

Fruit juice and blood glucose levels

Key points

- GI or Glycaemic Index is a measure of how quickly a food or drink increases blood glucose levels compared with a reference food, like white bread or a glucose drink.
- 100% fruit juice (FJ) is a low glycaemic index food, with an average score only slightly above whole fruit. This suggests that FJ and fruit have similar effects on blood glucose levels.
- The low glycaemic index of FJ, despite the natural sugar content, is thought to be due to the types of sugars (fructose) and the high polyphenol content.
- There is significant evidence demonstrating no plausible link between moderate FJ consumption and risk of developing type 2 diabetes. Indeed, studies confirm that FJ has a neutral effect on blood glucose control.

Glycaemic index

Glycaemic index (GI) is a measure of post-meal blood glucose concentration in relation to a reference, normally a glucose drink or white bread. It is well accepted that low GI foods are digested and absorbed slowly while high GI foods are rapidly digested and absorbed¹. The glycaemic response to a food depends on its macronutrient content, as well as levels of plant bioactives and fibre. Foods/drinks are categorised on the basis of their GI values as:

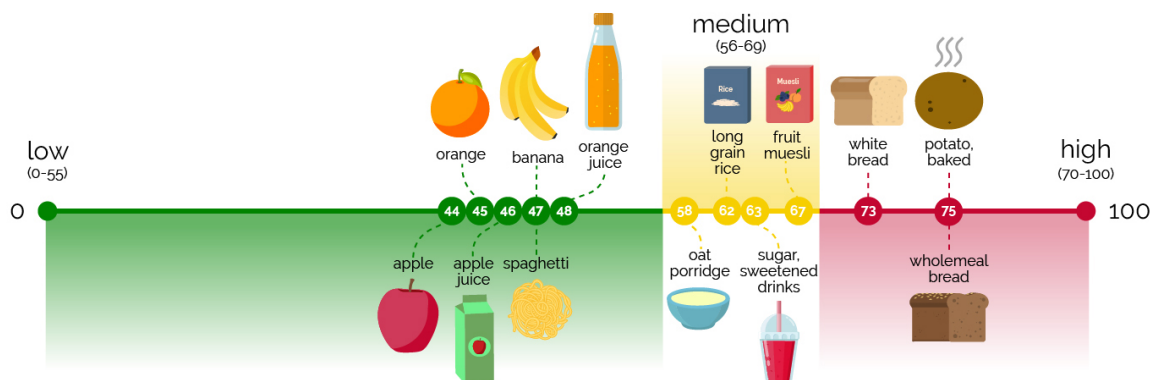
- high GI foods (≥ 70)
- intermediate GI foods (56–69)
- low GI foods (≤ 55).

Fruits and FJs have a low GI, whereas bread and baked potatoes are classified as high GI foods (see Figure 1). Sugar-sweetened beverages have a similar sugar content to FJ yet score as intermediate or high on the GI scale. High GI diets have been linked to an increased risk of chronic diseases, such as cardiovascular disease, whereas diets rich in low GI foods have been shown to reduce fasting blood glucose and HbA1c, a long-term marker of blood glucose control^{2,3}.

FIGURE 1

GLYCAEMIC INDEX (GI) OF FRUIT VERSUS JUICES

Fruits and juices are both low GI options

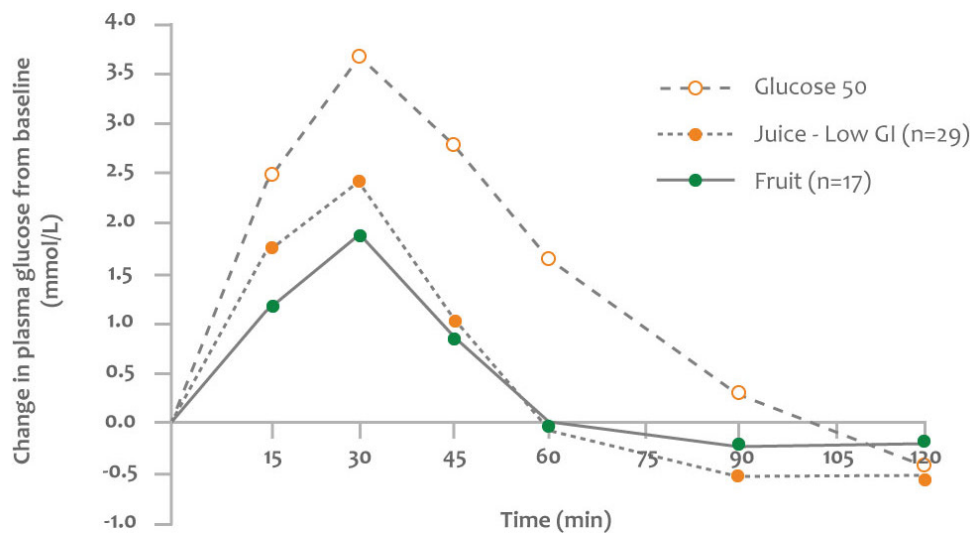


Glycaemic control

Fructose-containing foods, such as fruits, FJ and honey, tend to have a relatively low glycaemic response as they minimally increase blood glucose. Figure 2 shows the glycaemic response in healthy individuals to fruit and FJ, demonstrating their similar effects on blood glucose.

FIGURE 2

GLYCAEMIC RESPONSE IN HEALTHY INDIVIDUALS TO FRUIT VERSUS FRUIT JUICE



Brand-Miller JC et al. (2009) Glycemic index, postprandial glycemia, and the shape of the curve in healthy subjects: analysis of a database of more than 1000 foods. *American Journal of Clinical Nutrition* 89: 97–105.

This is backed by clinical trials. One small study in 12 healthy adults gave each participant a high fat and high carbohydrate meal with either 500mL water, 100% orange juice or an isocaloric glucose drink⁴. Following the meal with orange juice (or with water), researchers found better glycaemic control, when compared with the glucose drink. Systematic reviews of randomised controlled trials also report no significant adverse impact of FJ on fasting blood glucose or insulin^{5,6}. A further meta-analysis found that when FJ was substituted for other energy-matched macronutrients in the diet, beneficial effects were seen for blood glucose and insulin levels⁷.

Type 2 diabetes

There is some concern that the natural sugar content of FJ can increase the risk of type 2 diabetes; as other sugary drinks have been shown to do⁸. One study tracked the diets and health of nearly 10,000 healthy Americans⁹. Compared with individuals who consumed less than one serving per day of sugar-sweetened beverages, those who consumed more than two servings per day had 30% greater odds of prediabetes and higher glucose metabolism markers. However, detrimental effects were not seen for FJ.

Additionally, a meta-analysis looking at the dose–response relationship between FJ and metabolic syndrome - which is associated with increased risk of type 2 diabetes - found protection at moderate intakes of FJ¹⁰. In contrast, linear associations were reported for sugar-sweetened beverages, suggesting increased negative effects with increasing intakes. The seemingly protective effect of FJ at moderate intakes could be explained by its low GI and high polyphenol content.

Conclusion

Overall, the available evidence shows clearly that FJ has no negative effects on glycaemic control and is not a causal factor in the development of type 2 diabetes. This probably reflects the fact that FJ has a low GI and contains significant amounts of bioactive components, such as flavanones, that have been shown in studies to have favourable effects on metabolic markers including blood glucose and lipids, inflammation and blood pressure¹¹.

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References

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