Manipulating Pinot Noir quality with winemaking

Bob Dambergs

Pinot Masterclass

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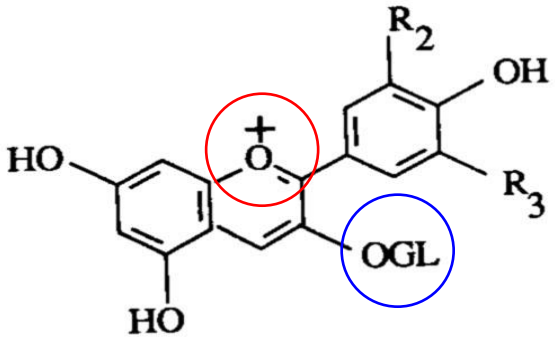
What defines a red wine?

The Australian Wine Research Institute

- Water
- Ethanol
- Organic acids
- **Phenolics**
  - tannins, anthocyanins
- Minerals
- Flavour compounds

Anthocyanins



Anthocyanins normally have a glucose molecule attached via a glycosidic bond, making them more stable….. “GG”

Anthocyanins also exist as acetyl and courmaryl derivatives which are even more stable

At very low pH (<2) all anthocyanins have a positive charge and are coloured, at wine pH only a small proportion are charged

If SO_2 binds to anthocyanins they are colourless

React with tannin to form stable pigments

Tannins

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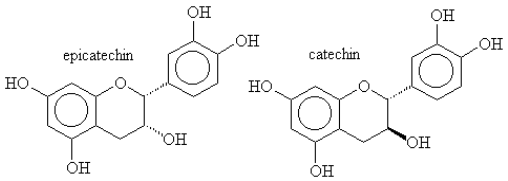
Pigmented tannin colour is less sensitive to pH

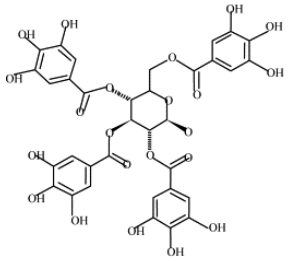
Pigmented tannin colour is not bleached by SO_2
"Non-bleachable pigments"

Tannins bind to proteins, to produce astringency, drying chalky characters when they bind to saliva linings of the mouth ….their sensory effect is "tactile" rather than "taste"

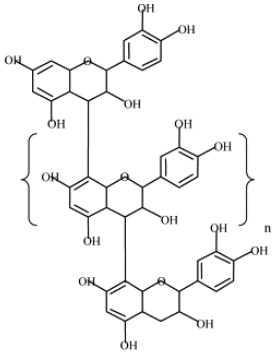
Seeds tannins vary in structure to skin tannin so their chemical reactivity and sensory properties vary

Seed tannin is more difficult to extract than skin tannin





Hydrolysable tannin



Condensed tannin

No free anthocyanins in old wines- pigmented tannins dominate colour

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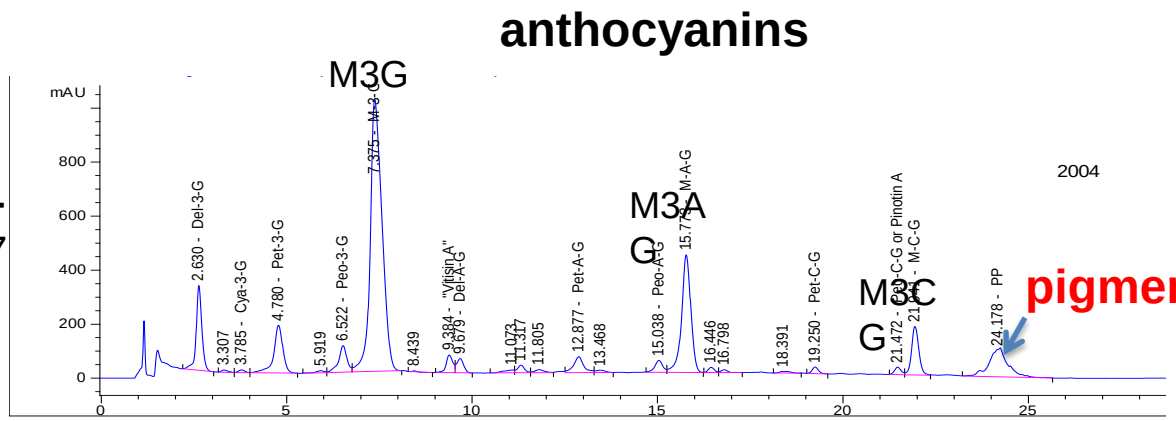
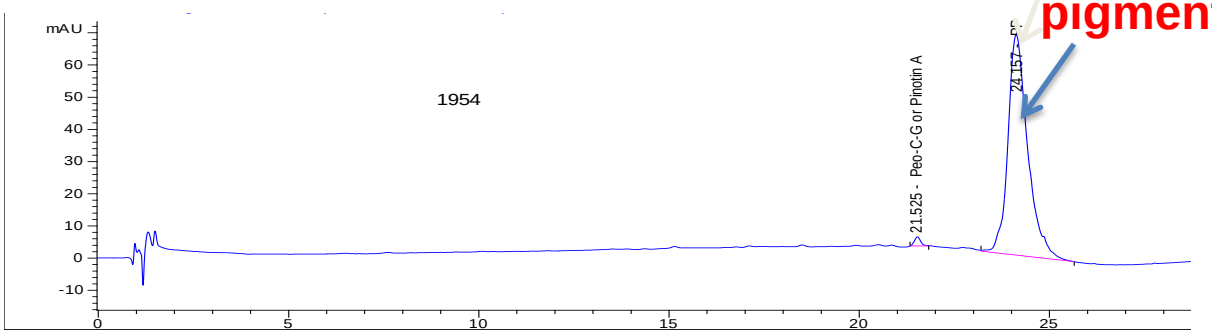
Vintage 2004
col dens 11.17
hue 0.70



pigmented tannins

Vintage 1954
col dens 5.50
hue 1.32



pigmented tannins

Tannin and pigment correlate with "quality"

