Lipophilic Phytosterol Derivatives: Synthesis, Thermal Property and Nanoemulsion Behavior

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Phytosterols and their esters have been reported as a cholesterol lowering agent in human. However, natural phytosterols have a low solubility in both water and fat resulting in a poor absorption in intestine. To improve the intestinal absorption and bioavailability of phytosterols, conversion of phytosterols into enzymeliable lipophilic derivatives, such as fatty acid esters was one of the possible strategies. Differences in molecular structures of modified phytosterols may result in the differences in their thermal and micelling behaviors. Therefore, the objectives of this study were to improve the productive yield of a series of βsitosteryl fatty acid esters (C2C18) and to investigate the thermal property and nanoemulsion behaviors of those compounds. This work reported a novel approach to synthesize phytosterol (β-sitosterol as a model) fatty acid ester by employing Candida antarctica lipase A (CAL A) which showed a superior catalytic activity towards secondary alcohol to another lipases. Series of βsitosteryl fatty acid esters (C2C18) were successfully prepared and their molecular structures were identified by ^{1}HNMR and Fourier transforminfrared spectroscopy (FTIR). The thermal property of βsitosterol fatty acid esters was governed by the carbon chain length of fatty acid incorporated. The nanoemulsions of a series of βsitosteryl fatty acid esters were prepared by probesonication method. The particle size distributions, zeta potentials and TEM images of those emulsions were different depending upon their structures.

Keywords: Phytosterol; βsitosterol; fatty acids; esterification; Candida antarctica lipase A, thermal property, Nanoemulsion