Valorization of Waste Peanut Skin

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INTRODUCTION

Peanut skin has been known to contain a class of compounds called polyphenolics, that exhibit antioxidant properties [1]. These compounds, mostly polar, have been traditionally extracted using solid-liquid extraction techniques with ethanol chosen as the extracting solvent. Due to its hydrogen bonding capability, ethanol provides higher extraction yields and is a widely chosen solvent. One of the unknowns is how long should the extraction take? Will one get the same yield of polyphenols after 4, 6, or 8 hours? Knowing the optimum extraction time would help save time and resources when extracting the polyphenolics. Samples were extracted at 5 hours 20 minutes, 6 hours 40 minutes, and 8 hours using the Soxtec Extractor.

MATERIALS & METHODS

Peanut Material

Raw, unblended peanut skin was provided by Jimbos Jumbos Farm in Edenton, NC. Raw peanut coat was blended in a robot coupe food processing blender and stored in refrigerator.

Soxhlet Ethanol Extraction

Ethanol extraction of polyphenols from peanut skin was carried out using a ST 243 Soxtec solvent Extractor. Raw blended peanut skins (PE) were placed in extraction thimbles, attached to a metal top held in place through magnetism. Thimbles with blended peanut extract are then submerged in the extraction solvent, 90% ethanol. Extraction times of 8 hours, 6 hours 40 minutes, and 5 hours 20 minutes at 35℃ were chosen as experimental parameters to determine the absorbance-GAE concentration relationship.

Gallic Acid Calibration Curve

Total polyphenol Analysis of each extraction sample was analyzed using the Folin reagent and procedure made by Singleton [2]. It was modified by preparing 5 ml water, 0.5 ml of diluted extraction sample, 0.5 ml of Folin reagent, after 3 minutes add 1 ml of 30% Sodium Carbonate, then add 3 mL of water to get a total volume of 10 mL for sample analysis. Samples were left in dark for 1 hour before beginning UV Analysis with Fisher UV Spectrophotometer at 725 nm wavelength.

RESULTS

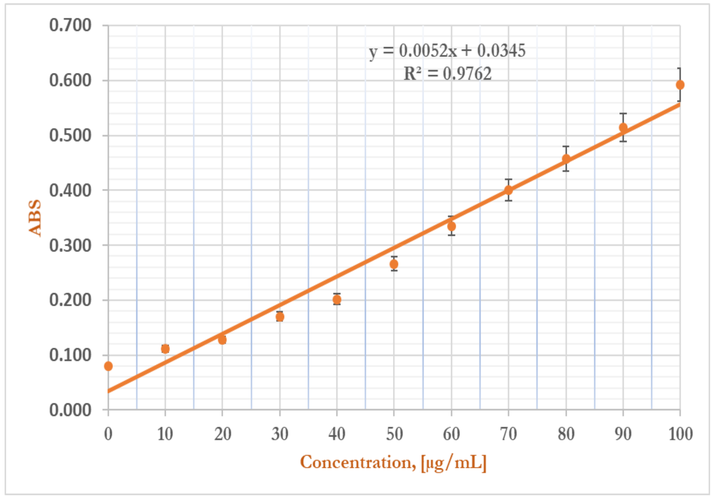

Figure 1. Gallic Acid Calibration Curve generated used for TPC

Using the method described in Gallic Acid Calibration Curve, Figure 1. was generated. The calibration curve is only valid for absorbance values in the range 0.080-0.592. Samples with absorbance higher in the range must be diluted with water and the multiplied by the dilution factor (DF) to get gallic acid equivalent concentration. The absorbance-GAE relationship was found to be:

$$GAE\ Concentration = DF * ((ABS * 192.31)\ - 6.63)$$

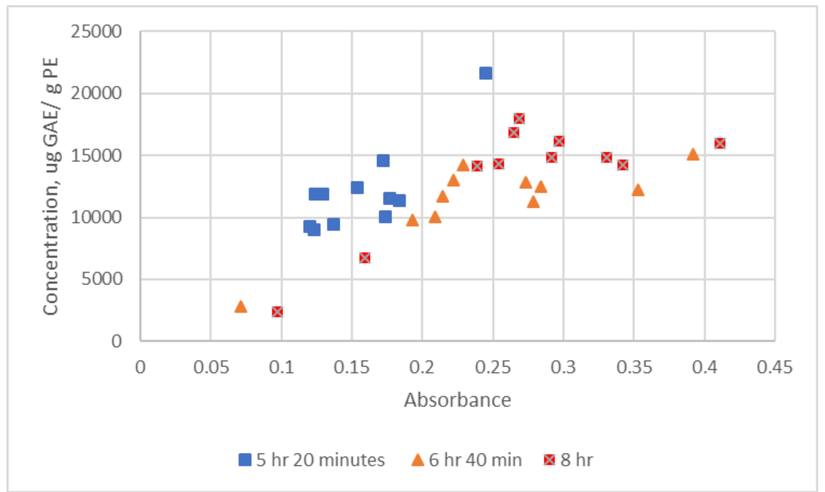

Figure 2. Absorbance values taken from 8 hr, 6 hr 40-minute, and 5 hr, 40-minute extraction periods. A legend for samples for each extraction period is given.

DISCUSSION

- Highest average GAE concentration was 13,489 ug GAE/ 1 g PE extracted with 50 mL 90% Ethanol for 8 hours, and extraction temperature of 35℃ .
- Lowest average GAE concentration was 12,097 ug GAE/ 1 g PE extracted with 30 mL 90% Ethanol for 5 hours & 20 minutes and extraction temperature of 35℃ .
- Longer extraction time provided higher absorbance values, which indicates either higher polyphenol concentration or multiple polyphenolic compounds.
- Experiment could not identify specific polyphenolic compounds, Micro HPLC or Micro LC would've helped for compositional analysis for each sample.
- Different Polyphenolic compounds can exist at different temperatures, extraction times, solvents (denatured by high temperature or pH of solvent).
- Parameters such as extraction temperature, Solid PE to solvent (ethanol) ratios, extraction solvent ratios, should be further investigated to further optimize the extraction of polyphenolic compounds from peanut skin.

REFERENCES

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[2]. V. L. Singleton, R. Orthofer, and R. M. Lamuela-Raventós, "Analysis of total phenols and other oxidation substrates and antioxidants by means of folin-ciocalteu reagent," Oxidants and Antioxidants Part A Methods in Enzymology, pp. 152–178, 1999.

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