

## 100% fruit juices and sugar

Sugars include all simple carbohydrates, monosaccharides and disaccharides, both those occurring naturally in a food as well as those added during production. The simple sugars contained in whole fruit, and fruit juices, are mostly fructose but also include glucose and sucrose. The sugars in 100% fruit juices always come directly from the fruits that have been juiced, and are never added.

### Sugars in fruits

The nutritional composition of the fruit depends on various aspects linked to the botanical variety and cultivar, the climate conditions during the ripening phases and the conditions of storage and preservation. In general, fruit is an important source of carbohydrates in the form of simple sugars and dietary fibre. In whole fruits, fructose makes up a significant proportion of the simple sugars, followed by glucose and sucrose (which is composed of a glucose molecule plus a fructose molecule). The content and proportions of these simple sugars vary considerably based on the type of fruit. Fruits with the highest total sugar content are: cherries, grapes, mangoes, pomegranates, figs and bananas. In bananas, starch represents about 10% of all available carbohydrates<sup>1</sup>.

### Sugar in 100% fruit juice

100% fruit juices never contain “added” sugar, as per the European regulation, but nevertheless have a sugar content corresponding to that of the fruits from which they were derived (on average, about 24g per standard 200ml portion). In particular, fruit juices contain fructose, to a highly variable extent as they are more or less equivalent (as regards portion) to the corresponding fruit (0.5 to 7g per 100g). Juices extracted from fruits with a higher sugar content contain more sugar than juices obtained from less sugary fruits<sup>2</sup>.

### Classification of sugars

The WHO<sup>3</sup> classifies simple sugars as *‘intrinsic sugars’*, i.e. those naturally occurring in the intact structure of fruit and vegetables, *“milk sugars”* (lactose and galactose) and *“free sugars”* which, according to the WHO, include monosaccharides and disaccharides *added* to food and drinks by the manufacturer, cook or consumer, but also sugars that naturally occur in honey, syrups, fruit juices and concentrated fruit juices. Other countries in Europe classify sugars in other ways, such as added or simple.

European legislation does not permit the addition of preservatives, sugars and flavours to 100% fruit juice<sup>4</sup>, nor can manufacturers legally reduce the sugar content of 100% fruit juice. Nevertheless, the WHO includes those natural sugars contained in fruit juices in the “free sugars” category<sup>3</sup>.

### **Recommendations to limit sugars**

The WHO recommends restricting the consumption of *free* sugars to no more than 10% of daily energy (corresponding to about 50g per day in a 2,000 kcal diet). Based on LARNs<sup>5</sup>, the Italian recommendations, the total consumption of *simple* sugars must be less than 15% of energy (for 2,000 kcal = 75 grams) and emphasis is made to the importance of restricting added sugars and fructose intake. In the UK, consumers are advised to have no more than 5% of daily energy from *free* sugars, corresponding to around 27g daily<sup>6</sup>. The Netherlands suggests intakes of *added* sugars below 20% energy, while the Nordic countries have a limit of 10% energy, again for *added* sugars<sup>7</sup>. The European Food Safety Authority is currently revising the dietary reference value for sugars.

### **Impact of fruit juice on sugar consumption**

Contrary to expectations, observational studies in children and adolescents have found that a higher consumption of fruit juices generally corresponds to a lower intake of simple sugars<sup>8,9</sup>. This may reflect other behaviours associated with fruit juice intake, such as lower consumption of confectionery or sugar-sweetened beverages.

A different pattern was seen in a secondary analysis<sup>10</sup> of the UK National Diet and Nutrition Survey (NDNS) which considered the impact of 100% fruit juice consumption on intakes of non-milk extrinsic sugars. Adults who consumed 1-150ml daily had a small but statistically significant rise in average sugar intakes of 1 percentage point compared with non-consumers. However, this trend was not seen in teenagers who had similar intakes of sugar whether or not they consumed fruit juice up to 150ml daily. Of note was the fact that non-consumers of fruit juice still had sugar intakes in excess of 10% of daily energy. Therefore avoidance of fruit juice does not appear to help consumers meet strict targets for sugar intake. In addition, the slightly higher sugar intakes seen in adult consumers did not translate into a higher body mass index according to a further secondary analysis of the NDNS<sup>11</sup>.