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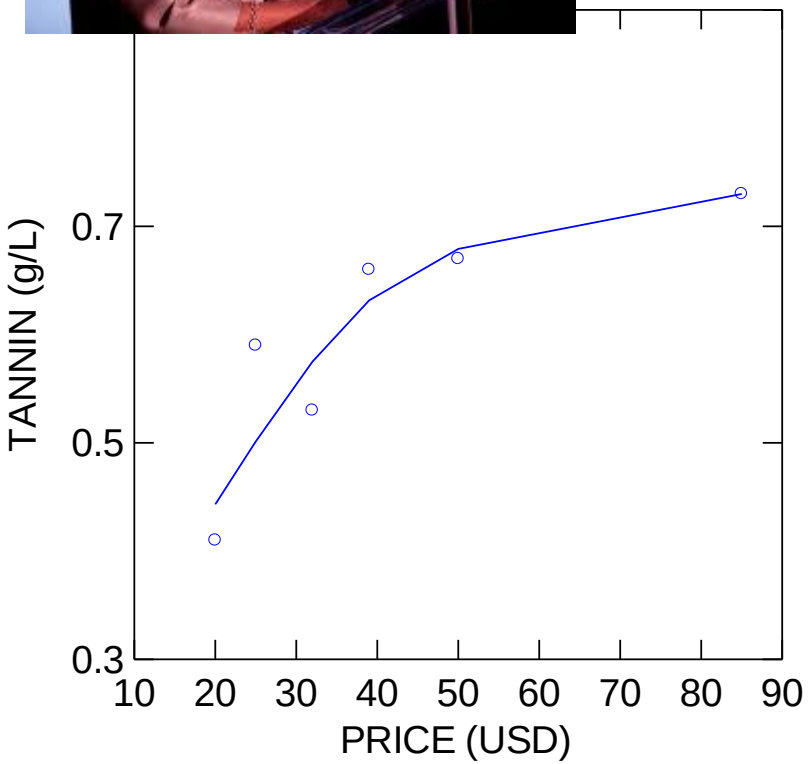
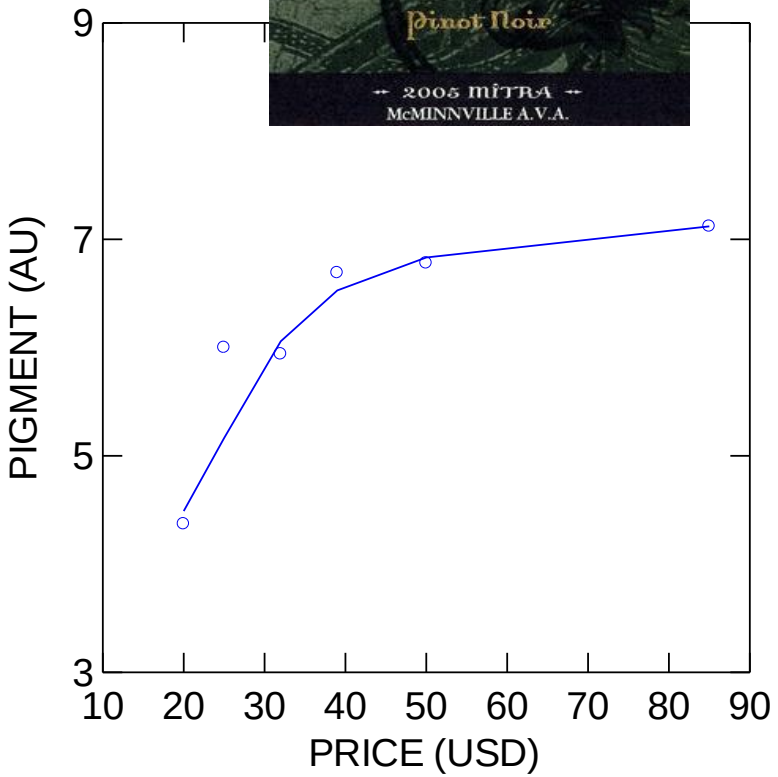
"One of the ultimate quality indicators is price"
- Jancis Robinson, ICCS Hobart





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

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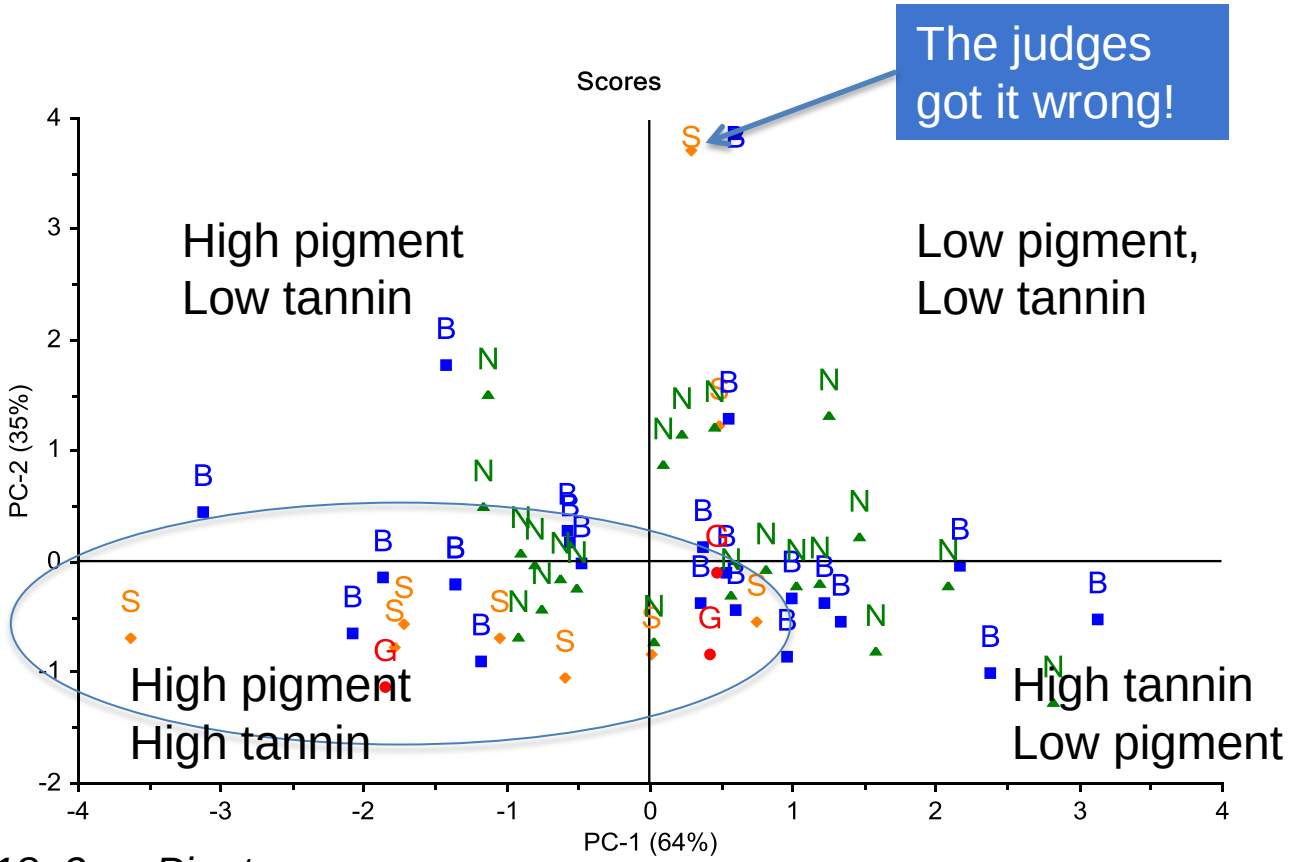

