AWRI

The Australian Wine Research Institute

Additives & processing aids: when things go wrong

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Inputs to Outputs: is less more?

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Consumer's first impression

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- Clarity is one of the leading consumer quality requirements
- A haze or a taint character can seriously affect perception of wine
- For the producer, economic consequences can be significant
  - Loss of brand value, reputation and confidence by the retailer
  - Recall of product, likely to be a very expensive process in export markets

Main products that cause problems

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- Tartaric acid
- Copper
- Grape juice concentrate
- Enzymes
- Bentonite
- Sorbic acid
- Tannins
- Calcium
- Iron and other metals

- <u>All materials have the potential to taint if they are themselves tainted</u>

Universal rule

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- Don’t change the composition after final stability tests are done (apart from filtration and standard additions pre-bottling.)
- Verify stability tests and analysis post last minute additions.
- Postponing bottling is not as bad as decanting, filtering and re-bottling!

Haze / Deposit investigations

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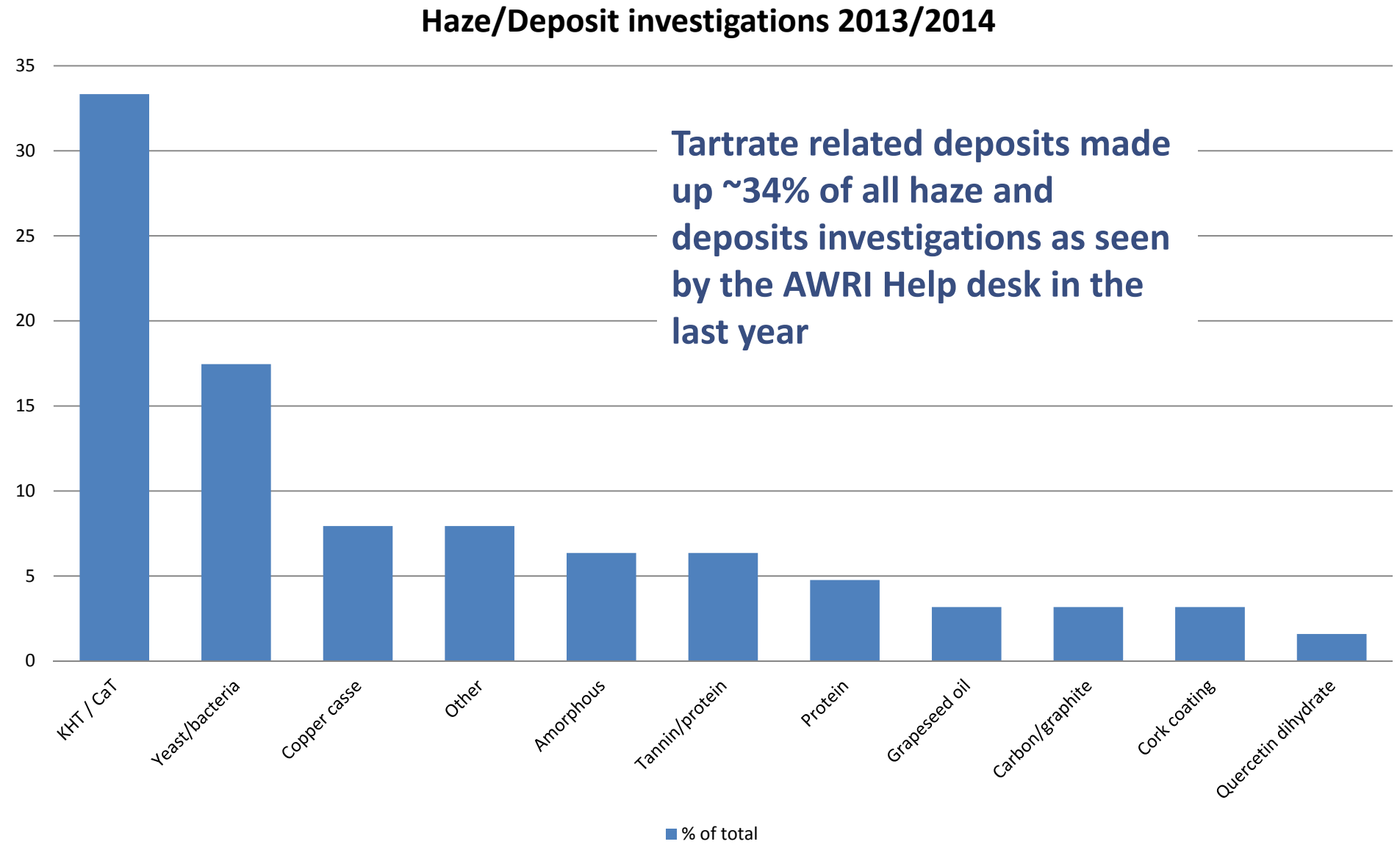

Tartrate related deposits made up ~34% of all haze and deposits investigations as seen by the AWRI Help desk in the last year

Tartaric acid–related issues

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- Potassium hydrogen tartrate (KHT) deposits
- Calcium L- and DL-tartrate deposits
- 2,6-Dichlorophenol taint (rare – thankfully!)

