Study on effect of custard apple leaf extract on physico-chemical properties of aonla juice


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ABSTRACT

The leaf extract was prepared by shade drying of leaves for 4-5 days, the dried leaves were pulverized and boiled in water bath with distilled water to get the liquid extract. Further the liquid extract was centrifuged and then supernatant was spray dried to get powdered extract. Sweetened aonla juice formulation was made with different proportion of custard apple leaf extract varying from 0 to 15 g in increasing order from control (0) to A1 (5g), A2 (10g) and A3 (15g ) respectively. The prepared juices were analyzed for physico-chemical composition and sensory evaluation. The retention of quercetin [(a flavonol, is a flavonoid, in other words, a plant pigment with a molecular structure like flavone. It is found in fruits, vegetables, leaves and grains. It can be used as an ingredient in supplements, beverages, or foods having nutraceutical value.)] in aonla juice sample A1, A2, A3 was 15.20, 32.80 and 49.75 mg per 1000 ml. Sample A2 (10g custard apple leaf extract) scored highest score for overall acceptability was 8.8.

Key words: Aonla juice, Custard apple leaf extract, Quercetin, Sensory evaluation.

INTRODUCTION

Custard apple (Annona squamosa) (family: Annonaceae) and Tribulusterrestris (family: Zygophyllaceae) are two common plants of India and well described for their traditional medicinal values. Anti-diabetic potential of both the plant has been investigated by different researchers. Methanol extract of aerial parts of Tribulusterrestris possess anti-diabetic effect against streptozotocin induced diabetes (El-Tantawy et al., 2007) and anti-diabetic potential of saponins isolated from the plant also investigated in alloxan induced diabetic mice (Li et al.,2002). Different researcher also investigated the anti-diabetic potential of ethanolic and aqueous extract of Annona squamosa leaf against different type 1 and type 2 diabetic model (Gupta et al.,2005, Kaleem et al., 2008). Annona squamosa L. (Annonaceae), commonly known as custard apple is a native of West Indies and is cultivated throughout India, mainly for its edible fruit. The plant is attributed with medicinal properties, (Shirwaikar et al., 2004).

The young leaves of annona squamosa are used extensively for its anti-diabetic activity by tribal men in and around the villages of Aligarh district in the state of Uttar Pradesh, India (Atique et al., 1985) and also by the people of Chota Nagpur district in the state of Bihar, India (Topno, 1997).

In Aligarh district villagers take a mixture of 4–5 newly emerged young leaves along with five grains of black pepper (Piper nigrum) early in the morning for the treatment of diabetes, with continued therapy ensuring up to 80% positive results. The treatment is particularly common and popular in the Lodha community where the plant is considered to be a holy fruit. The formula is being successfully used by some Unani and Allopathic physicians and is in existence till date. Black pepper is reported to be commonly used as a bioavailability enhancer (Atal et al., 1981) and piperine isolated from pepper fruits has been patented as a bioavailability enhancer (Majeed et al., 1998). The aqueous leaf extract of annona squamosa has also been reported to ameliorate hyperthyroidism which is often considered as a causative factor of diabetes mellitus (Sunanda and Anand, 2003).

Quercetin may also induce insulin secretion by activation of L-type calcium channels in the pancreatic β-cells (Bardy et al., 2013).Quercetin is shown effective against numerous conditions. According to the University of Michigan Health System, studies prove Quercetin’s ability to fight and help treat prostatitis, allergies and type 1 and type 2 diabetes. (University of Michigan Health System, 2014). At present, an increased consumer interest in diet and health is being observed. The food producers tend to produce safer food choices to meet consumers’ demand. A healthy food is a food believed to be highly beneficial to health which generally contains lots of fruits and vegetables and is low in fat, salt and sugar that may contribute to high risk of health problems regarding to diabetes, obesity, high blood glucose/cholesterol, teeth decay and cancer (Knecht 1990).

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MATERIALS AND METHODS

Custard apple leaves, distilled water, ethyl alcohol, spray dryer, pulverizer, Whatman No.1 filter paper, fresh aonla, mesh, blender, centrifuge, spectrophotometer.

Preparation of custard apple (Annona squamosa) leaf extract: The aqueous extract was prepared by cold maceration of 50 g of the shade-dried leaf powder in 1000 ml of distilled water and allowed to stand overnight and boiled for 5-10 hours till the volume was reduced to half of its original volume. The solution was then cooled, filtered, concentrated and spray dried in spray drier at temp. 130°C (yield 7 g) and the powder stored in a refrigerator at 2-8°C for subsequent experiments. Preparation of custard apple (Annona squamosa) leaf extract is given in figure 1. (Kaleem et al., 2006)

Selection of custard apple (Annona squamosa) leaves

Leaves of custard apple plants were shade dried (For 5-6 days)

Pulverized and passed through sieve 40 mesh

Cold Maceration
(Allowed to stand overnight)

Boiled till the volume was reduced to half of its original volume
(For 5-10 hours)

Solution was then cooled and filtered
(By using Whatman No.1 filter paper)

Centrifugation of filtrate was carried out
(at 10000 rpm for 15 min)

Discarded sediment to get supernatant

Leaf extract powder preparation
(By using spray drier)

FORMULATION OF CUSTARD APPLE LEAF EXTRACT FORTIFIED SWEETENED AONLA JUICE: Fresh, fully ripe, sound aonla were used for extraction of juice (Sasi Kumar et al., 2013). Each fruit was cleaned, thoroughly washed, blanched and blended in a laboratory blender to a pulp and the juice extracted was blended with custard apple leaf extract and stored refrigerated temperature. Further formulation process is given in figure 2.

