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Nano encapsulation of catechin in starch nanoparticles: Characterization, release behavior and bioactivity retention during in-vitro digestion

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The novel starch-based nanoparticles from three different sources viz: horse chestnut (HSC), water chestnut (WSC) and lotus stem (LSC) were prepared for nano-encapsulation of bioactive catechin molecules. Average particle size of nano-particles produced from HSC, WSC and LSC were found to be 322, 559 and 615 nm with encapsulation efficiency of 59.09, 48.30, and 55.00% and negative zeta potential of -18.05, -21.5 and -18.05mv were observed, respectively. The structural, physical and thermal properties were characterized by fourier transform infrared spectroscopy (FTIR), scanning electron microscopy (SEM), X-ray diffraction (XRD) and differential scanning calorimetry (DSC). The SEM analysis revealed capsule formation with entrapped catechin, while the broad characteristic peaks at 3479, 1683, 1283, 1144, 1070 and 860 cm -1 depicts the encapsulation of catechin in starch nanoparticles without any evident interaction. DSC thermogram reveals the thermal protection of catechin while XRD showed loss of crystallinity after encapsulation. The higher content of catechin in intestinal juice ensured controlled release in the intestine. Bioactivities like lipase, cholesteryl esterase and DPP-IV inhibition were higher in encapsulated catechin than free catechin upon simulated gastric and intestinal digestion.

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