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RESEARCH ARTICLE

Effect of Blanching on Nutritional Composition of *Rasbhari (Physalis peruviana)* Fruit

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Abstract

In nature there are many underutilized fruits of promising nutritive value, which can nourish even the increasing human population. The crops, which are neither grown commercially on large scale nor traded widely, may be termed as underutilized horticultural crops. These crops are cultivated, traded and consumed locally. These have many advantages like easier to grow and producing a crop even under an adverse soil and climatic conditions. In India various types of underutilized foods are available seasonally but are not utilized to the extent they should be in spite of their higher nutritive value. *Physalis peruviana* is one of the important lesser known fruit of Indian origin, belonging to the Solanaceae family, and is locally known as *Rasbhari.* The *Rasbhari* fruit is in the shape of a small, round and exotic berry, with a pulp ranging from yellow to dark orange, and protected by papery husks. The present study was conducted to estimate nutrient content of the *Rasbhari* fruit and to find out effect of blanching. The estimation of proximate nutrients revealed mean protein content of the fruit to be 1.51g/100g in unblanched sample, which reduced to 1.33g/110g on blanching. The mean fat content (1.25g/100g) also reduced on blanching (0.86g/100g). On the other hand, mean fibre and ash contents showed nutrient retention on blanching. Estimation of micronutrients too, showed retention of β-carotene and vitamin E content, whereas mean content of vitamin C decreased post blanching.

Keywords: Blanching, Nutrients, *Physalis peruviana, Rasbhari* Fruit

Introduction

Fruits and vegetables are considered as an important part of a good diet. Besides their delicious taste and flavour, they are known to reduce risk of several chronic diseases. Fruits and vegetables contain significant amounts of phyto-constituents, which are inversely associated with the morbidity and mortality from cerebro-vascular and cardiovascular diseases and various types of cancers (Parashar *et al.*, 2014).In India, rich asset of wild or underutilized fruits is accessible, which has newly drawn attention of numerous researchers as natural sources for treatment of different sicknesses. A few studies on underutilized fruits have guaranteed them to be better substitute of supplements (Das, 2012).

Underutilized species have been described using various terms, *viz.* minor, customary, ignored, new, substitutive, lost, vagrant, promising, unused, and so on. In addition to their significance for nutritive composition, assorted qualities of these fruits have traditional and social esteem and add to the strength of ecosystem. Underutilized fruits are not widely grown, and their utilization and exchange stay to be more constrained. Though, numerous are of extensive financial significance in their particular local market place (Roy, 2014).Some negative aspects of these fruit crops are that these have lesser credentials, almost missing or improper structured promoting system, indigenous knowledge, which receives little attention in institutional policies, research and development, *etc.*(Roy, 2014). In India, about 27 percent of the fruit production consists of a large number of underutilized fruits. There are nearly 150 consumable species of underutilized fruits in India (Majumder, 2004).

Rasbhari (*Physalis peruviana*) is one such underutilized fruit that belongs to the Solanaceae family and is being cultivated in Egypt, South Africa, India, New Zealand, Australia and Great Britain (Osman *et al.*, 2013). The *Rasbhari* fruits are entitled as goldenberry, gooseberry, cape gooseberry, and winter cherry all over the world (Perk *et al.*, 2013).The fruit is a little, round and glamorous berry, with colour of pulp going from yellow to dull orange, like tomato. The fruit may contain somewhere around 150 and 300 seeds, with a measurement running somewhere around 12.5 and 25.0 mm and weighing from 4 to 9 g each. It is encased in a papery husk, known as the calyx (Licodiedoff *et al.*, 2013).

Rasbhari is an herbaceous, semi-bush, up-straight, and perennial plant in subtropical zone. It is considered as a medicinal plant and is broadly utilized in traditional

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drugs as anticancer, antipyretic, antispasmodic, diuretic, germ-free, narcotic pain reliever; reinforce the optic nerve, gullet relief, disposal of gastric parasites, albumin and amoebas from kidneys and furthermore to treat illnesses, like dermatitis, malaria, asthma, stiffness and hepatitis (Wu, *et al.*, 2004; Arun and Asha, 2007; Hassanien, 2011).

Blanching is commonly used in food processing to inactivate enzymes and destroy microorganisms. It is a process of exposing fruits and vegetables to high temperatures for a short period. This process not only prolongs the shelf life of fruits and vegetables by inactivating the enzymes responsible for browning, but also improves both colour and flavour (Nurhuda *et al.*, 2013). However, when food is exposed to high temperatures, usually it experiences an adverse effect on quality (loss of texture and undesired colour changes) and nutrient content or bioavailability of some nutrients (Volden *et al.*, 2008).

