

COMPARATIVE IMPACT OF β -CYCLODEXTRIN AND MUSTARD EXTRACT ON STABILITY IN RED CLOVER EXTRACT-LOADED MICROCAPSULES

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Emulsion stability is crucial for microcapsule preparation, ensuring consistent encapsulation and release, so selecting appropriate emulsifiers is essential [1]. Mustard extract (ME) is a natural preservative and antiseptic agent, making it a promising option for improving emulsion stability [2]. β -cyclodextrin (CD), commonly used as a tablet excipient in the pharmaceutical industry, can also be an effective emulsifier due to its characteristics [3].

This study evaluated the emulsifying properties of CD and ME in O/W emulsions containing red clover extract and their impact on microcapsule parameters.

The emulsion formulations utilised a combination of 2% sodium alginate solution, sweet almond oil, CD or ME at varying concentrations as emulsifiers (2.5% to 10%), and xanthan. Emulsion stability was assessed through centrifugation, and particle size and distribution were analysed using Mastersizer. Microcapsules were formed using a 2% calcium chloride crosslinking agent, and their parameters were examined using a texture analyser and micrometre. Stability assessment showed that formulations reached maximum stability (100%) with the highest emulsifier percentages. At 7.5% ME, stability at 7000 rpm was 20%, while CD exhibited stability at 25%. Lower concentrations didn't form emulsions.

Particle size analysis of the most stable emulsions (10% ME/CD) revealed that 90% of ME particles were less than 0.744 μm ; CD particles were 0.981 μm . Microcapsules formed with 10% ME and CD had average sizes of 2.42 ± 0.02 and 2.56 ± 0.04 μm , respectively. Post-crushing, CD microcapsules exhibited superior strength at 858.40 ± 58.64 g compared to ME microcapsules at 803.60 ± 39.43 g. CD capsules also demonstrated higher swelling power at $287.01\pm 14.24\%$ than ME capsules at $209.12\pm 22.81\%$.

In conclusion, 10% concentrations of both emulsifiers provided optimal stability and particle size. Emulsions with CD had better parameters; however, ME also demonstrated effectiveness as a natural emulsifier.

[1] da Silva, L.C. et al., Methods of Microencapsulation of Vegetable Oil Principles Stability and Applications - A Minireview. Food Technol Biotechnol 60, 308-320, 2022.

[2] Wu., Y. et. al., Emulsifying Properties of Water Soluble Yellow Mustard Mucilage A Comparative Study with Gum Arabic and Citrus Pectin Food Hydrocoll. 47, 191-196, 2015.

[3] Matencio, A., et al., Applications of Cyclodextrins in Food Science: A Review. Trends Food Sci Technol. 104, 132-143, 2022.