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Effect of different juice extraction methods on quality of aonla (*Emblica officinalis* Gaertn.) Syrup during storage

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Abstract
An experiment was conducted in completely rsandomized design. Aonla juice was extrated with seven different juice extraction methods. Clear Juice obtained after sedimentation and siphoning was used for syrup preparation. Aonla syrup was filled in 200ml glass bottle and stored at ambient temperature (24-30 °C). Observations were recorded at every 2 months interval for quality parameters microbial count and sensory. Syrup prepared from treatment T_6 (Juice extraction by shredding the fruits, heating (80 ºC for 5 minutes) with water (1:0.50) and pressing in basket press, then addition of 10 per cent water in pulp residue and heating (80 ºC for 5 minutes) and pressing in basket press) recorded maximum overall acceptability score (7.30) and higher benefit: cost ratio (2.24).

Keywords: Aonla, syrup, juice, extraction methods

Introduction
Aonla (*Emblica officinalis* Gaertn.) is one of the precious gift of nature to mankind. Among the fruits, aonla commonly known as Indian Gooseberry finds a special place in India as it has got tremendous medicinal value. It was found mention in Vedas, Ramayana, Charak samhita, Sushruta, Samhita and literature of Kalidas and Kadambari. Aonla is one of the richest source of vitamin C, pectin and tannin which is being used for preparation of various ayurvedic, unani system of medicine, cosmetic, pharmaceuticals and processing industry (Singh and Gaur, 2002) [1]. The fruit is cooling, refrigerant, diuretic and laxative, hence used for treating the chronic dysentery, diabetes, fever, jaundice, cough, etc. It is highly nutritive and one of the richest sources of ascorbic acid. It increases the red blood cell count and helps to promote good health. Numerous experimental evidences have shown that aonla fruit possess anti-oxidant, hepatoprotective, hypocholesterolemic and anti-inflammatory activities.
Aonla becomes ready for harvesting from mid-November to first week of January. The produce remains in the market for a very short period. Since it is a perishable commodity, it needs quick disposal. Huge harvest of produce during peak harvesting season creates glut and the growers are compelled to sell their produce at lower prices. The post-harvest losses in aonla vary from 30 to 40 per cent due to its perishable nature and glut during harvesting time, which reduce the market value of the fruit. Owing to restricted availability and high perishability of aonla fruits, the value addition through processing would be the only effective tool for economic utilization of increased production of aonla fruits. With this view study on extraction of aonla juice by different methods for preparation syrup and its storage was intended.

Material and Methods
The experiment was conducted at the Pomology Laboratory and Fruit and Vegetable Processing Unit of Department of Horticulture, College of Agriculture, Dapoli, District-Ratnagiri (M.S.) during 2015-2016. The selected fruits were shredded with aonla shredding machine and seeds were separated. Then shreds were subjected to following treatments T_1-Juice extraction by shredding the fruits and pressing in basket press,T_2-Juice extraction by shredding the fruits, heating (80 ºC for 5min.) with water (1:0.25) and pressing in basket press, T_3-Juice extraction by shredding the fruits, heating (80 ºC for 5 min.) with water (1:0.25) and pressing in basket press, then addition of 10 per cent water in pulp residue and heating (80 ºC for 5 min.) and pressing in basket press, T_4 -Juice extraction by shredding the fruits, heating

(80 ºC for 5min.) with water (1:0.25) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating (80 ºC for 5 min.) and pressing in basket press, T_5-Juice extraction by shredding the fruits, heating (80 ºC for 5min.) with water (1:0.50) and pressing in basket press, T_6-Juice extraction by shredding the fruits, heating (80ºC for 5 min.) with water (1:0.50) and pressing in basket press, then addition of 10 per cent water in pulp residue and heating (80 ºC for 5min.) and pressing in basket press T7-Juice extraction by shredding the fruits, heating (80 ºC for 5min.) with water (1:0.50) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating (80 ºC for 5min.) and pressing in basket press, replicated thrice in completely randomized design (CRD) and stored at ambient temperature (24-30 °C). After juice extraction by different methods, juice obtained from 4 kg fruits for each treatment was filled in conical flasks. Flask were kept for sedimentation overnight. After sedimentation siphoning of clear juice was done. In the juice of seven treatments, sugar was added in 1:2 proportion. Heating was done to dissolve sugar. After that acidity of syrup was adjusted at 1 per cent by adding citric acid. Then preservative sodium benzoate was added @700mg/kg of syrup. Before filling syrup in bottles, glass bottles were washed with hot plain water, after that they were sterilized by keeping in boiling water for 30 minutes**.** Then they were dried in air and used for filling syrup. For each treatment 27 bottles were filled and kept for further study. Syrup was filled in 200 gm glass bottle after leaving head space. After filling, bottles were stored at ambient temperature (24-30 °C) and observations were recorded at every 2 months interval to study the quality of stored aonla syrup.

