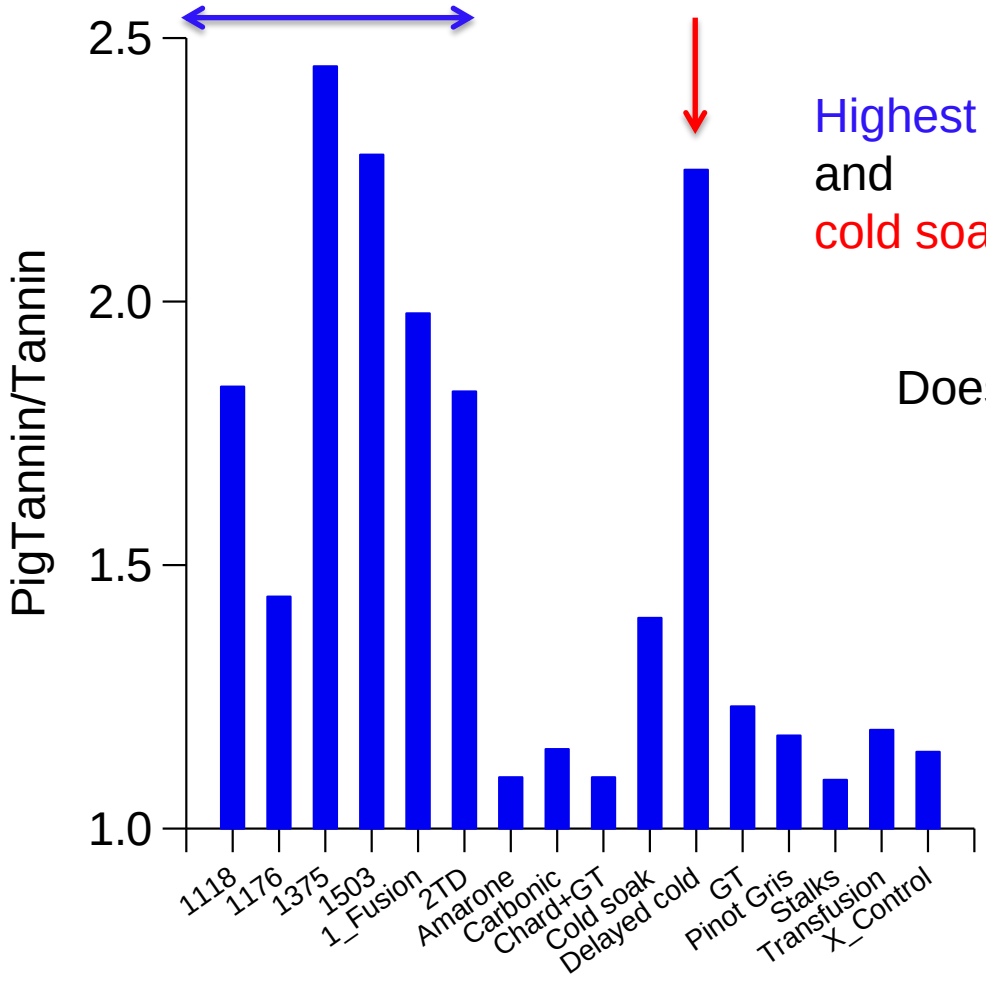

Highest were alternative yeasts
and
cold soak/delayed malo

Does it affect mouth-feel?

