

Antioxidant Activity, Total Phenolic and Vitamin C Contents in Mulberry (*Morus nigra L.*) Fruits



Thanphitcha Luangchan, Nuchnipa Nuntawong

Department of Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand

ABSTRACT

Mulberry (*Morus nigra L.*) is rich in phytochemicals, particularly phenolics, flavonoids, and anthocyanins, which are vital for antioxidant activity. However, the variation in antioxidant activity across different ripening stages is unclear. This study investigated the antioxidant activity, total phenolic, and vitamin C contents in unripe, semi-ripe, and ripe mulberries. Antioxidant activity and phenolic content were assessed using DPPH and Folin-Ciocalteu assays, while vitamin C was analyzed by redox titration. Results showed that ripe fruit had the highest phenolic content (0.2848 mg GAE/g extract), strongest antioxidant activity ($IC_{50} = 769.20 \mu\text{g/mL}$), and highest vitamin C content (1.116 mg/mL), followed by semi-ripe and unripe fruit. These findings suggest that fully ripe mulberries offer the greatest antioxidant benefits, making them ideal for health and cosmetic applications.

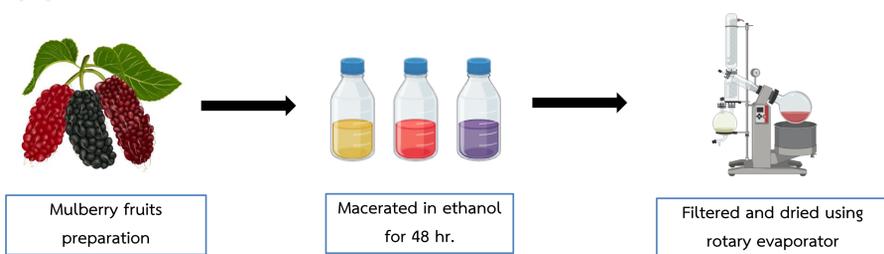
INTRODUCTION

Mulberry (*Morus nigra L.*) is rich in bioactive compounds, including phenolics, flavonoids, and anthocyanins which exhibit antioxidant properties, making it valuable for healthcare and cosmetic applications. Mulberry extracts are known to protect the skin from oxidative stress, reduce hyperpigmentation, and promote a youthful appearance. However, the levels of bioactive compounds vary by ripening stage, affecting their biological activity. This study investigates the antioxidant activity, total phenolic, and vitamin C contents across different ripening stages to determine the optimal stage for health and industrial use.

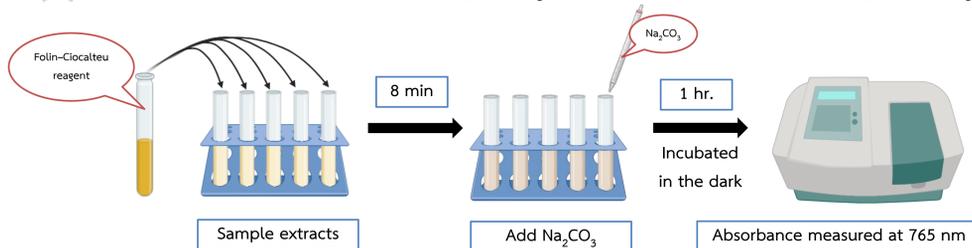


METHODOLOGY

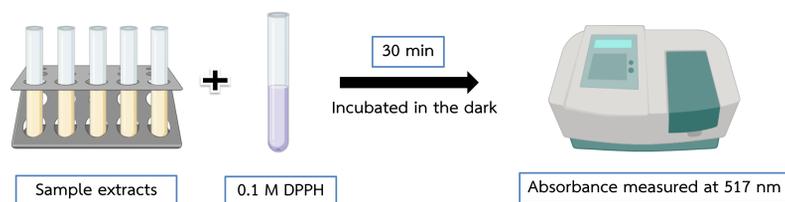
Extraction



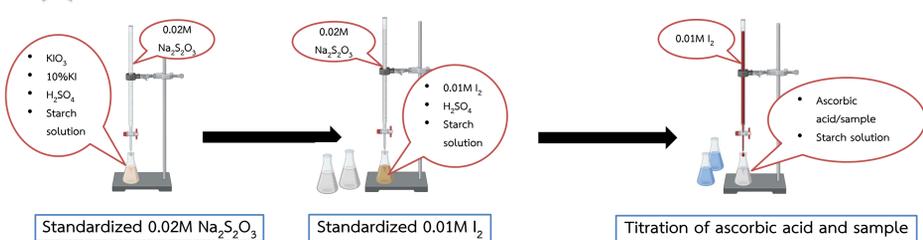
Total Phenolic Content (Folin-Ciocalteu method)



