



Anthocyanin And Polyphenolic Changes By Various Processing Treatments Of Purple Corn

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ABSTRACT

The color pigments present in purple corn cob was evaluated and the most efficient extraction method for anthocyanins was investigated. Higher temperature guaranteed higher yield rate of anthocyanins but high temperature extraction degraded anthocyanins very quickly. In the present study, mildly hot temperature (70°C) for 20min was the best time and temp combination for higher anthocyanin and phenolic compounds extraction.

INTRODUCTION

Purple corn (*Zea Mays*) is known as a significant source of natural colorant due to high anthocyanin concentration. Since the stability of anthocyanin is relatively low, loss of the content should be minimized during processing. In the present study, different temperature and time combination was applied to determine optimal processing conditions based on anthocyanin and phenolic changes. Also, the extraction efficiency of whole cob and powdered cob was compared.

MATERIALS AND METHODS

Material and preparation:

1. Half of purple corn cob was finely ground using lab-scale mill for 5 min while the other half was remained untreated. 2g of cob powder was brewed with 80mL of hot water at 50, 70, and 90°C for 5, 10, and 20 min. The description of treatments was described in Table 1. After brewing, each infusion cooled down to 25°C and filtered through Whatman #4 filter prior to chemical analysis.
2. Remaining purple corn cob (7.2899g) and equal amount of powered cob were brewed with 200mL of hot water at 90°C for 10 min. After filtering through #4 filter paper, whole cob was re-extracted with 90°C hot water for additional 10 min. The description of treatment was illustrated in Table 2.

Methods:

1. Total Phenolics (TP) (also known as total soluble Phenolics) was determined using Folin-Ciocalteu assay as early described by Swain and Hillis (1959) and expressed as gallic acid equivalent.

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1

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2. Total anthocyanin content was measured by spectrometric method. An aliquot supernatant from each sample was properly diluted into a spectrometric linear range for anthocyanins (Abs 0.8 – 1.2). The proper dilution factor varied depending on the samples and the range was from 4 to 6. Two aliquots of 0.5mL of properly diluted stock solution with pH 3.0 citric acid buffer were added to test tubes containing 4.5mL of pH 1.0 and pH 4.5 buffers and they were thoroughly mixed by vortex for 10 sec. After staying for 20 min at room temperature, each solution was measured at 520nm and 700nm against blanks of pH 1.0 and 4.5 buffers. Total anthocyanin calculation was calculated by

$$\text{Total anthocyanin (mg/L)} = (A/a) \times \text{MW} \times 1000 \times \text{DF}$$

Where: A = adjusted absorbance = $(A_{520}-A_{700})_{\text{buffer 1.0}} - (A_{520}-A_{700})_{\text{buffer 4.5}}$, 1000 = molar to ppm, DF = dilution factor

Three buffers (pH 1.0, 3.0, and 4.5) were prepared as described in SEN-TN-0019.

RESULTS AND DISCUSSION

Figure 1 and 2 illustrated total anthocyanin and total phenolic content by different time and temperature combination. For total anthocyanin, hot water extraction at 70°C for 20 min showed the highest yield compared to other conditions. In theory, higher temperature guarantees higher yield of anthocyanin but anthocyanin is unstable at high temperature. This explains why total anthocyanin decreased between 10 and 20 min at high temperature (90°C).

The same tendency was observed in total phenolic content. The highest yield was observed in 70°C at 20 min and it was significantly higher than other temperatures. Since polyphenolics in purple corn are mostly phenolic acids which are relatively unstable at high temperature, the same tendency might have been observed.

According to Figure 3, significantly higher anthocyanin and phenolic content were observed in powdered purple corn cob as we have observed in tea extraction.

Table 1. Description of processing treatment used in the present study.

Temp	50°C	70°C	90°C
Time			
5 min	1	2	3
10 min	4	5	6
20 min	7	8	9

Table 2. Processing method for whole and powdered purple corn cob.

	A	B	C
Description	Powdered	Whole	Re-extraction of whole

Figure 1. Difference in total anthocyanin by different processing methods.