Colour density

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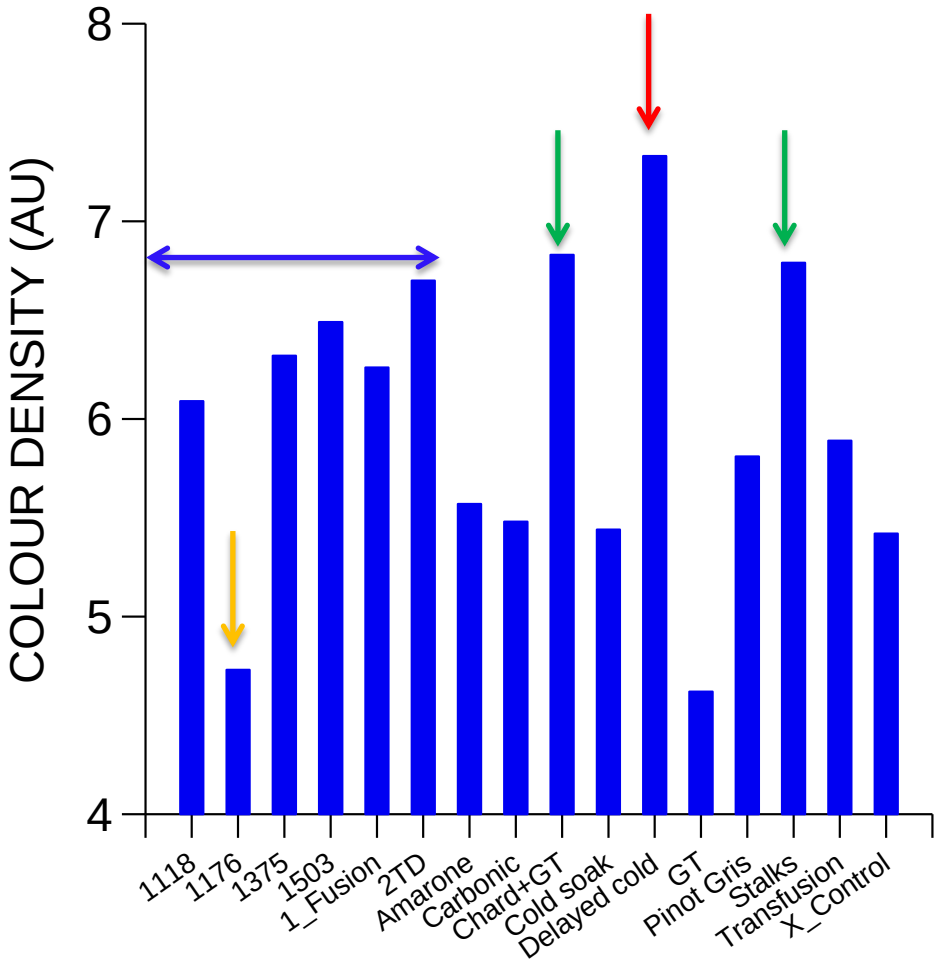
- Corrected for SO_2
- High colour density = high visual colour

