

Short Communication

QUANTIFICATION OF ASH AND SELECTED PRIMARY METABOLITES FROM NON-EDIBLE PARTS OF SEVERAL FRUITS

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ABSTRACT

Objective: Fruit peel and seeds are generally considered as waste and it creates a trouble in waste management. Economic value and use of the plant partially dependent on the quantitative and qualitative aspects of their organic reserves like sugar, starch, protein etc. The purity of material is associated with the ash analysis. The present study was aimed to analyze selected fruit waste for their ash content and primary metabolites.

Methods: Selected fruit waste was collected, cleaned, dried and powdered. This powdered material was used for analysis. Total ash value, water soluble ash value, and acid insoluble ash were analyzed. Methods proposed by Nelson for total and reducing sugar, Chinoy for starch and Bradford for protein were adopted for estimation of primary metabolites.

Results: Highest content of total ash was recorded $12.73 \pm 0.1\%$ in watermelon peel (WMP), acid insoluble ash $0.94 \pm 0.05\%$ in cucumber peel (CC) and water soluble ash was highest in WMP i.e. $11.44 \pm 0.05\%$. Pomegranate peel (PGP) recorded the maximum amount of total and reducing sugar 44.35 ± 0.20 mg/gdw and 45.68 ± 0.04 mg/gdw respectively. Mango seeds were recorded for highest starch content i.e. 21.86 ± 5.45 mg/gdw. Watermelon peel (WMP) showed the highest protein content i.e. 32.35 ± 0.66 mg/gdw in comparison with other fruit waste materials.

Conclusion: The outcome of this study might prove important in reducing waste and also in industries fruit waste can be utilized as raw materials having commercial importance. Secondary metabolites or bioactive compounds can be synthesized by using these primary metabolites. Obtained findings can lead to a great interest in fruit waste pharmaceuticals.

Keywords: Fruit waste, Primary metabolites, Ash.

India has a remarkable share in world fruit production. Fruits play a very important role in maintaining human health. Fruits and vegetables have always been necessary for growth and development of human life. Fruits are essential for a healthy lifestyle as they are rich in carbohydrates, fiber and micronutrients which are very important for the human body to function properly. Phytochemicals present in fruits is also protective against various diseases [1-3]. These benefits have made a special place for fruits in regular human diet. The ways of fruit consumption have been modified over the years with the increased fruit production. Nowadays fruits and fruit products are available as ready to serve beverages, fruit juice and pulps, dehydrated and frozen fruits products.

A large amount of waste produces in the form of peels and seeds during fruit processing. According to several studies, fruit and vegetable processing in India, the Philippines, China and the USA generate approximately 1.81, 6.53, 32.0 and 15.0 million tons of fruit and vegetable wastes [4-8]. Disposal of this waste is also a trouble. But, nature does not produce any waste. These peels and seeds of fruits are very rich in bioactive compounds, which are considered valuable for health. From last few years, efforts have been made to develop methods and ways of reusing this waste [9, 10] and it has become a bang to reduce environmental pollution. These residues are a rich source of natural antioxidants and dietary fiber [11, 12].

The present study is also an effort towards exploring the nutritive value of selected fruit waste material. Ten different fruit peels and seeds were selected for the study. These waste parts were explored to investigate ash content and primary metabolites such as total sugar, reducing sugar, starch, phenol, and proteins. Ash is the residual inorganic matter which remains after the removal of water and organic substances by heating. Minerals are not destroyed by heating. Ashes give us an idea of the mineral matter contained in a plant [13]. Primary metabolites are found in all plants and perform metabolic roles that are essential for plant growth and development. Primary metabolites are generally distributed within all living organism and are intimately connected with essential life processes.

The primary metabolite also acts as a precursor for bioactive compounds used as therapeutic drugs [14-17].

Ten different fruit peels and seeds viz. Orange peel (ORP), sweet lime peel (SLP), watermelon peel (WMP), cucumber peel (CC), pomegranate peel (PG), mango peel (MNP), mango seed (MNS), custard apple seeds (SS), black plum seeds (JS) and papaya seeds (PPS) were selected for the study. Selected fruit wastes were collected from fruit juice shop and domestic kitchen of the author from Ahmedabad, India. All the materials were cleaned, properly washed, dried under shade and powdered. These powdered plant materials were used for the determination of ash content and primary metabolites.

Ash value is very important parameter to check the purity of the crude drug, in powdered form. It includes determination of total ash value, acid insoluble ash value and water soluble ash value. These ash values were determined as per the protocols from Indian Pharmacopoeia [18-20].

