Effect of pretreatment and concentration of sugar solution on retention of nutritional parameters of osmodried whole amla (Phyllanthus emblica L)

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Abstract - Ascorbic acid and poly phenols of amla are important components of our nutrition because of their antioxidant and disease resistant capacities. However the loss of nutritional value depends on processing and storage of amla. Thus osmodehydration of amla using sucrose solution (300-600 B) was studied with respect to vitamin C, naringin and total phenol content. The samples under study were untreated, water blanching and prickling, prickling and water blanching, steam blanching. The study revealed that maximum retention of Vitamin C (2.1±0.15 mg/g fruit), naringin (1.9±0.11 mg/g fruit) and total phenol (37.5±1.11 mg/g fruit) was observed for amla with prickling after blanching in boiling water for 2-3 mins, compared to untreated amla of 0.5±0.02 mg/g fruit Vitamin C, 33.3±0.24 mg/g fruit total phenol and 1.5±0.06 mg/g fruit naringin content. The products were stored successfully for 6 months in glass container.

Keywords: Amla, Sucrose, Vitamin C, Naringin, Phenol

I. INTRODUCTION

Amla (Phyllanthus emblica L) also known as amlaki, aonla or Indian Gooseberry is one of the important fruits which has high nutritional value. It is rich in ascorbic acid content and possesses antiscorbutic, diuretic, laxative and antibiotic properties. It contains polyphenols like ellagitannins and gallic acid. However amla fruits are very astringent in taste and highly perishable in nature. Therefore processing of amla is very much needed to improve its taste and extension of shelf life.

Osmotic dehydration is one of the most widely studied preservation techniques. The process involves immersion of fruits and vegetables in hypotonic aqueous solution of osmotic agents commonly used are salt and sugar. The semipermeable nature of cell membranes of fruits and vegetables results diffusional mass transfer like passage of water from fruits and vegetables to solution resulting loss of water from it, transfer of solute from solution to sample. In addition solute of fruits and vegetables leaches out from the sample to solution. Thus nutrient loss occurs during osmotic treatment. But impregnation of commodities with osmotic agent improves texture sensory properties and dietary value. However the nutritional value of osmodried product depends on dehydration process parameters and application of osmotic agent.

Hence the objective of our study was to evaluate the effect of sucrose concentration on retention of Vitamin C, naringin and phenolic content of pretreated amla compared to control. The osmodried amla products were stored at 30°C.
II. MATERIALS AND METHODS

Fresh amla fruits were purchased from local market. The amla were cleaned thoroughly with tap water to remove adhering dust, foreign matter and wiped with a muslin cloth. The treatments prior to osmodehydration consisted of

(a) Whole fruits without any blanching were considered as control
(b) Water Blanching prior Pricking
(c) Pricking prior water Blanching
(d) Steam Blanching

Whole amla fruits were dipped in boiling water for 2-3 mins followed by cooling with cold water. Then amla fruits were pricked with the help of a needle. A portion of sample was first pricked with needle and then dipped in boiling water for 2-3 mins and immediately cooled by cold water. Steam Blanching was done in autoclave at 15 p.s.i pressure for 10 mins. The samples were separately dipped in sugar solution of 30⁰B. The concentration of sugar syrup increased upto 60⁰B. After 60⁰B samples were dried at 50⁰C temperature for 7 hours and packed in glass container for storage study. Samples were analysed for Vitamin C, naringin and total phenol content.

Analytical parameters:

TSS was measured by Hand Refractometer (Erma Inc., Tokyo, Japan) and expressed in terms of ⁰B. Total phenolic content was determined by folin-ciocalteu method¹² at a wavelength of 765 nm using gallic acid standard and expressed as mg of gallic acid/g of fruit. Ascorbic acid was determined by titrimetric method¹³ and the value expressed as mg of ascorbic acid /g fruit. Naringin content was determined by Davis Value Test at a wavelength of 420nm using naringin standard and the value expressed as mg of naringin/g fruit¹³.

