

Interaction with other tastes and flavours

Besides sweetness there are three other basic tastes: salt, sour and bitter. Sometimes umami is included as a fifth basic taste. In many food systems we use sweetness to balance the basic tastes and to enhance and modify flavours.

Sour applications

Beverages, jams and marmalades are all mixes of sweet and sour components. It is important to create a good balance between sourness and sweetness, which is often achieved by adding a mix of sugar and citric acid. This is a good mix because the time-intensity curves for both components are almost identical, i.e. the sweet and sour tastes reach their maximum almost simultaneously. The time-intensity curves for the natural sugars, sucrose, glucose and fructose, are illustrated in figure 1.

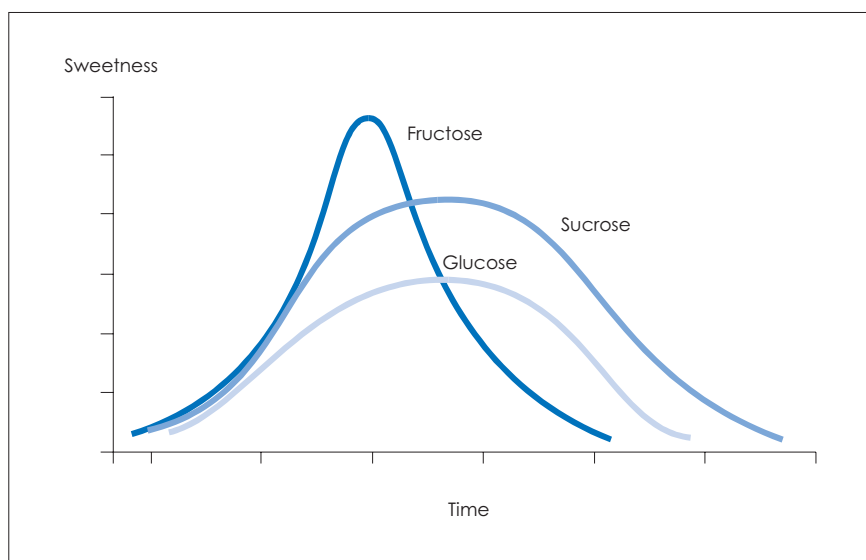


Figure 1. Time-intensity curves of fructose, glucose and sucrose.
Source: Shallenberger RS, Taste Chemistry, 1993

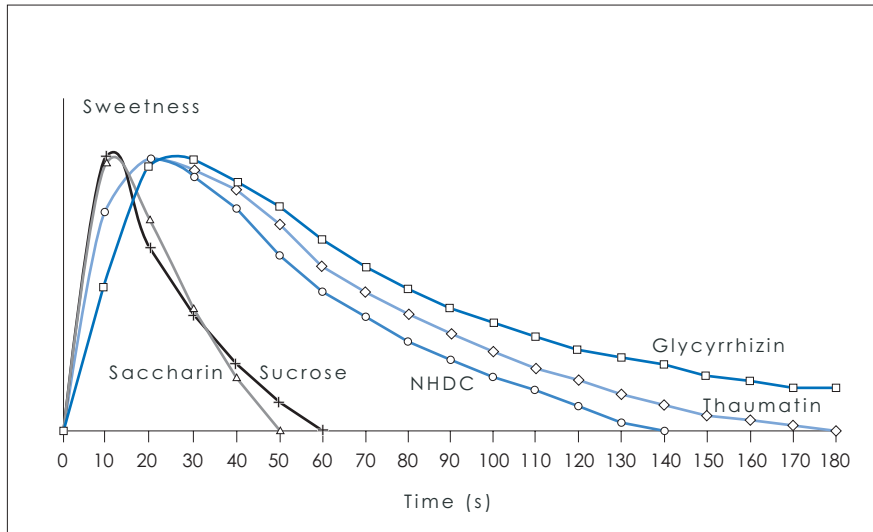


Figure 2. Time-intensity curves of selected sweeteners.
Source: Leatherhead Food RA Ingredients Handbook Sweeteners

The time-intensity curves of different sweeteners vary greatly. The sweetness of, for instance, aspartame and sucralose lasts longer than that of natural sugars. It also outlasts the sourness of citric acid to the effect that the sweet taste lasts for too long. Using another acid, e.g. malic acid, can to some extent compensate for this, as its sour taste lasts longer. The time-intensity curves of some sweeteners, for instance Thaumatin and Neohesperidin DC, are so different from all acids that they cannot be used in sour applications because the sourness disappears even before the sweetness is perceived. The sweetness is also very long-lasting, see figure 2.

Sucrose is often used in fruit preparations because of its ability to enhance the flavours of the fruit. This ability varies for different types of sweeteners. To find the optimal sweetener mix it is necessary to perform tests for every application. However, some mixes are preferred in most applications. Figure 3 shows the results of tests made to rank the preference of selected sweetener mixes in two applications: non-carbonated raspberry and wild strawberry soft drinks. All mixes with sugar or glucose syrup reduced the energy by 40% compared to the drink sweetened with sugar only.

