

HARMONY IN PROGRESS:

**INTEGRATING SCIENCE, TECHNOLOGY,
AND
SOCIAL INNOVATION
FOR SUSTAINABLE DEVELOPMENT GOALS**



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YST031 - BLOOMYBURST

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ABSTRACT

Most commercialized popping boba incorporates synthetic colorants to influence consumer purchasing decisions and elevate brand positioning. However, this usage of synthetic dye can lead to many global health risks such as allergies, cancer, and Attention-deficit/hyperactivity disorder (ADHD). BloomyBurst contains 26.95 mg GAE/g of Total Phenolic, 0.89 mg QE/g of Total Flavonoid Compound (TFC), and 0.59 mg/kg of Total Monomeric Anthocyanin (TMAC). This product also exhibited strong antioxidant activities based on DPPH and ABTS radical scavenging activities, which are 81.34% and 31.52%, respectively. BloomyBurst displayed as a vibrant pearl with L* (10.33±0.26) C* (9.46±0.06) and h° (338.19±1.13) values, making it more appealing for the targeted customers, who are kids and the beverage industry. Offered at a reasonable and affordable price (RM 8.20 for 500g), BloomyBurst can penetrate the market and gain a strategic advantage over its competitors based on the benefits offered.

Keywords – Popping Boba, natural colorant, natural antioxidant, calamansi lime and butterfly pea flower

INTRODUCTION

The increasing popularity of popping boba as a flavorful and sensory-enhancing ingredient in drinks and desserts has coincided with rising concerns about the heavy reliance on synthetic colors, flavors, and stabilizers in commercially available bead products. Conventional popping boba formulations often depend on artificial colorants such as Tartrazine, Brilliant Blue and Erythrosine to create visual appeal (Amchova et al., 2024). However, extended consumption of synthetic dyes has been associated with negative health impacts, including attention deficit hyperactivity disorder (ADHD), allergic reactions, and potential cancer risks (de Oliveira et al., 2024). Approximately 8% of children diagnosed with ADHD demonstrate notable increases in behavioral symptoms when they are exposed to synthetic food colorants. Furthermore, about 33% of these children experience an improvement in their ADHD symptoms when these dyes are eliminated from their diet (Rambler et al., 2022).

Butterfly pea flower (*Clitoria ternatea*), provides a vibrant blue pigment that is abundant in anthocyanins with impressive antioxidant properties (Thuy et al., 2021). Meanwhile, calamansi lime (*Citrus × microcarpa*) is rich in vitamin C and offers additional antioxidant benefits (Husni et al., 2020). This innovation not only enhances the visual appeal of

products but also supports the larger goal of encouraging healthier and cleaner eating choices, aligns with Sustainable Development Goals (SDG) by promoting element number 3 (Good Health and Well-being) and number 12 (Responsible Consumption and Production). The development of these natural, antioxidant-rich popping boba beads centers around an encapsulation process that utilizes sodium alginate through ionic gelation. This method enhances the stability of natural colorants and antioxidants by leveraging synergistic effects. BloomyBurst specifically targets health-conscious consumers and is designed for kids, offering a safer, clean-label treat alternative, thereby addressing rising concerns about the effects of synthetic additives on children's health.

OBJECTIVE

Our primary objective is to create popping boba that offers both enhanced health benefits and striking aesthetic appeal. This project directly contributes to two critical Sustainable Development Goals (SDGs), which are SDG 3, 'Good Health and Well-being,' by promoting health across all ages, and SDG 12, fostering sustainable production and consumption for future generations.

DESCRIPTION OF THE PROJECT

BloomyBurst is our innovative new product consisting of translucent, captivating blue beads, created by encapsulating butterfly pea flower with calamansi lime using sodium alginate. These popping bobas boast vibrant coloration from anthocyanins, offer notable antioxidant capacities, and contain beneficial phenolic acids, flavonoids, and vitamin C. Packaged in a 500 mL amber PET plastic bottle with inert and light-protective materials to prevent light degradation, BloomyBurst ensures a remarkable shelf life of two years, bringing you natural goodness that lasts. BloomyBurst provides a sustainable business proposition with the commercial price of RM 8.20 for 500g and projected return on investment (ROI) of 150%.

BloomyBurst serves as a healthier alternative to conventional boba in the current beverage industry offering naturally derived vitamins, antioxidants, and natural colourants. BloomyBurst has a strong market potential to be marketed with its ability to reduce health risks associated with artificial additives such as allergies, cancer, and Attention-deficit/hyperactivity disorder (ADHD). The target market includes health-conscious consumers and the penetration to premium beverage sector with established industry brands such as Tealive and Mixue. BloomyBurst is not only nutritious product, but it also offers as a natural functional and visually appealing product for beverage manufacturers seeking to enhance their product portfolio and sales.

NOVELTY

Our core novelty lies in the innovative encapsulation of butterfly pea flower (*Clitoria ternatea*) using calamansi lime (*Citrus x microcarpa*) via sodium alginate spherification. This pioneering method specifically enables the production of stable sodium alginate beads of *C. ternatea*, presenting a crucial, natural, and sustainable alternative to current synthetic food colorants. This unique combination and product stability define our significant contribution.

CONCLUSION

BloomyBurst represents a significant advancement in the development of natural, health-promoting popping boba by utilizing the synergistic benefits of butterfly pea flower (*Clitoria ternatea*) and calamansi lime (*Citrus x microcarpa*), encapsulated through sodium alginate ionic gelation. By replacing synthetic colorants with vibrant, antioxidant-rich plant extracts, this innovation addresses consumer and parental concerns about the harmful effects of artificial additives. The product's visually appealing characteristics, enhanced antioxidant properties, and prolonged shelf life offer a practical and scalable solution that aligns with Sustainable Development Goals related to health and responsible consumption. BloomyBurst offers a clean-label, safe, and functional alternative that meets the market's demand for natural, nutritious, and visually appealing treats, promoting better health outcomes and supporting a more sustainable food industry.

REFERENCES

- Amchova, P., Siska, F., and Ruda-Kucerova, J. 2024. "Food Safety and Health Concerns of Synthetic Food Colors: An Update". *Toxics*, 12(7), 466–466.
- de Oliveira, Z. B., Silva da Costa, D. V., da Silva dos Santos, A. C., da Silva Júnior, A. Q., de Lima Silva, A., de Santana, R. C. F., Costa, I. C. G., de Sousa Ramos, S. F., Padilla, G., and da Silva, S. K. R. 2024. "Synthetic Colors in Food: A Warning for Children's Health". *International Journal of Environmental Research and Public Health*, 21(6), 682.
- Husni, E., Ismed, F., and Afriyandi, D. 2020. "Standardization Study of Simplicia and Extract of Calamondin (*Citrus microcarpa* Bunge) Peel, Quantification of Hesperidin and Antibacterial Assay". *Pharmacognosy Journal*, 12(4), 777–783.
- Rambler, R. M., Rinehart, E., Boehmler, W., Gait, P., Moore, J., Schlenker, M., and Kashyap, R. 2022. "A Review of the Association of Blue Food Coloring with Attention Deficit Hyperactivity Disorder Symptoms in Children". *Cureus*.
- Thuy, N. M., Minh, V. Q., Ben, T. C., Thi Nguyen, M. T., Ha, H. T. N., and Tai, N. V. 2021. "Identification of Anthocyanin Compounds in Butterfly Pea Flowers (*Clitoria ternatea* L.) by Ultra Performance Liquid Chromatography/ultraviolet Coupled to Mass Spectrometry". *Molecules*, 26(15).