

## Research Article

## Physico-chemical Properties of Aonla Fruit and Juice

Pankaj Kulkarani, Hridyesh Pandey\*, Ashish Kumar Sharma and Dinesh Chandra Joshi

College of Food Processing Technology and BioEnergy, Anand Agricultural University, Anand-388 110

**Abstract**

Indian gooseberry (*Emblica officinalis* Gaertn. Syn. *Phyllanthus emblica* L.) fruit commonly known as aonla is one of the oldest minor fruit of India. Commonly grown variety of aonla in Gujarat is Anand Aonla-II. The fruits of aonla have average diameter of  $38.80 \pm 2.18$  mm (vertical) and  $33.28 \pm 1.53$  mm (horizontal). Average weight of whole fruit, pulp and seed were  $31.80 \pm 5.96$  g,  $28.21 \pm 4.83$  g and  $2.48 \pm 0.26$  g respectively. Specific volume and specific gravity of the fruits were  $29.50 \pm 4.97$  ml and  $1.07 \pm 0.06$  respectively. Fresh aonla juice contained 120.95 mg/100 ml of ascorbic acid with acidity of 2.34 % and pH of 1.97. TSS, reducing and total sugars of the juice were found to be 12.7 °B, 7.6 % and 7.91 % respectively. Tannin content of the fresh juice was higher (1.45 %) which contributed for astringent taste to the juice. Microbial analysis of the fresh juice revealed that the total plate count, yeast and mould count and coliform count of the juice were  $1 \times 10^3$  cfu/ml,  $301 \times 10^3$  cfu/ml and nil respectively.

**Keywords:** Aonla fruit, aonla juice, physico-chemical characteristics

**\*Correspondence**

Author: Hridyesh Pandey

Email: hridyeshpandey@gmail.com

**Introduction**

Indian gooseberry (*Emblica officinalis* Gaertn. Syn. *Phyllanthus emblica* L.) fruit commonly known as aonla is the oldest minor fruit of India. It belongs to the family *Euphorbeaceae* and is native of India, Srilanka, Malaysia, and China [1]. The main varieties of aonla grown in India are Banarasi, Chakaiya, Hathijhool, Bansi red, Pinki-tinged, NA7, Anand Aonla – II, Krishna, etc. The aonla gets ready for harvesting during November – January.

The fruit, due to its sour and astringent taste, has very limited table value. The fresh fruits are generally not consumed due to their high astringency but it has got great potential in processed forms. Aonla fruits are highly perishable in nature and hence its storage in atmospheric conditions after harvesting is very limited [2]. The fruit is used in the preparation of various ayurvedic tonics like chavanprash, triphala, etc. However, aonla fruits are processed into a number of food products like preserve, jam, jelly, candy, toffee, pickle, sauce, squash, juice, RTS beverage, cider, shreds, dried powder, etc.[3].

The fruit is highly acid, cooling, refrigerant, diuretic and laxative, hence used for treating common cold, gastric troubles, chronic diarrhoea and dysentery, headache, constipation, enlarged liver, diabetes, bronchitis, jaundice, fever, etc. A tablespoonful each of fresh aonla juice and honey mixed together forms a very valuable medicine for the treatment of several ailments like tuberculosis of lungs, asthma, bronchitis, scurvy, diabetes, anemia, weakness of memory, cancer, tension, influenza, cold, loss and grayness of hair, etc.

Determination of physico-chemical properties of the fruit may play an important role in design and development of various food processing equipment. The data on various physico-chemical properties of Anand Aonla – II variety developed at AAU, Anand is scarce. Therefore the study was undertaken to determine some of these properties.

**Materials and Methods**

The fully ripe aonla fruits (*Anand Aonla – II*) was procured from Horticulture Research Farm, Anand Agricultural University, Anand. The juice was extracted by standardized method in which aonla fruits were steam blanched for 2 minutes, shredded, pulverized and passed through screw type juice extractor at 90 rpm [4].

The steam blanching of aonla fruits was carried out in the steam autoclave (Make: Nova Digital, Ahmedabad) consisted of stainless steel chamber with lid, paddle lifting device and basket made up of thick stainless steel rods. The temperature in the autoclave could be controlled from 80-120 °C using Pt-100 type temperature sensor and a controller. Steam blanching of aonla fruits was carried by steaming the basket loaded with pre-determined quantity of

aonla into the chamber for 2 minutes. The samples were immediately taken out and cooled to room temperature using tap water.

