

# STUDIES ON PHYSICO-CHEMICAL COMPOSITION OF AONLA FRUIT (*EMBLICA OFFICINALIS* L.).

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## ABSTRACT

The experiment was conducted for "Physico-chemical composition of aonla fruit (*Emblica officinalis* L.) cv. NA-7 & organoleptic evaluation of ten treatments for making aonla candy" was executed at Department of Post-Harvest Technology, collage of Horticulture & Forestry, Narendra Deva University of Agriculture & Technology, Kumarganj, Faizabad (U.P.) India during 2013-14. The investigation comprised of two sets of experiments. In first experiment, physico-chemical characteristics of aonla fruit was studied, in second experiment different natural oil/extract treatments were evaluated for preparation of aonla candy. Results of present studies indicated that aonla fruit of cultivar NA-7 had fruit weight (42.90 g), seed content and pulp (5.7 & 92.92 %), length and width (3.52 & 4.38 cm), TSS (10.21° brix), acidity (1.72 %), ascorbic acid (473 mg/100 g), reducing, non-reducing and total sugars 2.4, 4.8, & 7.2 % respectively and total phenols (176.7 mg/100 g) these value were differ on the basis of cultural practices and agro climatic condition. In the organoleptic evaluation by a panel including 10 judges the result indicated that ginger extract, menthe oil, lemon oil and peppermint oil were rated 8.80, 8.51, 7.90 & 7.50 respectively.

## INTRODUCTION

Aonla fruit is highly nutritive with a great medicinal use and the richest source of vitamin C next to Barbados cherry (Shankar, 1969). Its contain gallic acid, elegiac acid and glucose which prevent oxidation of vitamin C. Aonla is also a source of carbohydrates, carotene, thiamine, riboflavin, and minerals like iron, calcium, phosphorus, magnesium and rich source in pectin. Its fruit have excellent therapeutic value which is utilized for treatment of several diseases from ancient times like tuberculosis of lungs, anti-HIV-1 activity (Lunavath and Mamidala, 2012), asthma, bronchitis, scurvy, diabetes, anemia, weakness of memory, cancer, tension, influenza, cold, loss and grayness of hair etc. Aonla fruits are highly perishable in nature and consumers are hesitant to eat it in raw form due to astringent test. This problem overcome by processing of aonla fruit in to different products like jam, jelly, RTS (Deka et al. 2001), squash, nectar, juice, canned fruit, ice cream, toffees, preserve, powder, candies (Tripathi et al. 1988), laddu, barfi, Chayvanprash (Rajkumar et al. 2001) and Triphala. Among these products osmo-dehydrated product/candy is now gaining much popularity in the market due to its natural appeal of an original fruit, nutritional quality, easy to handling and transport, better self-life, low preparation cost and good returns. But aonla candy is astringent in taste and have no flavor therefore, product is not gaining popularity as much have potency. Attempts have been made to produce products which are not only nutritionally delicious but also acceptable among the consumers.

## MATERIALS AND METHODS

This experiment was carried out at P. G. Laboratory of

Department of Horticulture. Narendra Deva University of Agriculture and Technology Kumarganj Faizabad (U.P.), India during the year 2013-2014.

### Raw material and sample preparation

The mature aonla fruits of NA-7 cultivar having uniform vigour were taken from the aonla orchard at Main Experimental Station of Department of Fruit Science, College of Horticulture & Forestry of the University. The fruits were harvested from the plants by hand in the month of December to avoid any type of physical damage including brushing. These aonla fruits were used for preparation of osmo-dehydrated product/aonla candy.

Observation on physical composition of aonla cultivar NA-7 such as fruit weight(g), seed content and pulp(%), length and width(cm) whereas chemical composition TSS(°B), acidity(%), ascorbic acid(mg/100g), reducing sugars, non-reducing sugar, total sugars (%) and total phenols(mg/100g). The experiment consists of 10 treatments of different natural oil/extract and treatment were replicated in three time. The statistical analysis of variance of data was carried out by the method of described by Panse and Sukhatme (1961) using C.R.D experiment.

