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Research Article

Storage studies of biochemical and sensory parameters of Indian gooseberry enriched wood-apple drink

Priya Awasthi, Setu Kumar, Subhash Chandra Singh, Rohit Kumar

Abstract

The current investigation was done at Post Harvest Technology and Biochemistry Laboratory in College of Horticulture, BUAT, Banda (U.P.) to develop the Indian gooseberry enriched wood-apple drink and analyze the quality changes in the drink during a storage period of up to three months. The juice of wood apple was extracted by mixing water and pulp in a 2:1 ratio, and Indian gooseberry juice was extracted by screw type juice extractor. The seven treatments includes T_1 (control-100 % W), T_2 (90 %W + 10 % A), T_3 (80 % W + 20 % A), T_4 (70 % W + 30 % A), T_5 (60 % W + 40 % A), T_6 (50 % W + 50 % A) and T_7 (40 % W + 60 % A). It was found that an increasing trend was found in TSS, Titrable acidity, and NEB (non-enzymatic browning) in all combinations with the increase in storage period, whereas, protein, Vitamin C, and phenols were decreased with storage period. At 60 days of storage highest value of ascorbic acid was recorded in T_7 (9.23mg/100ml) and the lowest in T_1 (0.14mg/100ml). Browning was significantly increased at different stages of the storage period; the highest value was noticed at 90 days (0.112) and the lowest at 0 days (0.050). All combinations were acceptable up to 90 days as per nine point hedonic scale rating for judging overall acceptability. It was observed that all values of organoleptic based attributes decreased with the storage period. From a nutritional aspect T_7 (40 % W + 60 % A) was recorded best in among all the treatments on the other hand on the basis of sensory qualities, T_4 (70 % W + 30 % A) was recorded best among all the treatments.

Keywords biochemical, juice, sensory, storage

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Authors:
P. Awasthi ✉, S. Kumar, R. Kumar
Department of Post Harvest Technology, College of Horticulture, Banda University of Agriculture and Technology, Banda, U.P. India

S. C. Singh
Department of Fruit Science, College of Horticulture, Banda University of Agriculture and Technology, Banda, U.P. India

✉ awasthi.coa.pa@gmail.com

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Introduction

In India, many tropical fruit falls under the category of underutilized, wood apple (*Limonia acidissima*) is such fruit it has a significant level of nutritional value and can grow in many sort of soil and environment. The wood apple is known as various names in various parts of the world like Elephant apple and Monkey jack. It is thought to have come from India's subtropical plains [1]. The pulp percentage in ripe fruit (70%), 2.2% (Protein), 22% (Carbohydrate), and fat (3.3%) provides 127 k-cal energy per 100g pulp. the wood-apple pulp contains Vit-C, Ca, Fe, P, Zn, Cu, and Mn which are 16, 3.5, 8.5, 46.6, 386.3, 0.8, and 0.7 (mg/100g pulp) respectively. The pulp contains 3-8% pectin and 6% seed on a dry weight basis [2]. Indian gooseberry (*Emblica officinalis*) is also known as Indian gooseberry. It is a major tropical and sub-tropical deciduous tree

belonging to the family Euphorbiaceae. The fruit is highly nutritious and is a rich source of pectin, poly-phenols a part from ascorbic acid. The fruits are well-known in the conventional Indian medical system for their therapeutic benefits in treating chronic dysentery, bronchitis, and diabetes. The fruit offers nearly all of the diet's necessary nutrients. It is a fantastic source of ascorbic acid, containing 200–900 mg per 100g of fresh pulp [3].

The highly perishable nature of the fruits makes it challenging to preserve or ship them across great distances. It must therefore be promoted and used right away. Fruit-based beverages are nutritionally far superior to many artificial and aerated drinks, being easily digested, incredibly refreshing, thirst-quenching, enticing, and attractive [4]. Juices are a fundamental element of a healthy diet and they are highly recommended due to their nutritional content, phytochemical worth, and presence of health-promoting compounds. Two or more fruits juice/pulp may be combined in various quantities to make nectar, RTS drinks, and so on.

