

Sustainable extraction of biocompounds from okara using biphasic NADES systems guided by COSMO-RS

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Soybean seeds (*Glycine max* L.) are highly valued in food production for their rich protein content and beneficial bioactive compounds. Okara, the by-product of soymilk production, is typically discarded despite its nutritional value. This study explores the use of Natural Deep Eutectic Solvents (NADES), a class of green solvents known for their low toxicity, biodegradability, and recyclability, to extract hydrophilic biocompounds from okara using a biphasic system.

The research involved predicting isoflavone solubility using the COSMO-RS model, focusing on six isoflavones: daidzein, genistein, glycitein, daidzin, genistin, and glycitin. Three hydrophobic NADES (Camphor:Thymol, Caprylic acid:Lauric acid, and Caprylic acid:L-Proline) and three hydrophilic NADES (Citric acid:Glucose, Choline Chloride:Citric acid, and Choline Chloride:Glucose) were tested. Extractions were performed at 45 °C for 45 minutes using a heating orbital shaker.

The hydrophilic extracts were analysed for Total Phenolic Content (TPC) and Total Antioxidant Capacity (TAC). COSMO-RS effectively optimized solvent selection, minimizing extensive experimental trials. The most efficient system combined Camphor:Thymol (3:2) and Citric Acid:Glucose (1:1), yielding the highest levels of hydrophilic compounds and strong antioxidant activity from okara (TPC=24,8139 mg GAE/g; DPPH=0,039726 mg TE/g; TEAC= 47,80434 µmol TE/g). Their biological activity is currently being evaluated through cytotoxicity (MTT) and anti-inflammatory assays using Caco-2 cells.

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