Blanched aonla fruits were passed through aonla shredder-cum-destoner, a power operated continuous flow type machine for production of aonla shreds developed at Anand Agricultural University.

The shreds of aonla were fed to pulverizer (Make: TempXchanger, Vadodara), a power operated continuous flow type machine for production of pulverized fruits. The machine consisted of a hopper, drum consisting of teeth and hammer, 2 mm sieve, discharge chute and power transmission system.

Juice extraction from pulverized aonla was carried out using screw type juice extractor (Make: MAC Laboratory Equipment, New Delhi) at 90 rpm. Screw type juice extractor is a power operated continuous extractor, consisted of a reinforced stainless steel tapered screen of size 2 mm, enclosing a large bore screw with narrow clearance between the screw and the screen.

Various physico-chemical parameters (ascorbic acid, acidity, pH, TSS, total sugars, reducing sugar), microbial parameters (total plate count, coliform count, yeast and mould) and sensory parameters of aonla juice were recorded for characterization of fresh aonla juice. Ascorbic acid content of sample was determined by visual titration method [5] using 2,6 dichlorophenol indophenol. The titratable acidity of fresh aonla juice samples was determined as per the standard procedure [5]. The pH of aonla juice was determined by using digital pH meter (Make: Elico LI 610). The total soluble solids content of the aonla juice was directly measured by using digital hand refractometers (Make: ATAGO hand refractometers). Microbial analysis of stored sample was carried out for  $10^{-3}$  dilutions. Sensory analysis of juice sample was carried out on the basis of color, taste, aftertaste, flavor and overall acceptability using 9 point hedonic scale [10].

## Results and Discussion

### *Physical Properties of Aonla Fruit*

Aonla fruits of Anand Aonla II variety were analyzed for physical properties i.e. diameter of fruit, weight, color, specific volume, specific gravity, weight of pulp, weight of stone, pulp to stone ratio, seed percentage, and diameter of seed. These properties are shown in **Table 1** and similar in previous results [6-9].

**Table 1** Physical properties of aonla fruit

| Properties                    | Values       |
|-------------------------------|--------------|
| <b>Diameter of fruit (mm)</b> |              |
| X Direction                   | 38.80 ± 2.18 |
| Y Direction                   | 33.28 ± 1.53 |
| Weight (g)                    | 31.80 ± 5.96 |
| Specific Volume (ml)          | 29.50 ± 4.97 |
| Specific Gravity              | 1.07 ± 0.06  |
| Weight of pulp (g)            | 28.21 ± 4.83 |
| Weight of stone (g)           | 2.48 ± 0.26  |
| Pulp to stone ratio           | 11.35 ± 1.11 |
| Seed %                        | 7.90 ± 0.78  |
| <b>Diameter of stone (mm)</b> |              |
| X Direction                   | 15.73 ± 1.14 |
| Y Direction                   | 16.57 ± 0.33 |

### *Characterization of Aonla Juice*

Various properties of aonla juice were determined using standard methods and are shown in **Table 2**.

### *Chemical analysis*

Chemical composition of fresh aonla juice is given in Table 2. Ascorbic acid content of fresh aonla juice was found to be 120.95 mg/100 ml which was lower than the reported values for aonla juice i.e. 387.53 – 729 mg/100 ml [4, 11].

Acidity of fresh aonla juice was 2.34 % which shows that aonla juice was very acidic in nature and this confirms with very low pH (1.97) of fresh juice (Table 2). However, acidity value of 0.82 % with pH value of 2.80 for the fresh juice from Anand Aonla II variety has been reported [4]. Acidity and pH of aonla juice from Desi variety as 1.99 %

and 2 respectively has been reported [12]. Acidity and pH, of juice from aonla fruits of NA-7 variety, extracted using cold and hot methods, were 2.80 % and 2.45%, 2.05 and 2.08, respectively [13], whereas for Chakaiya variety it were 0.82 - 1.73 % and 2.80 - 2.88 respectively [1, 11, 14].