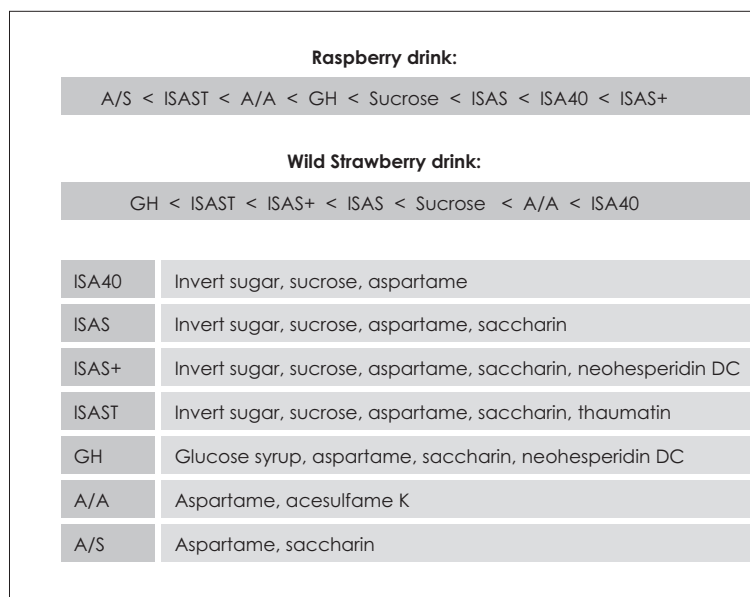


Figure 3. Preference ranking for non-carbonated soft drinks with total (A/A and A/S) or 40% (ISA40, ISAS, ISAS+, ISAST, GH) energy reduction compared to the sugar-sweetened drink.

Bitter applications

In bitter applications such as chocolate and coffee, sugar is often used to moderate or disguise the bitterness.

Using taste panels, Galvino examined the effect of sugar on coffee and vice versa. Varying amounts of sugar were added to a standard coffee (100% coffee) prepared from 100 grams of coffee made with 1 litre of water. It appears from figure 4 that sugar does have a strong influence on the perception of the coffee flavour and that the effect increases with increasing amounts of sugar, although not linearly. Likewise, the bitterness of coffee has a significant influence on the sweetness perceived, as illustrated in figure 5.

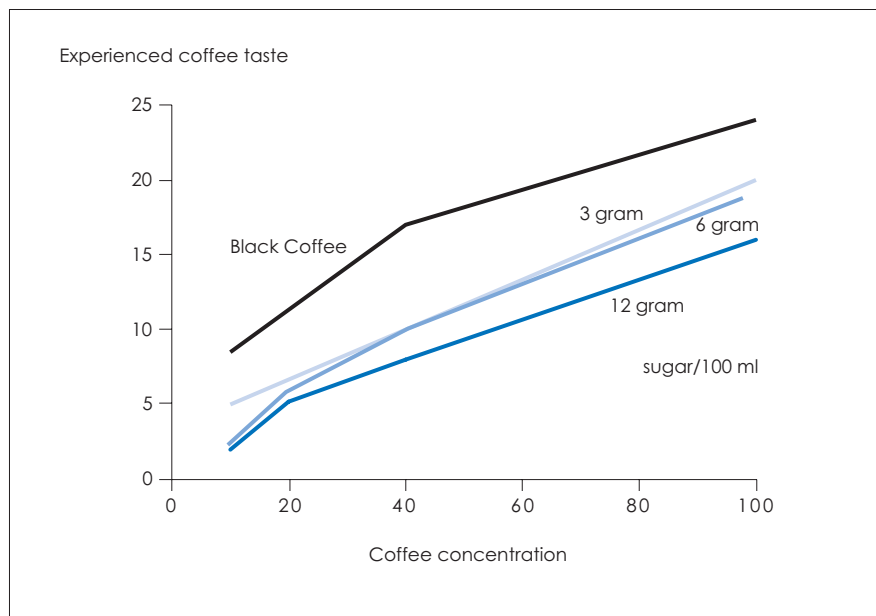


Figure 4. Effect of sugar on perceived coffee taste.
Data from Galvino et al, Chemical Senses, 1990.

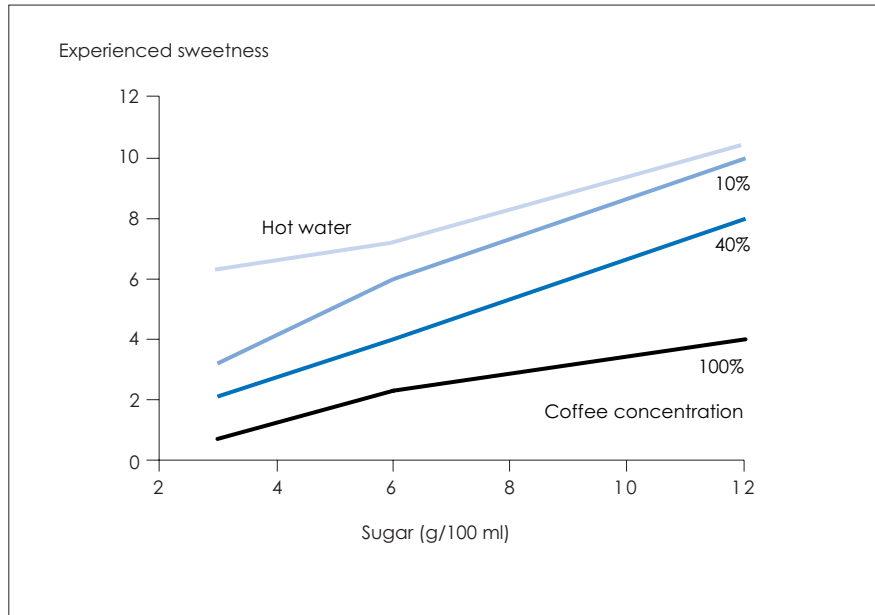


Figure 5. Effect of coffee bitterness on perceived sweetness.
Data from Galvino et al, *Chemical Senses*, 1990.