Wood apple and Indian gooseberry are two common nutritious fruits. They are wonderful for their flavor and taste. These fruits are not preserved for a long time. When wood apple juice and Indian gooseberry juice are combined a slightly more pleasant flavor results than when either juice is consumed alone. This combination is also beneficial to your health.

Methodology

The wood apple fruits were collected from a local mandi in the Banda district. The fully ripe and mature fruits were selected and brought to the laboratory for further experiment. Analytical grade compounds made up the majority of the substances employed in these experiments. Glass bottles were used for packaging the prepared product which was purchased by the local market of Lucknow (Uttar Pradesh) having a capacity of 200 ml.

Experimental Details

Extraction of wood apple juice

We select ripe, healthy, and uniformly mature wood apple fruits. After washing and peeling the fruits, the pulp is removed. Fully mature wood apple fruits were used for the pulp extraction process. Fruits were manually opened and the meat was taken out. Pulp was extracted by combining water and pulp in a 1:2 ratio and boiling at 60°C for 40 min. The boiled pulp was allowed to cool down and juice was extracted by filtering (muslin cloth) of the boiled pulp.

Indian gooseberry juice extraction

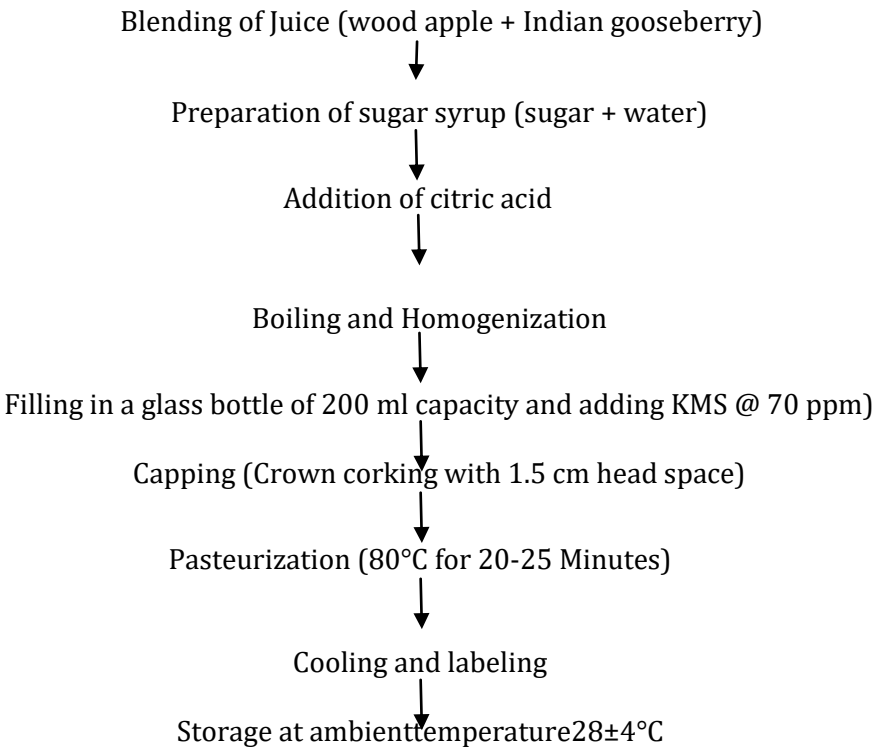
To extract juice, Indian gooseberry fruits were cut into slices using stainless-steel knives and smashed. The juices were refrigerated (4-2°C) for 24 hours to allow for sedimentation. After that, the clear juice was extracted and filtered through muslin cloth.

Preparation of RTS

Creating the RTS, Total soluble solids and total titratable acidity were first measured by hand refractometer and titration, respectively, in extracted juices before being used to formulate recipes. The amount of sugar and acid in the pulp was then calculated, along with the quantity of citric acid, potassium metabisulphite, and water still needed to make the finished RTS in the various ratios required by the requested recipes.

