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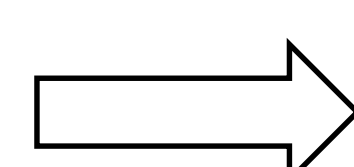
ABSTRACT

Red cabbage (*Brassica oleracea* L. var. *Capitata* f. *Rubra*) is a vegetable known for its antioxidant activity and rich nutrient composition, especially anthocyanin compounds. The objective of this research is to determine optimal conditions to yield the highest contents of anthocyanin, polyphenol and antioxidant activity from red cabbage with the microwave-assisted extraction method (MAE). Anthocyanin was evaluated based on the pH-differential method, the Folin-Ciocalteu method was used to evaluate the polyphenol content, antioxidant activity based on the DPPH free radical scavenging method. The results showed that, extraction conditions consisting of ethanol concentration of 60%, solid to solvent ratio of 1:30, microwave power of 600W and microwave-assisted extraction time of 2 minutes, gave the highest anthocyanin content at 73.89 mg/L. The content of polyphenol reached 5244.88 mg/L and the antioxidant activity was 1739.4 $\mu\text{mol/L}$.

INTRODUCTION



Fig 1. Red cabbage



ANTHOCYANIN PIGMENT

Shorter extraction time

Improve extraction efficiency and yield

Reduce solvent usage and energy consumption



Fig 2. Microwave oven

RESULTS AND DISCUSSION

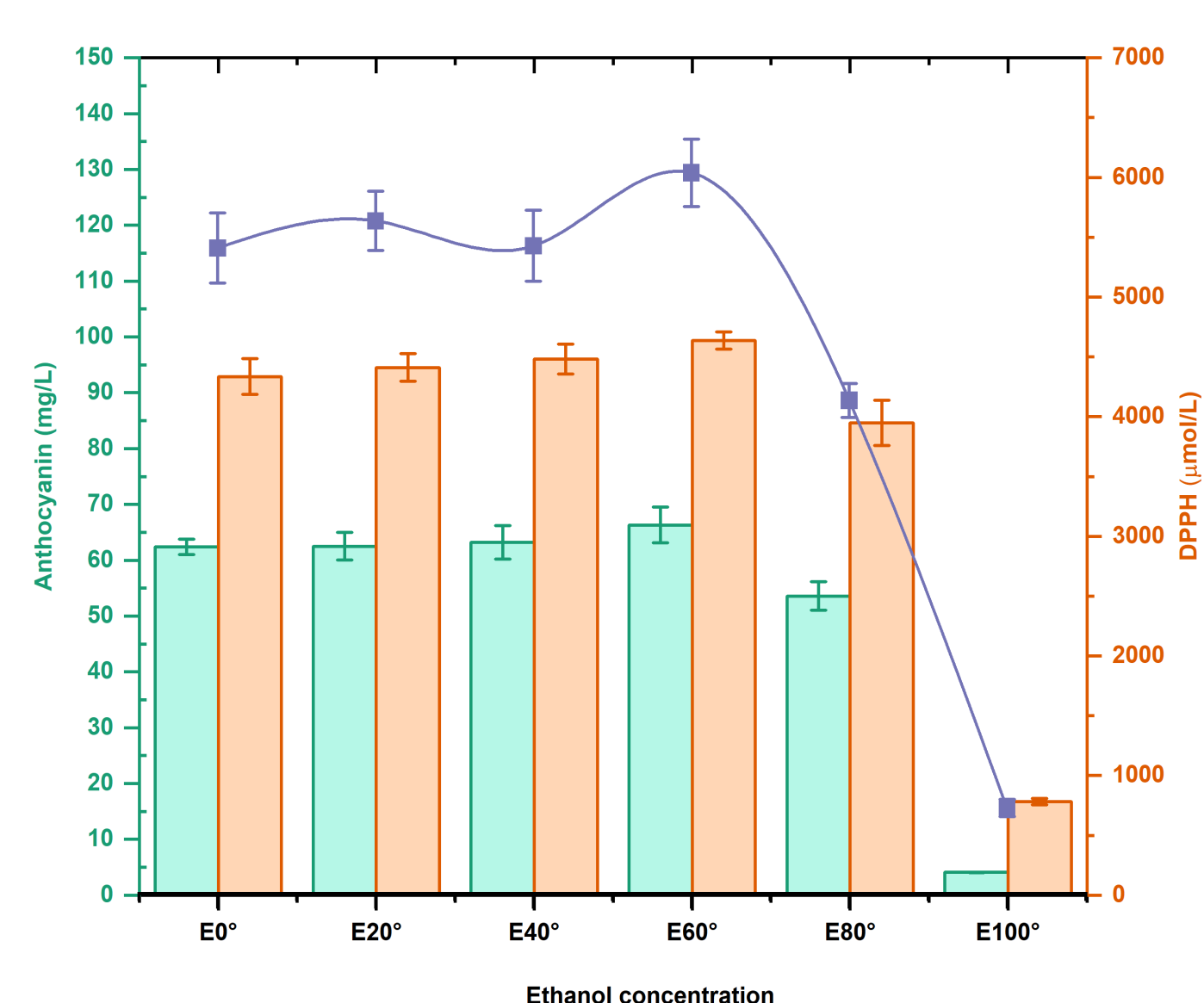


Fig 4. Effect of ethanol concentration on anthocyanin, polyphenol and DPPH contents in red cabbage extract