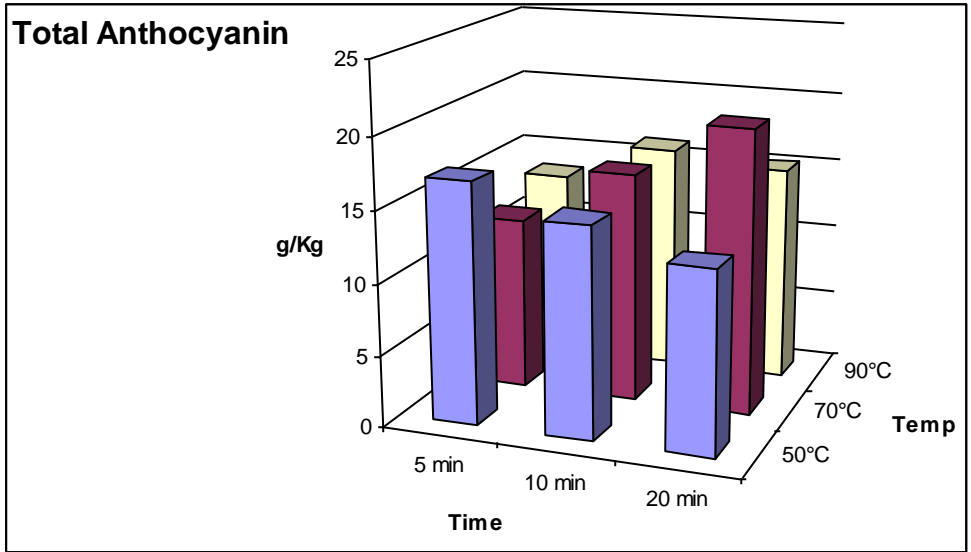


Figure 2. Difference in total phenolic content by different processing methods.

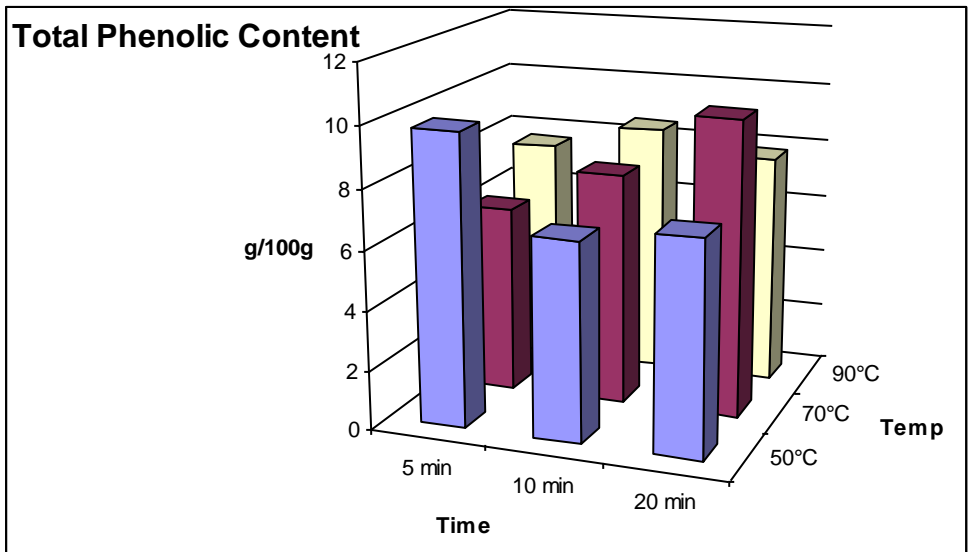
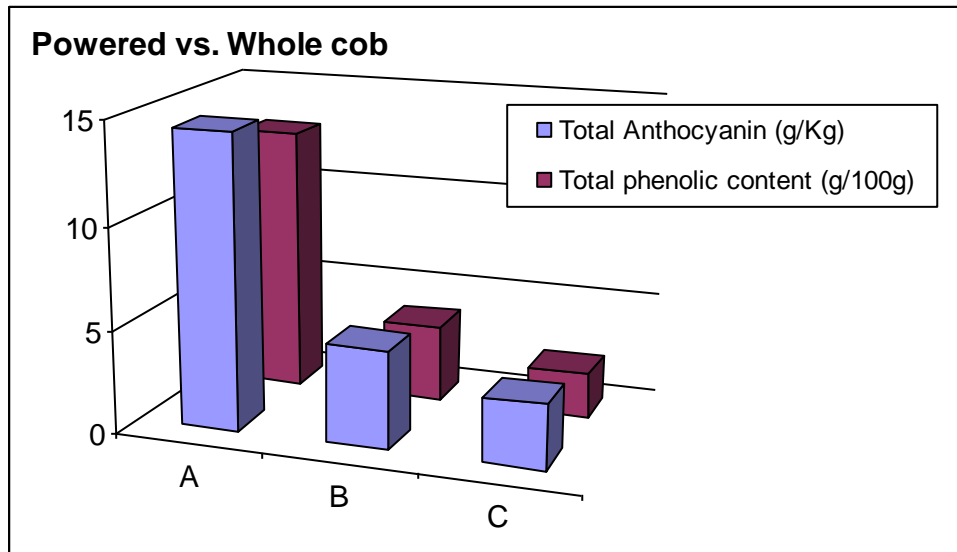


Figure 3. Powdered and whole purple corn cob in total anthocyanin and total phenolic content.



REFERENCE CITED

Swain, T.; Hillis, W. E. The phenolic constituents of *Purmus domestica*. I. The quantitative analysis of phenolic constituents. *J. Sci. Food. Agric.* **1959**, *10*, 63-68.