Total soluble solids (T.S.S.) were determined with the help of Hand refractometer (Erma Japan, 0 to 32º Brix and 52 to 90 ºBrix) and value was corrected at 20 °C with the help of temperature correction chart (A.O.A.C., 1975). The pH of the fruit juice and syrup was determined with the help of pH meter. (Model Systronics µ pH system 361). Standard solutions of pH 4.0 and 7.0 were used as reference to calibrate. The T.S.S. (°Brix), titratable acidity (%), reducing sugars (%), total sugars (%), ascorbic acid (mg/100 g) were estimated as per the methods suggested by Ranganna (1997) [2]. The results were analyzed statistically as per the methods suggested by Panse and Sukhatme (1995) [3]. The sensory qualities in terms of colour and flavour were assessed by panel of 10 judges with 9 point Hedonic scale score (Amerine and Singletone, 1972) [4]. The above observations were recorded at 2 months interval up to 4 months i.e. 0, 2, 4 months of storage. The net profit as well as benefit: cost ratio was calculated for different treatments.

Results and discussion

Effect of different juice extraction methods on T.S.S. (°Brix) of aonla syrup during storage is presented in Table 1. Treatment T_2 (i.e. Juice extraction by shredding the fruits, heating 80 ºC for 5 minutes with water (1:0.25) and pressing in basket press) recorded maximum T.S.S. at 4 months storage period. This might be due to minimum addition of water (1:0.25) in fruit shreds. At T_1 treatment water was not added and juice was extracted by pressing the fruit shreds without heating. However, T_2 treatments after adding water at 1:0.25 proportion heating was done at 80 °C for 5 minutes which might have released more T.S.S. and other chemical constituents. Hence, at T_1 even though water was not added T.S.S. of syrup was less than T_2. In the juices of all seven treatments same amount of sugar (1:2 proportion) was added. Hence, the difference in T.S.S. of syrup is the impact of original T.S.S. present in the extracted juices. The T.S.S. was found to be decreased slightly from T_2 to T_4 and T_5 to T_7, which might be the effect of dilution on native T.S.S. of juice as stated above. T.S.S. of aonla syrup increased gradually throughout the storage period. An increase in total soluble solids of syrup during storage might be due to hydrolysis of polysaccharides like starch, cellulose, and pectin substance into simpler substances. Similar results were recorded by Marimuthu and Thirumaran (2000) [5] who observed an increase in T.S.S. from 70 to 72 °B in jamun syrup during 0 to 3 months of storage. Similar observations were observed by Jadhav *et al.* (2004) [6] in ripe karonda syrup during storage period of 240 days and Choudhari *et al.* (2006) [7] in T.S.S. of aonla syrup during storage period.

Table 2 represents effect of different juice extraction methods on titratable acidity of aonla syrup during storage. Treatment T_7 (i.e. Juice extraction by shredding the fruits, heating (80 ºC for 5 minutes) with water (1:0.50) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating 80 ºC for 5 minutes and pressing in basket press) recorded minimum acidity (0.90%) after 4 months storage period. This treatment was at par with T_4 and T_6 which recorded 0.91 and 0.93 per cent titratable acidity after 4 months storage period, respectively. It could be observed from the data that as dilution level increases from T_2 to T_4 and T_5 to T_7 the titratable acidity was found to be decreased during storage. This could be due to the dilution effect on native acidity of aonla juice. Even the titratable acidity of T_2 was highest than T_1 treatment where dilution was not done. This may be due to the reasons as mentioned under 4.3.1 in T.S.S. content. Titratable acidity of aonla syrup decreased gradually throughout the storage period. The reduction in acidity during storage of aonla syrup might be associated with the conversion of organic acids into sugars and their derivatives. Similar results were recorded by Kannan and Thirumaran (2004) [8]. They studied storage life of jamun syrup and reported decrease in acidity from 2.0 to 1.96 per cent during 6 months of storage. Similar observations were observed by Reddy and Chikkasubbanna (2009) [9] who studied the storage behavior of aonla syrup and observed that there was decreasing trend in titratable acidity.