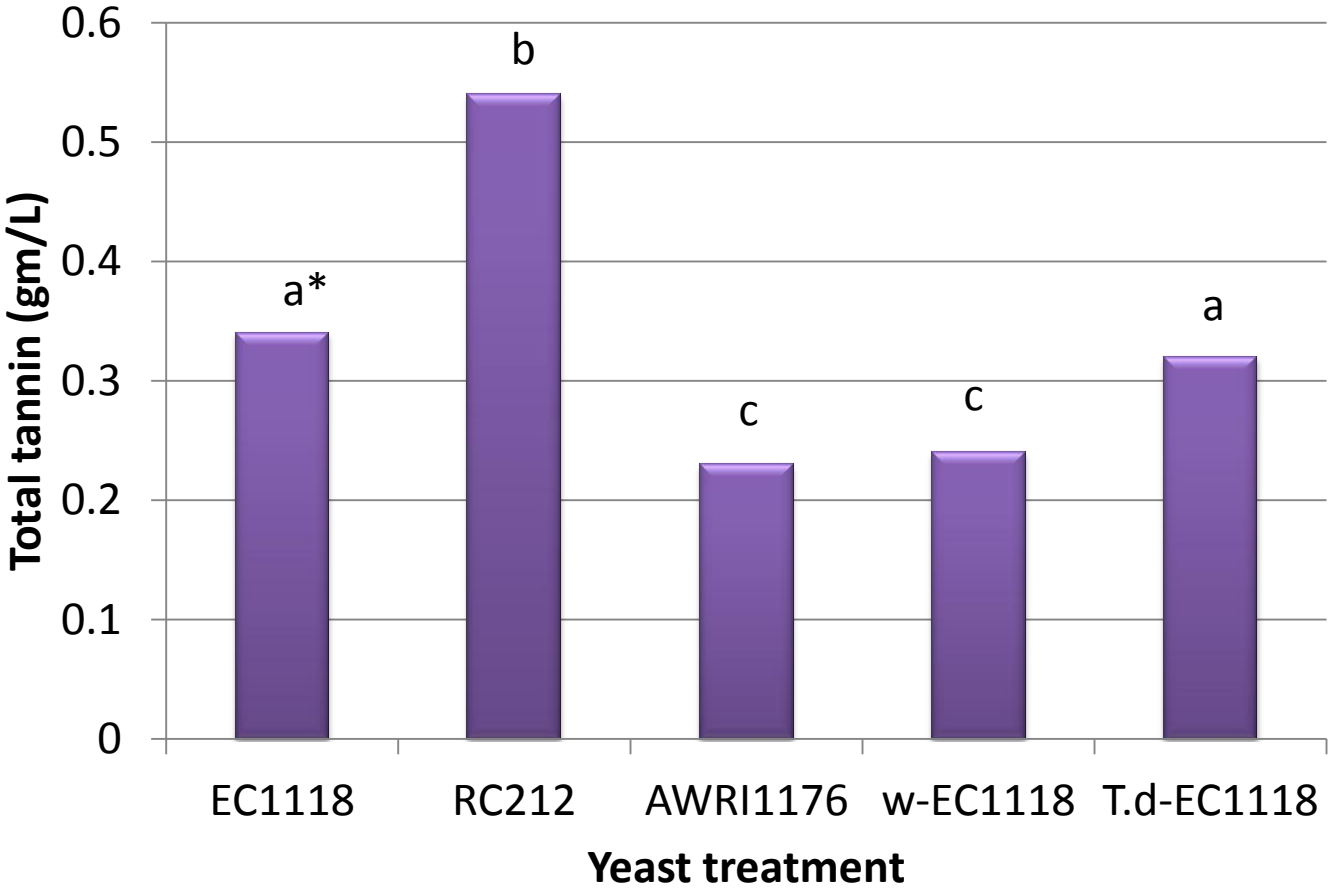


- Cold soak/delayed malo had highest
- Next were white skins and stalks!!
- Most alternative yeast higher than control but not 1176

Anna Carew: microwave maceration and yeast treatments

15th AWITC Posters 106, 108, 109

Yeast strain and total tannin



*Means with the same letter are not significantly different at the $p \leq 0.05$ level according to Tukey's Test.

Microwave maceration

TIA/AWRI have conducted 30+ replicated trials of microwave maceration for since 2010.

Compared with control fermented on skins for 8 days, microwave wines showed more rapid and effective extraction of phenolics.

Thus far, applied to Pinot noir and Shiraz musts, at laboratory scale (1kg).

1. Intermittent microwave & stirring

2. Monitor for peak temperature (70°C)

3. Hold time in 70°C waterbath

4. Cool to ~24°C, inoculate with ADY for AF

Options for winemakers

Rapid extraction by microwave of phenolics offers two options:

- EARLY PRESS-OFF: Press-off, cool and ferment juice (‘mpr’)

- FERMENT ON SKINS: Cool the must and conduct alcoholic ferment on skins (‘msk’)