Extracted juice was filtered and pasteurized. For the development of RTS sugar syrup was prepared by adding calculated sugar in pre-boiled water. The calculated amount of citric acid was added to the syrups followed by filtration with a muslin cloth in order to get clean syrup. Filtered syrups were mixed with pasteurized wood apple and Indian gooseberry juice as per the recipes proposed. After cooling, preservative potassium metabisulphite was added as @ 70 ppm. Bottling and capping were done and bottles were subjected to ambient storage. Only wood apple-based RTS

prepared as per FSSAI standards was taken as control. For the preparation of ready-to-serve drinks, various combinations of wood apple and Indian gooseberry juice were attempted. The basis of RTS was created using wood apple juice. The RTS was produced in accordance with FSSAI requirements (juice or pulp >10%, TSS >10 °B, acidity 0.3%, and preservative 70 ppm). Sterilized bottles with a 200 ml capacity were filled with the prepared RTS, leaving a 2 cm headspace, and the caps were corked. Flow-chart of wood apple-Indian gooseberry blend health drink (Flow chart 1)



Flow chart 1. Wood apple-Indian gooseberry blend health drink

Biochemical analysis

Biochemical characteristics of wood apple and Indian gooseberry fruits and prepared products were analyzed for the following parameters- A hand refractometer (QA Supplies, LLC) with a range of 0-450Brix was used to measure the total soluble solid (TSS). The TSS was recorded by placing 1-2 drops of the sample on the prism of a hand refractrometer. Total soluble solids was expressed as 0B (Brix). Titratable acidity was calculated as per AOAC method [5]. We used the [5] method to calculate the protein content. The following equation determines the percentages of nitrogen and protein:

$$\text{Nitrogen } \% = \frac{\text{Normally of acid } \times \text{TS } - \text{TB} \times \text{ meq. of N2}}{\text{Sample weight (in grams)}}$$

Where, Ts = Titre volume of the sample (ml), TB = Titre volume of Blank (ml), Meq. Of N2 = 0.014 and % Protein = (Nitrogen × 5.7).

The Folin-Ciocalteure agent was used to calculate the sample's total phenolic content using the method described by Rathod et al., [4]. The visual titration method of 2, 6-dichlorophenol-indophenols was used to determine ascorbic acid [6]. The non-enzymatic browning was measured by taking 10 ml RTS, centrifuge it, and collecting supernatant. After that take 6 ml ethanol (60%

concentration) and mix it with 4 ml supernatant then again centrifuges the sample @ 5000 rpm for 15 min. Collection of supernatant was done and reading at 440 nm [7]. The organoleptic evaluation of the prepared items was carried out using the [8] nine-point hedonic rating scale method. A panel of seven judges comprised of faculty members and postgraduate students was carefully chosen to assess the organoleptic features of items, including appearance, color, taste, mouth feel, and overall acceptability. All prepared treatments were tested for biochemical and sensory qualities up to three months in storage. For all quality criteria, observations were taken at 0-day, 1-month (30 days), 2-month (60 days), and 3-month (90 days) intervals. The data were analyzed using CRD.

Results and Discussion

Data on Total Soluble Solids (TSS) are presented in Table 1, and it is evident that TSS values dramatically rise with the storage period. The lowest mean TSS value was seen at 0 days (10.02), and the highest value was seen at three months (11.04). Data show that TSS dramatically increases as Indian gooseberry concentration in blend juice increases. The interaction of both factors (Recipe and Time) on TSS was found significant. Due to the polysaccharide's conversion to sugar in the presence of organic acids, the TSS increased in all treatments. The findings of the current investigation closely match those of [9] in the mulberry RTS study.

