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Standardization of ginger flavoured aonla-carrot blended beverage

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Abstract
The present investigation was aimed to standardize formulation for the preparation of nutritional as well as medicinal drink by blending aonla, carrot and ginger. The blended beverage with varying level of juice of fruits and vegetables with 15o Brix TSS, 0. 3 per cent acidity was preferred and evaluated by complete randomized design and three repetitions for changes in chemical qualities during storage period at 0 hr, 2nd, 4th and 6th months at room temperature. Aonla is considered to be the rich source of Vitamin-C, carrot is considered to be the rich source of Vitamin-A and ginger is rich in antioxidant properties. The highest bio-chemical character like TSS, acidity, total sugars, reducing sugars and ascorbic acid were recorded in proportion of T1 1 aonla(a) : carrot (c) : ginger(g), 18:0: 2. However, T1 a: c: g, 0:18:2 was found good in higher level of sugar:acid ratio and β-carotene. All bio-chemical constituents were found increasing except sugar:acid ratio, ascorbic acid and β-carotene which one decreasing during storage period

Keywords: flavoured aonla-carrot, blended beverage

Introduction
Aonla or Indian gooseberry (*Emblica officinalis* G.) is an indigenous fruit to the Indian subcontinent. Aonla is mostly cultivated in different states of India. In Gujarat, aonla is cultivated in North Gujarat, Central & North arid zone in 11.38 ha with production of 108. 54 MT (Anon., 2014) [1]. On an average a grown up tree yields 150 to 200 kg of fruits per annum. Aonla fruits are rich source of vitamin-C having an ascorbic acid content varying from 600-700 mg/ 100 ml (Jain and Meena, 2013) [5]. This fruit is highly valued among indigenous medicines. Trifala and Chyavanprash are well known indigenous medicines in ayurvedic system using amla fruits. Carrot (Daucus carota L.) is a very valuable cool season vegetable crop of India. The Asiatic carrots are generally red coloured because of anthocyanin pigment. The European types are orange coloured because of carotene, a precursor of vitamin-A. In India mostly Asiatic type is grown probably due to appealing red colour. The carrot is cultivated in area 62.41 ha with the production of 1073. 71 MT (Anon., 2014) [1]. It has a number of medicinal and nutritional uses, it is rich in Vitamin-A having β-carotene content varying from 350-400 mg/ 100 ml (Karanjanawipagul *et al*., 2010) [6]. It contains more than 490 phyto-chemicals and major vegetables in diets worldwide mainly due to their pleasant flavour and perceived health benefits it is good for eye disorders, skin care. Generally, Asiatic types yield 25 -30 t/ ha whereas, European types yield 10-15 t/ha. Ginger (Zingiber officinale Rosc.) growing in many states of India. The ginger is cultivated in area 132.62 ha with the production of 655.06 MT (Anon., 2014) [1]. Ginger is the underground stem (rhizome) of a perennial herb, which is used as a spice and as a preserve. It is used as a raw material in the production beverages, perfumes and medicines. Its constituents are fibre, protein, resin, oil etc. Ginger is rich in the medicinal and antioxidant properties and the incorporation of sensory, nutritional as well as medicinal properties of two or more plant species into beverage is possible by only blending technology of beverage processing (Bhagwan and Awadhesh, 2014) [2]

Material and method
The experiment was conducted at the Departments of Post-harvest technology. Fresh aonla, carrot and ginger were procured from local market. The experiment was conducted in CRD with three repetitions. The blended beverage was prepared with 20 per cent juice, 15° Brix TSS and 0.3 percent acidity.

The product was subsequently used for chemical evaluation for a period of 0 hr, 2n d, 4th and 6th months of storage. Blended beverage were analyzed for different bio-chemical parameters viz., TSS (°Brix), acidity (%), sugar:acid ratio, total sugars (%), reducing sugars (%), ascorbic acid (mg/ 100 ml), according to the procedure reported by Rangana, (1986) [9]. While β-carotene (mg/ 100 ml) was determined by spectrophotometric method detailed by Biswas *et al*. (2011) [3]. The data obtained were statistically analyzed as per Panse and Sukhatme (1967) [8].

Table 1: Treatment details under experimentation

Treatments	Blending ratio (aonla:carrot)	Ginger juice (%)
T1	0:18	2
T2	5:13	2
T3	6:12	2
T4	7:11	2
T5	8:10	2
T6	9:9	2
T7	10:8	2
T8	11:7	2
T9	12:6	2
T1 0	13:5	2
T1 1	18:0	2

Result and Discussion

It is evident from the data that among different treatments maximum TSS (° Brix) and acidity (%) were recorded in the treatment T1 1 (a: c: g, 18:0 :2) (table.2). TSS (° Brix) and acidity (%) content of beverage increased in all treatments with the increase in storage period. This increase in TSS may be due to the blending effect and the maximum concentration of aonla juice as well as the hydrolysis of polysaccharides like starch, cellulose and pectin substances into simple sugars during storage period. Such result was also observed by Kumar *et al*. (2009) [7] in aonla-pineapple nectar. For acidity (%), i t may be due to the blending effect and the maximum concentration of aonla juice, also attributed to the accelerated degradation of pectin substances and formation of organic acid by degradation of ascorbic acid during storage of blended beverage. Similar observation was found by Gaikwad *et al*. (2013) [4] in aonla-ginger RTS.