Wine phenolics

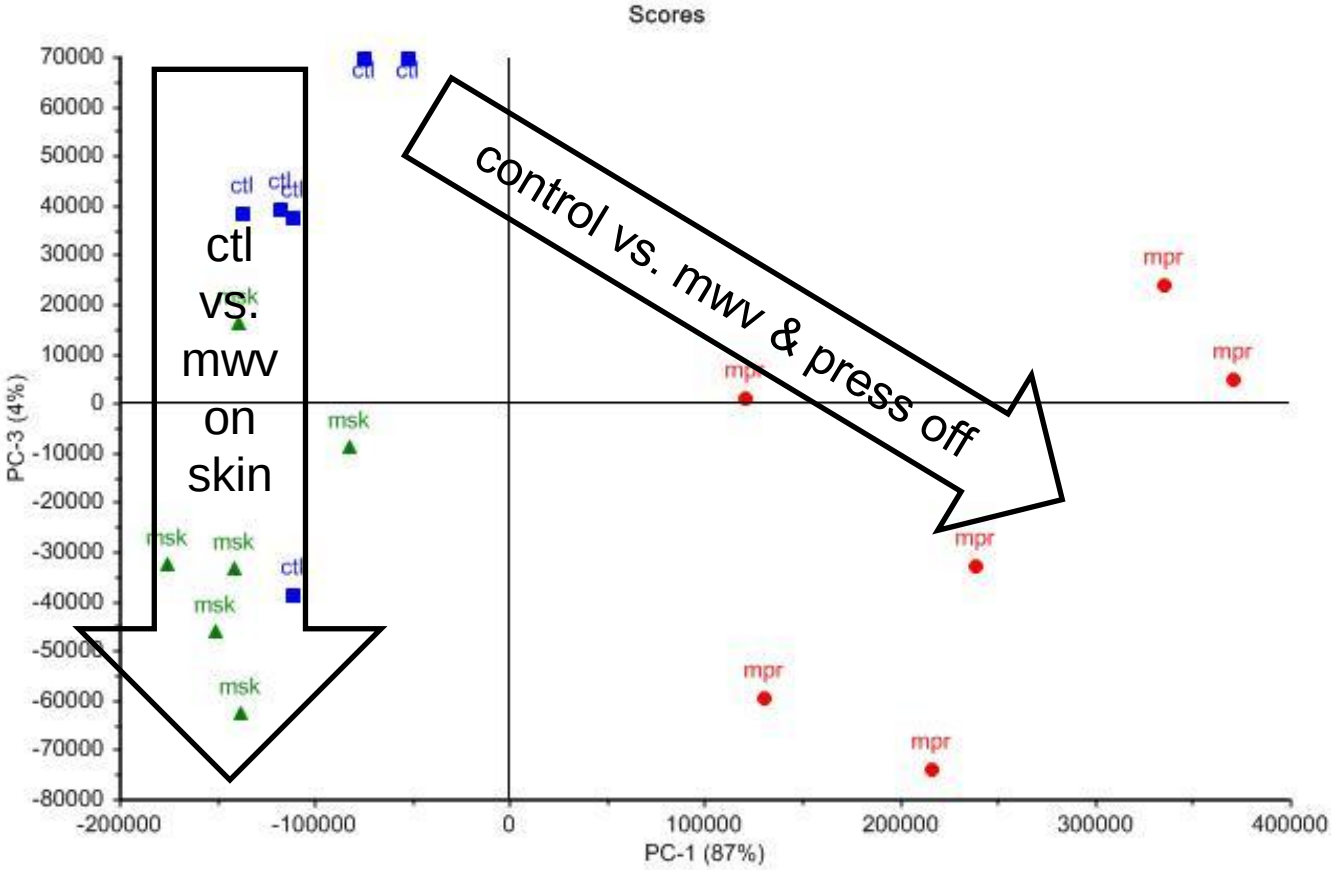
On skins | Early press off

	CTL	MSK	MPR
Anthocyanins (mg/L)	292 a	412 b	272 a
Pigmented tannin (AU)	0.31 a	0.50 b	0.45 b
Total tannin (g/L)	0.25 a	0.72 b	0.27 a

Different letter denotes significant among treatments within trial (P<0.05)

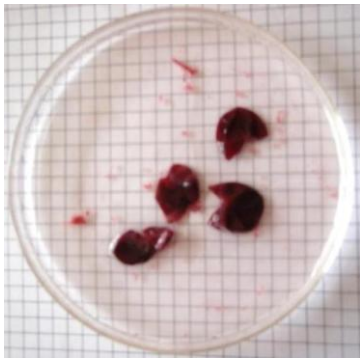
Their are also aroma differences

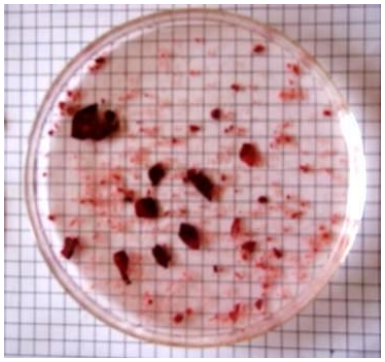
- PCA scores plot based on 18 volatile aroma compounds measured by GC-MS
- (informal) sensory appraisal suggests mpr wines are intensely fruity and aromatic