DPPH Radical Scavenging Activity



Vitamin C Content (Redox-titration)



RESULTS

Maturity stage	TPC (mg GAE/g extract)	IC_{50} ($\mu\text{g/mL}$)	Vitamin C Content (mg/mL)
Unripe fruit	0.1291	1490.79	-
Semi-ripe fruit	0.1530	1397.05	0.3300
Ripe fruit	0.2848	769.20	1.1160

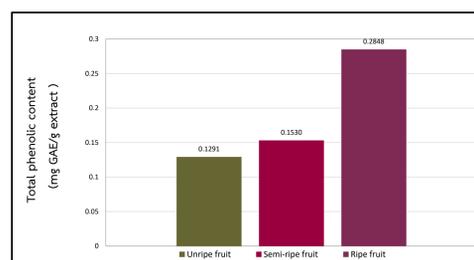


Fig.1 The reaction between Folin-Ciocalteu reagent and the sample results in a color change of the solution to blue

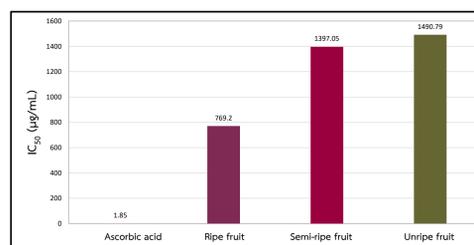


Fig.2 The reaction between 2,2-Diphenyl-1-picrylhydrazyl (DPPH) reduced by antioxidants in sample

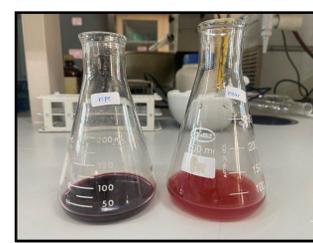
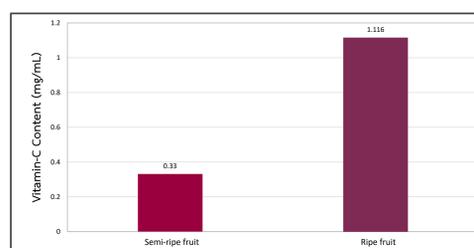


Fig.3 Mulberry Juice from ripe fruits and semi-ripe fruits, respectively

CONCLUSION

The results indicate that the fully ripe mulberry fruit had the highest total phenolic content (0.2848 mg GAE/g extract), antioxidant activity ($IC_{50} = 769.20 \mu\text{g/mL}$), and vitamin C content (1.116 mg/mL), compared to the semi-ripe and unripe fruits. These findings suggest that the ripening stage significantly influences bioactive compounds, with fully ripe mulberry fruit being the most suitable for use as an antioxidant in cosmetic formulations.

ACKNOWLEDGEMENT

The author wishes to express profound gratitude to Associate Professor Dr. Nuchnipa Nuntawong (Advisor) and Ms. Apichada Prompeera for their invaluable guidance throughout the experiments, which contributed to the successful completion of this research. Sincere appreciation is also extended to the Faculty of Science for organizing this academic presentation.

Reference :

- Arfan, M., Khan, R., Rybarczyk, A., & Amarowicz, R. (2012). Antioxidant activity of mulberry fruit extracts. *International Journal of Molecular Sciences*, 13(2), 2472-2480.
- Marija M., Zoran P., Senka S., Drago D., & Pavle Z. (2012). Free radical scavenging activity, total phenolic and flavonoid contents of mulberry (*Morus spp. L., Moraceae*) extracts. *Hem.ind.*, (4), 547-552.
- Wang, L., Wen, H., Yang, N., & Li, H. (2023). Effect of vacuum freeze drying and hot air drying on dried mulberry fruit quality. *PLOS ONE*, 18(6), e0283303.