### Biochemical analysis

The total soluble solids were determined by hand refractometer (ERMA made) of 0-32% (Ranganna, 2010). The total acidity present in sample was ascertained by titration of samples against NaOH solution. Then known amount of aliquot was taken and titrated against 0.1 N sodium hydroxide standard solution using 2-3 drops phenolphthalein as an indicator (Ranganna, 2010). To determine vitamin-C content sample was prepared in 3 per cent metaphosphoric acid

solution and known volume aliquot was titrated against 2, 6 dichlorophenol indophenols dye solution (A. O. A. C.,1970). The Fehling's 'A' and 'B' solutions (Lane and Eynon, 1923) were used to estimate the sugars content and procedure as suggested by (Ranganna, 2010). The total phenols were ascertained by the method of Swine and Hills (1959). The fruits started decaying visually was separated from the lots of treated and control fruits and their weight was recorded on electronic balance.

## RESULTS AND DISCUSSION

### Physico-chemical composition of aonla fruit

#### Physical composition

The results of present studies indicated variability in certain physical characteristics of aonla fruit weight, length, width, shape, seed percentage and pulp percentage were the major components of physical parameters under present study.

Average fruit weight was recorded 42.90 g. Several scientists have reported 32.45 to 53.40 g (Pathak, 1988), 32.62 g to 37.27 g in Chakaiya and 35.70 g in Banarasi (Sharma *et al.*, 1989, Gehlat and Singh, 2008, Ahmad *et al.*, 2010) and 40.00 to 44.00 g fruit weight of aonla cultivar NA-7 (A.I.C.R.P on Arid Zone fruits 2006, Bhosale *et al.*, 2006).

Average fruit length and width were observed 3.52 and 4.38 cm, respectively in aonla fruit. Several scientists have reported greater variability in average fruit length and width of aonla fruit ranged from 3.60 cm and 4.38 cm in NA-7 (A. I. C. R. P on Arid Zone fruits 2006), 3.27 cm and 4.00 cm in Chakaiya (Gehlat and Singh, 2008), 3.25 cm and 4.13 cm in Banarasi (Ahmad *et al.*, 2010), and 3.45 cm and 3.75 cm in Kanchan (Mandal *et al.*, 2011). Fruit shape was observed to be oval in NA-7 cultivar of aonla fruit.

Seed and pulp percentage was observed in cv. NA-7, 5.7 and 92.97, respectively. Singh and Pathak (1987) reported 90.20 to 94.40 per cent edible part. Ghosh *et al.* (2002) reported 95.00 per cent pulp in cv. NA-10 and 2.30 g seed weight in cv. Neelam. Bhosale *et al.* (2006) reported 3.6 g seed weight and 85 per cent pulp in NA-7 cv. of aonla. Kumar and Singh (2013) observed average seed and pulp per cent in ten aonla cultivar 4.2 to 6.07 and 92.85 to 94.90 respectively.

The differences between physical characters in present findings and in reported literature may be attributed to differences in location, orchard management, climatic conditions, fruit maturity, age of tree and growing season (Table No1)

#### Chemical composition

Among the different factors influencing fruit quality, chemical components in aonla fruit are of utmost concern to assess the fruits either for dessert purpose or for fruit processing. Chemical composition of Na-7 cultivar of aonla fruit was recorded in terms of total soluble solids, acidity, ascorbic acid, reducing sugars, non-reducing sugar and total sugars. Total soluble solids were found 10.21 per cent in Na-7 cultivar of aonla. TSS recorded by different workers were different like 10.10 per cent in cv. Chakaiya (Gehlat and Singh, 2008), 12.60, 11.85, 10.60 per cent in cv. Kanchan, Chakaiya and NA-6 (Mandal *et al.*, 2011), 7.5 to 15.0 per cent value of ten cultivars

