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Retention of physicochemical and antioxidant properties of dehydrated bael (*Aegle marmelos*) and palmyra (*Borassus flabellifer*) fruit powders

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Abstract

Present study was carried out to evaluate the effect of various dehydration techniques such as sun drying, solar drying, drying after freezing (Freeze for one hour followed by mechanical drying at 55°C), vacuum drying and drying using lab scale air oven on proximate composition and retention of antioxidants in different fruit powder prepared from Bael (*Aegle marmelos)* and Palmyra (*Borassus flabellifer)*. Moisture content, Total Ash, Crude fiber %, Fat %, Crude protein %, total phenolic content,β –Carotene and antioxidant activity were tested. The antioxidant activity was measured based on the ability of fruit extract to scavenge 1, 1-diphenyl-2-picrylhydrazyl (DPPH). Among different drying treatments the highest fat percentage recorded by the solar dried palmyra fruit powder and there is no significant difference (α= 0.05) between sun drying and vacuumed drying. Higher concentration of β -Carotene and total phenolic content were recorded in vacuum dried samples both in bael and Palmyra fruit powders and it significantly different (α= 0.05) from other treatments. The scavenging activity of bael fruit powder in vacuum drying was ranged from 65.36% to 81.33% of the concentration 200 µg/ml to1000 µg/ml and the palmyra fruit powder was recorded 57.32% to 83.25% of the concentration 200 µg/ml to1000 µg/ml. Vacuum dried fruit powders of palmyra and bael were given highest radical scavenging activity and the scavenging activity of palmyra fruit powder is higher than the bael. Therefore vacuum drying can be recommended as the most effective drying method to protect chemical characteristics and retention of antioxidant properties of fruit powders.

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1. Introduction

Tropical fruits are excellent source of carotenoids, vitamins and minerals. In recent years increasing attention has been paid to the role of diet in human health and among antioxidants, vitamin C has many biological activities on human body reducing level of C-reactive protein, a marker of inflammation and possibility a predictor of heart diseases. Bael (*Aegle marmelos)* is a tropical fruit native to south east Asia and its grown throughout India, Sri Lanka, Pakistan, Bangladesh and most of the Southeast countries. The bael fruit pulp contains many functional and bio active compounds such as carotenoids, phenolics, alcoloids, flevonoids and has innumerable traditional medicinal uses. Drying is the suitable alternative for postharvest management specifically in countries like Sri Lanka where exist poorly established low temperature distribution and handling facilities. It is noted that over 20% of the world perishable crops are dried to increase shelf life and promote food security[2]. Preservation of fruits through drying dates back many countries and is based on sun and solar drying techniques. The poor quality and product contamination lead to the development of alternate drying techniques. However the high moisture content of fruits, approximately 87%, can cause rapid deterioration after cropping. Thus, the dehydration is used to improve fruits stability by decreasing the water activity and microbial activity to minimize physical and chemical reactions that may occur during storage. Besides aggregating commercial value to the fruits drying reduces wastage of postharvest losses and might allow their commercialization for extended period of time with minor dependence of seasonal conditions .The choice of drying method depend on various factors such as type of product, availability of drying machineries, cost of dehydration and final quality of product. Energy consumption and quality of dried products are other critical parameters in the selection of drying process. The aim of this work was to Determination of the influence of different drying methods in preservation of antioxidants and other chemical compounds of selected fruit powders.

2. Materials and methods

2.1 Sample preparation

Bael (*Aegle marmelos)* and Palmyra (*Borassus flabellifer)* were produce from the local market and diseased and damaged fruits were sorted out where as remaining were washed and pulp was taken for preparation of fruit powder. Bael powder was prepared by scooping out the pulp and heat for 1 min. at 80 ºC then passed through the sieve for pulp separation. Palmyra fruits were burn to remove the latex and add water in 1:1 ratio followed by heating for 1 min. at 80 ºC. Pulp was separated by pressing it by hand. Separated pulp (1kg per each) was dried using different dehydration techniques such as sun drying (directly under sun), solar drying (by using direct type sola drier at 55°C), drying after freezing (Freeze for one hour followed by drying at 55ºC), and vacuum drying (JT SELECTA, Spain) at 50 º C and drying using lab scale air oven (ULE-500, Memmert, Germaney) at 55 º C for 24 hrs. Fruit powders were prepared by drying followed by grinding in a mixture grinder and sieved to get fine partials (150 µm).

2.2 Determination of the chemical properties of fresh pulp and dehydrated fruit powders

Moisture, crude protein, crude fat, crude fibre, Total ash were determined in triplicate [1]. β -Carotene content was determined using High Performance Liquid Chromatography (C-R6A, Shimadzu, Japan)[7] with some modifications. Total phenolic content (TPC) of dehydrated food samples were measured by the Folin-Ciocalteu phenol regent and the results were expresses as mg gallic acid equivalents per g of sample as gallic acid as the standard.

2.3. Determination of the antioxidant activity:

2.3.1. Solvent extraction process

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