In the present research an effort has been made to estimate the proximate nutrient content and vitamin content of *Rasbhari* fruit and further find out effect of blanching process on their content.

Materials and Methods

Collection and Preparation of Sample

Rasbhari fruit was procured from the Horticulture Centre, Jaipur and local market, Jaipur city. Once the fruits were procured, their outer covering (husk) was removed manually and divided into two lots – one lot of fresh fruits was cut into four slices, dried in hot air oven at 60°C and then ground into a fine powder, using blender (Rangana, 2010). The powder was then stored in zip lock bag and placed in clean air tight container. The second lot of the fruits was subjected to blanching process. For this, the clean and isolated fruits were blanched in hot water at 90°C for 5 minutes and then dipped in cold water (10-12°C) for 2 minutes (Yan *et al.*, 2010). The blanched pulp was then dried in hot air oven at 60°C and then ground to fine powder, using a blender and stored in zip lock bag in air tight container.

Nutrient Analysis

Proximate content of blanched and unblanched samples of *Rasbhari* fruit was estimated using standard procedures given by AOAC (2005). For total nitrogen determination, the Kjehdal method was used, which was estimated using a Kjeltec system. The protein was calculated from total nitrogen obtained, using a factor of 6.25. Soxhlet extraction method was used to measure fat content of *Rasbhari* fruit, using petroleum ether as a solvent. Crude fiber was obtained after acid-alkali treatment of the samples with diluted acid and alkali. Moisture was determined from weight loss of the sample on oven drying. Ash content was estimated after heating the sample at 500°C in Muffle furnace. Carbohydrate was calculated by difference, *i.e.*by subtracting the sum of values for protein, fat, fiber, moisture and ash from 100. Energy value was calculated using values of protein, carbohydrate and fat content. For estimation of β-carotene content, HPLC (High Pressure Liquid Chromatography) method (Ahamad *et al.*, 2007) was used. Vitamin E content was also estimated using HPLC method (Rachieru *et al.*, 2009). Vitamin C content was determined titrimetrically (Sharma, 2007).

Analysis of proximate nutrients and vitamins was carried out on five samples of *Rasbhari* fruit, each in triplicate. The mean and standard deviation of the estimated values were calculated for each nutrient.

Results and Discussion

The unblanched *Rasbhari* fruit (100g) on drying in hot air oven produced 15.72g of dry powder and blanched fruit produced 16.28g of dry powder, which was then used to estimate proximate nutrients and vitamins. The nutrient analysis of the fruit revealed mean moisture content of the unblanched sample to be 84.28±0.36g/100g and that of blanched sample to be 83.72±0.92g/100g indicating that blanching process caused decrease in moisture content of the fruit. The reduction was however, not significant (Table 1).The research carried out by Adeni and Tenkouano (2008) on banana pulp, too revealed decrease in moisture content on blanching. Estimation of fat value too, showed significant reduction in its value on blanching of the fruit. The mean fat content of the unblanched sample was 1.25±0.51g/100g, which reduced to 0.86±0.66/100g on blanching. This is in line with the work of Ahmed and Ali (2013) who reported a reduction in fat content of white cauliflower vegetable when subjected to blanching process. The reason attributed was that blanching might have led to fat oxidation at high temperature or could have been due to leaching.

On the other hand, retention was observed in case of fiber content of the fruit on blanching, however it was not significant, the same being 1.64±0.73g/100g in blanched fruit sample and1.40±0.82g/100g in unblanched sample. Similar results have also been reported by Akande *et al.*, (2014) who carried out a study on the effect of blanching on negro pepper. Ahmed and Ali (2013) who investigated the bioactive compounds of fresh and processed white cauliflower also reported retention of fiber on blanching. Retention of fiber on blanching is advantageous since fiber performs important role of promoting soft stools (Akande

et al., 2014). Mean content of ash (6.62±0.81g/100g) was found to be significantly higher in blanched fruit sample, than unblanched sample (4.82±0.68g/100g). This indicates that mineral retention is enhanced on blanching, which has also been reported by Akande *et al.*, 2014 in their study conducted on negro pepper.