Over all sugar : acid ratio (table.2) of beverage was found highest in T1 (a:c:g, 0:18:2), it may be due to the only blending of carrot and ginger juice without aonla which contain low level TSS and acidity. The pattern of decreasing sugar : acid ratio during storage might be due to the continue increasing TSS (o Brix) and acidity (%) during storage. Sugar : acid ratio always opposite direction of TSS and acidity. It was showed decreasing trend in all treatments during six months of storage. Such identical finding was observed by Ullah *et al*. (2015) [10] in carrot, kinnow and ginger blended RTS. The data (table. 3) clearly revealed that the total sugars content of beverage was found significant result during storage period.

Table 2: Changes in TSS (° Brix), acidity (%) and sugar: acid ratio of ginger f lavoured aonla- carrot blended beverage during storage.

Treatments	TSS (Brix)					Acidity (%)					Sugar :Acid ratio				
	0 hr.	2 Month	4 Month	6 Month	Mean	0 hr	2 Month	4 Month	6 Month	Mean	0 hr.	2 Month	4 Month	6 Month	Mean
T1	15.00	15.16	15.22	15.33	15.18	0.300	0.325	0.331	0.336	0.323	50.00	46.70	45.94	45.59	47.06
T2	15.00	15.19	15.28	15.35	15.21	0.300	0.331	0.338	0.341	0.327	50.00	45.90	45.22	45.08	46.55
T3	15.00	15.20	15.32	15.42	15.24	0.300	0.342	0.347	0.351	0.335	50.01	44.44	44.12	43.90	45.62
T4	15.00	15.25	15.36	15.47	15.27	0.300	0.345	0.350	0.353	0.337	50.01	44.20	43.88	43.83	45.48
T5	15.00	15.24	15.39	15.50	15.28	0.300	0.347	0.353	0.359	0.340	50.01	43.87	43.65	43.23	45.19
T6	15.00	15.28	15.45	15.54	15.32	0.300	0.350	0.355	0.363	0.342	50.01	43.69	43.48	42.81	45.00
T7	15.00	15.29	15.47	15.60	15.34	0.300	0.351	0.357	0.366	0.344	50.01	43.54	43.30	42.68	44.88
T8	15.00	15.31	15.47	15.72	15.38	0.300	0.355	0.361	0.369	0.346	50.01	43.08	42.82	42.66	44.64
T9	15.00	15.34	15.52	15.85	15.43	0.300	0.356	0.363	0.372	0.348	50.01	43.06	42.76	42.57	44.60
T10	15.00	15.35	15.60	15.90	15.46	0.300	0.360	0.368	0.376	0.351	50.01	42.68	42.43	42.29	44.35
T11	15.00	15.43	15.77	16.06	15.56	0.300	0.364	0.372	0.382	0.354	50.01	42.39	42.38	42.07	44.22
Mean	15.00	15.28	15.44	15.61	15.33	0.300	0.348	0.354	0.361		50.01	43.96	43.63	43.34	
S.Em ±	0.00	0.02	0.03	0.04		0.002	0.002	0.003	0.003		0.01	0.28	0.33	0.32	
CD (at 5%)	0.01	0.06	0.09	0.11		0.006	0.007	0.008	0.009		0.04	0.83	0.95	0.94	
CV %	0.04	0.23	0.33	0.40		1.095	1.131	1.339	1.525		0.04	1.11	1.29	1.28	

Over all total sugars (%) of beverage was found maximum in T1 1 (a: c: g, 18:0 :2). Whereas, it was found increase in trend up to six months of storage. The pattern of increasing of total sugars (%) during storage might be due to the blending effect and maximum concentration of aonla juice having more TSS and sugar than carrot and ginger and also due the breakdown of insoluble polysaccharides into simple sugars by solubilization of juice constituents during storage. Such result was also observed by Kumar *et al*. (2009) [7] in aonla-pineapple nectar. Table.3 shows the data of reducing sugars of all treatments; statistically i t revealed that the reducing sugars content of beverage was found increasing trend during storage period.

Table 3: Changes in total sugars (%) and reducing sugars (%) of ginger f lavoured aonla- carrot blended beverage during storage.