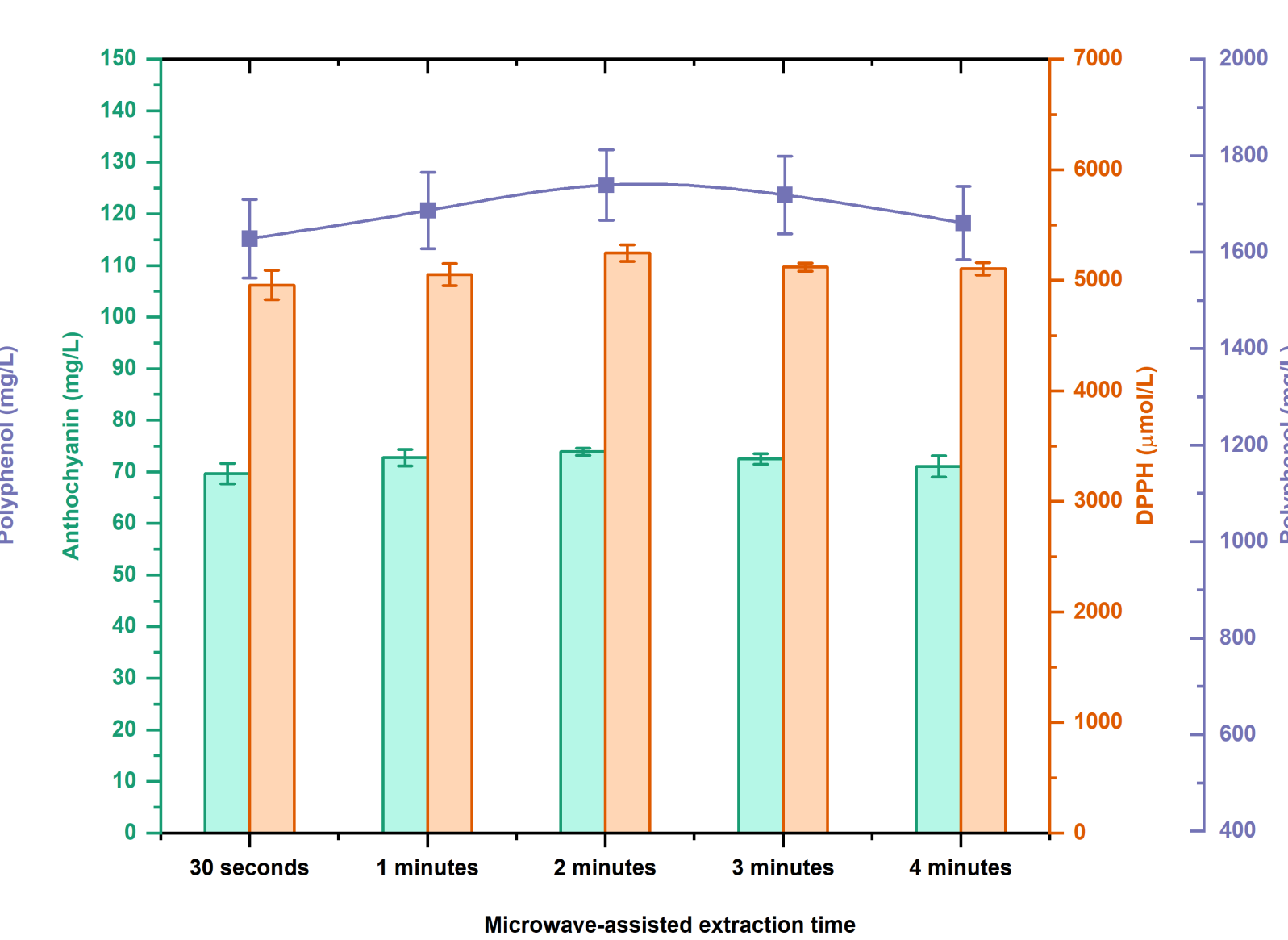


Fig 6. Effect of microwave power on anthocyanin, polyphenol and DPPH contents in red cabbage extract