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Table 1. Mean Proximate Nutrient Content of *Rasbhari* Fruit (unblanched and blanched)

Nutrients	Unblanched sample	Blanched sample
Moisture (g/ 100g)	*84.28 ± 0.36[a]*	*83.72±0.92[a]*
Fat (g/ 100g)	*1.25 ± 0.51[a]*	*0.86± 0.66[b]*
Fiber (g/ 100g)	*1.40 ± 0.82[a]*	*1.64± 0.73[a]*
Ash (g/ 100g)	*4.82 ± 0.68[a]*	*6.62 ± 0.81[b]*
Protein (g/ 100g)	*1.51 ± 0.73[a]*	*1.33± 0.57[b]*
Carbohydrate (g/ 100g)	*6.75 ± 0.54[a]*	*5.83± 0.63[b]*
Energy (Kcal/ 100g)	*44.29±0.87[a]*	*36.38±0.75[b]*

Mean ± Standard deviation
Mean with different superscript in a row denote significant difference ($p \leq 0.05$)
Mean with same superscript in a row denote no significant difference ($p \leq 0.05$)

The mean protein content of unblanched sample of *Rasbhari* fruit was found to be 1.51±0.73g/100g. The blanching technique caused a significant reduction in its content (1.33±0.57g/100g). This could be attributed to leaching out of soluble components of protein into the water used for blanching, since it was discarded, which would have led to loss of some protein (Adeparusi, 2001). Carbohydrate content was found to reduce significantly after blanching. Mean carbohydrate content of unblanched fruit was 6.75±0.54g/100g and that of blanched sample was 5.83±0.63g/100g (Table 1). Reason attributed for reduction of carbohydrate content on blanching could be that blanching leads to thermal hydrolysis, which in turn causes formation of simple carbohydrate that, are relatively soluble and could leach out in water. The energy value calculated on the basis of fat, carbohydrate and protein content of the fruit showed higher values in unblanched sample than the blanched sample and the difference being significant. Higher energy values in unblanched sample of *Rasbhari* fruit could be attributed to the higher content of the three energy giving nutrients in comparison to that in blanched fruit sample (Table 1).

Vitamins act as antioxidants that block harmful chemical reactions caused by oxidation in a human body. These are found in many fruits and vegetables (Wiel and Low, 2014). In the present study estimation of β-carotene, vitamin C and vitamin E was carried out using standard techniques.

The mean β-carotene content of *Rasbhari* fruit in blanched sample was found to be significantly higher than in its unblanched sample, *i.e.* 2327.27±1.03µg/100g and 1963.64±1.27µg/100g respectively, indicating retention of the nutrient. Mean vitamin E content too showed retention of the nutrient on blanching, the same being 0.39±0.85mg/100g in blanched fruit sample and 0.20±0.81mg/100g in unblanched sample (Table 2). The attributed reason could be that blanching helps to release bound carotenoids and make them easily extractable. Blanching results in an increase in the β-carotene content perhaps because of greater chemical extractability and loss of moisture and soluble solids which further concentrate the sample. Inactivation of certain oxidative enzymes takes place and it results in the breakdown of some structures leading to retention of β-carotene content (Dutta *et al.*, 2005).

Table 2. Mean Vitamin Content of *Rasbhari* Fruit

Vitamins	Unblanched sample	Blanched sample
-carotene (µg/ 100g)	*1963.64 ±1.27[a]*	*2327.27 ± 1.03[b]*
Vitamin C (mg/ 100g)	*63.63 ± 0.92[a]*	*44.04 ± 0.77[b]*
Vitamin E (mg/ 100g)	*0.20±0.81[a]*	*0.39±0.85[a]*

Mean ± Standard deviation
Mean with different superscript in a row denote significant difference ($p \leq 0.05$)
Mean with same superscript in a row denote no significant difference ($p \leq 0.05$)

Mean vitamin C content, estimated titrimetrically, was found to be 63.63±0.92 mg/100g in unblanched sample and 44.04±0.77mg/100g in blanched sample (Table 2). Estimated values revealed significant decrease in vitamin C content in the blanched fruit sample. This could be due to the fact that vitamin C is by far the least stable nutrient during processing; it is highly sensitive to oxidation and leaches into water during processing (Franke *et al.*, 2004; Patras *et al.*, 2011).

Conclusion

Rasbhari fruit is recognized for centuries, but the potential of the fruit has been merely explored. It is an underutilized edible fruit that belongs to the Solanaceae family and grown in subtropical regions.The fruit was estimated for its nutrient content, which revealed considerable amount of proximate nutrients and vitamins in both, unblanched and blanched samples. However, blanching caused reduction in number of nutrients, but beinga commonly

used processing technique in food industries to inactivate enzymes and destroy microorganisms, the process is required for better shelf life. *Rasbhari* can be a very interesting fruit for processed new purposeful foods and drinks. There is a wide scope for scientific exploration of *Rasbhari* as an innovative source of bioactive and functional food.

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