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New & innovative functional food & wine products for Ontario



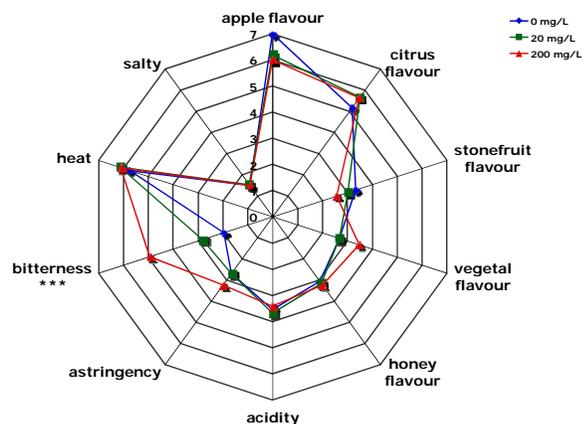
Introduction to the Innovation

The health promoting properties of some polyphenolic compounds are well established, and thus, they have significant potential for use as active ingredients in the functional food industry. For example, *trans*-resveratrol, a stilbene and phytoalexin found in the skins of grapes¹, is commonly associated with the health properties of red wine, and may help explain the healthiness of the Mediterranean diet² and the phenomenon of the 'French Paradox'³. While the potential use of some polyphenols as fortifying ingredients in various functional food and beverage formulations is promising, **polyphenols elicit bitterness**; a taste sensation that when experienced at heightened levels, is associated with a **decrease in consumer acceptance**⁴. Thus, in order for polyphenolic enriched foods to realise their full market potential, strategies need to be found to address their bitter properties.

Results to date

At CCOVI, we have experimented with functional food formulations, and have successfully fortified Cabernet Sauvignon and Riesling wines with 20 mg/L and 200 mg/L *trans*-resveratrol. These concentrations well exceed that which is normally found in wine (average total resveratrol concentration in red and white wine is 7 mg/L and .2 mg/L, respectively¹). A sensory panel was unable to detect flavour and aroma differences in the *trans*-resveratrol fortified Cabernet Sauvignon wines, however, the 200 mg/L Riesling was perceived as more bitter compared to the 20 mg/L and control (0 mg/L) Rieslings (Fig. 1). Thus, while direct fortification of polyphenols is a successful approach for some wine styles, others require additional modification to decrease bitterness and improve consumer acceptance.

Fig. 1. Flavour profile of *trans*-resveratrol fortified Riesling wines (0 mg/L, 20 mg/L, 200 mg/L) over 2 replications, n = 10. (Gaudette & Pickering, 2010, in prep). 0 mg/L (control) vs 200 mg/L ($p < .001$); 20 mg/L versus 200 mg/L ($p = .007$)



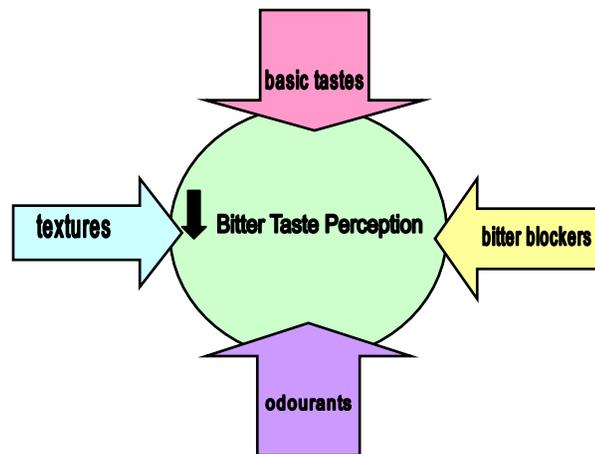
Bitterness modification strategies

The food industry currently implements several bitter masking and suppressing techniques to decrease the bitterness elicited by functional ingredients (Fig. 2). Traditional techniques include the use of sweet, salty, and savory tasting compounds, odourants and textures to mask bitterness. One disadvantage, however, of adding some sweeteners, salts and monosodium

glutamate is their negative association with health, which may therefore reduce the perceived value of the 'health-promoting' functional foods to which they have been added.

As an alternative, bitter inhibiting compounds, or 'bitter blockers', may be a valuable option for formulating various functional food products, including polyphenolic fortified wine. **Bitter blockers** decrease bitterness through complexation or encapsulation of bitterants, through interacting with bitter binding sites on taste receptor cells, or perhaps through interference with taste transduction mechanisms further downstream. Thus, their use may be particularly valuable for products that cannot be subject to more traditional bitter modifying approaches.

Fig. 2. Schematic representing approaches to reducing bitterness in foods and beverages.



Application

To date, there is no literature informing whether bitter blockers will successfully decrease the bitterness elicited by polyphenols. Therefore, we are currently investigating the potential role that bitter blockers may have in masking the bitterness of wine derived polyphenols. If successful, future strategies for bitterness modification could involve the use of bitter blockers alone, or in conjunction with more traditional approaches, to ultimately provide more effective options for the formulation of new functional food products in Ontario.

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¹Waterhouse, (2002), *Ann N Y Acad Sci*, 957:21; ²Mezzano et al, (2001), *Eur J Clin Nutr*, 55:444; ³Renaud & de Lorgeril, (1992), *Lancet*, 229:1523; ⁴Lesschaeve & Noble, (2005), *Am J Clin Nutr*, 81:330S