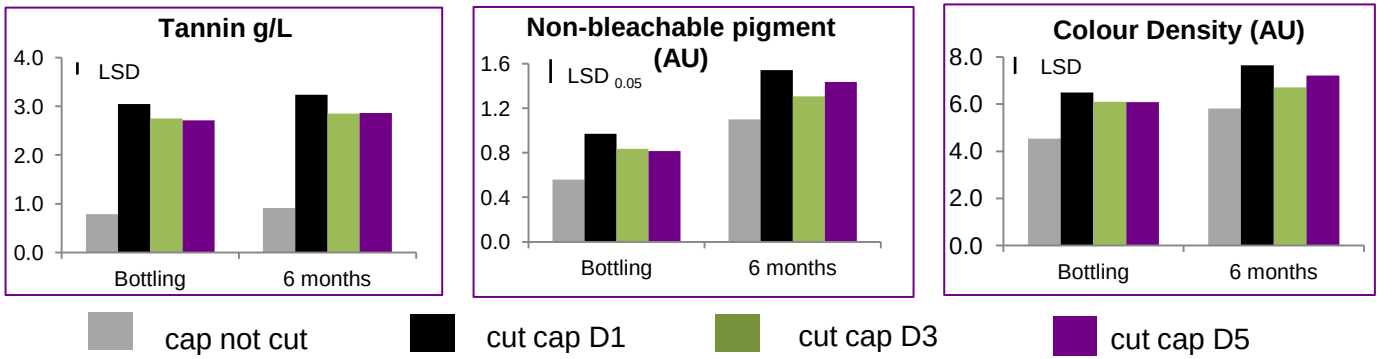


Selective skin maceration to enhance extraction

Angela Sparrow: Poster 101

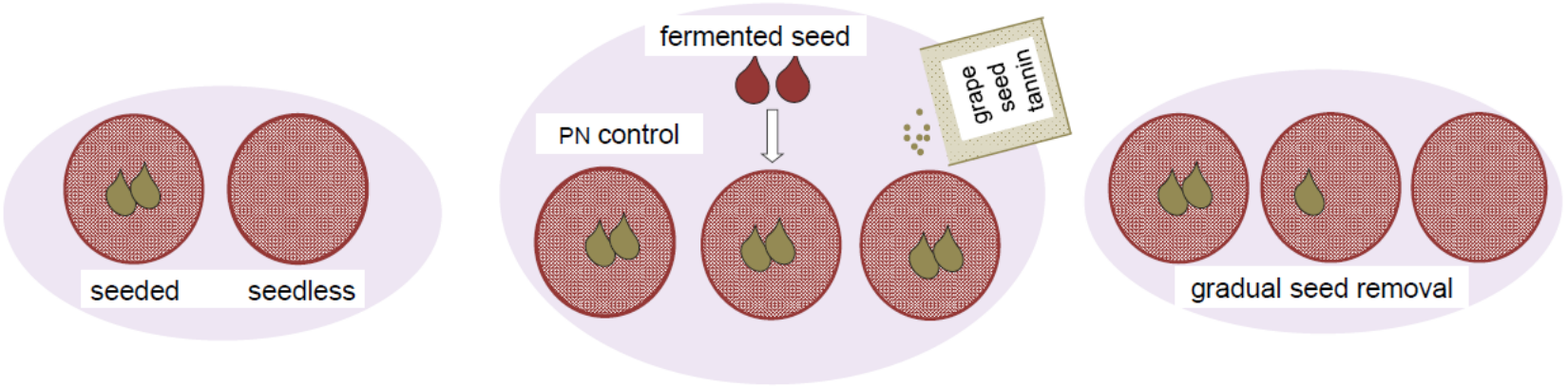


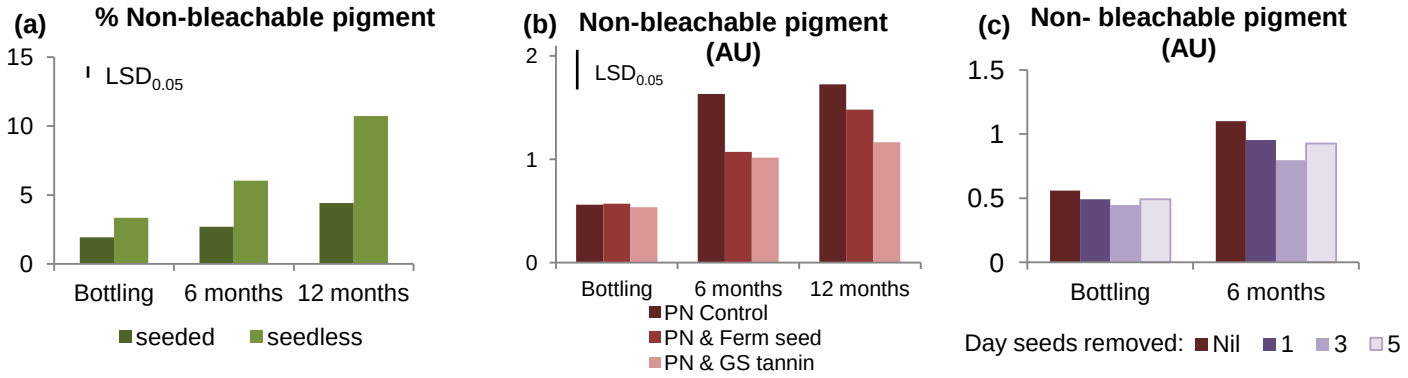




The influence of seeds

Angela Sparrow: Poster 102

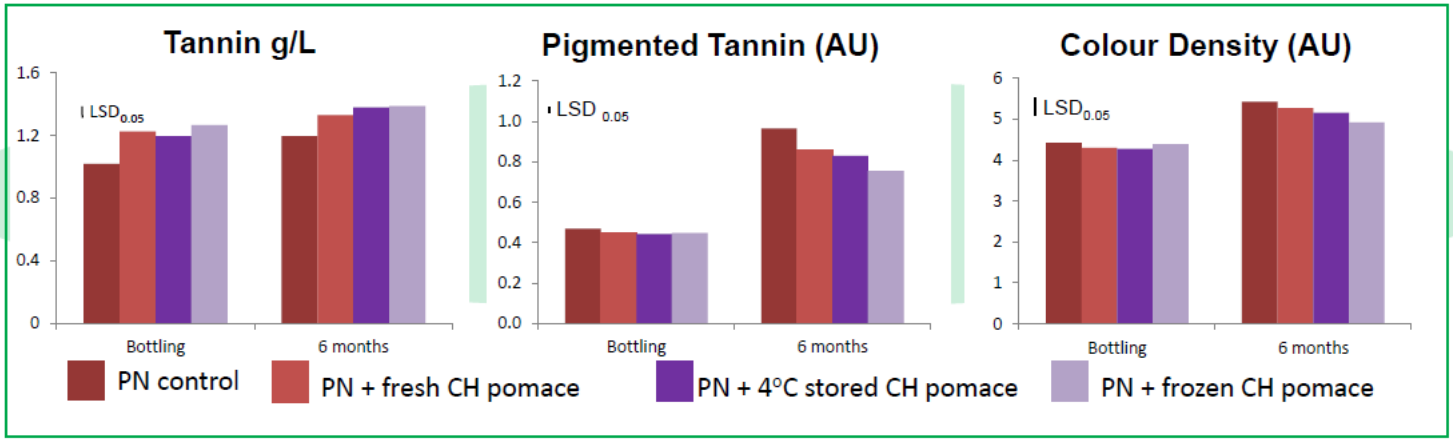




Adding fresh white pomace

Angela Sparrow: Poster 104

1. Pinot grapes 2. Add 20% CH pomace 3. Co-ferment



The winemaking control points

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- Extended maceration wines have high tannin and a high degree of colour stabilisation
- Cold maceration favours colour extraction
- Juice runoff (*saignee*) results in higher tannin and colour but favours colour more
- Running off juice and returning it later during ferment (*transfusion*) increases tannin and stable colour
- The selection of yeast strain has dramatic effects on tannin and colour
- Boosting tannin with a non-pigmented source (eg stems, white skins) can also increase colour but is it stable long-term?
- Is there a place for microwave maceration? Can this create a new winemaking paradigm?
- Do we really want seed tannin? How can we enhance skin tannin extraction?

THE FINAL WORDS

The Australian Wine Research Institute

- **Pinot noir tannin, total colour and colour stabilisation can be strongly influenced by maceration/vinification methods, including the choice of yeast**

- **For a given parcel of grapes, tannin in particular, can be doubled through manipulating vinification :**

“turning on the tap”

Acknowledgments

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AusIndustry

GWRDC

GRAPE AND WINE RESEARCH AND DEVELOPMENT CORPORATION

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The Australian Wine Research Institute

Modified Somers method

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