

Protein and polyphenol compounds extraction by subcritical water

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Introduction and experimental

BRAN RICE

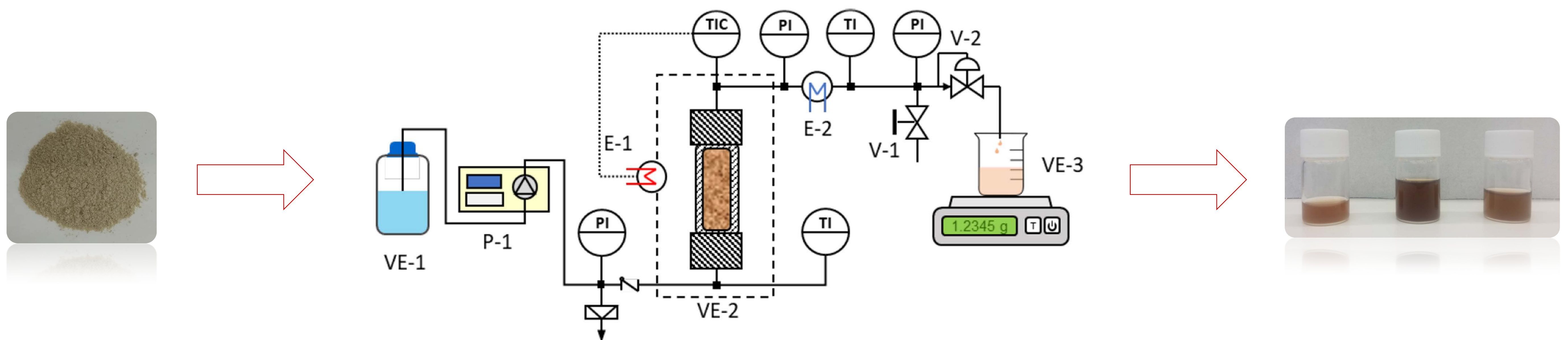
- Rice is important crops
- The husk and the bran layer are main byproducts
- Rice bran has **high nutritional value** and it is **underutilized**

SUBCRITICAL WATER EXTRACTION (SWE)

- Semi continuous fixed bed reactor
- Fixed water flow rate: 2.5 mL/min
- Pressure: 50 bar
- Time: 4h
- Temperature: 135°C, 155°C, 175°C
- Extracts were periodically collected

EXTRACTS ANALYSIS

- Total **proteins**
- Free amino acids**
- Total **polyphenols**
- Total **flavonoids**
- Antioxidant capacity**: FRAP, ABTS



Results and discussion

Protein

- The **protein** and amino acid content **increase** with **temperature**
- By **SWE** high **protein content** of rice bran (131 mg BSA/g dry bran) can be **obtained** at the **highest temperature** (175 °C)
- Hydrolysis of rice bran protein → Free amino acids

