Development of Traditional Snack Product - Moong Dal Laddu using Under-Utilized Pomegranate Peel Powder

Jonathan George, Aksharaa Kannan, R Emilin Renitta

Abstract: In the present study, pomegranate peel (Punica granatum) along with its secondary metabolites was incorporated into an indigenous product - Moong Dal Laddu, and checked for its total phenol content. The total activity of antioxidants in pomegranate peel was estimated and nutritive content of the product was enhanced in various in-vitro studies. The total phenolic content with brown sugar was obtained 236.93 mg/100g of final product which is higher compared to the sample with white sugar and control sample with 173.32 mg/100g and 16.45 mg/100g respectively. Due to the identification of high amount of antioxidant activity obtained from the peel, it has been used in the fortification of the indigenous product with claim of reducing of the risks related to cardiovascular diseases.

Keywords: pomegranate peel, indigenous product, antioxidant, cardiovascular disease

I. INTRODUCTION

In the recent years, the identification of phenolic compounds from various agro products has taken an important part of research in the medical and nutraceutical industries (Kushwaha et al., 2013). Bio-active compounds extracted from agro waste products has added the value of the original crop which is otherwise destroyed. Pomegranate is at present the most broadly investigated phenol sources with beneficial properties with polyphenols, anthocyanins, ellagitanins, flavonoids which is found to have potent antioxidants activity (Verotta et al., 2018). Along with the edible arils of the fruit the non-edible portion importantly the peels are also beneficial (Singh et al., 2018). Potent antioxidants are found more in the peel compared to juice, when compared to the pulp and other fractions of seed FRAP method was used (Hossin fatma labib ahmed, 2009). The objective is to study and develop an indigenous sweet incorporated with pulverized pomegranate peel powder and analyze its antioxidant contents.

II. MATERIAL AND METHODS

A. Pomegranate Peel Powder Preparation (PPP)

Pomegranate peels from fresh fruit were procured from fruit shops in Karunya nagar, Coimbatore, Tamilnadu, India. The peels are washed with distilled water and dried by using cross flow drier at 50°C for 18 hours. It is then finely ground by using hammer mill and they are passed through a 150mm sieve to obtain particles of equal size (El-Batawy et al., 2014).

B. Raw materials used

- Moong Dal Powder
- Pomegranate Peel Powder
- Clarified Butter
- White Sugar
- Palm Sugar
- Brown Sugar

C. Characterization of Pomegranate Peel Powder

Moisture Content Estimation

The dish without sample and the closure of dish plate are dried using an oven at 105 °C for 3 hours and moved to desiccator for cooling. They are then weighed. A sample of 3g is weighed into the dish and spread with a spatula. The dish is then placed in the oven with the sample and dried 3 hours at 105°C. The dish is taken out after drying and placed in the desiccator, partly closed, to cool. Reweigh dish and dry sample.

Percentage moisture =

(Weight of PPP before drying in grams – Weight of PPP after drying in grams) * 100 / (Weight of PPP before drying in grams)

Determination of Fiber Content

2 g of finely ground sample is defatted by treatment of petroleum ether. The powder is then boiled for 30 minutes with 200 ml of sulfuric acid and bumping chips. The extract is then filtered with boiling water through a muslin cloth until the residue is no longer acidic and boiled for 30 minutes with a 200 ml of NaOH solution. It is filtered and cleaned again using boiling 1.25% H2SO4 at 25ml, using 3 parts of H2O and 3 parts of Alcohol at 25 ml for both water and alcohol. The residue is then removed and transferred to an ashing dish weighing. The residue is then dried for 2 hours at 130 °C. The dish is then cooled in a desiccator and
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weighed again. It is then ignited for 30 minutes at 600°C and cooled in a desiccator and reweighed (Dai and Mumper, 2010).

%Crude Fiber in the ground sample = ((Weight of pre-dried PPP in grams – Weight of initially prepared PPP in grams) - (Weight of ignited PPP in grams - Weight of initially prepared PPP in grams) / weight of PPP initially taken)*100

Protein Estimation

0.5 g of sample was used for the estimation of protein which was done according to the Kjeldahl method of AOAC method 955.04 (AOAC, 2006).

Total Polyphenol Content

Overall polyphenolic contents in the moong dal laddu was found using Folin Ciocalteau reagent. Methanolic extract of 0.5 ml is taken and 2.5 ml Folin-Ciocalteau’s reagent (10%) dissolved in water and 2.5 ml Sodium Bicarbonate (7.5%). The PPP are incubated in a thermostat (45 °C for 45 min). Absorbance determination done at 450 nanometers. Concentration is read at milligram / millilitre from calibration line and phenolic content expressed in Gallic Acid (GA) equivalents (milligram Gallic Acid /gram of the PPP sample) (Singleton et al., 1999).