Table 1. Effect of storage on TSS (°Brix) and Titrable Acidity (%) of wood apple-Indian gooseberry health drink

Treatments	Total Soluble solids (°Brix)				Titrable Acidity (%)			
	Storage Period (Month)				Storage Period (Month)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	10.00	10.13	10.26	10.40	0.30	0.32	0.34	0.38
T_2 (90 %W + 10 % A)	10.00	10.16	10.36	10.53	0.30	0.33	0.34	0.38
T_3 (80 % W + 20 % A)	10.00	10.26	10.46	10.66	0.30	0.33	0.34	0.40
T_4 (70 % W + 30 % A)	10.06	10.40	10.70	11.06	0.30	0.34	0.35	0.41
T_5 (60 % W + 40 % A)	10.00	10.46	10.66	11.30	0.31	0.34	0.34	0.42
T_6 (50 % W + 50 % A)	10.00	10.56	10.93	11.43	0.31	0.35	0.36	0.44
T_7 (40 % W + 60 % A)	10.10	10.93	11.36	11.70	0.31	0.36	0.38	0.45
Mean	**10.02**	**10.41**	**10.68**	**11.04**	**0.04**	**0.33**	**0.34**	**0.41**
	T	S	TxS		T	S	TxS	
SEM±	0.084	0.064	0.169		0.004	0.003	0.008	
C.D.(0.05)	0.030	0.022	0.059		0.011	0.008	N/S	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction, N/S= Non-significant

Values related to titrable acidity in RTS beverages given in Table 1, data indicates that the influence of titrable acidity percentage has a positive non-significance relation on the value of acidity in RTS. At 0-day the acidity was observed approximately the same in all treatments, at one month (30 days) highest acidity in RTS was found in T_7, and the minimum in T_1 at two months (60 days) maximum value of acidity was observed in T_7 (0.38%) and minimum in T_3 (0.33%). With regard to recipe titrable acidity increasing significantly as Indian gooseberry juice concentration increased, the highest mean value of acidity was found in T_7, followed by T_6, and the lowest in T_1. There is a significant effect of the storage period showing down titrable acidity value in RTS. The increasing trend in acidity was found due to an increase in the organic acid content in RTS, because degradation of ascorbic acid with storage time and conversion of pectin substance into TSS which causes an increase in acidity. The study is confirmed by Vignesh et al., [10] RTS by various fruit blend juices observed with increasing in storage periods. The data indicate that the value of protein significantly decreases with increase during storage (Table 2). The highest protein contains was found at 0-day (0.42%) and lowest at three months (0.28%). The protein percent in the drink was observed to

decrease when the concentration of Indian gooseberry juice increased in the context of the recipe. The interaction of recipe and storage period on protein value has been found significant. The decrease in protein content was very significant as the protein provided by the incorporation of whey is of high quality and these blended drinks can be used as health drinks. Similar observations were also noted by Sakhale et al., [11].

Table 2. Effect of storage on Protein (%) and Vit C (mg/100) of wood apple-Indian gooseberry health drink

Treatments	Protein (%)				Ascorbic acid (mg/100)			
	Storage Period (Month)				Storage Period (Month)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	0.63	0.54	0.36	0.23	0.23	0.18	0.15	0.14
T_2 (90 %W + 10 % A)	0.54	0.50	0.43	0.33	1.56	1.43	1.33	1.16
T_3 (80 % W + 20 % A)	0.48	0.44	0.39	0.33	3.10	2.96	2.80	2.76
T_4 (70 % W + 30 % A)	0.42	0.41	0.39	0.33	4.50	4.36	4.03	3.96
T_5 (60 % W + 40 % A)	0.35	0.32	0.29	0.27	6.20	6.00	5.83	5.66
T_6 (50 % W + 50 % A)	0.30	0.29	0.27	0.26	7.66	7.53	7.40	7.16
T_7 (40 % W + 60 % A)	0.24	0.22	0.21	0.19	9.86	9.70	9.53	9.23
Mean	**0.42**	**0.39**	**0.33**	**0.28**	**4.30**	**4.59**	**4.44**	**4.30**
	T	S	TxS		T	S	TxS	
SEM±	0.012	0.009	0.025		0.037	0.028	0.075	
C.D.(0.05)	0.035	0.027	0.071		0.106	0.08	N/S	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction, N/S= Non-significant

