



Lightstruck character

The AWRI sometimes receives enquiries regarding development of ‘lightstruck’ character in bottled wine during storage. This column provides a brief summary of this phenomenon.

What is lightstruck character?

Lightstruck character is an off-aroma that sometimes occurs in white wines that have been exposed to light, especially sparkling wines. It has been described as ‘cooked cabbage’, ‘corn nuts’, ‘wet dog/wet wool’ and ‘soy/marmite’ (Dozon and Noble 1989). The formation of lightstruck character has also been reported in beer.

What causes lightstruck character?

Lightstruck character is caused by the formation of volatile sulfur compounds in wine resulting from exposure to light in the higher energy ultraviolet wavelengths. The light causes photodegradation of methionine and cysteine by riboflavin (vitamin B2), which is photosensitive and acts as an oxidising agent. Riboflavin becomes activated on exposure to light of wavelengths 370 and 440 nm and can oxidise the sulfur-containing amino acids. Subsequent reactions result in the formation of the sulfur compounds responsible for the off character, which are typically methanethiol and dimethyldisulfide (Dozon and Noble 1989, Mattivi et al. 2000).

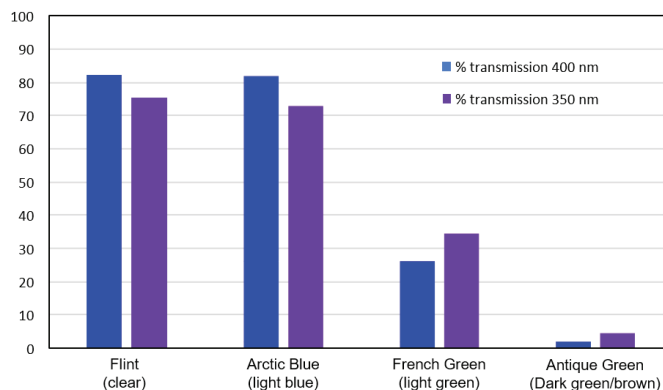
Why aren't red wines affected?

Red wines have high concentrations of procyanidins, which have a high absorption capacity for UV light. This prevents the light from activating riboflavin and causing lightstruck characters (Ribéreau-Gayon et al. 2006).

Won't the glass bottle absorb the UV light?

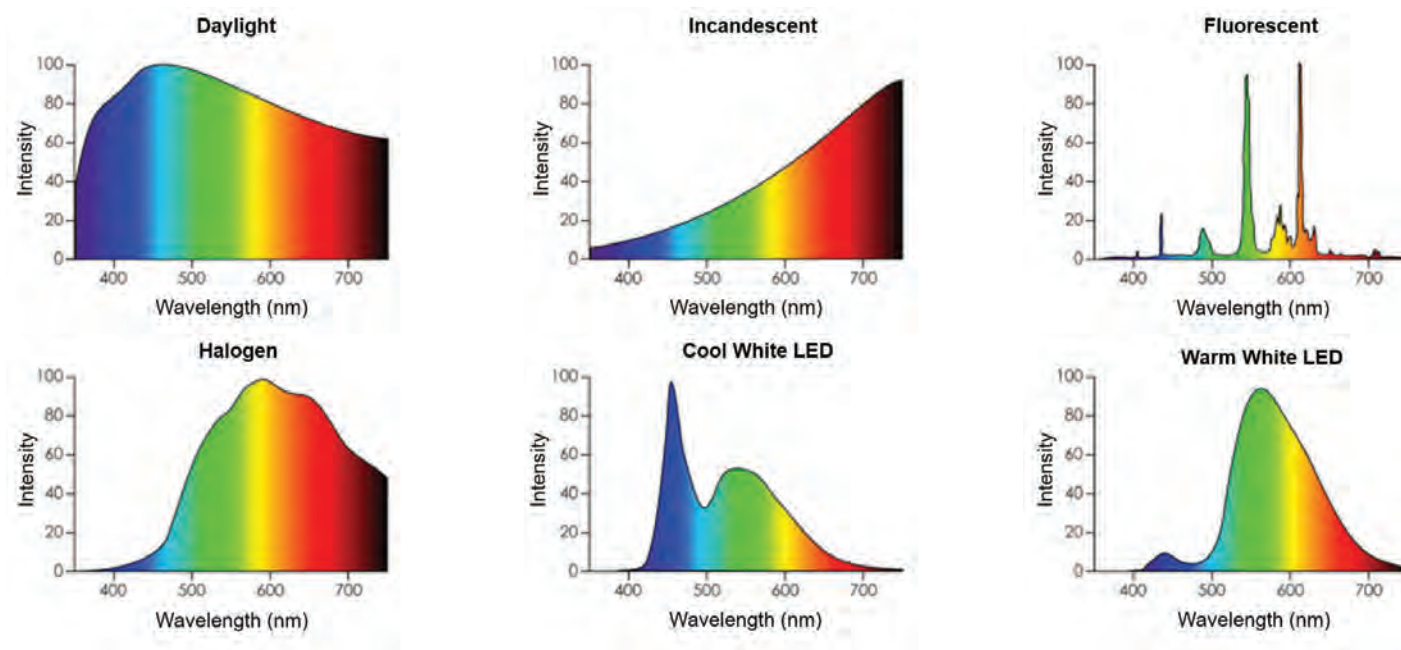
How much UV light is absorbed by the bottle depends on the colour of the bottle, its composition and the thickness of the glass. Figure 1 shows the amount of light transmitted through four different coloured wine bottles.

Most of the light at 400 nm and 350 nm was transmitted through the Flint and Arctic Blue bottles, whereas only about 26 and 35% of light at 400 nm and 350 nm penetrated the French Green bottles and very little of the light at the two key wavelengths penetrated the Antique Green bottles. Not surprisingly then, Dozon and Noble (1989) found that exposure of still and sparkling white wines in flint bottles to fluorescent light bulbs (40 W) at a distance of 35 cm caused development of lightstruck aroma after only 3.3 hours and 3.4 hours exposure, respectively, while the same wines bottled in green glass took 31.1 hours and 18 hours to develop the lightstruck character. Antique Green bottles would provide more protection against lightstruck character than the other three bottle colours due to their ability to block the relevant wavelengths of light.



Does the type of lighting influence the development of lightstruck character?

Given different light sources can emit wavelengths of light of differing intensity, the type of light source can influence the



rate of development of lightstruck character. Figure 2 shows the spectral response of different light sources, including daylight, incandescent bulbs, LED bulbs and fluorescent bulbs.

Figure 2 shows that sunlight provides a relatively continuous distribution across the entire visible and ultra-violet spectrum. Sunlight also has the highest intensities at wavelengths less than 450 nm compared to the other light sources. Consequently, sunlight has a higher propensity to cause lightstruck characters than the other light sources. However, the illuminance (how much light illuminates the surface) also plays a role. Given that sunlight through a glass window is approximately 200 times brighter than the normal lighting level for a well-lit room (Quill et al. 2007), exposure of bottled wine to sunlight, as might occur in retail window displays, would be more deleterious to wine quality than exposure to electric lighting systems. However, sparkling wine is sometimes stored in bins in warehouses for extended periods of time while on tirage, so use of 'warm' lighting in such areas, that is, lights which emit minimal light in the <450 nm range, would decrease the risk of inducing lightstruck character.

For further information on lightstruck character or any other technical issue related to grape and wine production, contact the AWRI helpdesk on helpdesk@awri.com.au or 08 8313 6600.

References

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