EVALUATION OF THE ANTHOCYANIN AND TOTAL PHENOLIC CONTENT OF SWEET POTATOE UNDER DIFFERENT DRYING REGIMES

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Abstract
In this study, I subjected the same variety of sweet potato grown under the same conditions to different drying method during processing and analyzed for anthocyanin and total phenolic content. The drying methods used are freeze drying, vacuum drying, heat pump drying, air drying, infrared drying, and oven drying. The rank order of Anthocyanin content is as follows: Freeze drying (9.44mgPN3GE/g dw) > Air drying (7.74mgPN3GE/g dw) > Vacuum drying (7.28mgPN3GE/g dw) > Heat Pump Drying (5.31mgPN3GE/g dw) > Infrared drying (5.13mgPN3GE/g dw) > Oven drying (5.12mgPN3GE/g dw). While that of total phenolic content in rank order is as follows: Infrared drying (61.5mg/g dw) > Oven drying (61.3mg/g dw) > Heat Pump drying (60.80mg/g dw) > Vacuum Drying (54.5mg/g dw) > Air drying (53.70mg/g dw) > Freeze drying (51.28mg/d dw).

Index Terms— Anthocyanin, Drying Methods, Freeze drying, Heat pump drying, Phenolic Compounds, Sweet potatoe, Vacuum drying.

1. INTRODUCTION

One of the most important crops in the world is sweet potatoes. This can be attributed to the considerable amount of nutrients and phytochemicals in its root and leaves.

Some of its advantages include high yielding ability, drought tolerance and wide adaptability to various climate and farming systems. It is known to contain high levels of pro vitamin N, vitamin C and minerals [12]. Most studies on the phytochemicals in root and leaves of sweet potatoes shows that the health promoting and disease prevention ability were related to high level of polyphenols [2]. It is also known to be very effective in its antioxidant activities, [6], [11], [9], [1].

In this study, I selected sweet potatoes cultivars of the same variety cultivated under the same conditions and subjected them to different drying methods, and evaluated its phenolic and anthocyanin content.

Drying is the most common form of food preservation. This process improves the food stability since it reduces considerably the water and microbiological activity of the material and minimizes physical and chemical changes during its storage [4]. Drying is the most energy intensive process in food industry therefore new drying techniques and dryers must be designed and studied to minimize the energy cost in drying process [7].

2. Materials and Methods

2.1 Materials

2.1.1 Chemicals and Reagents

Chemicals and Solvents of Analytical grade were used for this experiment. They are gallic acid standard, trolox standard, peonidin-3-glucoside, 2,2, azino-bis(3-ethylbenzthiazolina-6-sultonic acid (ABTS), folin-ciocalteu reagent, 1,1, diphenyl-2-picrylhydrazyl (DPPH).

2.1.2 Sweet Potatoes

Sweet potatoes were collected from the field of National Root Crops Research Institute Umudike, Abia State, Nigeria. They are of the same variety and were grown in the same

field under the same environment and conditions and were cut in 5mm thick sizes.

2.2 METHODS

2.2.1 Sample Preparation

Tubers were taken randomly for each sweet potatoes sample, washed with tap water, diced into approximately 0.5cm cubes. The back sample was divided into seven main samples of 20kg each and was subjected to different drying methods: freeze drying, vacuum drying, heat pump drying, natural air drying, infrared drying, microwave drying and oven drying. Each experiment was repeated three times.

2.2.2 Anthocyanin Content Measure

For preparation of anthocyanin extracts, 1g of sweet potatoes powder was extracted with 8ml acidified MeOH (1N HCl, 85:15, V/v) to obtain a sample to solvent ratio of 1:8. The flasks containing powder/solvent mixture were sealed with aluminium foil to avoid exposure to light. After 12 hours extraction, it was centrifuged (5000rpm, 30mm) and supernatant was collected in amber glass tube. A 1.0ml aliquot of supernatant was diluted with distilled water. The largest absorbance at diluted with distilled water. The largest absorbance at diluted extraction was measured at 280-600mm and each extraction of sweet potatoe was measured at the specific wavelength which the absorbance was largest commercially available peonioin-3-glucoside was used as the standard; and the total anthocyanin values were reported on milligrams peonidin-3-glucoside equivalents per gram dry weight (mg/g dw).

2.2.3 Total Phenolic Content Estimation

The total phenolics in the extracts were estimated by folin-ciocalteu colorimetric method according to[5] with slight modification. Briefly, approximately diluted sample extract (1ml) was added 3.0ml of 20 fold diluted folin-ciocalteu reagent and 1.0ml 0.5m NaOH containing 10% (W/V) $NaCO_3$. The mixture was incubated in a water bath at 50^0c for 15min, then placed in an ice-water bath for 5min. the absorbance was measured at 650mm and used to calculate total phenolics content using a standard curve based on gallic acid. Results were expressed in milligram of Gallic acid equivalent (GAE) per gram dry weight (mg/g dw).

3. Result and Discussion

3.1 Anthocyanin Content

The total anthocyanin content of Freeze dried sweet potato was found to be 9.44mg PN3GE/g dw, and higher than other drying methods. Air dried sample was 7.74mg PN3GE/g dw followed by vacuum dried sample which has anthocyanin content of 7.28 PN3GE/g dw. Heat pump, infrared and oven dried sample has Anthocyanin content of 5.31, 5.13, 5.12 PN3GE/g dw respectively. Anthocyanin is known to be very beneficial to health and a very important component of sweet potato [10].

3.2 Total Phenolic Content

The total phenolic content of extracts from the samples are shown in table I. the total phenolic content in rank over are infrared dried (61.5mg/g dw) > oven dried (61.3mg/g dw) > heat pump dried (60.80mg/g dw) > vacuum dried (53.76mg/g dw) > Air dried (53.70mg/g dw) > freeze dried (51.28mg/g dw). Daily consumption of crops with phenolic components are highly recommended due to their health benefits '

TABLE I: Total phenolic and anthocyanin content of sweet potato sample.

Drying Method	Anthocyanin content (mg/g dw)	Total phenolic content (mg/g dw)
Freeze drying	9.44	51.28
Vacuum drying	7.28	54.50
Heat Pump drying	5.31	60.80
Air drying	7.74	53.70
Infrared drying	5.13	61.5
Oven drying	5.12	61.3

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4. CONCLUSION

In conclusion, drying method plays a very important role on the Anthocyanin and Total Phenolic content of Sweet Potato. Therefore, when processing Sweet Potato, the drying method to be used should be put into consideration depending on what purpose the Sweet Potato will be used for. From the different drying method used, freeze dried sweet potato sample had the highest Anthocyanin content when compared to others while infrared dried sample had the highest Total Phenolic content compared to other drying methods used.

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