Class 18, 2 yo Pinot, Tasmanian Wineshow

Best wines have an ideal combination of tannin and pigment

Tannin and pigment analysis correlates with sensory

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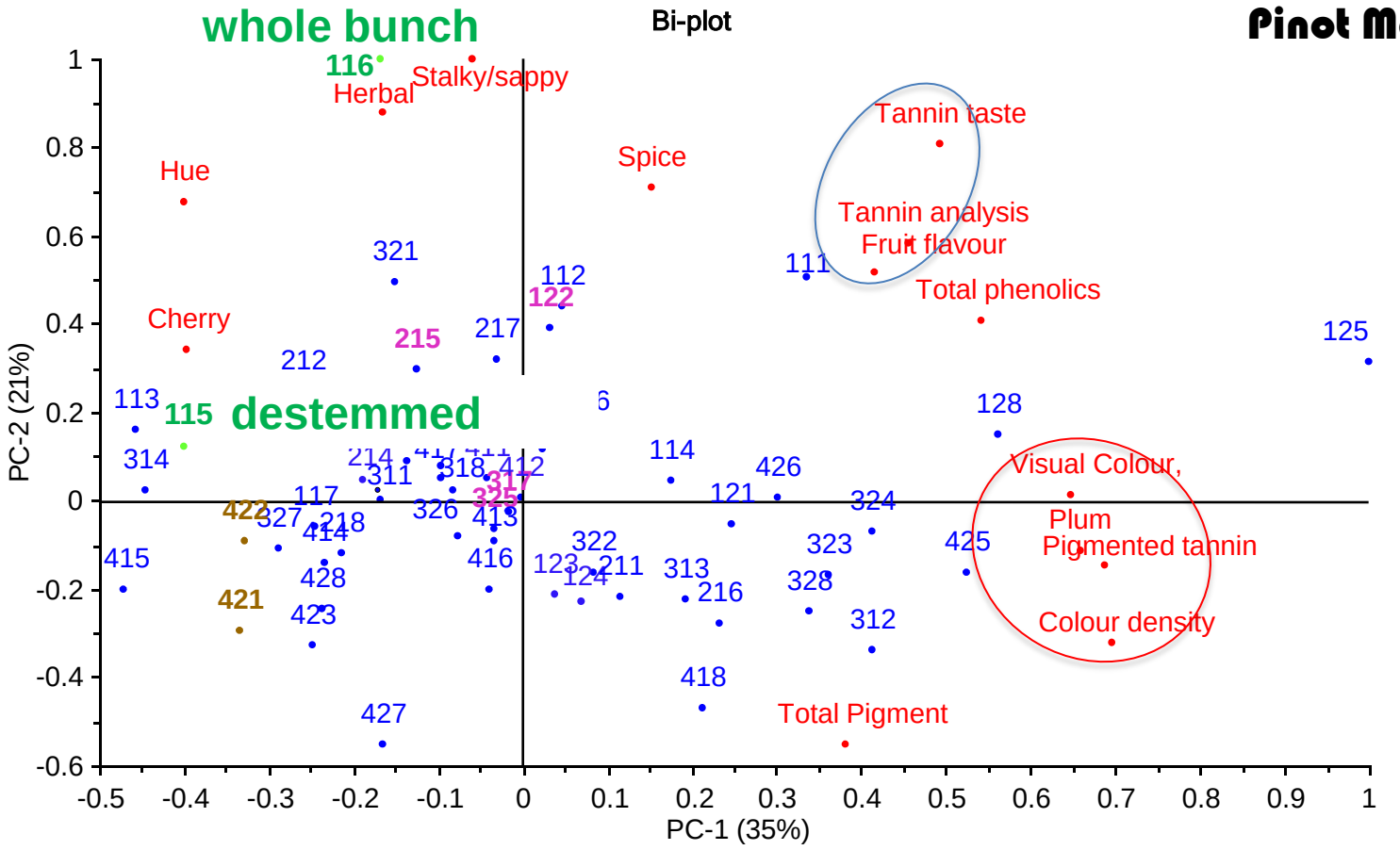
Pinot Massif



Simplifed wine analysis

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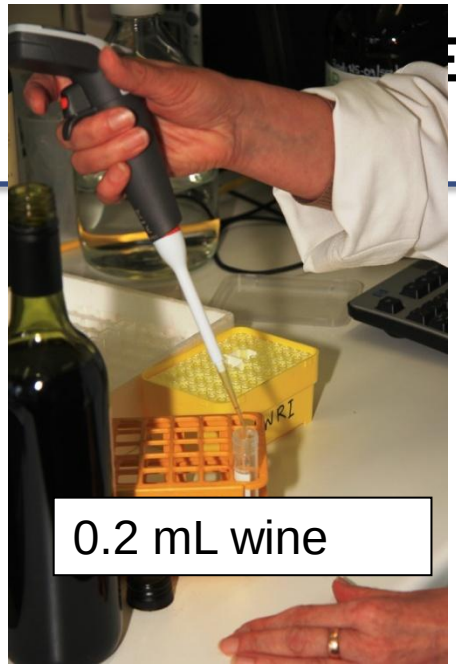
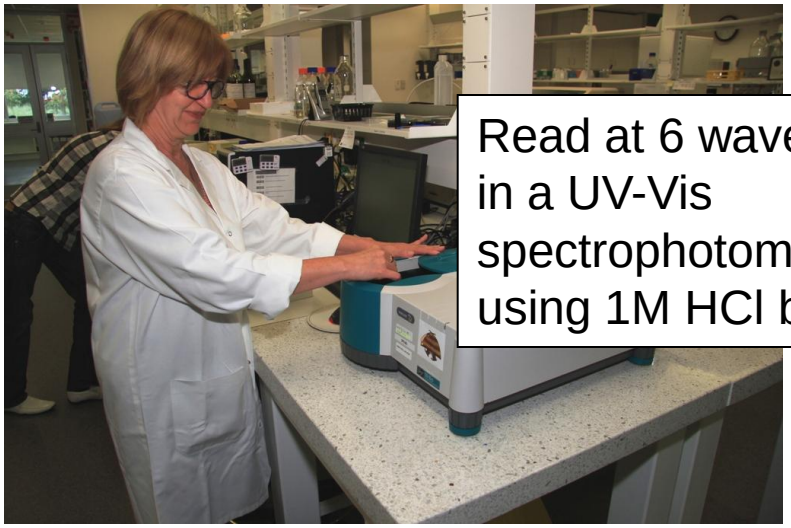
Modified Somers and tannin analysis

