Exploring the effect of gastrointestinal digestion on bioactivities of phlorotannins and the feasibility of enhancing their intestinal absorption

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Outline

1. Introduction
2. Impact of gastrointestinal digestion on the anti-inflammatory properties of phlorotannins from *Himanthalia elongata*
3. Encapsulation of phlorotannins from edible brown seaweed in chitosan: Effect of fortification on bioactivity and stability in functional foods
4. Conclusions

Abstract

A phlorotannin extract was obtained from brown algae, is a family of proven therapeutic agents. This study aims to investigate the anti-inflammatory effects of phlorotannins in the gastrointestinal tract and assessing strategies to improve their absorption. According to the results of these reports, when subjected to simulated gastrointestinal digestion, its levels of total phlorotannins and antioxidant activity, measured *in vitro* via $NO^{\bullet}$ and $O_2^{\bullet-}$ scavenging assays, were reduced, thus suggesting that these compounds' integrity and bioactivity are negatively affected by the digestive process. Nevertheless, when undigested vs. digested extracts were used on lipopolysaccharide-stimulated RAW 264.7 macrophages, both showed a strong inhibitory effect on the cellular $NO^{\bullet}$ production. Suggesting that even though there is a decrease in the phlorotannins' concentration after digestion, with a consequent loss of their scavenging properties, the possible degradation products being formed may exert their effects through the modulation of the intracellular signaling mechanisms. On the other hand, low stability disturbs their full bioactivity expression in the human body. Hence, this study focused on preserving their vitality through encapsulation. Their storage stability, processing stability, and bioactivity retention upon *in vitro* digestion were determined. Storage at –18℃ and 4℃ temperatures preserved thrice both the encapsulated and non-encapsulated phlorotannins than room temperature conditions. Fermented fraction of encapsulated form showed significantly higher antioxidant activities and total phlorotannins content (0.23 ± 0.03 mg/mL), suggesting the potential for targeted delivery of phlorotannins to their absorption sites through encapsulation. In summary, it is possible to infer that, although the digestive process may contribute to the breakdown of phlorotannins, the resultant degradation products may be relevant players in the health benefits attributed to the consumption of these compounds. Furthermore, there exists the scope for making use of the maximum possible bioactivity of phlorotannins through encapsulating in chitosan carrier in functional food and nutraceutical formulations.