



Investigating the chemistry of smoke taint and other extracts from wine grapes

Key Points

Investigating the application of a **pressurized hot water extraction (PHWE)** method to the wine industry including:

1. Evaluating PHWE as a method for determining smoke taint in grapes
2. A comparison of PHWE and traditional extraction techniques for grape matter
3. Testing a dinuclear-manganese catalysed oxidation reaction on grape skins for the removal of smoke taint
4. PHWE as a tool for grape marc extraction

A new method for decision support in the Wine Industry

Smoke from bush fires or burn offs near grape harvest time can significantly impact the wine industry. In addition to economic loss from unharvested crops, smoke exposure to grapes can cause unwanted sensory characteristics in the wine commonly referred to as 'smoke taint'.

In this project, I am investigating the use of a simple method for smoke taint extraction developed by the Smith & Bissember group, faculty of Chemistry, University of Tasmania. This group has explored Pressurized Hot Water Extractions (PHWE) using a standard household coffee machine as a simple method to produce extracts from various types of natural products.

The PHWE method could prove useful to the wine industry for decision support around the detection of smoke taint in wine. It may also offer a simple method for extracting useful compounds from grape marc; a by-product of the wine industry.

This research will also test a potential remedial treatment for smoke taint affected wine using an oxidation treatment applied to grape skins prior to processing.



Pressurized Hot Water Extraction (PHWE)

PHWE has the advantage of being fast, normally taking only a few minutes. This means less degradation of desirable organic compounds and minimal extraction of undesired chlorophylls and pigments. This reduces the costly and time consuming steps of separating these compounds in the extract. Additionally, this is a simple, inexpensive method which is environmentally benign as the primary solvent used is water.



The household coffee machine used for PHWE

PHWE method for grapes

10g of dry, ground plant matter (with dispersant) with 200-300 mL of a water/ethanol mixture over approximately 3 minutes will be used for extraction by PHWE. Quantitative analysis using gas chromatography-flame ionization detector (GC-FID) will then be conducted on the extract to determine the concentration of the volatile phenolics and other organic compounds.

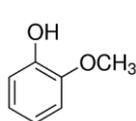
Grape Marc

Grape marc makes up approximately 20% of the mass from grapes harvested and its natural products contain a host of functional compounds. The PHWE method offers a simple low cost alternative extraction method that may yield economically useful compounds from grape marc.

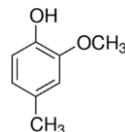
Grape marc from three different winemaking processes (red, chardonnay and rosé) will be freeze-dried both whole and in its separate components (skins, stalks and seeds) before extraction by the PHWE method.

Smoke Taint in Grapes

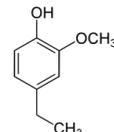
Some of the compounds synonymous with smoke taint in wine include the volatile oak derived phenolics as seen below. They are produced from the combustion of lignin, hemicellulose and/or cellulose found in plants.



Guaiacol

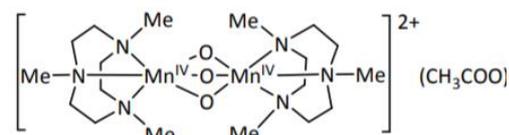


4-methylguaiacol



4-ethylguaiacol

Bunches of Pinot Noir grapes picked from Jansz Parish Vineyard were exposed to post harvest smoke for different time periods (30, 60 and 120 minutes) and were freeze-dried whole and in their separate plant components (skins, stalks, seeds, pulp). These samples will be extracted with the PHWE method.



Can smoke taint be corrected?

An oxidation reaction with a dilute solution of a dinuclear manganese catalyst, Pegasus (shown above) will be performed on the skins of grapes previously exposed to smoke. This will be done in the presence of hydrogen peroxide to oxidise the volatile phenols associated with smoke taint. This reaction treatment will be administered as a spray to test its ability as a practical remedial treatment.



DISCLAIMER

CRICOS Provider Code 00586B

While the Tasmanian Institute of Agriculture (TIA) takes reasonable steps to ensure that the information on its fact sheets is correct, it provides no warranty or guarantee that information is accurate, complete or up-to-date.

TIA will not be liable for any loss, damage, cost or expense incurred or arising by reason of any person using or relying on the information contained in this publication. No person should act on the basis of the contents of this publication without first obtaining specific, independent, professional advice.

TIA and contributors to this Fact Sheet may identify products by proprietary or trade names to help readers identify particular types of products. We do not endorse or recommend the products of any manufacturer referred to. Other products may perform as well or better than the products of the manufacturer referred to.



UNIVERSITY of
TASMANIA

Contact

Brianna Skierka

Brianna.skierka@utas.edu.au

Dr Jo Jones

Joanna.jones@utas.edu.au