National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Development and Characterization of Phytosterol Infused Microcapsules via Complex Coacervation for Extrusion Applications
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Venue	: CH-Old Seminar Room
Date and Time	: 28 Feb 2024 (11:15 AM)
Abstract	: Phytosterols, bearing a structural resemblance to cholesterol, are recognized for their ability to lower cholesterol levels in blood serum. Studies have shown that consuming 1.5 to 2 g of phytosterols daily can significantly decrease low-density cholesterol in the serum. However, the intake from natural plant sources falls short, providing only 160 to 430 mg daily, necessitating supplementation to reap health benefits. Nonetheless, incorporating phytosterols into food products is challenging due to their poor water solubility, lipophilic nature, high melting point, waxy texture, and limited bioavailability. Encapsulating phytosterols via complex coacervation aids in shielding them from adverse conditions. This research focuses on establishing a method for producing phytosterol-enriched microcapsules using the complex coacervation technique, which are then added to pea protein-enriched corn extrudates. Initially, phytosterols (1.5%, w/v) were mixed with various edible oils, such as sunflower, soybean, rice bran, canola, and coconut oil, selecting the best based on physicochemical properties, low crystallinity, and thermal stability. Subsequently, coacervates of pea protein isolate (PPI) and locust bean gum (LBG) were formulated at different ratios and pH levels. The ideal conditions for encapsulation were identified at a PPI/LBG ratio of 5:1 and pH 4.5, based on phase behavior, viscoelastic properties, zeta potential, and yield, attributed to strong electrostatic and hydrogen bond interactions. Under these optimal conditions, phytosterol microcapsules were developed, and their encapsulation efficiency, moisture content, water activity, particle size, and dispersity were examined across different core-to-wall ratios and pH levels. The microcapsules produced at a 1:1 ratio and pH 5.5 demonstrated superior encapsulation efficiency, moisture content, water activity, and particle size. XRD and FTIR analyses confirmed successful encapsulation, while SEM and CLSM imaging revealed spherical microcapsules with a protective structure, indicating effective encapsulation using PPI/LBG coacervates. These findings suggest that PPI/LBG coacervates are an efficient carrier for encapsulating heat-sensitive bioactive compounds, especially phytosterols.