Determination of Antioxidant activity

A fresh working solution for FRAP assay is prepared by adding 0.01M 2, 4, 6-tripyridyl-s-Triazine (2.5 ml) solution in HCl and added with 2.5 ml of 0.02M FeCl3.6H2O solution to 25ml of acetate buffer (0.3 ml) of pH 3.6. The resulting mixture is heated to 37°C. 150 µL of PPP extract is mixed with 2850 microliter FRAP solution is incubated in dark for 30 minutes. Optical Density measured at 593 nm (Hosu et al., 2016).

D. Product Development

Process Flow Chart

Fig.1. Process Flow Chart

Formulation Variants of Moong Dal Laddu

To improve the nutritional value and taste of the moong dal laddu, the PPP was incorporated with different sugars at different proportions. To reduce the bitter taste of tannins, cardamoms are used in the proportions for good product. The pomegranate peel powder variations were done as 2.0%, 3.0%, 5.0%, 7.5%, 10% and 12% of the total weight of the raw material mixture.

Sensory Evaluation

Evaluation was based on nine point hedonic scale. The judgement given by trained also untrained panelists on basis of Appearance, Taste, Texture, Aroma and Overall Likeability.

III. RESULTS AND DISCUSSION

A. Biochemical Composition of PPP

Table 1: Biochemical Composition of PPP

<table>
<thead>
<tr>
<th>Parameters</th>
<th>PPP</th>
<th>Control Sample</th>
<th>7.5% PP with white sugar</th>
<th>7.5% PP with brown sugar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture (%)</td>
<td>4.75</td>
<td>3.9</td>
<td>2.52</td>
<td>2.26</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>3.06</td>
<td>10.69</td>
<td>9.63</td>
<td>8.1</td>
</tr>
<tr>
<td>Crude Fiber (%)</td>
<td>19.03</td>
<td>1.94</td>
<td>1.53</td>
<td>2.33</td>
</tr>
<tr>
<td>Total Phenol Content (mg/100g)</td>
<td>9785.90</td>
<td>16.45</td>
<td>173.32</td>
<td>236.93</td>
</tr>
<tr>
<td>Total Antioxidant activity (mg/g)</td>
<td>326.08</td>
<td>0.557</td>
<td>4.761</td>
<td>4.880</td>
</tr>
</tbody>
</table>

Data in Table 1 indicates that the moisture content ranged from 2.52% - 3.9% in the product both control sample and trial samples, protein varies from 10.69 in control sample with 9.63 and 8.5 in the trial samples. This reduction in protein may be attributed to the interaction of proteins and the lipids and formation of complexes between proteins and polyphenols leading to destruction of specific amino acids (Mauron, 1990).

The crude fiber values again range from 19.03 in PPP to 1.53, 1.94, 2.33 in control sample, Trial 1, Trial 2 respectively. The high level of crude fiber in PPP is due to the non-digestible cellulosic part like cellulose, hemicellulose and lignin. The varying trend of the crude fiber in the control and the trial samples may be due to interaction with other components or also due to the nature of raw material used (Kushwaha et al., 2013).

Total Phenol Content of the samples vary from 16.45 to 236.93. The positive trend in increase is due to the supplementation of control sample with PPP which has a Total Phenol Content of 9785.90 mg/100g.

Fig. 2. Total Phenols Vs Antioxidant Activity
From earlier works related to addition of PPP in foods to increase its functional aspect (Paul and Bhattacharrya, 2015), it has concluded that the addition of PPP has showed highest levels of Total Activity of Antioxidants and Phenol Count (Altunkaya, 2013). Further comparing the Total Activity of antioxidants and Phenol Count Contents in individual products, our product (moong dal laddu), shows a significantly higher amount than other products like bread, cookie (Paul and Bhattacharrya, 2015), yoghurt (El-Batawy et al., 2014).

This may be because, this traditional sweet involves minimal heating or processing or any other changes like fermentation which may alter the nutritional properties. Hence this product could be used as a potential source for Total Antioxidant Activity and to reduce risk of Cardio-vascular disease.

**B. Sensory Evaluation**

![Fig.3. Sensory evaluation chart](image)

The texture and smell of 7.5% PPP with unrefined sugar has an average score of 7.5 in the 9 – Point hedonic scale and the overall likeability also comes within acceptable range.

**IV. CONCLUSIONS**

It is observed from this work that pomegranate peel powder when added to an indigenous sweet increases its value in terms of the antioxidant value. It was also observed that unlike most of the other fortified product like breads, cookies where the maximum amount of powder used for fortification is 5%, this product has 7.5% of PPP by weight. Hence it can stand true to its claim of reducing the risk of Cardio-vascular diseases. Further work can also be done by substituting sugar with other non-calorie sweeteners aiming the calorie conscious population. Also work on analyzing the individual flavonoids present in the product can be done.

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**REFERENCES**


