TRIAL SESSIONS: Multi-winery studies of Pinot Noir vinification methods.

60-ish winemakers from across Victoria
Who is involved?.....

Why do we do it?.....

Prompted by a wish to make winemaking decisions based on evidence, using practical trial work scaled to replicate our usual winemaking environment.

Resultant wines: Lab and Organoleptic analyses

Some past topics.....
2012...
Malolactic Fermentation
Inoculated vs Indigenous

INOCULATED
Wine inoculated with commercially available MLB culture at the post-pressing stage and managed as winery deems appropriate

INDIGINOUS
Wine was NOT inoculated, and allowed to proceed through an indigenous derived MLB fermentation and managed as winery deems appropriate.

Trial examines outcome of process, not just action...
2014....

Batonnage in Pinot Noir

Single batch Pinot Noir sourced from a single block

Fruit vinified as a single batch of wine and transferred to duplicate sets of barrels....

Treatment One
CONTROL

Treatment Two
BATONNAGE
2011… Enzyme v No Enzyme

2015… Racking v No racking

… Pumping v Gravity
Transfusion Trial

Control vs Transfusion
a multi-winery trial
VPNW 2013
Initial idea...

- Chaptalisation (sucrose)
  - Alc%: prolonged fermentation:
  - Richer, fuller, complex, savoury.

- Consideration for publication of results

- Request made via Creina Stickley AWRI
  - Wine Industry Technical Advisory Committee (WITAC)
    - Food standards Australia & New Zealand (FSANZ)

- Exemption not granted
  - Participants not able to use trial wine in commercial blend

- Plan B = Transfusion (juice)
  - Using juice to manipulate concentration of sugar over primary fermentation

- Bob Dambergs
  - Transfusion and coffee pots
Transfusion Trial

• The Transfusion...
  Initiated November 2012
to be conducted Vintage 2013
assessed November 2013 (VPNW13)

• Participating wineries (8)...
  Curly Flat – Phil Moragahan
  Domaine Chandon – Dan Buckle
  Dromana Estate – Duncan Buchanan
  Lethbridge Winery – Ray Nadeson
  Moorooduc Estate – Richard McIntyre
  Paradigm Hill – George Mihaly
  Tarrawarra – Clare Halloran, Adam McCallum
  Ten Minutes by Tractor – Jeremy Magyar
Hypothesis ..... 

• The process of removing a portion of juice prior to fermentation, and subsequently returning this juice at the late stages of fermentation....

... will produce a different outcome ..... 

.... than vinifying the same fruit as per the wineries usual methods, all else remaining the same where possible.
What are we looking at?....

Prompted by a wish to make winemaking decisions based on evidence, using practical trial work scaled to replicate our usual winemaking environment.

- The TRANFUSION Trial...

**CONTROL**
Wine vinified and managed as winery deems appropriate.

**TRANSFUSION**
Wine vinification subject to juice removal prior to fermentation, then returned at late stage of fermentation, and managed as winery deems appropriate.

Trial examines outcome of the *process* not just the action...
Trial Protocol .......
Method ...

Fruit randomly split and processed ....

Treatment One
CONTROL
Managed as winery deems appropriate ... as identically as possible

Treatment Two
TRANSFUSION
Managed as winery deems appropriate ... as identically as possible

Single batch Pinot Noir (MV6) sourced from single block
The method ...

- Fruit received and randomly split into two treatment groups
- Destemmed into vats, equal mass for each arm of trial
- 24hr period before initial analyses undertaken (Baumé/°Brix)
- Juice volume corresponding to 1 baumé calculated
Transfusion procedure...

Vat 1 = 1000 kg fruit = 700 L juice

Calc:
1 baumé = 54.7 L @ 12.8 baumé

Refrigerate at 4°C to inhibit fermentation of “transfusion juice”.
Reintroduction of juice ...

Juice warmed from 4°C → >16°C as not to temp shock yeast

Juice returned to transfusion treatment vat at desired fermentation stage of:

1 – 2 Baumé (1.8 – 3.6°Brix)

Both arms from this point on managed identically where possible.....
Wine treatment:

- **Treatment One (CONTROL)**: Juice returned immediately after removal pre-ferment.

- **Treatment Two (TRANSFUSION)**: Juice returned at late stage of fermentation.

Only substantive difference:

- Wineries take their usual approach to manage each treatment as deemed appropriate.

