Effects of anthocyanins extracted from butterfly pea on probiotic growth and physicochemical properties of fermented milk product

Rungtiwa Luecha and Thida Kaewkod*

Microbiology, Department of Biology, Faculty of Science, Chiang Mai University, 50200 Thailand

*Email: thida.keawkod@cmu.ac.th

Abstract

Functional foods, particularly probiotic products, are increasingly popular for digestive health benefits. Anthocyanins from butterfly pea (*Clitoria ternatea* L.) are natural colorants with potential bioactive properties that may influence probiotic survival in fermented milk. This study evaluated the effects of anthocyanin supplementation (3.125 and 6.25 mg/ml) on probiotic growth and physicochemical properties during 9 days of storage. Samples were analyzed for viable cell counts, pH, lactic acid, anthocyanin content, and physical characteristics.The results showed that anthocyanin supplementation had a significant effect on the growth of *Lacticaseibacillus paracasei*. The supplemented groups showed significantly higher probiotic survival on day 9 compared with the control group, with 6.25 mg/mL demonstrating the best ability to maintain probiotic viability during fermentation. Anthocyanin addition affected product color but did not markedly alter acidification patterns. Lactic acid increased during early storage and slightly declined later, consistent with pH changes. Meanwhile, anthocyanin content gradually decreased over time, reaching its lowest level on day 9, possibly due to microbial utilization or changes that occurred during fermentation. These findings suggest that butterfly pea anthocyanins help maintain probiotic viability and influence product characteristics during fermentation.

introduction

Probiotics provide health benefits but their viability in fermented milk often declines during fermentation and storage due to acidic and oxidative conditions. Anthocyanins from butterfly pea (*Clitoria ternatea* L.) are natural antioxidants with potential prebiotic-like properties. This study investigated the effects of butterfly pea anthocyanins on probiotic growth and physicochemical properties of fermented milk during storage.

objectives

To evaluate the growth of probiotics in fermented milk product containing different anthocyanin concentrations.

To compare physicochemical changes in fermented milk product containing anthocyanin.

Methodology

1 Preparation of Anthocyanin Extract



2 Milk Fermentation

Milk fermentation by *Lacticaseibacillus paracasei* with anthocyanin extract



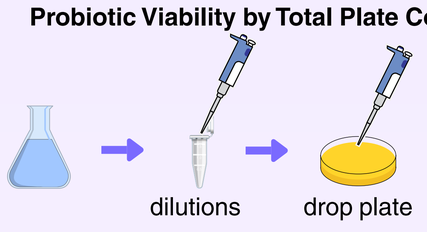
Control Group: Fermented milk with probiotic (no extract)

Test Group 1: Fermented milk with probiotic+anthocyanin extract (3.125 mg/ml)

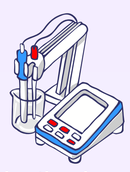
Test Group 2: Fermented milk with probiotic+anthocyanin extract (6.25 mg/ml).

3 Chemical & Microbiological Analysis

Probiotic Viability by Total Plate Count Assay

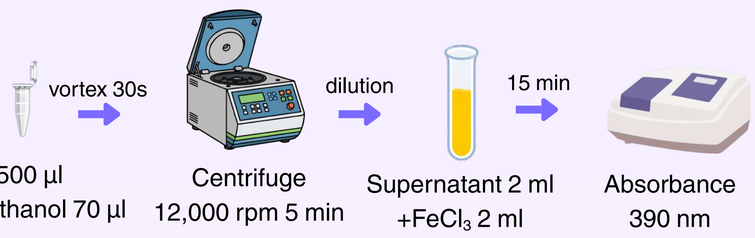


Acidity

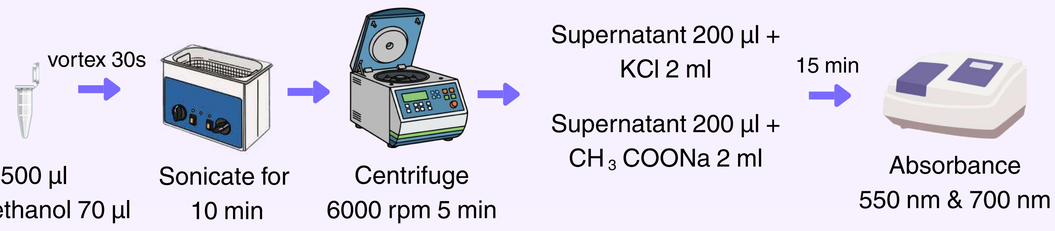


Determination by pH meter

Lactic Acid Determination by Ferric Chloride Method



Anthocyanin content (pH-differential)



