

## **Effect of Co-Pigmentation on Anthocyanin Stability in Roselle Petal Extract Under Heat Treatment**

Nur Iffa Hanna Binti Izham<sup>a</sup>, Azizah Othman<sup>a\*</sup>

### **Structured Abstract**

**Background:** *Hibiscus sabdariffa* L., also known as roselle, is a plant that contains anthocyanins used in the culinary and pharmaceutical sectors as both natural colourants and pharmacologically active substances. Consumer demand for natural food colourants is rising due to a preference for healthier and cleaner label ingredients. However, their sensitivity to heat, light, and pH limits their application in food products. Co-pigmentation, a natural phenomenon where anthocyanins interact with other molecules, is a promising strategy to enhance anthocyanin stability through interactions with other molecules, thus preventing colour fading.

**Methods:** This study investigated the effect of co-pigmentation with oxalic acid, maleic, and malic acid on the thermal stability of roselle anthocyanin extracts. Roselle petals were extracted with distilled water to obtain the Roselle Anthocyanin Extraction (RAE). Screening of ideal co-pigments involved comparing the colour analysis and absorbance change after and before heating. Then, the thermal stability of the co-pigmented RAE complexes was assessed by monitoring the retention rate of total anthocyanin content using spectrophotometry. Additionally, thermal degradation kinetics were analyzed to understand the degradation rate of anthocyanins.

**Results:** This study shows that oxalic acid (OA) with a ratio of 1:2 is the most effective co-pigment for enhancing anthocyanin stability based on the lowest colour fading rate (%) and the highest  $a^*$  value after heating treatment. Thermal stability studies revealed that co-pigmentation with oxalic acid significantly enhanced the thermal stability of roselle anthocyanins. This was evident from the higher RAE content, higher retention rate, and slower degradation rate constant ( $k$ ).

**Conclusion:** In conclusion, the findings of this study evaluated the effectiveness of different co-pigmentation, which are the organic used, oxalic acid, maleic acid, and malic acid, in enhancing the stability of roselle anthocyanins. Overall, the co-pigmentation of RAE by OA could be considered a promising strategy to improve the stability of natural anthocyanin, which provided basic references for developing natural colourants in the food industry.

**Keywords:** Anthocyanin, Co-pigmentation, *Hibiscus sabdariffa*, Organic acid, Stability.

\*Correspondence: azizah973@uitm.edu.my

<sup>a</sup> School of Industrial Technology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia