OPTIMIZATION OF PROCESS VARIABLES FOR THE ENCAPSULATION OF ANTHOCYANIN-RICH EXTRACT FROM BLACK RICE BRAN VIA RESPONSE SURFACE METHODOLOGY

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An Undergraduate Thesis Submitted to the Faculty of the Department of Chemistry,
College of Arts and Sciences, Central Luzon State University,
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in Partial Fulfillment of the requirements
for the degree of

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APPROVAL AND ACCEPTANCE

The undergraduate thesis entitled **OPTIMIZATION OF PROCESS VARIABLES FOR THE ENCAPSULATION OF ANTHOCYANIN-RICH EXTRACT FROM BLACK RICE BRAN VIA RESPONSE SURFACE METHODOLOGY** prepared and submitted by **PAUL JHON G. EUGENIO** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN CHEMISTRY** is hereby

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"The complexity of life depends upon the perception of mankind."

PAUL JHON G. EUGENIO

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OPTIMIZATION OF PROCESS VARIABLES FOR THE ENCAPSULATION OF ANTHOCYANIN-RICH EXTRACT FROM BLACK RICE BRAN VIA RESPONSE SURFACE METHODOLOGY[1]

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ABSTRACT

Background: Diverse functionality of anthocyanin in food and pharmaceutical applications are held limited due to the loss of its biological activity when exposed to external factors i.e., light, heat, pH change. Encapsulation technology can improve the bioavailability of this bioactive compound. However, further optimization is needed to formulate a cost-effective process for the encapsulation. In this study, encapsulation of anthocyanin-rich extract from black rice bran was optimized via response surface methodology employing two-level full factorial and Box-Behnken designs. **Methods:** The anthocyanin-rich extract was encapsulated through pre-gelation and polyelectrolyte complex formation processes. Screening of factors (chitosan concentration, pH, stirring speed) was held using two-level full factorial design. Box-Behnken design was employed to determine the optimum conditions for the encapsulation process with the following process variables: chitosan concentration, pH, and $CaCl_2$ concentration. The resulting capsules were subjected to phytochemical analyses and characterized in terms of the chemical properties, surface morphology, and particle size. **Results:** The optimum conditions for the encapsulation of anthocyanin were 6.30 mg/mL chitosan, pH 5.5, and 36 mM $CaCl_2$ with an encapsulation efficiency of 51.40%. The developed anthocyanin-loaded nanocapsule had high TPC (3.87±0.33 mg GAE/g) and strong antioxidant activity (5.69±0.06 mg TE/g). It had smooth surface area, round particles clumping together with average particle size diameter of 118.83 nm. FTIR analysis confirmed the incorporation of anthocyanin in the nanocapsules. **Conclusion:** The encapsulation of anthocyanin-rich extract from black rice bran was optimized via RSM.

Keywords: anthocyanin, encapsulation, Response Surface Methodology, chitosan-alginate nanoparticles, Box-Behnken design, two-level full factorial design

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