### **100% fruit juice and effects on health**

For moderate consumption, the amounts of simple sugars in 100% fruit juices are far lower than the levels considered to have adverse effects on health. It should be remembered that these would be added to those coming from other sources – the largest proportion of sugar in the diet tends to come from sweetened products (cakes, confectionery, desserts) and sugar-sweetened beverages. In Europe, 100% fruit juices contribute 1-8% of added/free sugar intakes in adults and 1-12% in children and adolescents<sup>12</sup>.

There is evidence of some favourable effects of fruit juices, particularly on lipid profile and blood pressure. With regard to the association between 100% fruit juices and obesity and diabetes, there is very little evidence of an increased risk if consumption is moderate (150-200ml daily) and part of a balanced and varied diet. The few available studies concerning the possible effects on cardiovascular and cancer risk suggest a neutral impact. With regard to

dental caries, there is no significant evidence of an association with the consumption of fruit or 100% fruit juice, except in relation to their routine administration by bottle in early childhood. In a systematic review of the evidence, the UK's Scientific Advisory Committee on Nutrition found no consistent evidence for a negative impact of 100% fruit juice on health, including body weight, weight gain, cardiovascular disease and risk of type 2 diabetes<sup>6</sup>.

### Conclusion

The sugar content in 100% fruit juices is similar to the fruits from which they are derived. Based on available studies, children and adolescents who report a higher level of added sugar consumption tend to consume the least fruit juice. At the moderate intakes suggested in dietary guidelines, 100% fruit juices are not a significant contributor to high sugar intakes. It is worth noting that European law does not permit the natural sugar content of 100% juices to be artificially increased or reduced.

### References

- <sup>1</sup> USDA Food Composition Databases.  
<https://ndb.nal.usda.gov/ndb/nutrients/report/nutrientsfrm?max=25&offset=0&totCount=0&nutrient1=212&nutrient2=210&nutrient3=211&subset=0&fg=9&sort=f&measureby=m>
- <sup>2</sup> Serpen JY (2012) Comparison of sugar content in bottled 100% fruit juice versus extracted juice of fresh fruit. *Food Nutr Sci* 3: 1509-1513.
- <sup>3</sup> World Health Organization (2015) Guideline: Sugars intake for adults and children. Geneva; World Health Organization. [www.who.int/nutrition/publications/guidelines/sugars\\_intake/en/](http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/)
- <sup>4</sup> Official Journal of the European Union. Directive 2012/12/EU of the European Parliament and of the Council: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:115:0001:0011:EN:PDF>
- <sup>5</sup> LARN – Livelli di Assunzione di Riferimento di Nutrienti ed energia per la popolazione Italiana. IV Revisione. *SICS Ed. 2014*.
- <sup>6</sup> SACN (2015) Carbohydrates and health. Public Health England.
- <sup>7</sup> Diewertje S et al. (2016) Total, free, and added sugar consumption and adherence to guidelines: The Dutch National Food Consumption Survey 2007–2010. *Nutrients* 8: 70.
- <sup>8</sup> Gibson S & Boyd A (2009) Associations between added sugars and micronutrient intakes and status: further analysis of data from the National Diet and Nutrition Survey of Young People aged 4 to 18 years. *Br J Nutr* 101: 100-7.
- <sup>9</sup> O'Connor L et al. (2013) Dietary Energy Density and its association with the nutritional quality of the diet of children and teenagers. *J Nutr Sci* 2: e10, 1-8.
- <sup>10</sup> Gibson S & Ruxton CHS (2016) Fruit juice consumption is associated with intakes of whole fruit and vegetables, as well as non-milk extrinsic sugars: a secondary analysis of the National Diet and Nutrition Survey. *Proc Nutr Soc* 75 (OCE3): E259.
- <sup>11</sup> Gibson S et al. (2015) *Ann Nutr Metab* 67 (suppl1): abstract 149/1262.
- <sup>12</sup> Azaïs-Braesco V et al. (2017) A review of total & added sugar intakes and dietary sources in Europe. *Nutrition Journal* 16: 6.