Material change for a better environment

Information sheet

Glass wine bottles and UV light

Bottle colour, design and the effect of ultra violet (UV) light on wine quality

This information sheet has been prepared as part of (Waste & Resources Action Programme) GlassRite Wine project. One of the objectives of the project was to encourage further lightweighting of wine bottles, thereby reducing the tonnage of glass entering the waste stream and improving resource efficiencies.

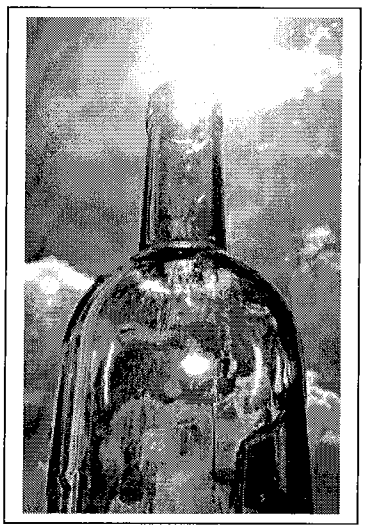
One of the major concerns within the wine sector is 'If a wine bottle is made lighter and thinner, will more light get through the bottle and damage the wine?' To address this concern, an assessment was carried out by Glass Technology Services (GTS) and the University of Sheffield to better understand the relationship between wine glass bottle design and colour. This factsheet aims to provide information on the effects of light on wine and the influence the glass bottle can have in avoiding or minimising any detrimental effects on wine quality.

Protection offered by glass

For light to damage wine it must first pass through the bottle. Having passed through the bottle, light's wavelengths become paramount, as they are absorbed by the wine.

In the context of wine quality, it is the blue end of the visible light spectrum and, more importantly, the UV range that can taint wine. Short wavelength UV light can cause the release of sulphurous compounds within the wine and can impart an unpleasant taste. Different glass colours will allow different wavelengths to be transmitted, and technical evidence suggests that wine bottled in clear or even green glass is susceptible to some degree of spoilage.

Figure 1 (overleaf) shows that for light of wavelengths up to 300nm[1], glass of all colours effectively stop all UV radiation. The graph shows the wavelengths at which various coloured glasses (clear, green and amber) are transparent to light, including UV radiation.



Clear glass

The protection offered by clear glass falls off steeply towards the upper region of the UV spectrum, giving poor protection at some critical wavelengths. Clear glass allows around 90% of light with a wavelength of 350nm to pass.

Green glass

Green glass, the traditional wine industry choice, gives better protection than clear, but at 370nm it still allows about 70% of light to pass.

Amber glass

Amber glass gives excellent protection over the full UV spectrum and even well into the visible region. This illustrates that amber glass has excellent filtering properties.

The interaction of light and wine

Exposure of wine to light results in what is known as light-struck flavours and aromas. These are produced by the initiation of chemical reactions in the wines, resulting in the formation of sulphurous compounds with an unpleasant smell and taste. The reactions can occur within minutes of exposure to light. However, some natural constituents of wine can act to prevent the odours and flavours associated with light degradation.

[1] *(nanometre: 1 nm being 1 millionth of 1 millimetre)*

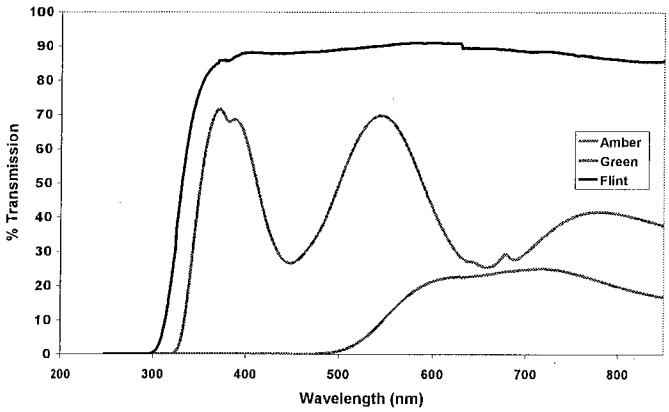


Figure 1: UV to visible light transmission of clear, green and amber glasses
Source: GTS

For example, white wine generally has a lower phenolic content than red and therefore has less natural protection against light than red wine, which due to the use of dark coloured grape skins is more resilient to light.

Light exposure

Most high volume selling wine is boxed in cardboard packaging soon after filling, transported in sealed containers and therefore has little exposure to light until it is displayed on retailers' shelves. Retail in-store fluorescent lighting – more so than the heat given off by the lighting - can affect wine, particularly white wine bottled in clear glass on the top shelf.

Bottle design and light

The amount of light absorbed by a glass bottle is also dependent on the direction of the light and the bottle's shape. When light shines from above, bottles with a long neck and shallow angled shoulders are best at protecting wine from light-strike.

As far as lightweight bottles are concerned, research suggests that the reduction in bottle wall thickness does not result in a linear decrease in UV protection. For example, a 20% reduction in wall thickness is only accompanied by a 6.7% reduction in UV filter power.

Additives to the glass, coatings or sleeves could compensate for the decrease in any wall thickness, although their impact on recyclability needs to be considered.

Additionally, some coatings could actually strengthen the glass.

Solutions

A number of solutions can be considered to reduce the impact of UV degrading wine in glass bottles, such as:

- use of filters over in-store lighting;
- use of a UV-screening coatings or sleeves on the bottle;
- use of amber or green glass for wine bottles, most notably for white wine; and
- label placement and size to minimise light entry.

A modelling tool

As part of GlassRite Wine, the University of Sheffield has developed a tool to aid glass manufacturers in the production of suitable glass colours to inhibit light filtration, and to calculate the effect of the bottle's wall thickness on UV light absorption. This tool can be downloaded at www.wrap.org.uk/retail

Further information

Find out more about lightweighting and how WRAP can help your brand and business by visiting www.wrap.org.uk/retail

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