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Crude protein hydrolysates for the enhancement of cocoa-like flavour attributes of carob-based dark chocolate substitutes

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Abstract

In recent years, high cocoa prices have fuelled significant commercial and research interest in developing cocoa alternatives that still retain sensory quality. Amongst which, carob (*Ceratonia siliqua*) pulp stands out due to its unique cocoa-like flavour upon roasting. The species is widely cultivated for its seeds which are used in the extraction of locust bean gum (E410). However, the use of carob pulp in cocoa-based product applications is limited by differences in flavour. Specifically, its cocoa-like aroma and bitter taste is weaker compared to conventional cocoa. As such, the enzymatically-derived protein hydrolysates. These hydrolysates function as reservoirs of cocoa-aroma precursors (branched-chain amino acids; BCAA) and bitter-tasting peptides. In this study, intrinsic (carob pulp protein) and exogeneous protein isolates were investigated. Upon direct protease treatment of carob pulp proteins, there was a marginal increase in alpha-nitrogen content. This resistance to proteolysis was hypothesized to be due to substrate complexation with the endogenous carob tannins present. In contrast, amongst exogeneous protein isolates, soy protein hydrolysate contained high BCAA (68.82 mg/g) and short-chain peptide (< 1.7 kDa, 3.04 x 10^7 peak area) content. The addition of this hydrolysate yielded a distinct increase in 2-methylbutanal (38.3 %) and 3-methylbutanal (69.8 %). Descriptive sensory analysis revealed a small increase in cocoa-like aroma and distinct increase in bitterness. In conclusion, these findings are envisioned to encourage and empower confectioners to adopt carob applications in cocoa-based products.

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