- Managed appropriately...

@ 6 months:

- Lab Analysis (Vintessential) = Standard lab profile
- Lab Analysis (A. Carew, B. Dambergs) = Tannin + Phenolics

@ 7 months:

- VPNW 2012: Organoleptic analysis
What else was different ...

- Transfusion treatment: Volume of juice removed over majority of primary fermentation period

- Reintroduction procedure may result in other influences through action: temperature modification, additional oxygen etc.

Uniformity
- Source of fruit
- Vinification method
- Additions, where possible i.e. H₂T
- Oak – matching barrels (>2-3 each treatment)
- Winemaking, racking, topping, SO₂ add
Organoleptic assessment

6 (8) wineries   2 wines each   12 glasses

Each of these parameters are to be scored...

- a. fruit
- b. complexity
- c. structure / texture
- d. balance
- e. palate length

Can you detect any difference between the 2 wines (pair) YES or NO

For each winery, which wine do you prefer...
VPNW 2013 - Transfusion Trial

1) Score each box
   1 = low
   2
   3
   4 = high

2) Can you detect any difference between the 2 wines?? ....CIRCLE: Yes or No

3) Tick preferred wine for each winery

<table>
<thead>
<tr>
<th>Winery</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>A</td>
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<td>b. Complexity</td>
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<td>c. Structure / Texture</td>
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<td>Can you see any difference?</td>
<td>Yes / No</td>
<td>Yes / No</td>
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<td>Yes / No</td>
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<tr>
<td>l. Preferred wine [tick preference]</td>
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</table>
your time starts now......

VPNW 2013 - Transfusion Trial

1) Score each box  
1 = low  
2  
3  
4 = high

2) Can you detect any difference between the 2 wines?? .........CIRCLE: Yes or No

3) Tick preferred wine for each winery

A B A B A B A B A B A B A B

<table>
<thead>
<tr>
<th>Winery</th>
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<th>4</th>
<th>5</th>
<th>6</th>
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<tbody>
<tr>
<td>a. Fruit</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
<td>A</td>
<td>B</td>
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<td>b. Complexity</td>
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<td>d. Balance</td>
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<td>e. Palate length</td>
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</tbody>
</table>

Can you see any difference? | Yes / No | Yes / No | Yes / No | Yes / No | Yes / No | Yes / No | Yes / No |
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</tr>
</thead>
<tbody>
<tr>
<td>f. Preferred wine [tick preference]</td>
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</tbody>
</table>

Insert number 1 or 2 or 3 or 4 here

Place a single ✔ in one of these boxes

Circle Yes / No here
Laboratory analyses ...

- The following were measured in all of the wines ...

<table>
<thead>
<tr>
<th>Substance</th>
<th>Code</th>
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<tbody>
<tr>
<td>*Acetic Acid (W01)</td>
<td></td>
</tr>
<tr>
<td>*Alcohol (W33)</td>
<td></td>
</tr>
<tr>
<td>*Glucose &amp; Fructose (W03)</td>
<td></td>
</tr>
<tr>
<td>*Glycerol (W28)</td>
<td></td>
</tr>
<tr>
<td>*Malic Acid (W04)</td>
<td></td>
</tr>
<tr>
<td>*pH (W05)</td>
<td></td>
</tr>
<tr>
<td>*Titratable Acidity pH 8.20 (W09)</td>
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</tr>
<tr>
<td>*4ep/4eg</td>
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</tr>
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</table>
Acetic Acid (g/L)

- **Winery One**
- **Winery Two**
- **Winery Three**
- **Winery Four**
- **Winery Five**
- **Winery Six**
- **Winery Seven**
- **Winery Eight**

**Legend:**
- **Control**
- **Transfusion**
Alc % v/v : Glucose+Fructose (g/L)

Winery One
Winery Two
Winery Three
Winery Four
Winery Seven
Winery Five
Winery Six
Winery Eight
pH : TA (g/L)

- **Control : pH**
- **Control : TA**
- **Transfusion : pH**
- **Transfusion : TA**