Effect of different juice extraction methods on pH of aonla syrup during storage is depicted in table 3. Treatment T_7 (i.e. Juice extraction by shredding the fruits, heating (80 ºC for 5 minutes) with water (1:0.50) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating 80 ºC for 5 minutes and pressing in basket press) recorded highest pH (4.82) at 4 months storage period. It is observed from the data that, as dilution level increases the pH was found to be increased during storage. This could be due to the dilution effect on native acidity of aonla juice. Even the pH of T_2 was minimum than T_1 treatment where dilution was not done. This may be due to the reasons as mentioned under 4.3.1 in T.S.S. content. The pH of aonla syrup increased gradually throughout the storage period. This increasing trend of pH may be due to corresponding decreasing trend of titratable acidity during storage of aonla juice as seen under 4.3.2 in titratable acidity content. Similar results were recorded by Sawant (2000) [10] who reported that there was increasing trend in pH of the syrup prepared from jackfruit (3.40 to 3.62). Similar observations were observed by Bhandari (2004) [11] who reported that the pH content of

jamun juice increased during storage of 6 months at ambient temperature.

Effect of different juice extraction methods on reducing sugars (%) of aonla syrup during storage is presented in table 4. Treatment T_2 (i.e. Juice extraction by shredding the fruits, heating 80 ºC for 5 min. with water (1:0.25) and pressing in basket press) recorded highest reducing sugars (37.78%) after 4 month of storage period. It could be observed from the data that as dilution level increases from T_2 to T_4 and T_5 to T_7 the reducing sugars was found to be decreased during storage. This could be due to the dilution effect on native sugars of aonla juice. Even the reducing sugars of T_2 was greater than T_1 treatment where dilution was not done. This may be due to the reasons as mentioned under 4.3.1 in T.S.S. content. Reducing sugars of aonla syrup increased gradually throughout the storage period. The increase in reducing sugars during storage of aonla syrup might be associated with the hydrolysis of non-reducing sugars into reducing sugars. Similar results were recorded by Korade (2013) [12] who observed that the reducing sugar content of the kokum syrup was increased from 28.68 to 51.95 per cent after 90 days of storage. Similar observations were observed by Choudhari *et al.* (2006) [7] who reported that reducing sugars of aonla syrup increased with increasing storage period.

Treatment T_2 (i.e. Juice extraction by shredding the fruits, heating 80 ºC for 5 min. with water (1:0.25) and pressing in basket press) recorded highest total sugars (65.95%) after 4 month of storage period. (Table 5) It could be observed from the data that as dilution level increases from T_2 to T_4 and T_5 to T_7 the total sugars was found decreased during storage. This could be due to the dilution effect on native sugars of aonla juice. Even the total sugars of T_2 was greater than T_1 treatment where dilution was not done. This may be due to the reasons as mentioned under 4.3.1 in T.S.S. content. Total sugars of aonla syrup increased gradually throughout the storage period. The increase in total sugars during storage of aonla syrup might be associated with the conversion of starch in to soluble sugars and their derivatives. Similar results were recorded by Korade (2013) [12] who reported that the total sugars content increased from 61.32 to 63.84 per cent after 90 days of storage. Similar observations were observed by Choudhari *et al.* (2006) [7] who reported that the total sugars of aonla syrup increased with increasing storage period.

The results indicated that treatment T_2 (i.e. Juice extraction by shredding the fruits, heating 80 ºC for 5min. with water (1:0.25) and pressing in basket press) recorded highest ascorbic acid (78.47 mg/100 ml) after 4 months storage period (Table 6). It could be observed from the data that as dilution level increases from T_2 to T_4 and T_5 to T_7 the ascorbic acid was found to be decreased during storage. Even the ascorbic acid of T_2 was maximum than T_1 treatment where dilution and heating of aonla shreds was not done. This may be due to the reasons as mentioned under 4.3.1 in T.S.S. content. Ascorbic acid of aonla syrup decreased gradually throughout the storage period. Reduction in ascorbic acid of aonla syrup during storage may be due to oxidation of ascorbic acid. Similar results were recorded Priya and Khadatar (2013) [13] who carried out studies on the effect of processing methods on keeping quality of aonla syrup and reported that mean vitamin-C content in syrup decreased from 41.800 mg/100 ml to 29.500 mg/100 ml during storage of 90 days. Similar observations were observed by Yadav *et al.* (2015) [14] who reported that there was decreasing trend in ascorbic acid of aonla syrup.