III. RESULTS AND DISCUSSION

Initial vitamin C content of amla was 4.7±0.14 mg/g fruit. The pretreatments given to the amla fruit before osmotic drying effects the retention of vitamin C. From the table 1 it is clear that retention of vitamin C in the control sample was minimum retaining only 0.5±0.02 mg/g fruit. While maximum retaining of vitamin C shows in the pricking after water blanching sample (2.1±0.15 mg/g fruit) followed by pricking before water blanching (1.3±0.03 mg/g fruit).

<table>
<thead>
<tr>
<th>Sample</th>
<th>Vitamin C(mg/g)</th>
<th>Naringin(mg/g)</th>
<th>Total Phenol(mg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sucrose solution (⁰B)</td>
<td>Sucrose solution (⁰B)</td>
<td>Sucrose solution (⁰B)</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>Control</td>
<td>4±0.25</td>
<td>2.85±0.08</td>
<td>1.5±0.03</td>
</tr>
<tr>
<td>WB+P</td>
<td>2.85±0.12</td>
<td>2.8±0.08</td>
<td>2.7±0.07</td>
</tr>
<tr>
<td>P+WB</td>
<td>1.7±0.03</td>
<td>1.4±0.02</td>
<td>1.35±0.03</td>
</tr>
</tbody>
</table>

Table 1: Effect of concentration of sucrose solution on vitamin C, naringin and total phenol of whole amla
Ascorbic acid being an unstable compound decomposed easily under undesirable conditions\textsuperscript{14}. Among treated sample steam blanching results higher loss in Vitamin C retaining (0.7±0.015 mg/g fruit). Sagar et al reported thermal degradation of amla during osmotic process\textsuperscript{15}. In case of naringin content little change were observed with pretreatments of amla and it was (1 to 1.9 mg/g fruit) for treated samples. Reduction in total phenol content was observed with increase in concentration of sucrose solution and at 60\degree B total phenol content (37.5±1.11 mg/g fruit) was maximum with blanching prior prickling sample. Retention of total phenol content was minimum in steam blanching (20±0.64 mg/g fruit) followed by prickling before blanching (33.33±0.47 mg/g fruit).

Table 2: Nutritional parameters of osmodried amla after 6 months of storage

<table>
<thead>
<tr>
<th>Sample</th>
<th>Vitamin C(mg/g)</th>
<th>Total phenol(mg/g)</th>
<th>Naringin(mg/g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB+P</td>
<td>1±0.11</td>
<td>31.25±0.46</td>
<td>1.25±0.1</td>
</tr>
<tr>
<td>P+B</td>
<td>0.5±0.02</td>
<td>29.16±0.3</td>
<td>0.62±0.03</td>
</tr>
<tr>
<td>SB</td>
<td>0.5±0.01</td>
<td>12.5±0.24</td>
<td>0.42±0.03</td>
</tr>
</tbody>
</table>

Table 2 represents the nutritional parameters of osmodried amla after 6 months of storage. Ascorbic acid content of osmodried amla decreases further when stored for 6 months. The retention was highest in water blanching prior prickling (1±0.11 mg/g fruit). Loss of naringin is highest in steam blanching retained only (0.42±0.03 mg/g fruit). Maximum amount of naringin revealed in blanching prior prickling sample (1.25±0.1 mg/g fruit). Maximum total phenol retained in prickling after water blanching (31.25±0.46 mg/g fruit) and minimum in steam blanching (12.5±0.24 mg/g fruit). In all cases loss in Vitamin C, naringin and total phenol occurs but loss was minimum for water blanching prior prickling samples. Control (Unblanched) samples became unacceptable within 8-9 weeks of storage due to dark brown coloration of amla. This may be due to faster rate of browning reaction of control samples than other pretreated samples.

However retention of nutritional content was not so significant between pretreated samples but better than control sample and can be stored upto 6 months in glass container.

**IV. CONCLUSION**

Whole amla can be preserved by osmotic dehydration process. Retention of nutritional parameters was maximum for amla fruits pricked after blanching. Samples were successfully stored up to 6 months at room temperature. Further studies are needed to prepare better quality product.

**V. ACKNOWLEDGEMENT**

The financial assistance of University Grant Commission in carrying out this work is gratefully acknowledged.

**VI. ABBREVIATION**
WB+P- Water blanching prior prickling, P+B- Prickling prior water blanching, SB- Steam blanching

REFERENCES