<table>
<thead>
<tr>
<th>Winery</th>
<th>pH</th>
<th>TA</th>
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</thead>
<tbody>
<tr>
<td>One</td>
<td>3.48</td>
<td>3.47</td>
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<tr>
<td>Two</td>
<td>3.45</td>
<td>3.44</td>
</tr>
<tr>
<td>Three</td>
<td>3.46</td>
<td>3.45</td>
</tr>
<tr>
<td>Four</td>
<td>3.43</td>
<td>3.39</td>
</tr>
<tr>
<td>Five</td>
<td>3.4</td>
<td>3.42</td>
</tr>
<tr>
<td>Six</td>
<td>3.85</td>
<td>3.88</td>
</tr>
<tr>
<td>Seven</td>
<td>3.46</td>
<td>3.32</td>
</tr>
<tr>
<td>Eight</td>
<td>3.55</td>
<td>3.45</td>
</tr>
</tbody>
</table>
**Malic Acid (g/L)**

- **Winery One**
- **Winery Two**
- **Winery Three**
- **Winery Four**
- **Winery Five**
- **Winery Six**
- **Winery Seven**
- **Winery Eight**

Legend:
- Blue: Control
- Red: Transfusion
Length of fermentation (days)

- **Winery One**
- **Winery Two**
- **Winery Three**
- **Winery Four**
- **Winery Five**
- **Winery Six**
- **Winery Seven**
- **Winery Eight**

**Control** vs **Transfusion**
Anna Carew  Bob Dambergs . . .

“Impact of “Transfusion” on colour / tannin.”

Analysis : VPNW Transfusion trial samples
Phenolics 101

- **Tannin**
  - Total tannin i.e. pigmented and non-pigmented
  - Increases slowly while wine is on skins (extraction needs alcohol and heat)
  - Skin tannin is more readily extracted than seed tannin
  - Decreases slightly with aging

- **Total phenolics**
  - Anything that absorbs UV at 280 nm
  - All forms of tannin, anthocyanins, phenolic acids, flavonols etc

- **Total Pigment**
  - Free anthocyanin and pigmented tannin
  - Increases rapidly while wine is on skins then decreases gradually with age

- **Free anthocyanin**
  - Increases quickly while on skins (freely soluble)
  - Decreases quickly off skins (after 5 years all consumed)

- **Pigmented tannin**
  - “pigmented polymers”, “non-bleachable pigment”
  - Formation starts during fermentation
  - Gradual increase after wines taken off skins and during maturation
  - Formation promoted by yeast metabolites
  - Formation promoted by micro-oxidation and barrel maturation
  - Strongly promoted by post-ferment extended maceration

- **Colour Density**
  - Intensity of the wine colour
  - Corrected for alcohol concentration, pH and SO₂

- **Hue**
  - The nature (tint) of the colour
  - Corrected for alcohol concentration, pH and SO₂
  - As hue increases, garnet/brown tints increase
  - Low hue wines are plummy/purple
  - Hue increases with age

- **HueSO₂**
  - Similar to hue but measured in the presence of high SO₂
  - Indication of the hue of stable pigment with the free anthocyanin effect removed
  - Wines with low hue SO₂ will tend to keep plummy/purple colours during aging
  - Strongly affected by yeast strain and maceration methods
Colour Density (AU)
Hue

↑ : purple ➔ red ➔ garnet, orange

Control

Transfusion

Winery One  Winery Two  Winery Three  Winery Four  Winery Five  Winery Six  Winery Seven  Winery Eight
Anthocyanin [free] (mg/L)

Winery One  Winery Two  Winery Three  Winery Four  Winery Five  Winery Six  Winery Seven  Winery Eight

Control  Transfusion
Non-bleachable pigment

- Winery One
- Winery Two
- Winery Three
- Winery Four
- Winery Five
- Winery Six
- Winery Seven
- Winery Eight
Total Phenolics (AU)

- **Winery One**
- **Winery Two**
- **Winery Three**
- **Winery Four**
- **Winery Five**
- **Winery Six**
- **Winery Seven**
- **Winery Eight**

- **Control**
- **Transfusion**
Tannin (g/L)

Winery One
Winery Two
Winery Three
Winery Four
Winery Five
Winery Six
Winery Seven
Winery Eight

Control
Transfusion
PCA cluster analysis labelled with winery

Curly Flat, Tarrawarrra, Moorooduc, TMBT, Dromana and Lethbridge
= control to RHS of transfusion
Chandon = no different
Paradigm = control to LHS of transfusion

Samples near each other are similar with regard to **phenolic profiles**

The further away from each other the more different they are…

RHS placement of the controls for six out of eight is not a significant finding, but may indicate the **controls** were higher in **total phenolics** than transfusion treatment.
PCA cluster analysis labelled with treatment

Scores

Full scan, 220-590nm, 1M HCl
Conclusions ...