- 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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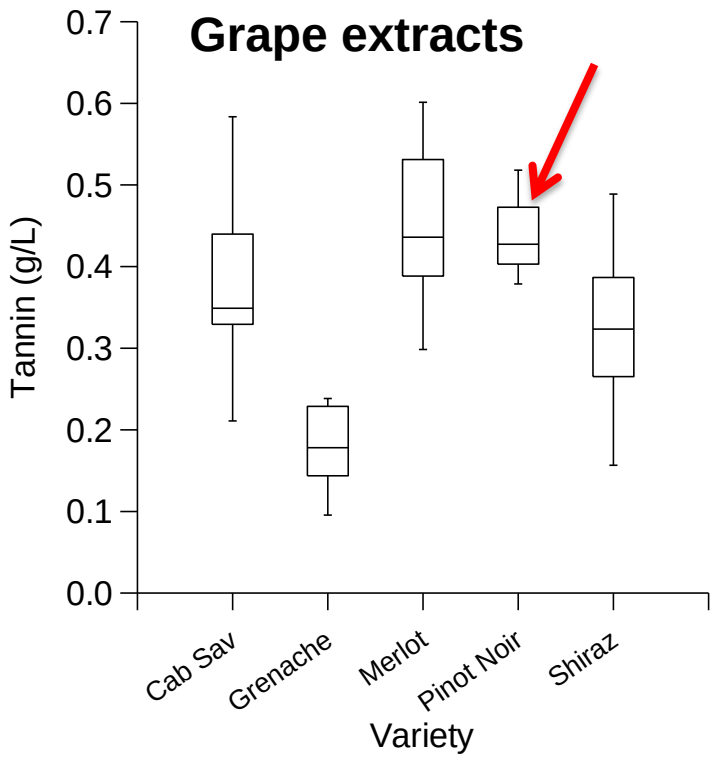
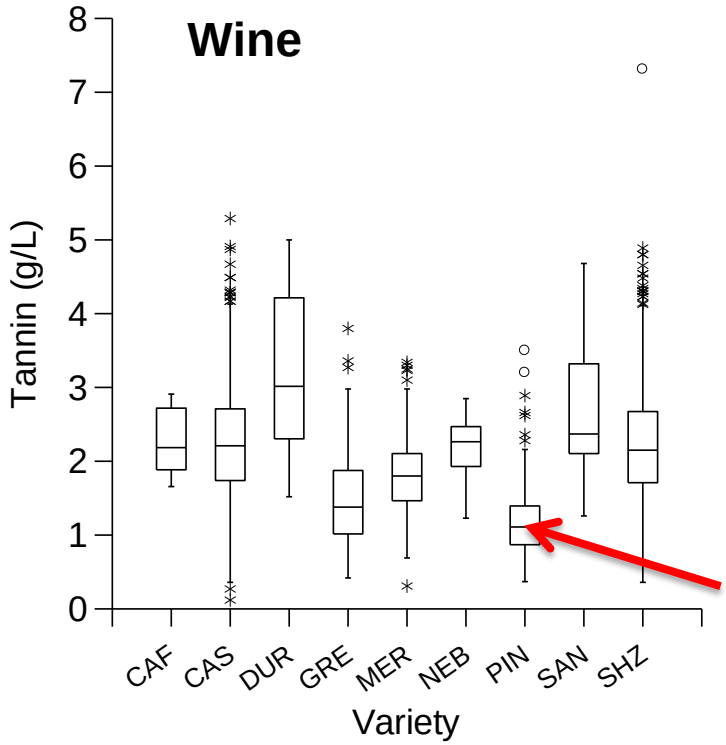
Low total anthocyanins

No acylated or coumarylated anthocyanins

Grapes have high tannin but it's mostly seed tannin

Wines have relatively low tannin and colour





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?

Optimising phenolic development during red wine maceration

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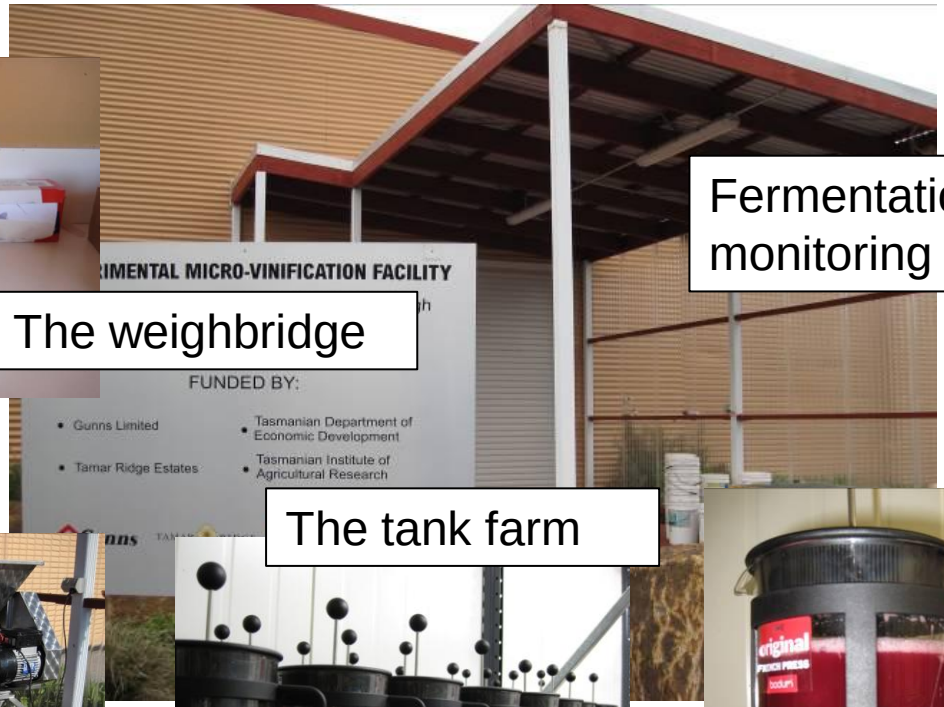
Need to synchronise