The results presented in table 7 revealed that treatments T_4 and T_6 i.e. (juice extraction by shredding the fruits, heating (80 ºC for 5min.) with water (1:0.25) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating (80 ºC for 5min.) and pressing in basket press) and (juice extraction by shredding the fruits, heating (80 ºC for 5 min.) with water (1:0.50) and pressing in basket press, then addition of 10 per cent water in pulp residue and heating (80 ºC for 5min.) and pressing in basket press) recorded lowest bacterial count (2×10^{-3}) after 4 months storage period. It could be observed from the data that as storage period advances there was continuous increase in bacterial count. This might be due to the contamination and multiplication of bacteria with advancement of storage period. Similar results were recorded by Johar and Anand (1952) [15] in aonla preserve.

The results revealed depicted in table 8 that treatments T_4 (i.e. Juice extraction by shredding the fruits, heating (80 ºC for 5 min.) with water (1:0.25) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating (80 ºC for 5min.) and pressing in basket press) recorded lowest fungal count (4×10^{-3}) during storage period. It could be observed from the data that as storage period advances there was continuous increase in fungal count. This may be due to the multiplication of fungus. Similar results were recorded by Korade (2013) [12] who reported that at 0 days of the storage, the microbial count was nil in all the treatment, then increase in mean microbial count from 0 to 3.33 cfu/ml irrespective of the treatments was observed after 90 days of storage of kokum syrup.

Effect of different juice extraction methods on overall acceptability of aonla syrup during storage is presented in table 9. The results indicated that treatments T_6 (i.e. juice extraction by shredding the fruits, heating (80 ºC for 5 min.) with water (1:0.50) and pressing in basket press, then addition of 10 per cent water in pulp residue and heating (80 ºC for 5 min.) and pressing in basket press recorded highest) (7.30) overall acceptability score after 4 months storage period. From the table it was observed that, as storage period advances there was continuous decrease in overall acceptability score. This decreased may be due to degradation of colour and changes in flavour of stored aonla syrup. Similar results were recorded by Choudhari *et al.* (2006) [7] who reported that the sensory mean score for aonla syrup for each attribute was the highest on the first day, then decreased with increasing period of storage.

The cost of production for the preparation of aonla syrup is given in Table 10. From the results it could be observed that the total expenditure for production of aonla syrup was highest (Rs. 2170.52) in T_7 i.e. Juice extraction by shredding the fruits, heating (80 ºC for 5 minutes) with water (1:0.50) and pressing in basket press, then addition of 20 per cent water in pulp residue and heating 80 ºC for 5 minutes and pressing in basket press and lowest (Rs.1243.36) in T_1 i.e. Juice extraction by shredding the fruits and pressing in basket press. Higher gross return and net profit of Rs.4878 and Rs. 2707.47, respectively was found in T_7 and lowest gross return and net profit of Rs. 2562.75 and Rs.1319.38, respectively was found in T_1. Benefit: cost ratio was maximum (2.24) in treatment T_6 and T_7. Among both the treatment, treatment T_6 recorded maximum overall acceptability score as shown in Table 24.

Table 1: Effect of different juice extraction methods on T.S.S. (°Brix) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**Initial**	**2 Months**	**4 Months**
T_1	67.00	68.33	69.33
T_2	69.67	70.83	72.33
T_3	68.83	69.67	71.83
T_4	68.67	69.33	71.33
T_5	69.67	70.33	72.00
T_6	69.33	69.83	70.33
T_7	68.00	69.00	69.83
Mean	68.74	69.62	71.00
S. Em. (±)	0.432	0.393	0.500
C.D. at 1%	1.818	1.656	2.105