- Transfusion
  - No consistent treatment effect in lab results.
  - Was the transfused volume enough to see an effect? approx 8% (Bob 20%) (problem with whole berry ferments)

What might have happened?...

Bobs past observations:

  Transfusion induced increases in tannin, total phenolics, % non-bleachable pigment (ie higher proportion of pigment as pigmented tannin) and hue (also reflecting conversion of pigment to stable forms).

The theory behind this?...

  Labile metabolites of active yeast (eg pyruvate and acetaldehyde) may affect extraction and pigment stabilisation.....therefore adding the juice as ferments taper off helps them kick along at a higher rate near the end.

  So was an 8% transfusion (similar to chaptalisation) a big enough ‘kick’?
Conclusions ...

Conclusions ... If not the lab
..... maybe in the glass?....
Many thanks to ...
Organoleptic assessment

6 (8) wineries 2 wines each 12 glasses

Each of these parameters are to be scored...

- a. fruit
- b. complexity
- c. structure / texture
- d. balance
- e. palate length

Can you detect any difference between the 2 wines (pair)

YES or NO

For each winery, which wine do you prefer...
Winery One: Lethbridge

Control

Transfusion

fruit

complexity

palate length

balance

structure / texture
Winery Two: Moorooduc

- Fruit
- Palate length
- Balance
- Complexity
- Structure / Texture

Control
Transfusion
Winery Three : Curly Flat

- **fruit**
- **palate length**
- **balance**
- **structure / texture**
- **complexity**

Control

Transfusion

Winery Three: Three : Curly Flat
Winery Four : Ten Minutes

- Fruit
- Palate length
- Complexity
- Balance
- Structure / Texture

Control
Transfusion
Winery Five: Paradigm

- Fruit
- Complexity
- Structure / Texture
- Palate Length
- Balance

Graph showing the comparison between Control and Transfusion for different wine attributes.
Winery Six: Dromana

- Fruit
- Palate length
- Complexity
- Structure / Texture
- Balance

Control
Transfusion
Difference perceived...

<table>
<thead>
<tr>
<th>Winery</th>
<th>YES (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winery One</td>
<td>100</td>
</tr>
<tr>
<td>Winery Two</td>
<td>75</td>
</tr>
<tr>
<td>Winery Three</td>
<td>75</td>
</tr>
<tr>
<td>Winery Four</td>
<td>90</td>
</tr>
<tr>
<td>Winery Five</td>
<td>75</td>
</tr>
<tr>
<td>Winery Six</td>
<td>80</td>
</tr>
</tbody>
</table>
Preferred wine (%)

- Winery One
- Winery Two
- Winery Three
- Winery Four
- Winery Five
- Winery Six

Control
Transfusion
Preferred wine

Control

Transfusion

46%

54%
Conclusions ... ?

• Was the transfused volume enough to see an effect?
• approx 8% (Bob 20%) (problem with whole berry ferments)
Initial idea...

• VPNW 2013: Transfusion = 8%
  o VPNW 2013: Conclusion = Failed to see an effect
  o Enter George and the pilot study VPNW 2014:

so lets make it bigger ...

• VPNW 2014 = Extreme transfusion = 20%
  • Same methodology
  • Larger juice fraction removed
  • Juice returned at conclusion of ferment (five aliquots)
Transfusion procedure...

Vat 1 = 1000 kg fruit = 700 L juice

Calc:
2 baume = 109.6 L @ 12.8 baume

Refrigerate at 4°C to inhibit fermentation of “transfusion juice”
Pinot Noir MV6 - TRANSFUSION TRIAL TREATED - TANK E - 2014

Date

Must Temp. (°C)

Sugar [Brix] or Temp [°C]
Conclusions …

- No effect on pH : TA

  - X-Transfusion = “slightly” : higher alc%  
    - less glycerol  
    - less residual glucose

- X-Transfusion = LESS :
  - colour density  
  - free anthocyanin  
  - pigmented tannin  
  - pigment  
  - total phenolics  
  - tannin  
  - less everything

So what was the effect of increased skin:juice ratio during the ferment (pre-transfusion) ?
Thank you ...