Smoke Taint Management

Department of Environment, Water and Natural Resources

Purpose

This document outlines strategies to reduce the impacts of smoke from prescribed burning on grapes that will be used by DEWNR.

Background

Issue Grapevines exposed to smoke from bushfires or prescribed burning, during sensitive growing periods, may produce wine that displays smoke like aromas that render the wine unfit for consumption. The exposure of grapes to smoke can therefore result in significant financial losses when growers produce grapes for the wine industry.

Vineyards near Parks & Reserves Vineyards occur predominately in the Adelaide Hills, River land, South East, Clare Valley, Barossa Valley, Fleurieu Peninsula and parts of Kangaroo Island. The Adelaide Hills pose the greatest risk to vines due to the frequency of burns, greatest topography and closest proximity to vineyards.

Components of Smoke Smoke is comprised of a variety of gases, and airborne solid and liquid particulates. The main compounds resulting in smoke tainting in grapes include phenols, guaiacol and 4-methylguaiacol.

Fire and Vines

Risk to vines

Smoke as a result of fire can have a notable impact on the taste and quality of grapes to be used in wine production. Smoke taint can lead to undesirable burnt, dirty, ash, disinfectant, smoked meat, leather and charring flavours. As a result the wine becomes unfit for sale or reduces value. The level to which a grapevine is susceptible to smoke exposure is directly related to the growth stage and veraison period (the onset of ripening).

As shown in figure 1: the first growing period has the lowest potential for smoke taint of grapes, where the period from seven days post veraison to harvest has the highest potential for smoke uptake. During this period, grapes are the most sensitive to smoke and atmospheric factors.

Smoke taint can impact on all grape varieties however some have a greater sensitivity to smoke exposure than others. Heavy exposure of smoke to grapevines for a period of 30 minutes is sufficient to result in smoke taint.

		Grapevine growth stage	Potential for smoke uptake
P1		Shoots 10 cm in length	Low
		Flowering	Low
P2		Berries pea size	Variable (low to medium)
		Beginning of bunch closure	Variable (low to medium)
		Onset of veraison to 3 days post veraison	Variable (low to medium)
P3		From 7 days post veraison to Harvest	High
			

Figure 1: The key stages of grapevine development and sensitivity to smoke exposure (Extracted from Kennison, et al, 2009).

Repeated smoke exposures and exposures for a long period of time have also been found to result in a build up of smoke aromas and compounds in resulting wines. However, a carry over effect from one year to the next has not been found in grapevines that have been exposed to smoke compounds.

Other effects of smoke on grapevines also include:

- a decrease in grapevine function and development;
- necrotic lesions on grapevine leaves after repeated smoke exposure (figure 2);
- decrease in fruit ripening capabilities;
- significant decrease in fruit yield in the next fruiting season following repeated smoke exposure;
- impacts on wine fermentation process.

Figure 2: (left) Necrotic lesions on leaves after repeated smoke exposure compared to *(right)* healthy leaves on a grapevine that has not been exposed to smoke. (Extracted from Kennison, et al, 2009).

Management Options for grape growers

Research from the Australian Wine Research Institute suggests that smoke taint can be reduced by leaf removal; washing grapes post-harvest; high volume cold water wash; hand harvesting; and avoidance of leaf matter in the grape load. More advanced options to reduce smoke tainting impacts on grapevines include:

- pressing whole bunches of grapes and the further division of juice into the press fractions;
- pre-harvest testing of grapes for guaiacol and 4-methlyguaiacol to detect the presence of smoke taint to make informed production and management decisions;
- vegetation buffers to reduce smoke intensity;

For the latest information on specific vineyard management strategies please contact the Australian Wine Research Institute or National Wine Centre.

DEWNR Actions for Risk Management Fire Planning

- Identify and map vineyards located in close proximity to DEWNR-managed lands.
- Prioritise prescribed burns in proximity to vineyards to be conducted in spring (reduced risk of grape damage).
- Liaise with SA Wine Industry Association and Wine Grape Council of SA about the proposed plan for prescribed burns for each burn season to seek comment
- Liaise with Regional Wine Growers Association before burn season to inform of planned prescribed burns and the potential impacts.

DEWNR Actions for Risk Management Prescribed Burning

- Identify burns with potential impacts to local vineyards.
- Pick favourable wind conditions for burns that avoid smoke exposure to vineyards (wind conditions that blow away from vineyards sites).
- Use smoke modelling tools to predict smoke dispersion and movement.
- Replan and/or reschedule a burn if the conditions are not favourable.
- Liaise with adjoining grape growing landholders to advise on burn logistics and to negotiate alternatives if the burn conditions are not suitable.
- Ensure weather conditions during the burn period are constantly monitored for any changes that may lead to unsuitable conditions.

Timing of burn

To reduce the effect of smoke taint, DEWNR should aim to:

- Avoid burning during the veraison period - where grapevines are the most sensitive to smoke exposure (ranges Jan-Apr).
- Avoid burning when fuels are moist to reduce smoke intensity;
- Avoid burning with weather conditions such as inversion layers, still days and nights when there is no wind.
- Avoid burning in areas of high risk – gullies/valleys with limited wind movement.
- Avoid burning when wind direction is likely to move smoke into grape growing areas.
- If weather conditions alter to risky or unsuitable conditions cease burning to mitigate any further smoke exposure or impacts to grape growing areas.

Bushfires - recommendations for Incident Controllers

Bushfires

- Contact the Regional Wine Growers Association to advise on potential smoke exposure to vineyards and grape growers in the area.
- Contact the grape growers as soon as possible to advise on the potential smoke exposure risk.
- Request a CFS media release be sent out to the general public advising of the risks of smoke exposure and the impacts for grape growers in the area.
- Use BOM website smoke modelling tools to determine the smoke dispersion.
- Where possible, plan back burn operations that do not increase the risk of smoke exposure to vineyards.

After Fire

Monitoring and Feedback

- Monitor/patrol the burn area for possible re-ignition or flare ups that may create smoke.
- Engage grape growers in monitoring and feedback of potential impacts of prescribed burning and bushfires

References

Kennison, K., Wilkinson, K. and Gibberd, M. (2009) Latest Developments in the Investigation of Smoke Derived Taint in Grapes and Wine. Factsheet produced by Department of Agriculture and Food Western Australia, University of Adelaide and Curtin University, 7 pages.