- 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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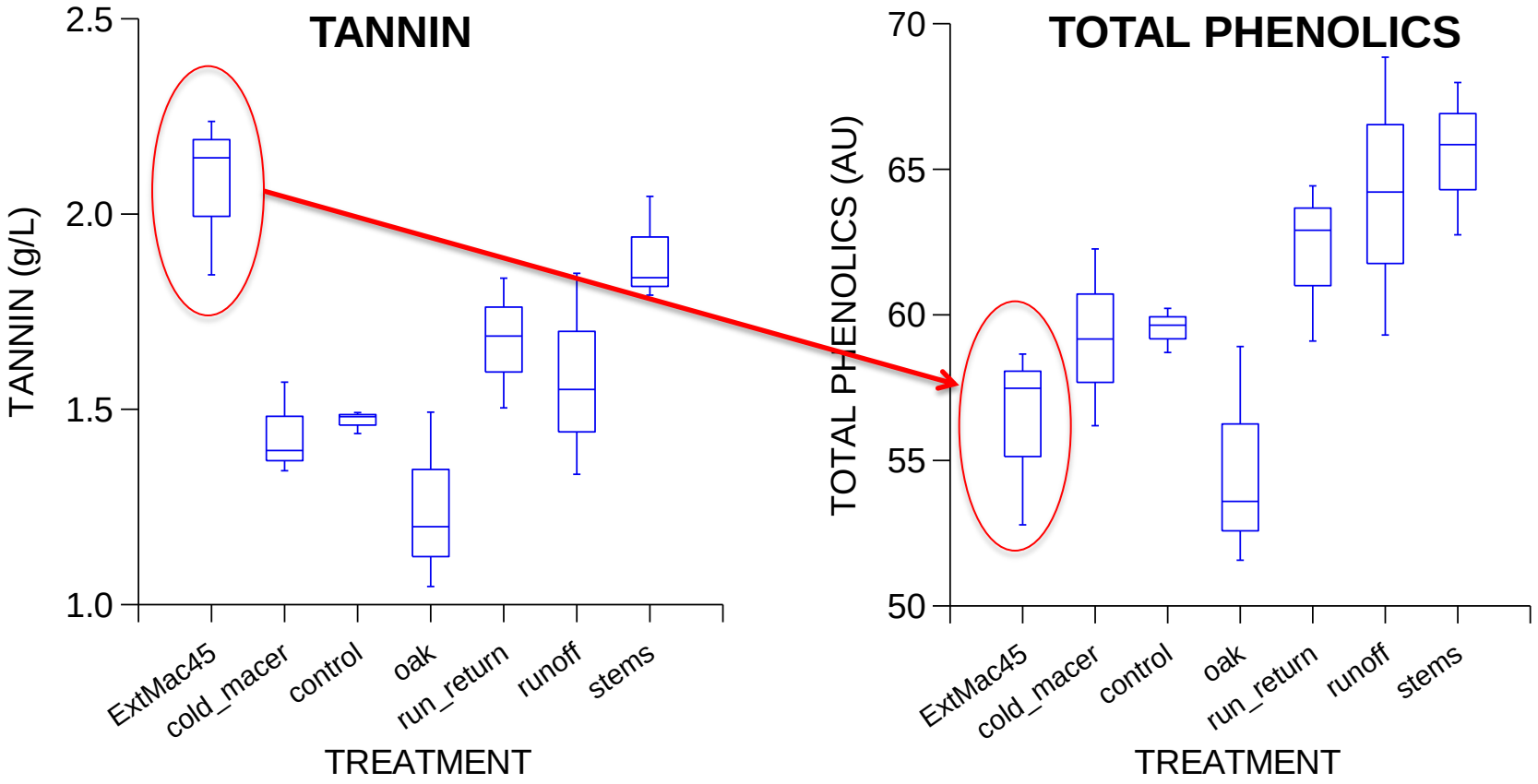

Not equivalent to tannin !!

An example of rapid colour stabilisation

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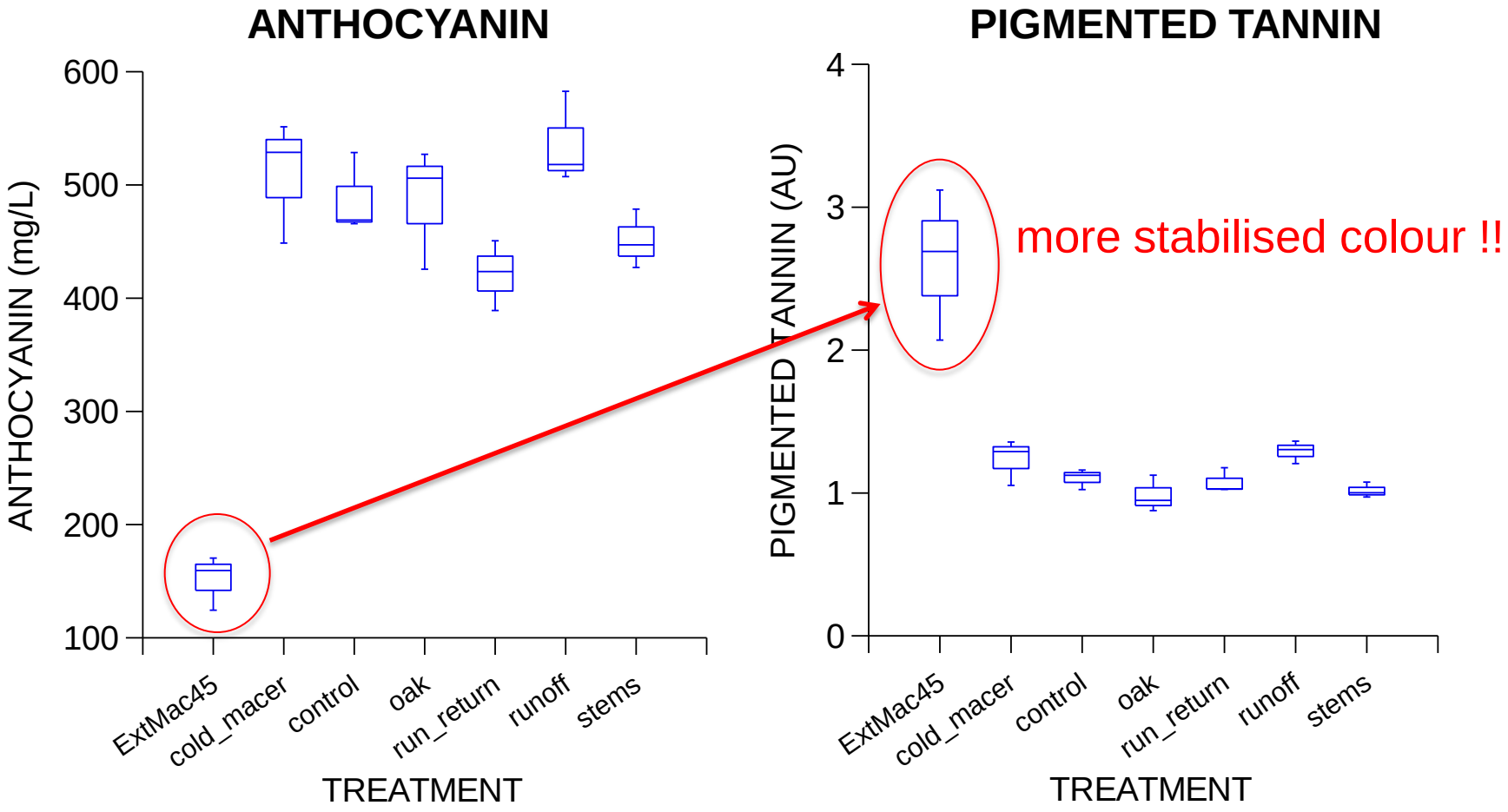
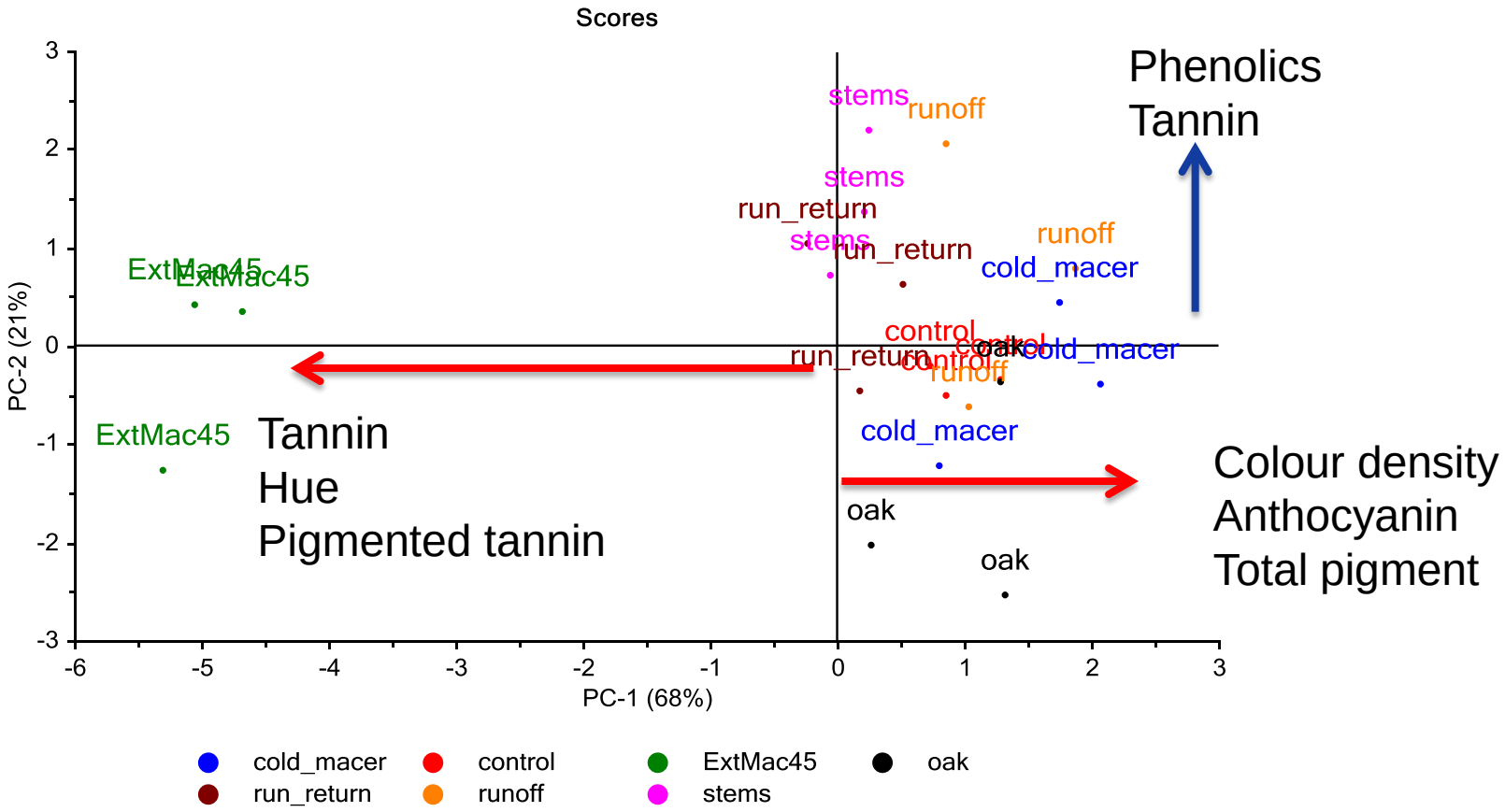