of aonla (Kumar and Singh, 2013) and 9.48 per cent in cv. NA-6 (Srivastava *et al.*, 2015). Acidity content was recorded 1.72 per cent in NA-7 cultivar of aonla fruit. Several workers observed 1.85 per cent in cv. Chakaiya (Gehlat and Singh, 2008), acidity ranged from 1.6 to 2.4 per cent (Kumar and Singh, 2013) and 2.40 per cent in aonla fruit cv. NA-6 (Srivastava *et al.*, 2015). In this study ascorbic acid content was found 473 mg per 100 g fruit pulp. However, several scientists have reported 662 mg in cv. Chakaiya (Gehlat and Singh, 2008), 538.13 mg in NA-10 and 484.50 mg in NA-6 (Mandal *et al.*, 2011), 700.0 mg per 100 g average fruit pulp in ten cultivars of aonla fruit (Kumar and Sing, 2013) and 379.7 mg per 100 g in wild aonla (Khomdram and Devi 2010). Reducing sugars percentage was observed 2.40, whereas Gehlat and Singh (2008) reported 5.14 per cent reducing sugars in cv. Chakaiya of aonla fruit. Non-reducing sugar was recorded 4.80 per cent in this study in NA-7 cultivar of aonla. Total sugars percentage was recorded 7.20 in this study while Gehlat and Singh (2008), Mandal *et al.* (2011) and Kumar and Singh (2013) reported 8.53 in Chakaiya, 9.43 in Kanchan and 7.26 in NA-6 and 3.5 to 4.9 per cent total sugars in ten cultivars of aonla fruit, respectively. Total phenols content in NA-7 cultivar of aonla was recorded 176.7 mg per 100 g fruit pulp, whereas several authors reported 56.3 to 77.7 mg Singh and Pathak (1987), 167.34 mg, 175.73 mg, 162.56 mg, 162.53 mg, and 175.74

**Table 1: Physical characteristics of aonla fruit**

S. No.	Characters	Average value
1.	Fruit weight (g)	42.90
2.	Seed (%)	5.70
3.	Pulp (%)	92.97
4.	Fruit size	Length (cm) 3.52
1.		Width (cm) 4.38
5.	Fruit shape	Oval

**Table 2: Chemical characteristics of aonla fruit**

S. No.	Characters	Average value
1.	TSS (%)	10.21
2.	Acidity (%)	1.72
3.	Ascorbic acid (mg/100g)	473
4.	Reducing sugars (%)	2.4
5.	Non-reducing sugar (%)	4.8
6.	Total sugars (%)	7.20
7.	Total phenols (mg/100g)	176.7

**Table 3: Organoleptic quality of different natural oil/extract of aonla candy**

Treatments	Score	Rating
Rose water	5.70	Like slightly
Ginger extract	8.80	Like Extremely
Tulsi oil	5.42	Like slightly
Mentha oil	8.51	Like Extremely
Kewra water	6.25	Like moderately
Peppermint oil	7.50	Like very much
Lemon oil	7.90	Like very much
Khus oil	4.85	Neither like nor dislike
Khus water	4.70	Neither like nor dislike
Eucalyptus oil	4.58	Neither like nor dislike
CD at 5%	0.04	

mg/100 g total phenol respectively in aonla cv. Banarasi, Krishana, Chakaiya, Kanchan, and Francis. Singh (1997) reported 157 to 177 mg/100 g in aonla cultivars and 162.2 to 175.7 mg/100 g total phenols in ten cultivars of aonla {(Kumar and Singh, 2013), (Table 2)}

Data recorded on the organoleptic quality of different natural oil/extract of aonla candy is given in Table 4.3. Result shows that the candy prepared with ginger extract was found to be the best followed by mentha oil candy. However, there was significant difference between all treatments. The organoleptic score of ginger extract and mentha oil candies were like extremely and lemon, peppermint oil candy was like very much. Thereafter, these four treatments of candy were stored for further storage study (Table 3).

The differences between chemical characters in present findings and in reported literature may be attributed to differences in location, orchard management, climatic conditions, fruit maturity, age of tree and growing season.

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