TABLE 1: Formulation of custard apple leaf extract fortified Sweetened Aonla juice

<table>
<thead>
<tr>
<th>Aonla juice</th>
<th>Quantity of Juice</th>
<th>Aspartame</th>
<th>Citric acid</th>
<th>Water In liter</th>
<th>Leaf extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>750 ml</td>
<td>4 g</td>
<td>11 g</td>
<td>4.2</td>
<td>—</td>
</tr>
<tr>
<td>A1</td>
<td>750 ml</td>
<td>4 g</td>
<td>11 g</td>
<td>4.2</td>
<td>5 g</td>
</tr>
<tr>
<td>A2</td>
<td>750 ml</td>
<td>4 g</td>
<td>11 g</td>
<td>4.2</td>
<td>10 g</td>
</tr>
<tr>
<td>A3</td>
<td>750 ml</td>
<td>4 g</td>
<td>11 g</td>
<td>4.2</td>
<td>15 g</td>
</tr>
</tbody>
</table>

A1 - 5 g custard apple leaf extract incorporated sample
A2 - 10 g custard apple leaf extract incorporated sample
A3 - 15 g custard apple leaf extract incorporated sample

Determination of quercetin in prepared Aonla juice: It was done by taking absorbance (AU) readings in duplicate at 362 nm using a double beam spectrophotometer and compared with standard sample of quercetin solution.

Sensory evaluation of custard apple leaf extract fortified Sweetened Aonla juice: Custard apple leaf extract fortified Sweetened Aonla juice was organoleptically evaluated by panel members by using nine point Hedonic Scale.

RESULTS AND DISCUSSION

Formulation of custard apple leaf extract fortified Sweetened aonla juice: Recipe for preparation of artificially sweetened aonla juice, the formulation was made with different proportion of custard apple leaf extract varying from 0 to 15 g in increasing order from control (0) to A1 (5g), A2 (10g) and A3 (15g) respectively. The recipe of aonla juice was standardized by considering the quantity of ingredients like aonla juice, aspartame, and citric acid as per the process adopted by (Srivastava and Sanjeev Kumar, 2006). The artificial sugar like aspartame was used as it is 200 times sweeter than sucrose and the amount (4g) is used as proportion to the sweetness ratio with sugar. (NICUS, 2013). The proportion of custard apple leaf extract used in the aonla juice was decided by considering the permissible intake of 250 mg / kg body weight as suggested by (Pornrut et al., 2009). The data with respect to formulation of custard apple leaf extract fortified aonla juices were presented in Table 1.

Retention of quercetin in prepared aonla juice: In aonla juice custard apple leaf extract was fortified at the level of
Effect of addition of different proportions of custard apple leaf extract on chemical properties of Aonla juice:
The aonla juice samples contain TSS in control sample (7.0 Bx), sample A₁ (7.1 Bx), sample A₂ (7.2 Bx), A₃ (7.3 Bx). Acidity of control sample was (0.38 per cent) similarly sample A₁ (0.37 per cent) A₂ (0.37 per cent), A₃ (0.34 per cent). The control sample of aonla juice contains (pH 3.8) similarly sample A₁, A₂ and A₃ (pH 3.9, 4.0 and 4.1) respectively. The pH of control sample is statistically significant over other samples whereas highest pH was recorded by sample A₃.

The non-reducing sugar content of sweetened aonla juice was 4.7 percent whereas reducing sugar content of control sample (2.95 per cent), A₂ (2.97 per cent), A₃ (2.98) and A₄ (2.99 per cent) respectively. The reducing sugar content of all the samples was found to be less as sugar was replaced by artificial sweetener.

The non-reducing sugar content of sweetened aonla juice was also less. The non-reducing sugar content of control sample (2.71 per cent), A₁ (2.73 per cent), A₂ (2.72) and A₃ (2.71 per cent) respectively. The non-reducing sugar content of all the samples was found to be less whereas lowest non-reducing sugar content score was recorded by control sample and A₁. Total sugar content of sweetened aonla juice were control (5.66), A₁, A₂ and A₃ (5.70 per cent) respectively.

The ash content of sweetened aonla juice control (0.03 percent), A₁ (0.047 per cent), A₂ (0.064 per cent) and A₃ (0.81 per cent). Similar result for chemical properties are reported by Pareek et al. (2012). The data with respect to effect of addition of custard apple leaf extract on chemical properties of aonla juice were presented in Table 3.

The prepared sweetened aonla juice containing different proportions of custard apple leaf extract were organoleptically evaluated with regards to colour and appearance, flavor, taste and mouth feel and overall acceptability. The scores rated by the judges are summarized in Table 4.

CONCLUSION
It can be finally concluded that organoleptically acceptable aonla juice having higher nutraceutical value containing flavonoid Quercetin (16.72 mg/g) can be prepared. Sample A₃ (10g custard apple leaf extract) scored highest score for overall acceptability was 8.8 on 10 point hedonic scale.
REFERENCES


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University of Michigan Health System (USA), (2014).