MATERIALS AND METHODS

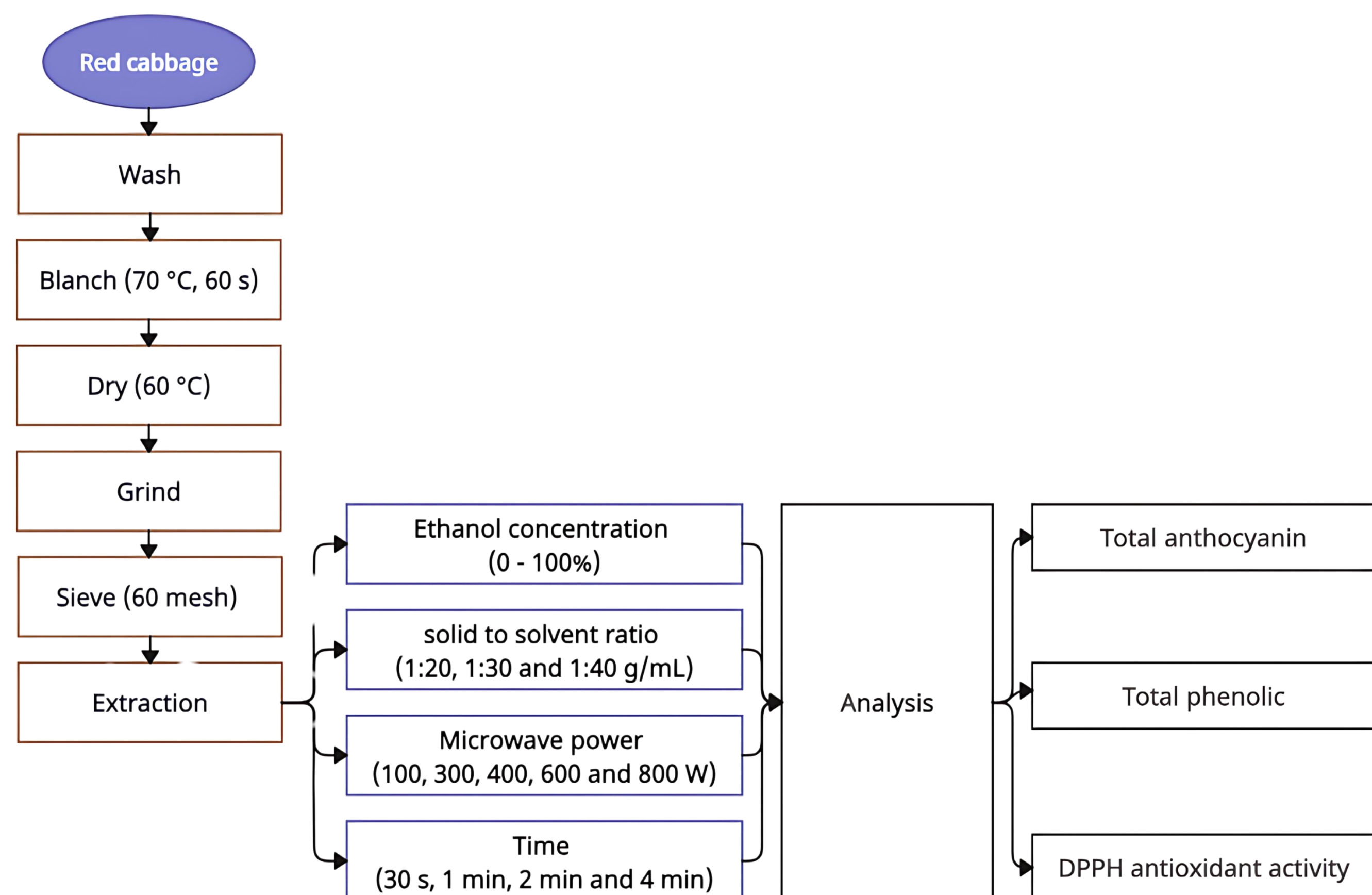


Fig 3. Sample processing and research diagram

