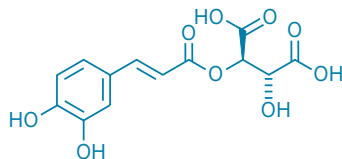




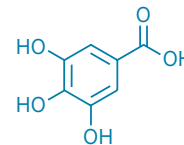
WINE SIMPLIFIED

The taste and feel of the Italian wine amarone can be reproduced with only 35 chemical compounds, according to enologists.

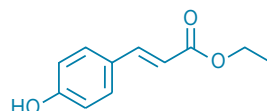
Puckering Astringent



- ▲ (E)-Cafutaric acid
- ▶ Furan-2-carboxylic acid
- ▶ (Z)- & (E)-Aconitic acid



- ▲ Gallic acid (*antioxidant*)
- ▶ HMW fraction (*a high-molecular-weight fraction that includes polysaccharides and tannins*)



- ▲ p-Coumaric acid ethyl ester
- ▶ Gallic acid ethyl ester
- ▶ Syringic acid ethyl ester
- ▶ Vanillic acid ethyl ester
- ▶ Caffeic acid ethyl ester
- ▶ Ferulic acid ethyl ester

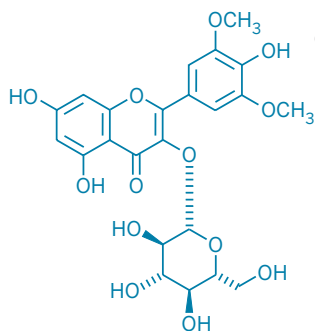
Bitter Astringent

(High alcohol content increases the perception of bitterness)

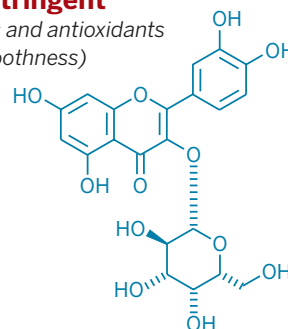
- ▶ Protocatechuic acid ethyl ester
- ▶ (+)-Catechin (*flavan-3-ol, antioxidant*)
- ▶ (-)-Epicatechin (*flavan-3-ol, antioxidant*)

Velvety Astringent

(Flavonol glucosides and antioxidants provide smoothness)

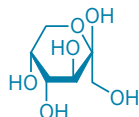


- ▲ Syringetin-3-O-β-D-glucopyranoside
- ▶ Isorhamnetin-3-O-β-D-glucopyranoside
- ▶ Dihydroquercetin-3-O-α-L-rhamnopyranoside

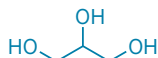


- ▲ Quercetin-3-O-β-D-galactopyranoside
- ▶ Dihydrokaempferol-3-O-α-L-rhamnopyranoside
- ▶ Quercetin-3-O-β-D-glucopyranoside

Sweet & Mouthful



- ▲ Fructose
- ▶ Glucose
- ▶ L-Proline



- ▲ Glycerol (*mouthful*)
- ▶ 1,2-Propanediol (*mouthful*)

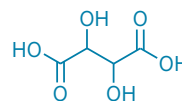
Salty

(These compounds help suppress perceived sourness)

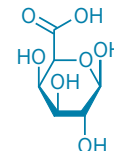
- ▶ Potassium phosphate
- ▶ Magnesium chloride
- ▶ Ammonium chloride

Sour

(These compounds help amplify the puckering astringent perception)



- ▲ Tartaric acid
- ▶ Acetic acid
- ▶ Succinic acid
- ▶ Malic acid



- ▲ Galacturonic acid
- ▶ Lactic acid
- ▶ Citric acid

NOTE: Astringent = A dry sensation in the mouth that can be smooth, sandpapery, and/or bitter.
Mouthful = A sensation of richness in the mouth.

SOURCES: Hofmann laboratory/TUM, *J. Agric. Food Chem.* 2008, DOI: 10.1021/jf073031n and 10.1021/jf801742w