Primary metabolites were quantified by using different protocols. 100 mg dried materials were homogenized separately in mortar and pestle and was used for estimation of total and reducing sugar [21], starch [22] and protein [23] respectively. All experiments repeated in triplicate and presented as means (\pm SD) was calculated.

All plant material was subjected to total ash, acid insoluble and water soluble ash analysis. Minimum total ash was recorded $1.85 \pm 0.10\%$ in custard apple (SS) seeds while the maximum total ash was recorded $12.73 \pm 0.1\%$ in watermelon peel (WMP).

Acid insoluble ash ranged from $0.38 \pm 0.05\%$ to 0.94 ± 0.05 in sweet lime peel (SLP) and cucumber peel (CC) accordingly. Water soluble ash was highest in WMP i.e. $11.44 \pm 0.05\%$ and found lowest in SS i.e. $1.04 \pm 0.69\%$ (graph 1). Evaluation of total ash specifies the purity of the sample by indicating the existence of foreign matters like metallic salts or silica. It has been also noticed that in all plants water soluble ash content is more than acid-insoluble ash content.

This reveals the lower amount of acid insoluble siliceous matter than that of water-soluble ash [24].

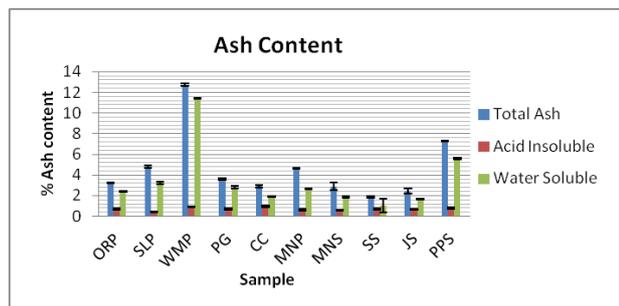


Fig. 1: Ash values in selected fruit waste

All the selected fruit waste parts were evaluated quantitatively for the analysis of total sugar, reducing sugar, starch and protein (graph 2). It has been found that fruit waste materials are rich in metabolites which are involved in the normal growth and also very useful in flavoring, fragrances, in insecticides, sweeteners and natural dyes [25].

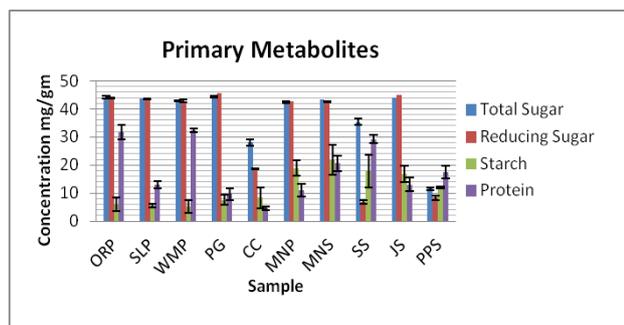


Fig. 2: Primary metabolites concentration in selected fruit waste

Pomegranate Peel (PGP) recorded the maximum amount of total and reducing sugar 44.35 ± 0.20 mg/gdw and 45.68 ± 0.04 mg/gdw respectively. Papaya seed (PPS) showed the minimum sugar content i.e. 11.58 ± 0.41 mg/gdw total sugar and 8.29 ± 0.75 mg/gdw reducing sugar. Plant sugar is very important as artificial sweeteners [26].

Starch is biodegradable and renewable in nature and it is one of the most abundant metabolites in plants [27]. Starch is having many commercial applications as it is used in cosmetic formulations and in dusting preparations that use an aerosol dispensing system. It is also considered as a recyclable alternative for synthetic additives in many products like plastics, detergents, pharmaceutical tablets, pesticides, cosmetics and even oil drilling fluids [28-31]. Starch quantity was recorded between 5.21 ± 2.15 mg/gdw (WMP) and 21.86 ± 5.45 mg/gdw (MNS-Mango Seed).

Watermelon Peel (WMP) showed the highest protein content i.e. 32.35 ± 0.66 mg/gdw and cucumber peel (CC) reported for having the lowest protein content i.e. 4.42 ± 0.66 mg/gdw. Proteins are the primary components of living things and its higher concentration in plant indicates possibilities toward their increase food value or that a protein base bioactive compound could be isolated in future [32,33].

Fruit waste materials having good amount of primary metabolites which can be utilized in industries as raw materials having commercial importance. Secondary metabolites or bioactive compounds can be synthesized by using these primary metabolites. Obtained findings can lead to a great interest in fruit waste pharmaceuticals.

CONFLICT OF INTERESTS

Declared None

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