Table 2: Effect of different juice extraction methods on titratable acidity (%) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**Initial**	**2 Months**	**4 Months**
T_1	1.00	0.98	0.97
T_2	1.00	0.99	0.98
T_3	0.99	0.97	0.94
T_4	0.99	0.95	0.91
T_5	1.00	0.97	0.95
T_6	0.99	0.95	0.93
T_7	0.99	0.95	0.90
Mean	0.99	0.97	0.94
S. Em. (±)	0.010	0.007	0.008
C.D. at 1%	NS	0.030	0.034

Table 3: Effect of different juice extraction methods on pH of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**0 months**	**2 months**	**4 months**
T_1	3.19	3.45	4.74
T_2	3.17	3.42	4.73
T_3	3.20	3.46	4.76
T_4	3.22	3.47	4.78
T_5	3.25	3.49	4.79
T_6	3.25	3.50	4.80
T_7	3.27	3.52	4.82
Mean	3.22	3.47	4.78
S. Em. (±)	0.017	0.013	0.013
C.D. at 1%	0.072	0.056	0.055

Table 4: Effect of different juice extraction methods on reducing sugars (%) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**Initial**	**2 Months**	**4 Months**
T_1	11.63	27.92	34.29
T_2	15.93	28.70	37.78
T_3	12.21	23.26	36.47
T_4	11.85	20.55	32.47
T_5	11.57	20.06	32.00
T_6	8.33	19.36	31.04
T_7	7.84	17.59	30.07
Mean	11.34	22.49	33.45
S. Em. (±)	0.972	1.970	1.094
C.D. at 1%	4.093	8.292	4.604

Table 5: Effect of different juice extraction methods on total sugars (%) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**0 months**	**2 months**	**4 months**
T_1	49.17	52.72	58.62
T_2	56.63	59.55	65.95
T_3	56.25	57.33	63.38
T_4	51.35	55.82	61.47
T_5	50.34	55.36	60.28
T_6	49.99	52.62	57.84
T_7	46.39	51.18	56.55
Mean	51.45	54.94	60.59
S. Em. (±)	1.628	1.170	1.093
C.D. at 1%	6.855	4.926	4.603

Table 6: Effect of different juice extraction methods on ascorbic acid (mg/100ml) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**0 months**	**2 months**	**4 months**
T_1	99.43	91.00	68.07
T_2	117.43	105.67	78.47
T_3	107.67	98.74	76.41
T_4	98.80	87.40	67.33
T_5	91.81	84.14	65.67
T_6	85.22	72.71	65.33
T_7	80.68	71.03	63.67
Mean	97.29	87.24	69.28
S. Em. (±)	3.107	4.120	2.565
C.D. at 1%	13.079	17.347	10.799

Table 7: Effect of different juice extraction methods on bacterial count (colony count × 10^{-3}/ml) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**Initial**	**2 Months**	**4 Months**
T_1	1.00	3.00	8.00
T_2	0.00	1.00	3.00
T_3	1.33	2.00	5.00
T_4	1.00	1.00	2.00
T_5	2.00	3.00	6.00
T_6	0.00	1.00	2.00
T_7	1.00	5.00	11.00
Mean	0.90	2.29	5.29
S. Em. (±)	0.454	0.845	0.535
C.D. at 1%	NS	NS	2.250

Table 8: Effect of different juice extraction methods on fungal count (colony count ×10^{-3}/ml) of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**0 months**	**2 months**	**4 months**
T_1	2.00	9.00	11.00
T_2	0.00	4.00	5.00
T_3	2.00	6.00	5.00
T_4	0.00	2.00	4.00
T_5	0.00	4.00	5.00
T_6	1.00	6.00	8.00
T_7	2.00	2.00	12.00
Mean	1.00	4.71	7.14
S. Em. (±)	0.436	1.195	1.047
C.D. at 1%	NS	NS	4.406

Table 9: Effect of different juice extraction methods on overall acceptability of aonla syrup during storage at ambient (24-30 °C) temperature

	Storage period		
Juice extraction methods	**Initial**	**2 Months**	**4 Months**
T_1	7.50	7.13	7.10
T_2	7.75	7.72	7.10
T_3	7.67	7.75	7.00
T_4	7.50	7.87	7.20
T_5	7.80	7.65	7.15
T_6	7.92	7.70	7.30
T_7	7.67	7.60	6.75
Mean	7.69	7.63	7.09
S. Em. (±)	0.236	0.113	0.074
C.D. at 1%	NS	0.474	0.312

