

APPLICATION OF SPRAY DRYING FOR THE STABILIZATION OF NATURAL COLORANTS

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Bio-colorants are natural pigments and dyes derived from renewable biological sources, such as plants, microorganisms and insects. They offer a sustainable, eco-friendly alternative to synthetic, petroleum-based colourants. Pigments such as chlorophylls, carotenoids and anthocyanins are used increasingly in the food, pharmaceutical and cosmetic industries [1]. Recently, vegetable residual materials have gained significant attention as a promising source of bio-colorants. Beetroot (*Beta vulgaris* L.) is a highly important source of natural red and purple colourants. Its characteristic colour is attributed to a group of water-soluble pigments known as betalains, which are considered to be safe, biodegradable and non-toxic alternatives to synthetic dyes. However, betalains are chemically unstable and sensitive to environmental factors such as light, oxygen, heat, pH and moisture [2]. These limitations reduce their shelf life and restrict their industrial application. One way to overcome these challenges is to encapsulate natural photochromic dyes to enhance pigment stability and protect them from degradation. Spray drying is the most commonly used encapsulation technique. It produces a stable powdered product and is already widely used in the food and pharmaceutical industries. Spray drying is considered an appropriate technique for thermosensitive compounds due to its short processing time and relatively mild thermal exposure [3]. The aim of this work was to obtain more stable betalain systems using κ-carrageenan as an encapsulating matrix and applying the spray drying method. To achieve this goal, more favorable spraying conditions were sought, such as sample composition, feed concentration and feed flow rate, inlet temperature, and spray gas flow. The most suitable spray drying conditions were selected based on the stability, antioxidant capacity and colour properties of the encapsulated dyes produced. A more detailed discussion of the results will take place during the poster session.

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- [2] R. M. Martinez et al., "Betalains: A narrative review on pharmacological mechanisms supporting the nutraceutical potential towards health benefits," *Foods*, vol. 13, no. 23, p. 3909, Dec. 2024, doi: 10.3390/foods13233909.
- [3] N. F. N. A. Rahman, S. I. Zubairi, H. Hashim, and H. Yaakob, "Revolutionizing Spray Drying: An In-Depth analysis of surface stickiness trends and the role of physicochemical innovations in boosting productivity," *Journal of Food Quality*, vol. 2024, no. 1, Jan. 2024, doi: 10.1155/2024/8929464.