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PHYSICOCHEMICAL AND RHEOLOGICAL PROPERTIES OF WHEY PROTEIN MICROENCAPSULATED 3, 3'-DIINDOLYLMETHANE

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Diindolylmethane (DIM) is a bioactive metabolite of indole-3-carbinol found in cruciferous vegetables and has anticancer potential. Stability and sensitivity to the environment are the major challenges for the application of this compound. The objective of this study was to develop whey protein microencapsulated DIM using the combined heating-ultrasound method. Solutions with different ratios of DIM to whey protein (1:12, 1:6, 1:4, 1:3, w/w) with constant whey protein (12%, w/v) were heated at 85˚C for 30 min and then treated with ultrasound for 5, 15, and 30 min, respectively. Zeta potential, particle size, and rheological property of the samples were studied. Samples after ultrasound treatment showed significantly the reduced particle size of 280-450 nm and narrowed size distribution (polydispersity index of ~0.47) compared with heated samples ($P<0.05$). A significant decrease in zeta potential ($P<0.05$) was seen when the heated samples (-28.54±54 mV for 1:4 samples) were ultrasound treated for 5 minutes (-37.667±0.77 mV), 15 min (-33.36±0.85 mV) and 30 min (-31.13±1.02 mV). The viscosity of the ultrasound treated samples was significantly ($P<0.05$) decreased as compared to untreated samples. All samples exhibited shear thinning behavior (pseudoplastic, $n<1$) and fitted with Sisko model ($R^2>0.997$). Consistency index (K_s) of the samples was increased by ultrasound treatment. Results indicated that whey protein-based nanoparticles can be used to protect 3, 3'-diindolylmethane for food and pharmaceutical applications.

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