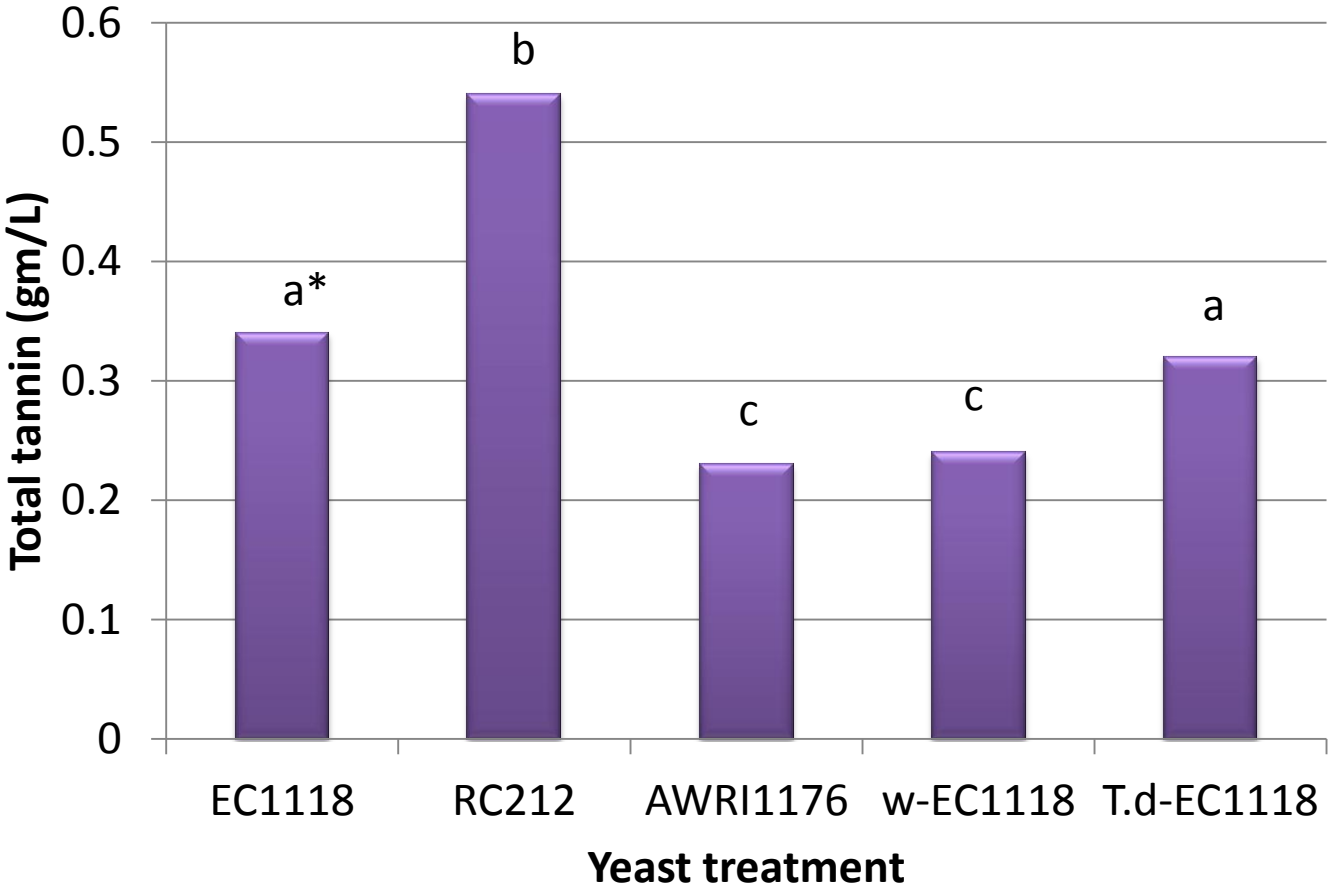
Cluster analysis (PCA)- all samples



Anna Carew: yeast treatments

- EC1118 *Saccharomyces cerevisiae* – 'workhorse' strain & recognised in wine science
- RC212 *S.c* – widely used in Australia (unpublished) & California/Oregon (Haeger 2008)
- AWRI1176 *Saccharomyces bayanus* – for under-ripe/green fruit; high glycerol producer (AWRI tech rev 182).
- wild-EC1118 (sequential inoculation with EC1118) – wild with 'insurance policy'. Practiced by ~35% California/Oregon Pinot noir makers (Haegar 2008).
- Td-EC1118 *Torulaspora delbruekii* (sequential inoculation with EC1118) – to replicate 'wild' effects but with greater control of ferment.