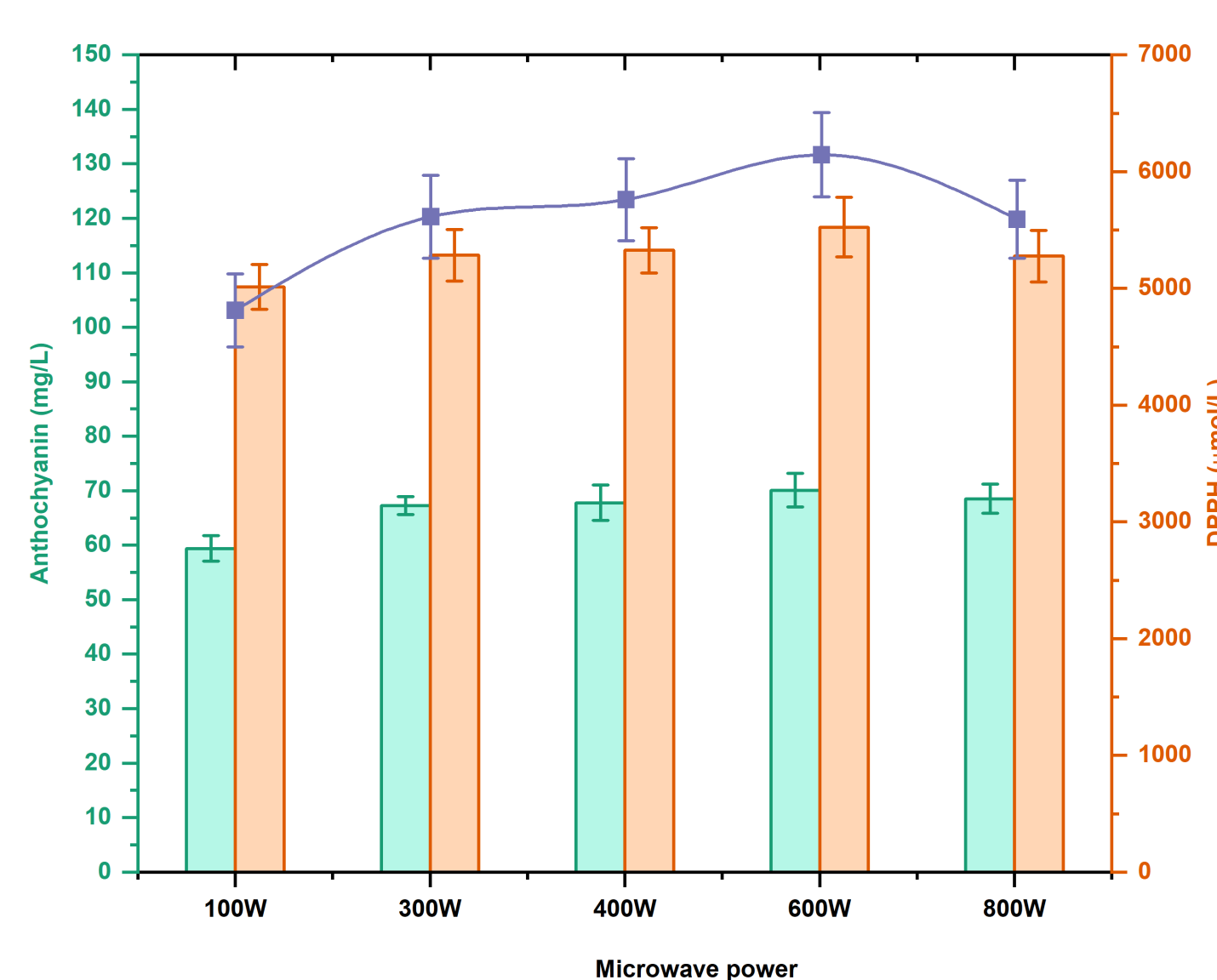


Fig 5. Effect of solid to solvent on anthocyanin, polyphenol and DPPH contents in red cabbage extract