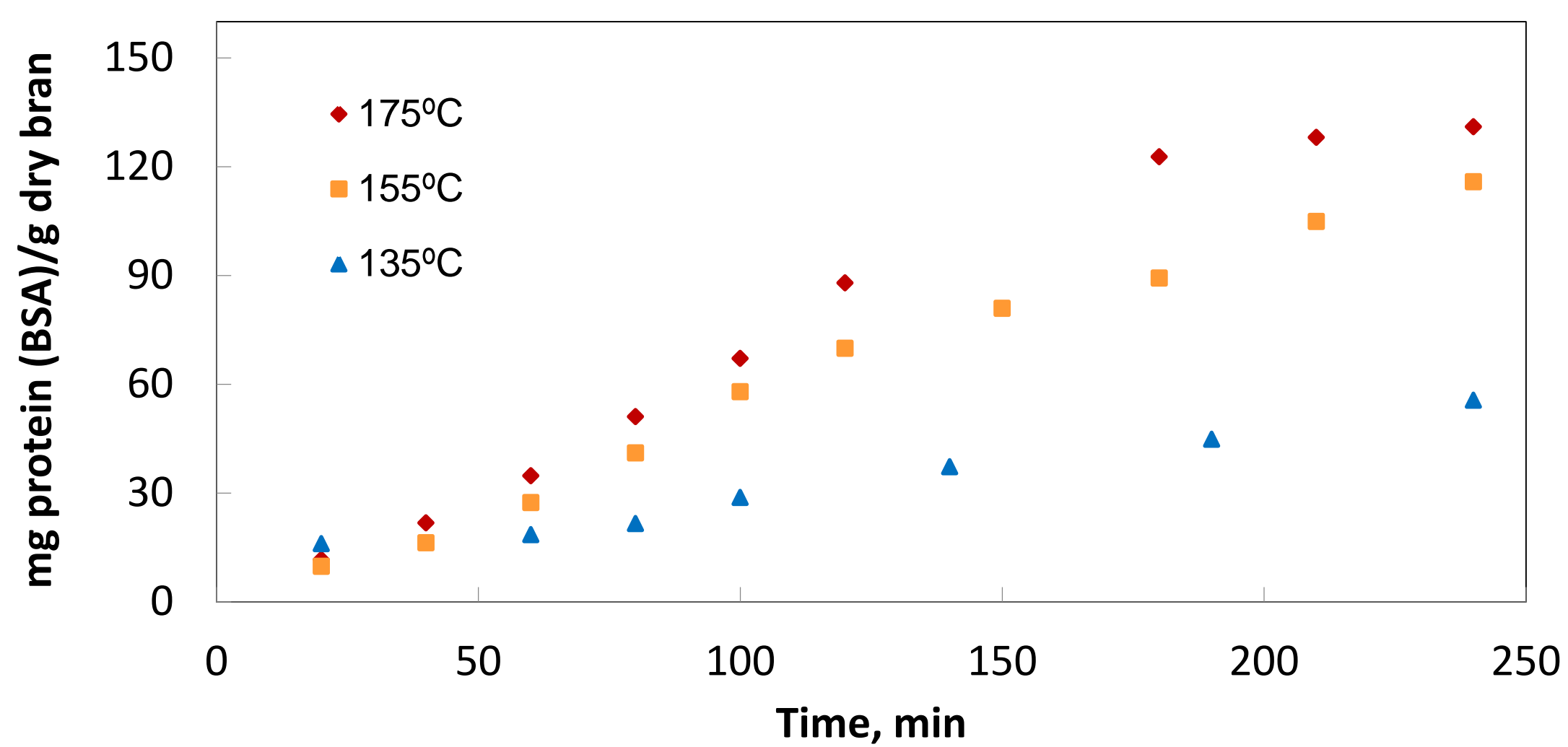


Figure 1. Effect of temperature on protein extraction from rice bran by SWE at 50 bar and 2.5 mL/min at different temperatures: ◆ 175 °C, ■ 155 °C, ▲ 135°C

Polyphenol content and Flavonoid content

- Total **polyphenol** content was **higher** than the value by **acid hydrolysis**
- Bound phenolic** compounds of rice bran samples were **hydrolysed**
- New antioxidants** compounds could be formed due to Maillard reactions