Total tannin



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

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

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

Taming tannin

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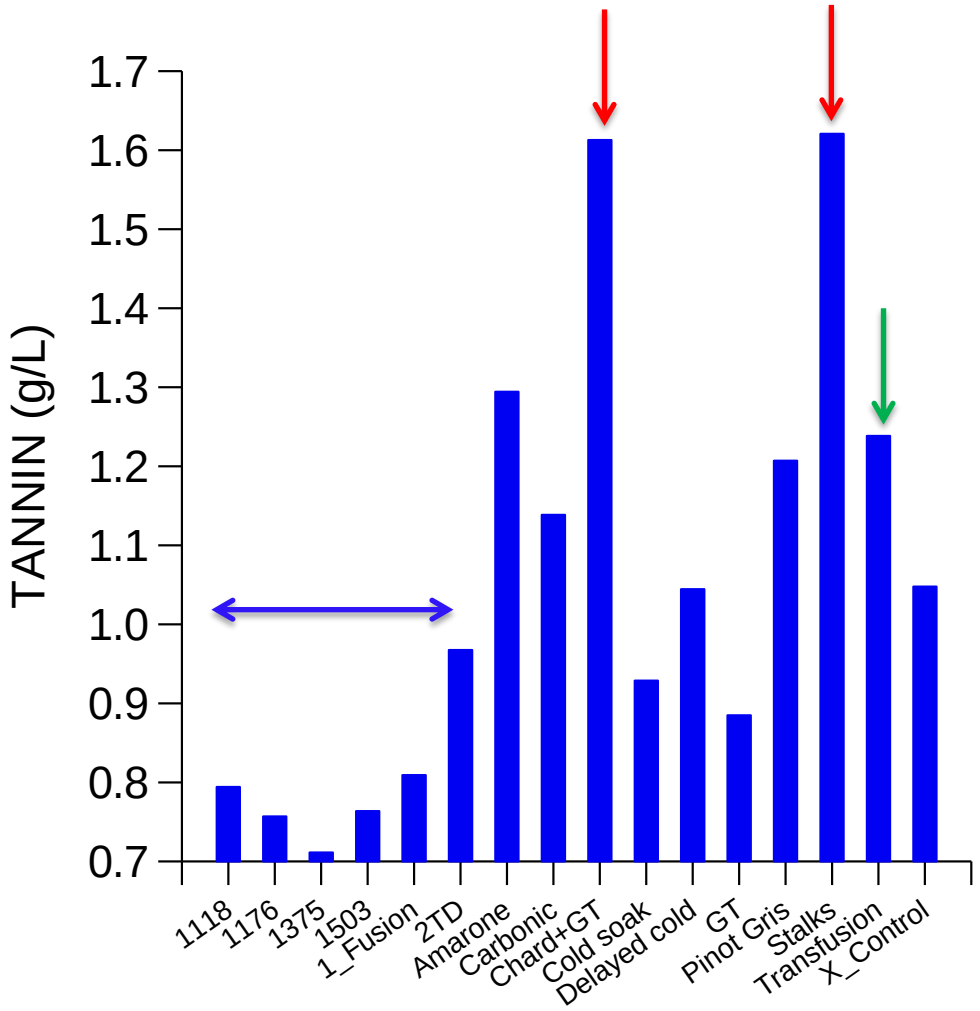

- White skins or stalks added had the highest tannin
- Alternative yeasts lower than RC212
- Transfusion higher than control

Taming pigmented tannin

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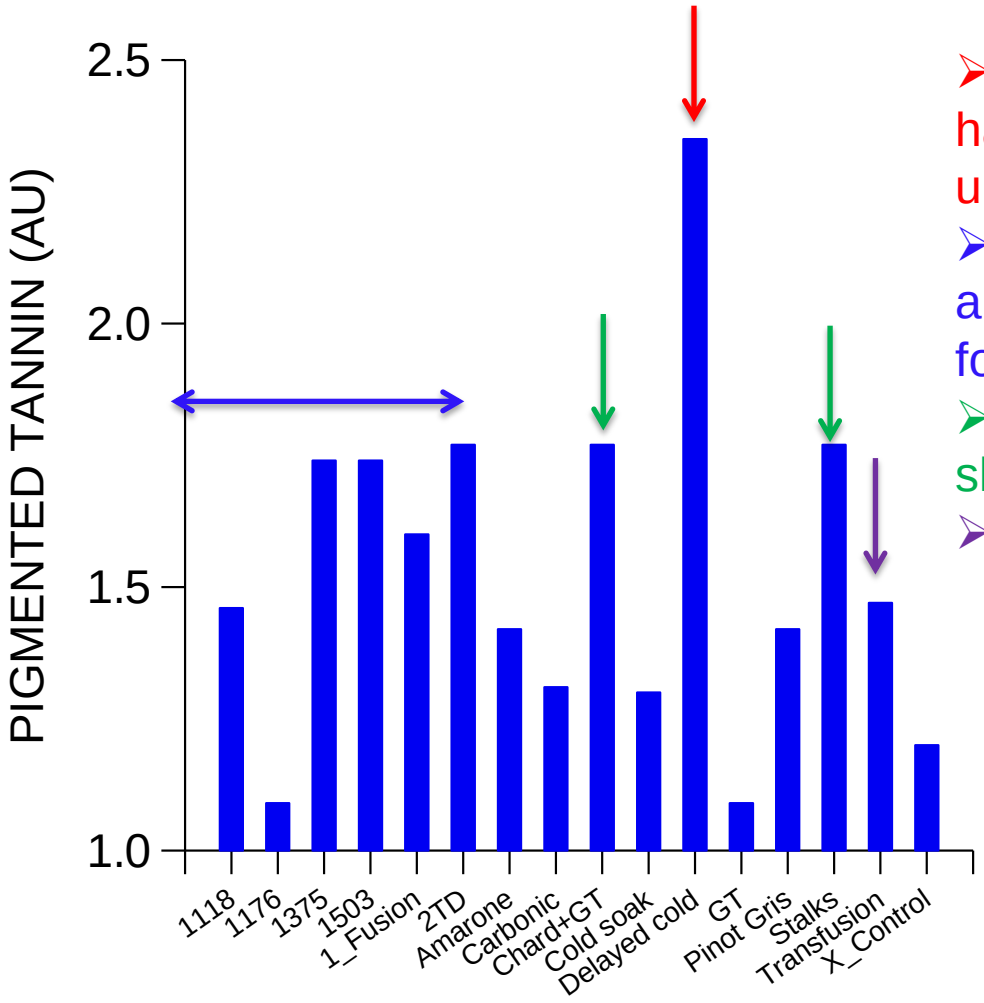