Ascorbic acid was noticed in Table 2 in T_7 (9.86mg/100ml) and lowest in T_1 (0.23mg/100ml). The same trend was seen at one month (30 days) the highest value of ascorbic acid was observed in T_7 (9.7mg/100ml) and the lowest in T_1 (0.18mg/100ml), at the last stage of the study period same trend of result was found highest value of ascorbic acid was recorded in T_7 (9.23mg/100ml) and lowest in T_1 (0.14mg/100ml). As the amount of Indian gooseberry juice in the mixed juice increased, the influence of the recipe on the ascorbic acid value was also discovered to be substantial, with the highest value being observed in T_7 and the lowest in T_1. Storage time also significantly affected the ascorbic acid value as the storage period increased value of ascorbic acid decreased. The reduction in ascorbic acid concentration may be caused by oxygen (O_2) trapped in the product's containers and intra-molecular space oxidizing ascorbic acid into dehydro-ascorbic acid. The findings of a blended RTS made from mango, kagzi lime, aloe vera, and ginger provide additional support for the current findings on changes in ascorbic acid levels during beverage storage [12].

The total phenols contain in RTS increase significantly with Indian gooseberry juice concentration in RTS. The data regarding the total phenol of RTS is shown in Table 3. Thus the maximum value of phenol was observed in T_7 (22%) then in T_6 (18%) and the lowest value in T_1 (11.6%). The value of total phenol significantly decreased with increase during storage, the highest value was noticed at 0-day and the lowest at the end of the study period 90-days (3 months). The interaction of both factors on phenol was found significant. Since the total phenols are volatile compounds with a storage period the quantity of total phenol was degraded significantly, Similar results were reported by Singh and Singh [13] in litchi beverage, suggesting that other explanations could be related to their condensation into dark pigments or the nature of their highly volatile and readily oxidizing substance.

The amount of Indian gooseberry juice has demonstrated a positive relationship with Non enzymatic browning in RTS, and as the proportion of Indian gooseberry juice increases, so does the value of browning as shown in Table 3. The highest value of browning was observed in T_7 (0.120) and the lowest in T_1 (0.049) in terms of O.D. (Optical density). During the storage period a significant increasing trend was observed in browning at different stages of the storage period, the highest value was noticed at three months (0.112) and lowest at 0 days (0.050). The interaction of both factors

Table 3. Effect of storage on total phenol (mg/100ml) and non-enzymatic browning (O.D.) of wood apple-Indian gooseberry health drink

Treatments	Total Phenol (mg/100ml)				Non-Enzymatic Browning (O.D.)			
	Storage Period (Month)				Storage Period (Month)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	13.8	12.7	11.2	9.03	0.030	0.043	0.053	0.070
T_2 (90 %W + 10 % A)	15.1	13.8	11.9	9.9	0.031	0.057	0.083	0.093
T_3 (80 % W + 20 % A)	16.5	15.7	13.7	11.8	0.037	0.067	0.080	0.103
T_4 (70 % W + 30 % A)	18.2	16.1	14	11.8	0.050	0.063	0.083	0.090
T_5 (60 % W + 40 % A)	19.7	17.0	15.1	12.2	0.060	0.090	0.116	0.113
T_6 (50 % W + 50 % A)	21.3	19.1	17	14.6	0.063	0.090	0.124	0.143
T_7 (40 % W + 60 % A)	25.6	23.0	21.8	19.0	0.083	0.120	0.126	0.115
Mean	**18.6**	**16.8**	**14.8**	**12.6**	**0.050**	**0.076**	**0.095**	**0.112**
	T	S	TxS		T	S	TxS	
SEM±	0.08	0.06	0.16		0.003	0.002	0.005	
C.D.(0.05)	0.227	0.172	0.454		0.007	0.005	0.0014	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction

among all treatments was observed significant, the lowest value was observed on the preparation day of storage in T_1 (0.030) and highest at three months (90 days) in T_6 (0.143). Indicate that a progressive increase in browning in term of O.D. in RTS during the entire period of storage may happen due to the Millard reaction or oxidation of phenol which lead to browning. Non-enzymatic browning in Indian gooseberry-based RTS beverages was reported to increase with the storage period [14].