Results



Table 1 :Yield, physical characteristics and anthocyanin content of butterfly pea extract

Plant	Extraction yield (%)	Physical Characteristics	Anthocyanin content (mg/ g extract)
Butterfly pea (*Clitoria ternatea* L.)	45.02	Dark blue powder	1124.39 ± 280.87

Table 2 :Physical changes of fermented milk supplemented with anthocyanin during production

Milk Fermentations	Curd	Whey Separation
Day0 	-	-
Day3 	++	+
Day6 	++	++
Day9 	++	++

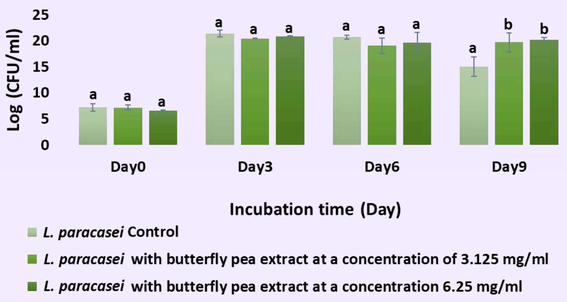


Fig. 1 : Probiotic growth during fermentation. different letters indicate significant differences among treatments within the same day ($P < 0.05$).

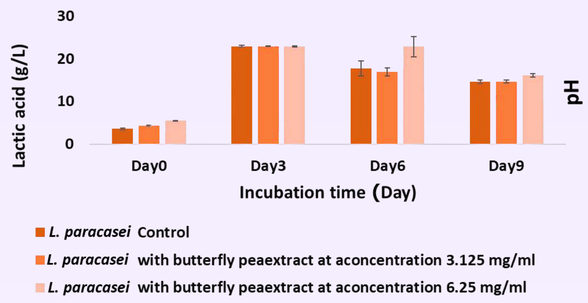


Fig. 2 : Lactic acid content of fermented milk during production

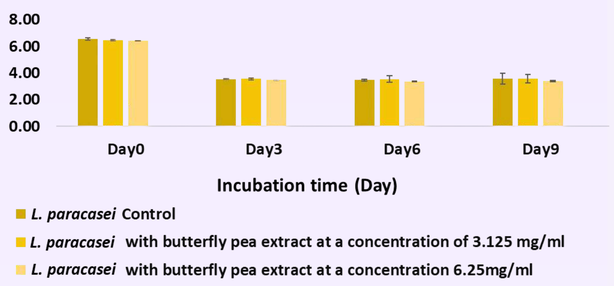


Fig. 3 : pH changes of fermented milk during production

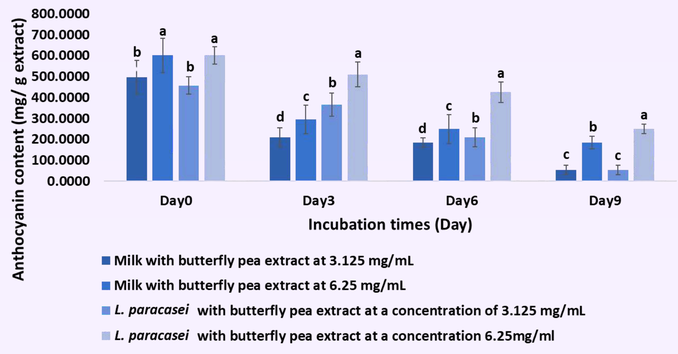


Fig. 3 : Anthocyanin content during milk fermentation.
[a-d]Different letters indicate significant differences among treatments ($P < 0.05$).

Conclusion

- Anthocyanin (6.25 mg/ml) supplementation enhanced the survival of *L. paracasei* in fermented milk during production.
- The addition of anthocyanin also influenced the physical characteristics of the product, particularly its color.
- The pH and lactic acid changes followed normal fermentation patterns and were not significantly affected by anthocyanin supplementation.
- Butterfly pea anthocyanins can be applied as a natural ingredient to help maintain probiotic stability in fermented milk products.

References

- Sarvari, F., Mortazavian, A. M., and Fazeli, M. R. (2014). Biochemical characteristics and viability of probiotic and yogurt bacteria in yogurt during the fermentation and refrigerated storage. Appl. Food Biotechnol." 1(1): 55-61.

Acknowledgements

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