Tartaric acid–related issues

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- Potassium hydrogen tartrate (KHT) deposits

Tartaric acid–related issues

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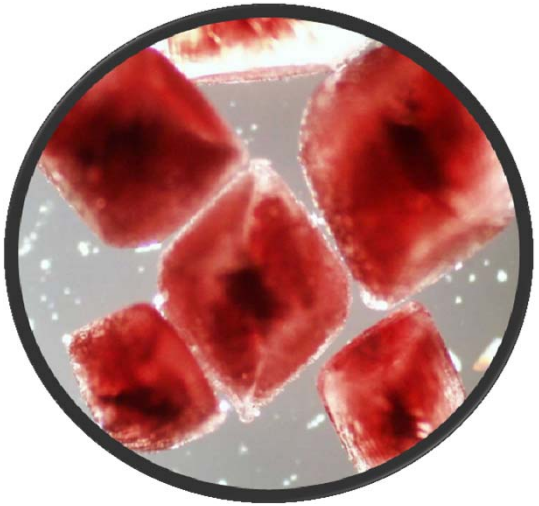
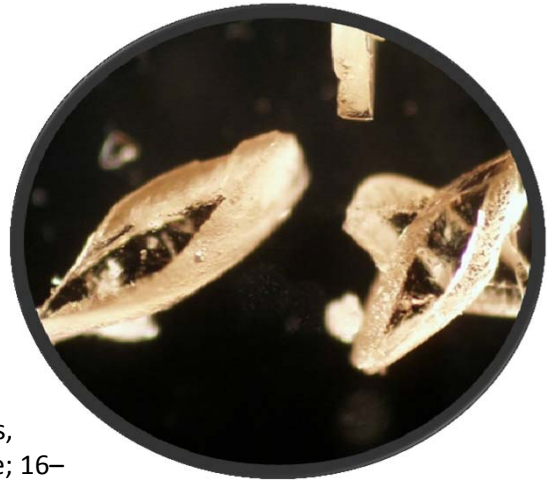
Potassium hydrogen tartrate (KHT) deposits



- Filter at stability temperature (don't let warm up & then filter)
  - otherwise KHT can re-dissolve & render wine unstable
- Check stability post blending
- Cold stab Method
  - –4 ° C/3 days best predictor of long-term stability (Leske et al 1992)
- CMC can be an 'insurance policy' (whites)



Leske, P.A.; Bruer, N.G.C.; Coulter, A.D. (1996) Potassium tartrate—how stable is stable? Stockley, C.S.; Sas, A.N.; Johnstone, R.S.; Lee, T.H. eds. Proceedings of the ninth Australian wine industry technical conference; 16–19 July 1995; Adelaide, SA. Adelaide, SA: Winetitles;: 39–45.

Tartaric acid–related issues

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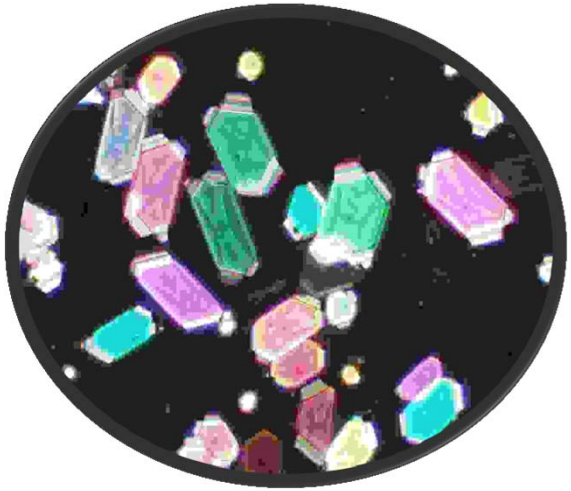
Calcium L-tartrate (CaT) deposits

- No reliable stability test

- Precipitation favoured at higher wine pH values
  - Operations that may increase the pH (e.g. MLF/ deacidification / blending) can increase the likelihood of instability.