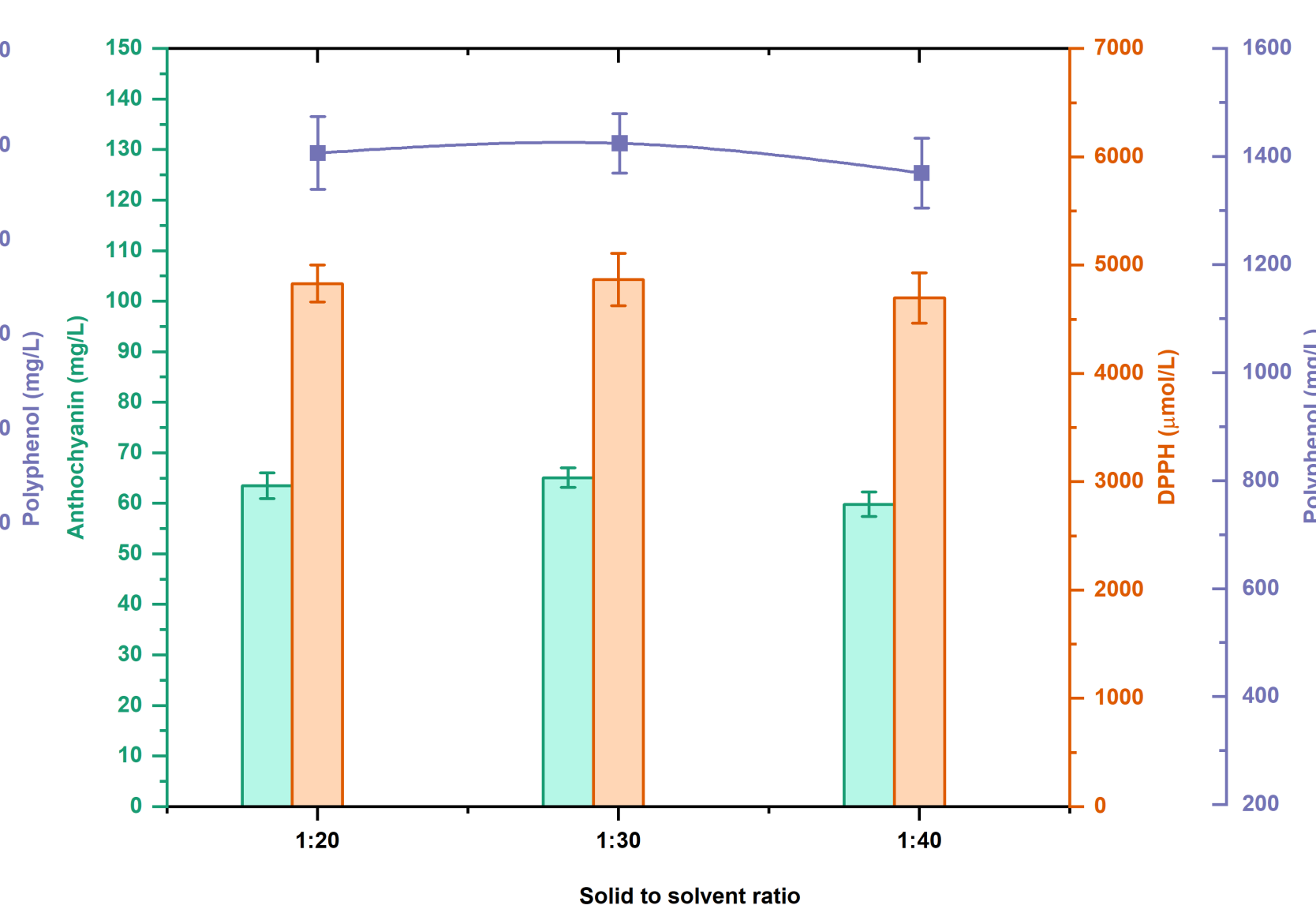


Fig 7. Effect of microwave power on anthocyanin, polyphenol and DPPH contents in red cabbage extract

CONCLUSIONS

Through the results obtained during the study, it was found that at the concentration of ethanol 60%, the highest contents of extract compounds will be obtained. If the concentration of ethanol increased to higher than 60%, the contents of extracted compounds would be significantly reduced. Regarding the solid to solvent ratio, at the ratio of 1:30, the highest contents of compounds would be obtained. The microwave power exerted strongest impact on extraction capacity at 600W. Excessively extended microwave-assisted extraction time will reduce the contents of the obtained compounds and microwave-assisted extraction time 2 minutes would be appropriate to obtain maximal anthocyanin. This result also shows that microwave can significantly shorten extraction time and these results may act as a precursor for research in pigment powders produced from red cabbage.

REFERENCES

