Stability and degradation mechanism of (-)-epicatechin in thermal processing

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The processing method is an important factor to greatly affect the stability and profile of dietary flavonols, which are highly dependent on their chemical structures [1]. Thermal processing (e.g. baking, roasting, pasteurization, steaming) are common cooking methods for dietary sources of (-)-epicatechin (EC), in addition to heat exploited during extraction. In the meantime, chemical reactions such as oxidation can place leading to EC degradation [2,3]. Nevertheless, the exact reaction mechanisms of EC degradation during thermal processing have yet to be revealed. In this study, bathing in boiling aqueous solution (100 ℃) was used for simulating high temperature of boiling EC-rich food in water followed by profiling degradation products using UPLC-ESI-TSQ-MS/MS analysis. UPLC-MS is the optimum analytical tool for monitoring biotransformation or chemical reaction products in dietary sources considering its high separation potential, sensitivity, in addition to the strong structural elucidation power of the TSQ mass spectrometer [4,5]. The results revealed for ca. 65.2% loss of EC was detected in the first 10 min, and over 99.5% of EC was degraded within 30 min. A total of 22 degradation products were identified based on retention time, full and tandem MS data are first time to be comprehensively reported. Isomerization, oxidation, hydroxylation, dimerization, and ring cleavage were the main chemical reactions that occurred for EC in boiling aqueous solution.

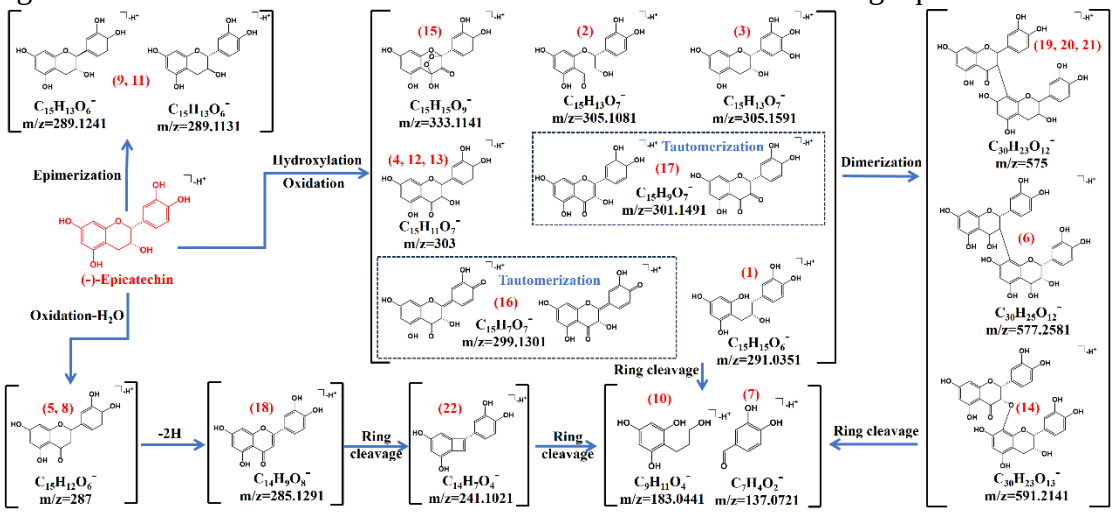

Figure 1: Proposed degradation pathways of EC in boiling aqueous solution.

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