

# PREPARATION AND INVESTIGATION OF STABILITY OF EMULSIONS COMPOSED OF BLACKCURRANT EXTRACTS AND MODIFIED STARCH

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Blackcurrant berries are widely recognized as a superfood, largely due to their high content of bioactive compounds. However, their short shelf life means that most berries are processed into derived products, generating substantial amounts of by-products. The valorization of blackcurrant pomace (skins and seeds) offers an opportunity to produce higher-value ingredients. In particular, extracts from blackcurrant skins are rich in anthocyanins, whereas seed extracts are a valuable source of polyunsaturated fatty acids. Anthocyanins are valuable natural pigments with strong antioxidant activity and growing application as natural colorants and functional ingredients for food industry and nutraceuticals. However, their application is constrained due to poor stability, as anthocyanin molecules readily degrade under adverse environmental conditions such as elevated temperature, light exposure, pH fluctuations, and oxygen, leading to loss of color and bioactivity during processing and storage [1].

To overcome these limitations, various encapsulation techniques have been widely explored. Among these, encapsulation of anthocyanins in emulsions with polysaccharide-derived wall materials has shown promise [2]. In addition, blackcurrant seed extracts could serve as an oil phase in emulsions. Starch sodium octenyl succinate, is known for emulsifying capability and ability to form protective matrices, also known as a safe food-grade additive and can be used to entrap anthocyanins within emulsion droplets, thus improving the stability and potential bioavailability of anthocyanins.

In this study, emulsions containing lipophilic (LE), water (WE) and ethanolic (EE) extracts of blackcurrant seeds and skins were prepared with sodium octenyl succinate starch (OSA-S) and their physical stability at different temperatures during a 28- day storage period was investigated.

Various emulsions, using rotor-stator homogenizer at 12,000 rpm for 10 min, were prepared with the following composition (w/w): 20% OSA-S, 2.5% or 5% LE, without or with 0.1% of emulsifier Tween 80 (tw) or lecithin (lec), and without and with 1% of EE or WE. Physical stability of prepared emulsions was investigated at temperatures of 4 °C and 20 °C over a 28-day period. Parameters such as particle size, polydispersity index, zeta potential, creaming index (CI) and clarification index (CLI) of the emulsion were determined after 1, 3, 8, 14, 21 and 28 days. Results showed that physical stability was highly depended on the composition of emulsion and the storage temperature. The most stable emulsion was composed of 20% OSA-S, 2.5% LE, 0.1% tw and 1% of WE and kept at 4 °C.

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[1] D. Cai, X. Li, J. Chen, et al., "A comprehensive review on innovative and advanced stabilization approaches of anthocyanin by modifying structure and controlling environmental factors," *Food Chemistry*, vol. 366, 130611, 2022.

[2] Y. Pan, X. Ma, J. Sun, and W. Bai, "Fabrication and characterization of anthocyanin-loaded double Pickering emulsions stabilized by  $\beta$ -cyclodextrin," *International Journal of Pharmaceutics*, vol. 655, 124003, 2024.