Treatments	Total sugars (%)					Reducing sugars (%)				
	Storage period				Mean	Storage period				Mean
	0 hr.	2 Month	4 Month	6 Month		0 hr.	2 Month	4 Month	6 Mont	
T1	14.40	14.33	14.53	14.70	14.49	4.93	5.87	5.99	6.03	5.70
T2	14.53	14.57	14.76	14.86	14.68	5.07	6.01	6.17	6.23	5.87
T3	14.62	14.70	14.91	15.00	14.81	5.09	6.16	6.33	6.42	6.00
T4	14.74	14.81	15.05	15.17	14.94	5.35	6.46	6.49	6.53	6.21
T5	15.01	15.04	15.37	15.52	15.23	5.40	6.55	6.61	6.70	6.32
T6	15.16	15.18	15.50	15.62	15.37	5.67	6.12	6.79	6.92	6.38

T7	15.28	15.46	15.66	15.77	15.54	5.67	6.35	6.83	7.11	6.49
T8	15.41	15.72	15.83	15.92	15.72	5.82	6.68	6.97	7.12	6.65
T9	15.63	15.85	15.92	16.22	15.91	6.08	6.98	7.16	7.31	6.88
T10	16.74	16.86	17.01	17.83	17.11	6.53	7.38	7.69	7.74	7.34
T11	17.02	17.08	17.17	18.12	17.35	6.62	7.42	7.76	7.82	7.40
Mean	15.32	15.42	15.61	15.88		5.66	6.54	6.80	6.90	
S.Em ±	0.10	0.12	0.10	0.11		0.05	0.07	0.08	0.09	
CD (at 5%)	0.29	0.34	0.29	0.33		0.16	0.22	0.24	0.25	
CV (%)	1.12	1.29	1.11	1.23		1.65	1.95	2.05	2.18	

These chemical reactions were quicker under high temperature at ambient conditions which lead to increase the level of reducing sugars in the product. Similarly observation found by Kumar *et al*. (2009) [7] in aonla-pineapple nectar. It was found maximum in T1 1 (a:c: g, 18:0: 2). This can be attributed that the partial acids are hydrolysis the starch and disaccharides of juice into invert sugars.

Table 4: Changes in ascorbic acid (mg/ 100 ml) and β- carotene (mg/ 100 ml) of ginger f lavoured aonla- carrot blended beverage during storage

Treatments	Ascorbic acid (mg/ 100 ml)					β-carotene (mg/ 100 ml)				
	0 hr.	2 month	4 month	6 month	Mena	0 hr.	2 month	4 month	6 month	Mean
T1	5.04	4.89	4.62	3.03	4.39	4.81	4.68	4.46	4.42	4.59
T2	5.12	4.97	4.69	3.18	4.49	4.77	4.67	4.40	4.38	4.56
T3	5.57	5.42	4.90	3.53	4.85	4.73	4.62	4.37	4.34	4.52
T4	9.11	9.00	8.48	7.51	8.52	4.53	4.42	4.34	4.29	4.39
T5	10.35	10.24	9.55	8.17	9.58	4.45	4.39	4.29	4.27	4.35
T6	11.03	10.92	9.93	8.69	10.14	3.90	3.76	3.64	3.59	3.72
T7	11.51	11.39	10.39	9.26	10.64	3.87	3.71	3.59	3.56	3.68
T8	12.01	11.87	11.02	10.53	11.36	3.80	3.68	3.55	3.52	3.64
T9	14.03	13.87	13.10	12.44	13.36	3.76	3.65	3.48	3.44	3.59
T10	16.51	16.37	15.81	14.11	15.70	3.72	3.45	3.33	3.29	3.45
T11	16.56	16.41	15.91	14.20	15.77	3.64	3.40	3.26	3.22	3.38
Mean	10.62	10.49	9.85	8.60		4.18	4.04	3.88	3.85	
SEm ±	0.05	0.04	0.03	0.03		0.05	0.04	0.04	0.04	
CD (at 5%)	0.15	0.13	0.10	0.09		0.15	0.13	0.11	0.11	
CV %	0.82	0.73	0.59	0.63		2.08	1.85	1.64	1.61	

Overall ascorbic acid (mg/ 100 ml) of beverage (table.4) was found highest in T1 1 (a: c: g, 18 :0:2) due to highest aonla juice. Whereas, it showed decreasing trend during the storage period due to increase in temperature level which was affected the ascorbic acid due to thermolabile nature. Moreover, it may probably due to the process of oxidation of ascorbic acid into dehydroascorbic acid by enzyme ascorbinase. Similar result were observed by Gaikwad *et al*. (2013) [4] in aonla-ginger RTS. Overall β-carotene (mg/ 100 ml) of beverage (table. 4) was found highest in T1 (a: c: g, 0: 18: 2) due to be increased with increasing proportion of carrot juice. Whereas, it showed decreasing trend of β-carotene (mg/ 100 ml) during storage might be due to oxidative breakdown or enzymatic destruction of pigments as well as maximum heating time during processing as β- carotene is sensitive to heat. (Ullah *et al*., 2015) [10]

Conclusion

Looking to the bio-chemical composition of ginger flavoued aonla-carrot blended beverage T1 1 (a: c: g, 18:0: 2) was highest in respect to TSS, acidity, total sugars, reducing sugars and ascorbic acid. However, Proportion of T1 (a: c: g, 0:18: 2) which was highest in sugar: acid ratio and β-carotene. All bio-chemical constituents were found increasing except sugar: acid ratio, ascorbic acid and β-carotene which were decreasing during six months of storage period.

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