

*Sugar, total phenolic content and antioxidant activity of integral carob (*Ceratonia siliqua* L.) powder during the simulated gastrointestinal tract digestion as related to the particle-size effect*



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Abstract

Carob (*Ceratonia siliqua* L.) fruit is obtained from the evergreen carob tree, native to the Mediterranean region ^{1,2} and produced mainly in Portugal, Italy, Morocco and Turkey ³⁻⁵. Portugal has a high-cultivated extent with relevant carob fruit production at low prices. Carob products containing phenolic substances exhibit antioxidant capacity and can promote human health, and aid in preventing chronic diseases ^{6,7}. Currently, carob powder (CP) production is mainly achieved after the pulp separation despite having been demonstrated that seeds improve the extraction efficiency of bioactive compounds like polyphenols ⁴. This study aimed to produce an integral CP through an innovative process and assess its physicochemical and bioactive properties in different particle sizes throughout a simulated gastrointestinal tract (GIT) digestion.

The sugar content profile obtained throughout GIT digestion indicates that the highest present sugar in undigested carob powders is digested and broken into simple sugars like glucose and fructose, potentiating CPs as a functional and within healthy food intake recommendations ingredient to use.

The total phenolic content and antioxidant activity obtained for the $\leq 100 \mu\text{m}$ fraction are correlated and gastric digestion promotes the increase in TPC value compared to

chemically extracted samples (undigested). The >100 µm fractions display a distinct profile from ≤100 µm, possibly due to higher content in insoluble fibers, which hinders the release of these bioactive compounds from the carob matrix.

This study showed that the particle-size affects the sugar, antioxidant and total phenol content under gastrointestinal tract digestion. The ≤100 µm fraction obtained the best suitable profile as a functional food ingredient.

Keywords: carob powder, GIT digestion, total phenolic content, antioxidant activity.

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