- Check wine calcium level
  - Reduce to <80 mg/L (blending, electrodialysis, Calcium tartrate seeing, ion exchange - re-check all stability tests)

- Meta-tartaric acid can be effective against CaT, (although shelf life is temperature dependant).
  - CMC's are ineffective against CaT precipitation

Tartaric acid–related issues

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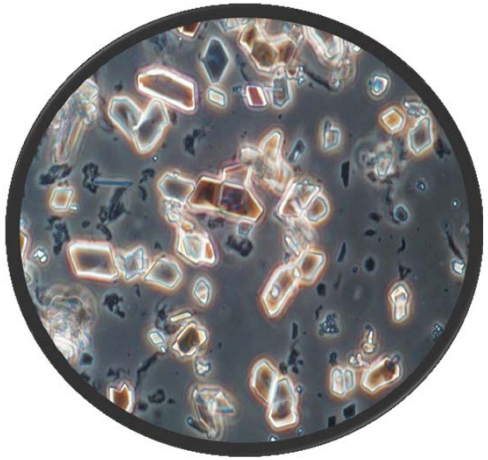
Potassium and Calcium DL-tartrate (K & Ca DL-T) deposits

- Results from the use of racemic (synthetic) DL-tartaric acid (beware of impure or cheap tartaric acid)
- Also can result from the use of racemic KHT seed crystals (see Holdstock et al 2007)
- Make sure filter off cold stab deposit at the stability temperature (don't let warm up & then filter)



Holdstock, M.; Cowey, G.; Coulter, A. (2007) Calcium DL-tartrate instabilities – a recent increase in their occurrence. The Australian & New Zealand Grapegrower & Winemaker: 85–88.

Grape juice concentrate (GJC)

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"Did you add GJC a couple of weeks before bottling?"

- Microbiological problems – filtration issues with red wines
  - Add closer to filtration time (but make sure mixed)
- 'Random' protein instability – insufficient mixing before bottling
  - Take top and bottom samples and test for G+F
- KHT precipitation due to high potassium concentration in GJC
  - Be aware that addition of GJC can change cold stability

Enzymes

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- Residual enzyme stable in wine A may not be stable when blended with wine B (if there is a change in pH and/or increase in ethanol concentration)

- Enzymes are proteins and can cause hazes if they remain in wine

Bentonites

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- Use of calcium bentonite can increase the calcium concentration in wine and consequently increase the risk of calcium L-tartrate instability
  - Be careful in high protein years – check calcium levels (AAS)
  - Want <80 mg/L calcium

- Some sodium bentonites have elevated iron levels (Leske et al 1995)
  - Be careful in high protein years – check iron levels (AAS), especially in bentonite lees tanks
  - If >6 mg/L then greater risk of iron instabilities (ferric phosphate, ferric tannate)

Leske, P. A. Bruer, N. G. C. Capdeboscq, V. (1995) An evaluation of some characteristics of commercial bentonites. *Australian & New Zealand Wine Industry Journal* 10(1). Winetitles: Adelaide, SA : 73-77.

Sorbic acid & geranium character

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- LAB (mainly Oenococcus oeni) can metabolise sorbic acid to produce 2-ethoxyhexa-3,5-diene (geranium tone)
- Do not add sorbic acid to white wines if MLF is required
- Be careful of additions to red wines – check that sorbic acid is not present in the additive/processing aid **as an antimicrobial agent** (e.g. tannins)

Copper

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- Number of copper hazes increased when use of screw caps increased.
- Due to adding copper at bottling ‘just in case’
- If sulfide aromas detected shortly before the pre-determined bottling date
  - re-schedule so wine can be treated in advance
- Having to decant, filter and re-bottle due to a copper haze is more inconvenient (and costly!) than re-scheduling a bottling

Copper

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Copper haze at start of bottling

- Copper ions from pipes can remain in filler bowl or on filter pads
- First wines off the line high in copper
  - Copper haze
- Drain filler bowl and rinse pads with citric acid solution