Data related to appearance is shown in Table 4. Data indicate with the decreased RTS content of wood apple juice, the data of appearance increased significantly the maximum score mean value of appearance was noticed in T_6 and T_7 and minimum in T_1. The storage period also affect the appearance of RTS, at 0 days the mean data of appearance was noticed highest (7.7), and at 90 days (three months).

Table 4. Effect of storage on Appearance and Color of wood apple-Indian gooseberry health drink

Treatments	Appearance				Color			
	Storage Period (Month)				Storage Period (Month)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	7.4	7	7	4.6	7.6	6.4	5.2	5.2
T_2 (90 %W + 10 % A)	7.6	7.6	7.4	5.4	7.6	7	5	4.6
T_3 (80 % W + 20 % A)	7.8	7.6	7.2	5.4	7.8	6.8	5.2	4.8
T_4 (70 % W + 30 % A)	7.6	7.2	7.2	6.2	7.6	7	6.6	6.4
T_5 (60 % W + 40 % A)	7.8	7.6	7.4	5.4	7.8	7	5	4.8
T_6 (50 % W + 50 % A)	8	8	7.8	5.6	8.4	7.8	5.8	5
T_7 (40 % W + 60 % A)	8.2	7.8	7.8	5.6	7.6	7.4	6.4	6.2
Mean	**7.7**	**7.5**	**7.4**	**5.4**	**7.7**	**7**	**5.6**	**5.2**
	T	S	TxS		T	S	TxS	
SEM±	0.36	0.27	N/S		0.41	0.31	0.83	
C.D.(0.05)	0.13	0.09	0.26		0.14	0.11	0.29	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction, N/S= Non-significant

It was observed lowest (5.4). The interaction of both factors (Recipe and Storage period) was observed non-significant. The reason may be increasing the transparency in RTS. Moazzem et al., [15] reported that appearance was declined with storage period in wood apple beverages. The score

related to the color of RTS is given in Table 4. It indicates that the score of color decreased significantly with storage time, the color retention was highest at 0 day and lowest at 90 days on the basis of sensory organ of 5 semi trend judge on the basis of 9 point hedonic scale. Data indicate that the highest mean value of the score of color was observed in T_7 and T_4 and lowest in T_2 then T_1, T_3, and T_5. The interaction of both factors on color was found significant. The temperature has a significant impact on the biochemical processes that cause unfavorable flavor development as well as discoloration (browning), obscuring the beverage's natural color. These reported observations support the present findings. A similar change in hue has already been documented in pomegranate drinks [16].

Data presented in Table 5 indicates that the storage period had a significant effect on the taste of RTS. The recipe also affected the taste of RTS beverage, the T_1 (100% wood apple) was insipid in taste so it was not preferred by the judge panel, and T_7 due to the high concentration of Indian gooseberry treatment was not accepted by the judge panel, but T_4 was more accepted by judges. The interaction of both factors (recipe and storage time) on taste was noticed as non-significant. The maximum value T_4 (7.8) at 0 day, while the minimum value T_7 (4.4) at 3 months (90 days) was found. The taste was decreased due to an increase in acidity percentage. Ullah et al., [17] said that the taste of RTS (carrot, kinnow, and ginger blend) was decreased with the storage period.

Table 5. Effect of storage on Taste and Flavor of wood apple-Indian gooseberry health drink

Treatments	Taste				Flavor			
	Storage Period (Month)				Storage Period (Days)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	7.4	6.2	5.4	4.6	7	6.2	5.4	5
T_2 (90 %W + 10 % A)	7.4	7	7	5.8	7.4	6.8	5.8	5.2
T_3 (80 % W + 20 % A)	7	6.6	5.6	5	7.2	6.6	5.8	4.8
T_4 (70 % W + 30 % A)	7.8	7.8	7.4	6.4	7.6	7.6	6.2	4.4
T_5 (60 % W + 40 % A)	6.8	6	5.2	4.8	6.4	6	4.8	4.4
T_6 (50 % W + 50 % A)	6.4	6.6	5.6	4.6	6.8	6.6	4.8	4.4
T_7 (40 % W + 60 % A)	6.4	6.2	5.2	4.4	6.8	6.6	4.8	4.4
Mean	**7**	**6.6**	**5.9**	**5**	**7**	**6.5**	**5.4**	**4.6**
	T	S	TxS		T	S	TxS	
SEM±	0.42	0.32	N/S		0.47	0.35	N/S	
C.D.(0.05)	0.15	0.11	0.30		0.16	0.12	0.33	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction, N/S= Non-significant