**Table 2** Chemical properties of fresh aonla juice

| Chemical attributes      | Values |
|--------------------------|--------|
| Ascorbic acid, mg/100 ml | 120.95 |
| Acidity, %               | 2.34   |
| pH                       | 1.97   |
| TSS, °Brix               | 12.7   |
| Reducing Sugars, %       | 7.6    |
| Total Sugars, %          | 7.91   |
| Tannins, %               | 1.45   |

Total soluble solids of the fresh juice were found to be 12.7 °B (Table 2) which is lower than the TSS of the fresh juice from Anand Aonla II variety (17 °B) [4]. The reported TSS values for the aonla juice from Chakaiya, Desi and NA-7 varieties were in the range of 5.5 – 15.7 °B [1, 11, 13, 14].

Aonla fruit contains sugars like fructose, glucose and sucrose [14]. Reducing and total sugars of the fresh juice were found 7.6 and 7.91 % respectively (Table 2). However, reducing and total sugars in the fresh juice from Anand Aonla II variety were higher as 10.64 and 11.03 % respectively [4]. Whereas, reported reducing and total sugars of aonla juice of NA-7 variety, extracted using cold method and hot method, were 5.11 and 5.98 %, and 5.01 % and 5.95 % respectively [13]. Aonla juice extracted from Chakaiya variety has reducing and total sugars as 3.25 % and 7.03 % [11].

Aonla fruit contains number of polyphenolic substances such as tannic acid, gallic acids, phloroglucinol, pyrogallol, catechol, trigalloylglucose, terchebin, corilagin and ellagic acid [15]. Tannin content of fresh juice was found to be 1.45 % (Table 2), which was lesser than the tannin content of fresh aonla juice from Chakaiya variety as 2.72 % [14].

### Microbial analysis

The microbiological quality in terms of the total plate count, coliform count and yeast and mould count of fresh aonla juice sample is presented in **Table 3**. Total plate count, yeast and mould count and coliform count were 1 cfu/ml, 301 cfu/ml and nil respectively at  $10^{-3}$  dilution after 72 hours. The standard plate count and yeast and mould count of fresh aonla fruit of Anand Aonla II variety has been reported as 5275 cfu/ml and 232 cfu/ml respectively [16,17]. Presence of yeast in aonla juice of Chakaiya variety has also been reported by Jain *et al.* (2003)[14].

**Table 3** Microbial counts of the fresh aonla juice

| Attributes           | cfu/g (log cfu/g)        |
|----------------------|--------------------------|
| Total plate count    | $1 \times 10^3$ (3)      |
| Yeast and mold count | $301 \times 10^3$ (5.48) |
| Coliform count       | nil                      |

**Table 4** Sensory quality of fresh aonla juice

| Sensory attributes    | Sensory score |
|-----------------------|---------------|
| Color                 | 7.83          |
| Taste                 | 7.62          |
| Aftertaste            | 7.59          |
| Flavor                | 7.66          |
| Overall Acceptability | 7.79          |

### Sensory analysis

Sensory analysis was carried out using 9-point hedonic scale [10]. Sensory quality of fresh aonla juice on the basis color, taste, aftertaste, flavor and overall acceptability are as shown in **Table 4**. Color of the fresh juice has highest sensory score (7.83) while least score was for aftertaste (7.59). The sensory score were in the range 7 - 8 in 9 point hedonic scale which indicates that fresh aonla juice from Anand Aonla II variety had good acceptance in respect of all sensory attributes.

### Conclusions

The various physico-chemical properties of aonla fruit determined. It includes average diameter  $38.80 \pm 2.18$  mm (vertical) and  $33.28 \pm 1.53$  mm (horizontal). Average weight of whole fruit, pulp and seed were  $31.80 \pm 5.96$  g,  $28.21 \pm 4.83$  g and  $2.48 \pm 0.26$  g respectively. Specific volume and specific gravity of the fruits were  $29.50 \pm 4.97$  ml and  $1.07 \pm 0.06$  respectively. Fresh aonla juice contained 120.95 mg/100 ml of ascorbic acid with acidity of 2.336 % and low pH of 1.97. TSS, reducing and total sugars of the juice were found to be 12.7 °B, 7.6 % and 7.91 % respectively. Tannin content of the fresh juice was higher (1.45 %) which contributed for astringent taste to the juice. Microbial analysis of the fresh juice revealed that the total plate count, yeast and mould count and coliform count of the juice were  $1 \times 10^3$  cfu/ml,  $301 \times 10^3$  cfu/ml and nil respectively.

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