Table 10: Cost of production of aonla syrup prepared from 10 kg fruits/treatment

		T_1		T_2		T_3		T_4	
Sr. No.	**Particulars**	**Quantity**	**Cost (Rs.)**	**Quantity**	**Cost (Rs.)**	**Quantity**	**Cost (Rs.)**	**Quantity**	**Cost (Rs.)**
1	Aonla fruits @Rs. 15/kg	10 kg	150	10 kg	150	10 kg	150	10 kg	150
2	Glass container (capacity 200g) @Rs. 5/bottle	85.42	427.1	126.62	633.12	129.25	646.25	134.65	673.25
3	Sugar @Rs. 35/ kg	11.39	398.65	16.885	590.975	17.23	603.22	17.95	628.42
4	Citric acid @Rs.92.40/kg	48.75	4.504	75	6.93	75	6.93	80	7.392
5	Preservatives (S.B.) @Rs.252/kg	11.9	2.99	17.725	4.46	18.075	4.55	18.85	4.75
6	Labour charges @Rs. 180/day	1 ¾	28.25	1 ¾	28.25	1 ¾	28.25	1 ¾	28.25
7	Fuel and electrical charges		6	-	7	-	7.50	-	8
	Working capital (A)		**1017.5**	**-**	**1420.7**	**-**	**1447**	**-**	**1500.3**
B	Interest on working capital @12%		122.1	-	170.49	-	173.63	-	180.04
C	Supervision charges @10% on working capital (A)		101.75	-	142.07	-	144.07	-	150.03
D	Depreciation charges on fixed capital @10% on Rs.59375/-i.e. Rs.0.813/hour		1.01	-	1.01	-	1.01	-	1.01
E	Interest on fixed capital @10% on Rs.59375/-i.e. Rs. 0.813 /hour		1.01	-	1.01	-	1.01	-	1.01
	Total cost (A+B+C+D+E)		1243.36	-	1735.31	-	1767.29	-	1832.40
1.	Cost of production of aonla syrup (10 kg fruits)		1243.36	-	1735.31	-	1767.29	-	1832.40
2.	Total receipt @Rs.150/kg syrup		2562.75	-	3799.12	-	3877.87	-	4039.87
3.	Net profit of aonla syrup (if sold direct to the consumer)		1319.38	-	2063.80	-	2110.57	-	2207.46
4.	Benefit: cost ratio		2.06	-	2.18	-	2.19	-	2.20

		T_5		T_6		T_7	
Sr. No.	**Particulars**	**Quantity**	**Cost (Rs.)**	**Quantity**	**Cost (Rs.)**	**Quantity**	**Cost (Rs.)**
1	Aonla fruits @ Rs. 15/kg	10 kg	150	10kg	150	10 kg	150
2	Glass container (capacity 200 g) @ Rs. 5/bottle	153.025	765.125	154.975	774.875	162.6	813
3	Sugar @ Rs. 35/kg	20.405	714.175	20.665	723.275	21.685	758.975
4	Citric acid @ Rs.92.40/kg	90	8.31	90	8.31	130	12.01
5	Preservatives(S.B.) @ Rs.252/kg	21.425	5.39	21.67	5.46	22.75	5.73
6	Labour charges @ Rs. 180/day	1 ¾	28.25	1 ¾	28.25	1 ¾	28.25
7	Fuel and electrical charges		8.25	-	8.75	-	9.25
	Working capital (A)		**1679.8**	**-**	**1699.2**	**-**	**1777.47**
B	Interest on working capital @12%		201.57	-	203.9	-	213.3
C	Supervision charges @10% on working capital (A)		167.98	-	169.92	-	177.75
D	Depreciation charges on fixed capital @10% on Rs.59375/-i.e. Rs.0.813/hour		1.01	-	1.01	-	1.01
E	Interest on fixed capital @10% on Rs.59375/-i.e. Rs.0.813 /hour		1.01	-	1.01	-	1.01
	Total cost (A+B+C+D+E)		2051.31	-	2075.00	-	2170.52
1.	Cost of production of aonla of syrup		2051.31	-	2075.00	-	2170.52
2.	Total receipt @Rs.150/kg syrup		4591.12	-	4649.62	-	4878
3.	Net profit of aonla syrup (if sold direct to the consumer)		2539.80	-	2574.61	-	2707.47
4.	Benefit: cost ratio		2.23	-	2.24	-	2.24

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