

Investigation the Drying Conditions of *Garcinia Mangostana* L. Rind in Response to Anthocyanins and Total Phenolic Contents

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Abstract

This study aimed to investigate the effects of drying conditions of mangosteen (*Garcinia mangostana* L.) rind on total monomeric anthocyanins (TMA) and total phenolic contents (TPC) yields. Mangosteen rind was subjected to a convective oven at temperatures of 50, 60, 70, 80, and 90 °C for durations of 30, 60, 90, 120, and 150 min. PH-differential and Folin-Ciocalteu methods were used to quantify TMA and TPC after drying at each condition. Results indicated that the rind which dried at 50 °C for 120 min obtained extract with the highest TMA of 1.127 ± 0.012 mg cy-3-glu/g. Meanwhile, the rind which dried at 90 °C for 150 min gave the highest TPC of 65.254 ± 0.275 mg GAE/g.

Introduction

Mangosteen (*Garcinia mangostana* L.) is one of the popular tropical fruits which has high valuable bioactive phenolic compounds. Its rind also has been discovered to have a high content of anthocyanins and xanthone and they have been found to have a strong relationship with antioxidants properties [1-4]. As such, mangosteen rind has become an interest of exploration to many researchers recently [5]. Drying is a pre-treatment to preserve a plant material before further process. However, the heat involved in the drying could damage the valuable bioactive compounds such as nutrients, flavour, and protein contents in fruits and plant materials [6]. Therefore, this study was carried out to investigate the influence of drying temperatures and durations on TMA and TPC.

Research Methods

Mangosteen rinds were cut into even cube sizes. 50 g of mangosteen rind underwent drying process in an oven at the temperatures of 50, 60, 70, 80, and 90 °C for 30, 60, 90, 120, and 150 min. Five grams of rind from each drying condition were placed in a teabag. Then, the teabag was immersed into 100 ml of distilled water, which had boiled to 100 °C, for 5 min. After leaving for cooling at room temperature for 1 hour, the extract was filtered using filter paper.

The filtrate was collected for TMA and TPC determination. The experiment was conducted in duplicate. Data were analysed using Microsoft Excel's Data Analysis and results were expressed as mean \pm standard deviation (SD) with $p < 0.05$ indicating a significant difference.

Results and Discussion

Figure 1 shows the effect of drying temperatures and durations on TMA. Results showed that drying at 50 °C for 120 min obtained the highest TMA of 1.127 ± 0.012 mg cy-3-glu/g. Different drying conditions have been reported for different plant materials. For instance, *Vaccinium meridionale* Swartz has been reported that drying at 50 °C for 15 min was sufficient to obtain the highest TMA of around 9.5 mg cy-3-glu/g dm [7]. Many studies have reported that heat processing decreased TMA value. Chaovanalikit et al. [8] observed that after fresh mangosteen juice underwent spray drying process, TMA value was decreased from 3.71 to 2.49 mg cy-3-glu/100 mL. Furthermore, Alfaro et al. [9] compared hot air drying between 65 °C and 80 °C for murtilla fruit. They reported that TMA decreased to 38.5% and 66.7% in comparison to fresh murtilla fruit.

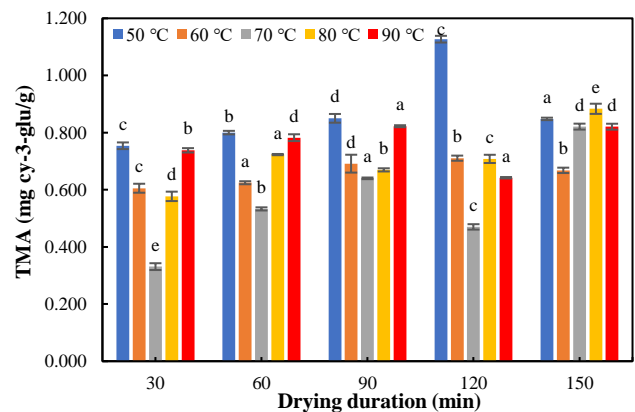


Figure 1 Effects of drying temperature and duration of mangosteen rind on TMA values.

Note. Means \pm SD with different letters indicates significant difference ($p < 0.05$).

Figure 2 illustrates the effect of drying temperatures and durations of mangosteen rind on TPC. Results showed that the rind which dried at 90 °C for 150 min gave the highest TPC of 65.254 ± 0.275 mg GAE/g. Drying might destruct the cell wall structure of rind which subsequently eases the release of phenolic compounds. However, different drying methods might have different optimum conditions for obtaining the maximum TPC. Ozcan-Sinir et al. [10] demonstrated that vacuum drying of sliced kumquats at 70 °C and 100 mbar obtained TPC of 3095.71 ± 101.41 mg GA/100g.

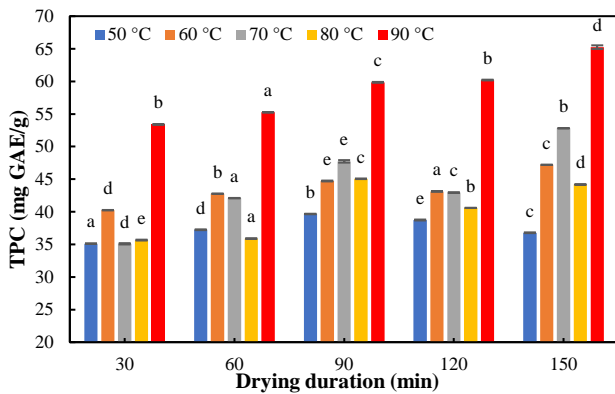


Figure 2 Effects of drying temperature and duration of mangosteen rind on TPC values.

Note. Means \pm SD with different letters indicate significant difference ($p < 0.05$).

Conclusion

To obtain a high TMA value extract from mangosteen rind, a low drying temperature of 50 °C is recommended. However, if a high TPC value extract is to be obtained from mangosteen rind, a high drying temperature of 90 °C should be employed. Mangosteen rind has a high content of anthocyanins which could be used as a natural colorant. Therefore, this information is important for food industries to formulate the process parameters in order to derive and preserve the best natural colour attributes into the desired food products.

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