- X.D. Le, M.C. Nguyen, D.H. Vu, M.Q. Pham, Q.L. Pham, Q.T. Nguyen, T.A. Nguyen, V.T. Pham, L.G. Bach, T.V. Nguyen and Q.T. Tran, Optimization of Microwave-Assisted Extraction of Total Phenolic and Total Flavonoid from Fruits of *Docynia indica* (Wall.) Decne. Using Response Surface Methodology, *Processes* 2019, 7, 485;
- A. Mena-García, A. I. Ruiz-Matute, A. C. Soria, M. L. Sanz, Green techniques for extraction of bioactive carbohydrates, *TRAC Trends in Analytical Chemistry*, 119 (2019) 115612.
- V. Farzaneh and I. S. Carvalho, "Modelling of microwave assisted extraction (MAE) of anthocyanins (TMA)," *J. Appl. Res. Med. Aromat. plants*, vol. 6, pp. 92–100, 2017.
- K. Kaderides, L. Papaioannidou, M. Serafim, and A. M. Goula, "Microwave-assisted extraction of phenolics from pomegranate peels: Optimization, kinetics, and comparison with ultrasound extraction," *Chem. Eng. Process. Intensif.*, vol. 137, pp. 1–11, 2019.
- A. Mena-García, A. I. Ruiz-Matute, A. C. Soria, M. L. Sanz, Green techniques for extraction of bioactive carbohydrates, *TRAC Trends in Analytical Chemistry*, 119 (2019) 115612.

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