Taint Investigations

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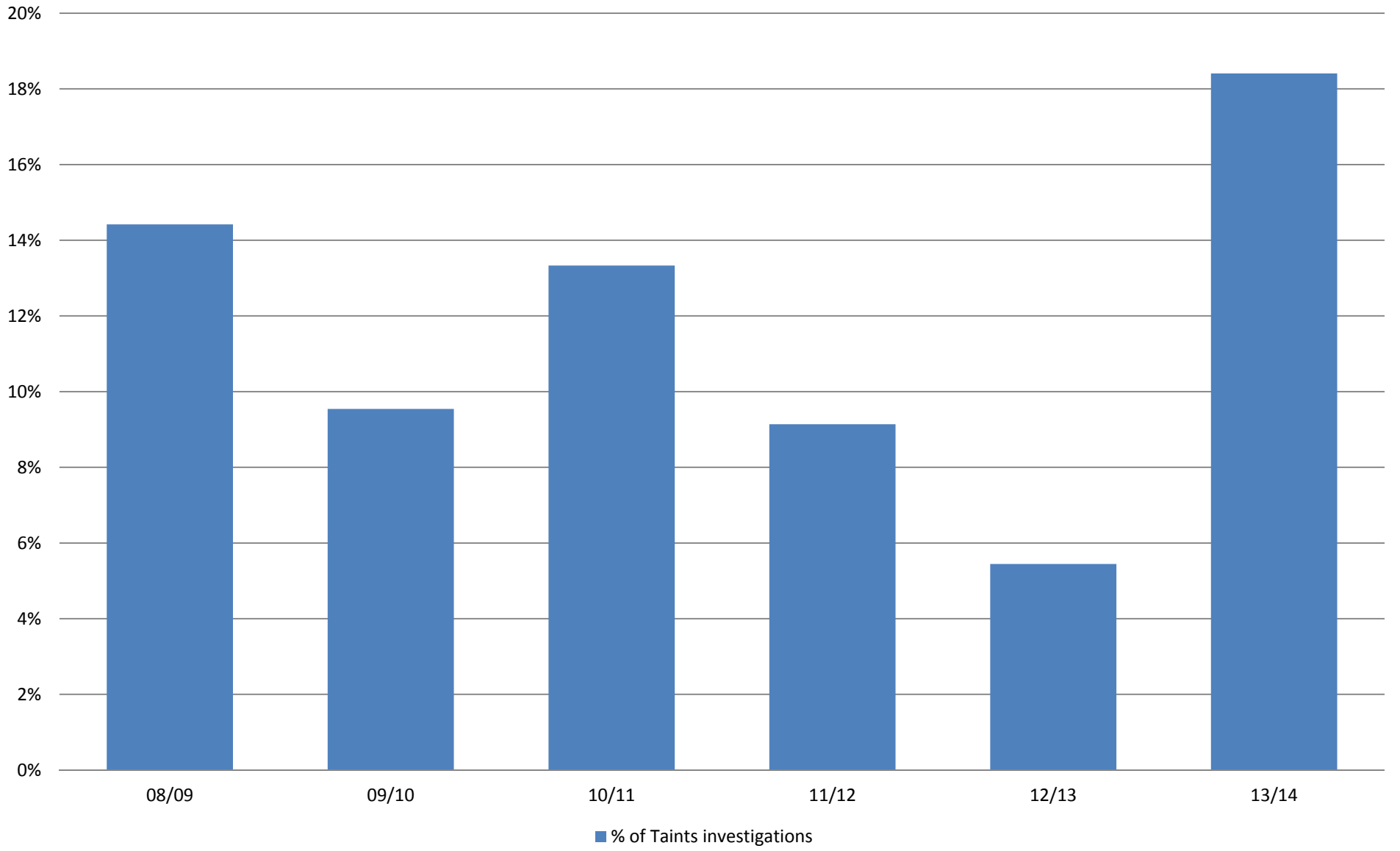

Taints from additives/processing aids

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Winemaking additive/processing aid	Associated taint compounds
Bentonite	Hydrocarbons, TCA
Carbon dioxide	Aromatic hydrocarbons
Diatomaceous earth	TCA, aromatic hydrocarbons
Oak chips	TCA, naphthalene, alkylnaphthalenes and other aromatic hydrocarbons
Perlite	TCA, aromatic hydrocarbons
Tartaric acid	Chlorophenols
Yeast Hulls	Chlorocresol
PVPP	TCA, chlorophenols

Taints from additives/processing aids

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- Always keep hold back samples pre and post bottling
- Where possible keep samples of additives and record production lot details
- Ensure there is a paper trail, so you can refer back to key processing information and when additions were made
- Implement a screening program to prevent the accidental introduction of off-flavours
- Simple soak and compare test
- Rely on more that one person to assess sensorily

Taints from additives/processing aids

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www.awri.com

- Industry Support & Education (main menu)
  - Winemaking resources (sub-menu)
    - Sensory assessment (sub-menu)
      - Screening tests for commonly used winemaking chemicals and processing aids

Acknowledgements

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Australian Government
Australian Grape and Wine Authority