The score of flavour decreases significantly with the storage period. A significant variation was recorded in different treatments in the context of flavor, the highest score was observed in T_4 and lowest in T_1. During the storage time, a significant decreasing trend was noticed in flavor at different stages of the storage period, with the minimum value (4.6) at 90 days (three months) but the maximum value (7.0) at zero days was recorded (data presented in Table 5). The flavor value was likely reduced as a result of the oxidation process, which resulted in a drop in the flavoring components' esters, aldehydes, acids, ketones, tannins, and ethers. Markam and Singh [18] noticed that as storage time increased, the custard apple RTS beverage's flavor got worse.

The data regarding to mouth feel of RTS is given in Table 6. Data indicate the decreased treading of the mouth feels affected by the recipe and storage period. The effect of the recipe in the contest of mouth feel was noticed statically non-significant. The highest value was found in T_4 then T_7, T_2, T_6, T_3, and lowest in T_1 and T_5. The effect of the storage period has been found significant with increase in storage time. The highest value was recorded at 0 days (6.7) and the lowest at 90 days (4.4). The mouth feels score decline during storage could be the result of various unfavorable changes that happened to the product. Similar results were observed in the study of Shinde et al., [19] in RTS jackfruit mixture powder. Data related to the overall acceptability of RTS beverages is given

Table 6. Effect of storage on mouth feel and overall acceptability of woodapple-Indian gooseberry health drink

Treatments	Mouth feel				Overall acceptability			
	Storage Period (Month)				Storage Period (Month)			
	0	1	2	3	0	1	2	3
T_1 (control-100 % W)	6.6	5.6	4.8	4.2	7.2	6.1	5.5	4.7
T_2 (90 %W + 10 % A)	6.6	6	5.2	4.5	7.3	6.8	5.8	5
T_3 (80 % W + 20 % A)	6.6	5.8	4.8	4.4	7.2	6.6	5.7	4.8
T_4 (70 % W + 30 % A)	7.4	6.6	6	5.6	7.6	6	6.6	5.8
T_5 (60 % W + 40 % A)	6.6	5.6	4.8	4.4	7	6.4	5.4	4.7
T_6 (50 % W + 50 % A)	6.4	5.8	5	4.4	7.1	6.8	5.3	4.7
T_7 (40 % W + 60 % A)	6.8	6	5.2	4.2	7.1	6.6	5.7	4.9
Mean	**6.7**	**5.9**	**5.1**	**4.4**	**7.2**	**6.6**	**5.7**	**4.9**
	T	S	TxS		T	S	TxS	
SEM±	N/S	2.4	N/S		0.21	0.15	N/S	
C.D.(0.05)	1.1	0.87	2.3		0.076	0.056	0.14	

Where, W= Wood apple, A= Indian gooseberry, T= Treatment, S= Storage, TxS= Interaction, N/S= Non-significant

in Table 6. It indicates that among all treatments the highest mean score was rated T_4 by a panel of judges on the basis of 9 point hedonic scale and lowest T_5 and T_6. Among the different treatment, a significant variation was observed which indicate that the recipe also affected the value of overall acceptability. The interaction of both factors has observed non-significant indicating that with storage period score was decreased may be due to the continuously decreasing trend was recorded in all parameters (appearance, color, taste, flavor, and mouth feel).

There was a decrease in the overall acceptability from 0 to 3 months (0-90 days) of storage. Jain et al., [20] noted that guava and papaya pulp that has been mixed has less overall acceptability when stored at low temperatures (6±1°C). According to Afreen et al., [21], the 50:50 mixture of sour orange juice and carrot juice scored 6.66±0.087 for overall acceptability.

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