- Cold soak/delayed malo had highest but it was an unusual plummy colour
- Elevated with most alternative yeasts except for 1176
- Elevated when white skins and stalks added
- Elevated with transfusion

The ratio of pigmented tannin and total tannin

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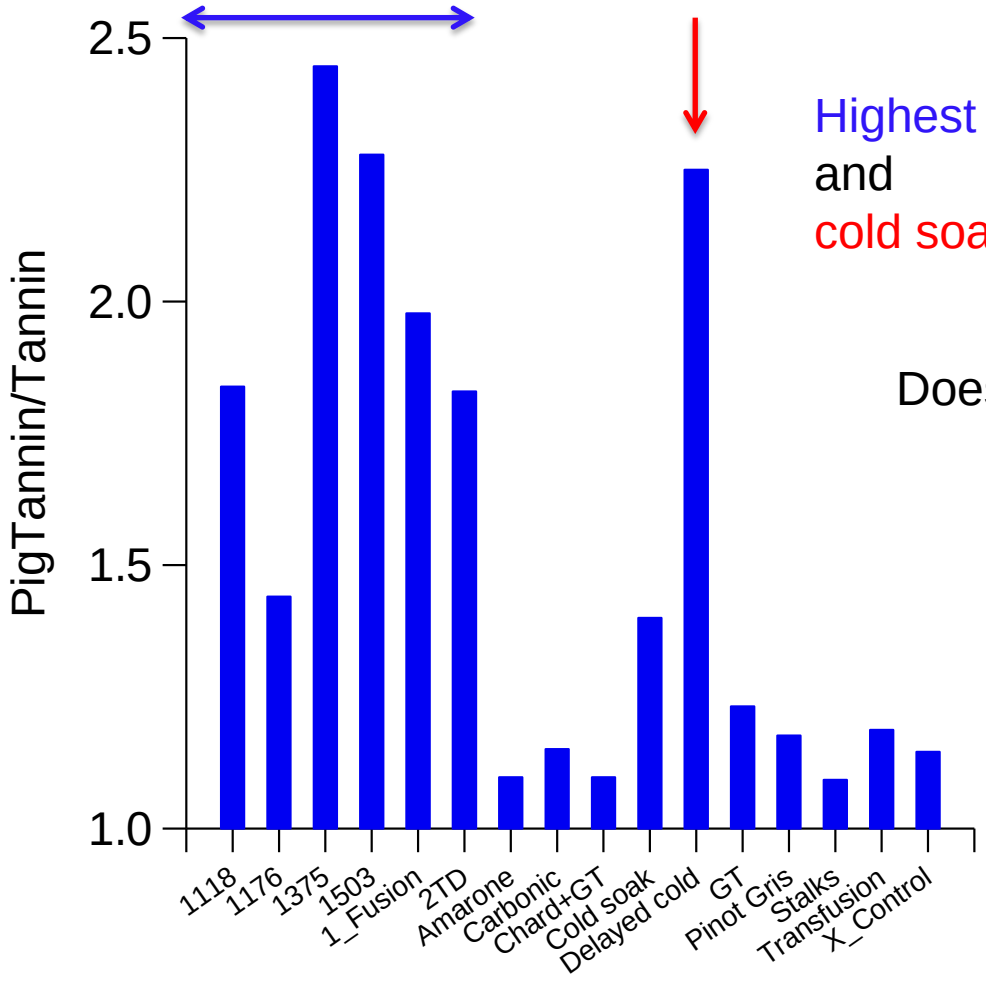

Highest were alternative yeasts
and
cold soak/delayed malo

Does it affect mouth-feel?

Colour density

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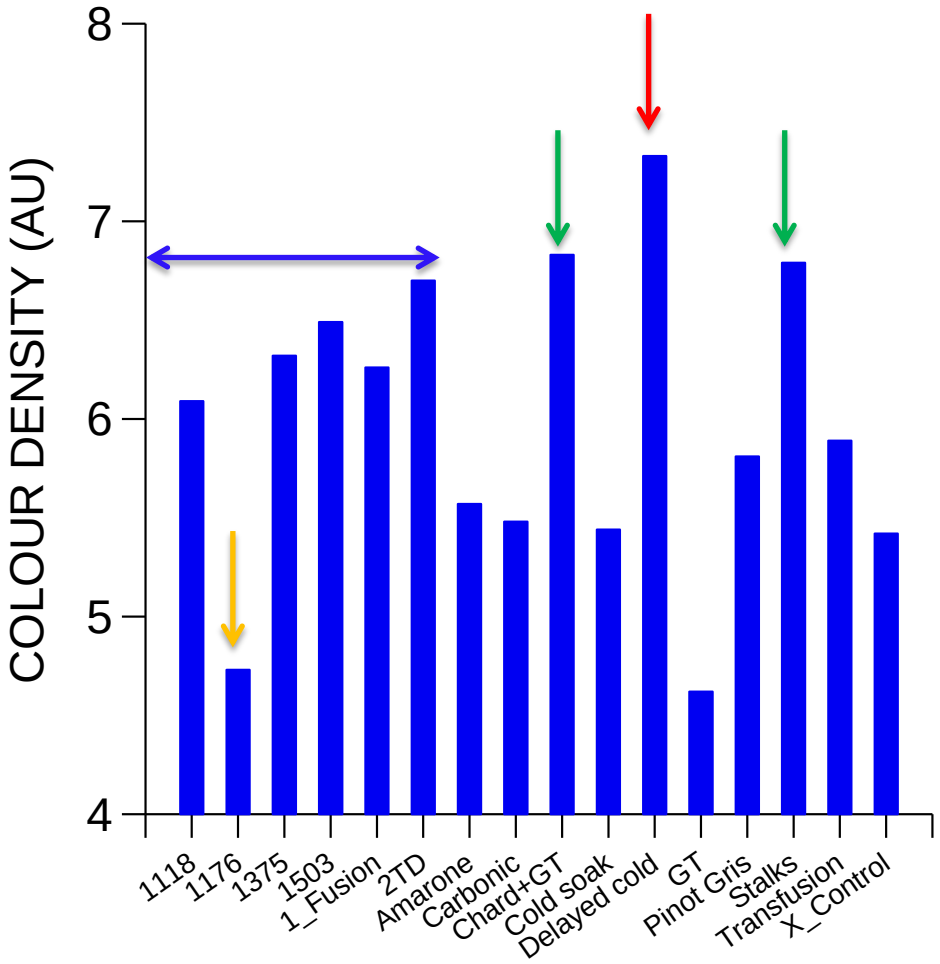
- Corrected for SO_2
- High colour density = high visual colour



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

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 stable colour

THE FINAL WORDS

- **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**

Acknowledgments

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bob.dambergs@awri.com.au