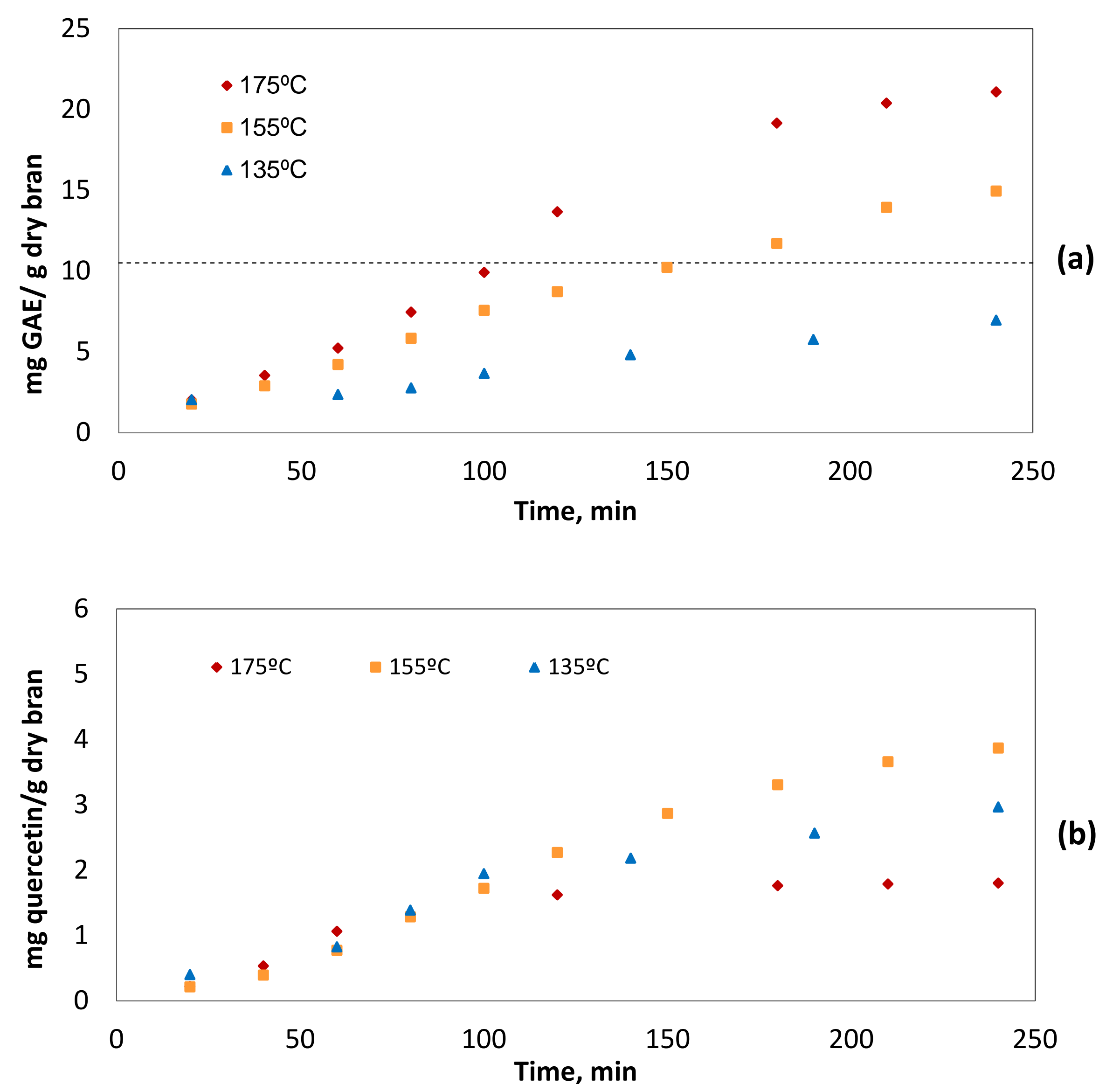
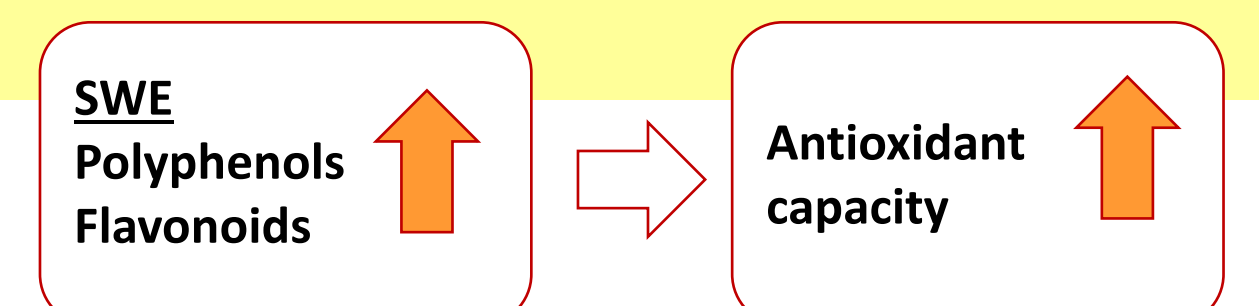


Figure 2. Effect of temperature on extraction of total polyphenol compounds (a) and total flavonoid compounds (b) at 50 bar and 2.5 mL/min at different temperatures (◆ 175 °C, ■ 155 °C, ▲ 135°C)

Conclusions

- SWE** is a **promising technology** to **valorise** the rice bran **byproduct**
- By **SWE** the amount of proteins and aminoacids **increased** with **temperature**
- The **extracts** presented **high** amount of **antioxidant compounds** (polyphenols and flavonoids) and **high antioxidant capacity**

References

- I. Sereewatthanawut, S. Prapintip, K. Watchiraruj, M. Goto, M. Sasaki, A. Shotipruk, *Bioresource Technology* **2008**, 99, 555-561.
- S. Hata, J. Wiboonsirikul, A. Maeda, Y. Kimura, S. Adachi, *Biochemical Engineering J.* **2008**, 40, 44-53.