

PHYSICO-CHEMICAL CHARACTERISTICS OF BLENDED BEVERAGES (RTS) PREPARED FROM GUAVA AND PINEAPPLE

VAMSI KRISHNA NADELLA¹, DEVI SINGH², VIJAY BAHADUR HOD³,
ATUL YADAV⁴, SATYENDRA NATH⁵ AND S.K. SRIVASTAVA⁶

^{1,2,3,4}Department of Horticulture, NAI, SHUATS, Prayagraj, U.P., India

⁵Department of Environmental Science & NRM, NAI, SHUATS, Prayagraj, U.P., India

⁶Directorate of Seed and Farm, SHUATS, Prayagraj, U.P., India

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Abstract—A lab experiment “Physio-chemical characteristics of blended beverages (RTS) prepared from guava and pineapple” was conducted during winter season of 2021 at Post Harvest technology Laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India. The experimental material consisted of ten treatments replicated thrice under Completely Randomized Design with combination of different recipes including two standard recipes without blending of guava and pineapple with varying levels of TSS for RTS. The blended RTS prepared from different recipes and blending ratio were also analysed periodically at 30 days interval for their various chemical constituents. The blended RTS organoleptically evaluated by adopting 9-point Hedonic rating scale and observations were recorded for their chemical changes during storage for 90 days. A critical analysis of physical composition of guava and pineapple fruits revealed that average fruit weight was recorded 5 kg and 5kg, pulp weight 4.2 kg and 4 kg, weight of non-edible waste 880g and 970g, respectively. Among the chemical composition, the TSS was recorded (12.31%, 12.80%), acidity (0.43%, 0.42%), ascorbic acid (243 mg/100 ml, 28.8 mg/100 ml), pH (2.41, 2.29). Among various recipe tried in this investigation, the nectar prepared from the treatment T4 (Guava pulp (40%) + Pineapple juice (60%)) recorded highest TSS, Ascorbic acid, organoleptic score with respect to aroma, taste and overall acceptability. During storage of RTS the acidity, TSS, showed an increasing trend with increasing period of storage (0 to 90 days) under ambient condition. While, there was a decreasing trend of ascorbic acid, pH and organoleptic score during storage period up-to 90 days of storage under ambient condition.

INTRODUCTION

Guava (*Psidium guajava* L.) is quite hardy, prolific bearer with sweet aroma and pleasant sour sweet taste, it is a member of dicotyledonous, belong to large member of Myrtaceae or Myrtle family believed to be originated in Central America and Southern part of Mexico (Somogyi *et al.*, 1996). It is a small tree or shrub of 2 to 8 m in height with wide spreading branches (Singh, 1988). It is claimed to be the fourth most important cultivated fruit in area and production after mango, banana and citrus. India leads the world in guava production (Singhal, 1996). Crop in India occupies an area of 2.20 lack ha with annual production 25.72 lack MT having productivity 11.70 MT/ha (2021).

Pineapple (*Ananas comosus* L.) is a tropical plant of family Bromeliaceae and it is widely cultivated in India. The major growing states are west Bengal, Assam, Kerala, Karnataka, Tripura, Meghalaya and Nagaland. The area under pineapple cultivation in India is about 121.09 thousand ha and it produces around 2038.44 thousand MT pineapple in the year 2016-17 (Horticultural statistics at a glance 2017). The post-harvest loss of fruits varies from farmer field to consumer level is nearly 21 % and sometimes it goes upto 40-50% (Kabir *et al.*, 2010). Pineapple fruits are considered as good source of carbohydrates, dietary fiber and minerals such as calcium, iron, phosphorus, sodium and potassium (Hossain and Bepary, 2015). Pineapple fruit also contains some vitamins including A, thiamine,

(¹M.Sc. Scholar, ²Associate Professor, ³Assistant Professor, ⁴Associate Professor, ⁵Associate Professor)

riboflavin, niacin, pantothenic acid, pyridoxine, folate and ascorbic acid (Ancos *et al.*, 2017). The fruit is also rich in bromelin and it has pharmacological as well as meat tenderizing properties (Lobo and Siddiq, 2017; Rekha *et al.*, 2013). Fresh pineapple fruit is consumed as desserts and salad and it can be processed into juice, canned flesh, fruit cocktail, crushed pineapple, fruit punch, frozen pineapple, yoghurt, pineapple powder, freeze-dried pineapple, wines, sauces, jams, marmalades and confectionery product.

The important cultivar grown in India is Cayenne, Mauritius, Vazhakulam pineapple, Amritha, Kew, Giant Kew Queen and MD-2. The quality of pineapple fruit changes rapidly during storage and hence it influences the acceptability of the consumer (Shamsudin *et al.*, 2007; Jha *et al.*, 2012). Pineapple is a non climacteric fruit (Ding and Syazwani, 2016) and fruit does not continue to ripen or sweeten significantly after harvest.

Pineapple juice is widely commercialized as concentrated juice. Vacuum evaporation stands out as the most used procedure by the industries of concentrated juices. The main advantages of evaporation are the capacity to reach high concentrations, the versatility of concentrating different products, and to allow other procedures to be performed simultaneously (Fellows, 2006). One disadvantage is that it presents the degradation of composites sensitive to heat, as well the loss of volatile substances, reactions of browning, enzymatic darkening, coagulation, flocculation, and precipitation, besides being an energy-consuming process (Álvarez *et al.*, 2000; Girard; Fukumoto, 2000).

Ready to Serve (RTS) beverage is a non-fermented beverage prepared from mixing edible portion of fruit, sugar, water, and additives for direct consumption. Introduction of value added natural RTS beverages. This is a type of fruit beverage which contains at least 10 per cent fruit juice and 10 per cent total soluble solids besides about 0.3 per cent acid. It is not diluted before serving; hence it is known as ready-to-serve (RTS).

MATERIALS AND METHODS

An experiment was conducted during 2021 at Post harvest laboratory, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The experiment entitled "physio-

chemical characteristics of blended beverages (RTS) prepared from guava and pineapple" adapting Completely Randomized Design consisting of 10 treatments and three replications. Healthy and ripen guava and pineapple, free from disease, pest and insects were randomly selected and purchased from fruit mandi in Prayagraj (U.P), India. Other ingredients like sugar were brought from local shops in Prayagraj. Other items like glass bottles (200 ml) brought from online at Indian mart web site.

Preparation of blended nectar of guava and pineapple

The fruits to be processed were washed thoroughly under tap water to remove dust, dirt and other undesired materials adhering to the fruits, and the fruits were placed in a cotton dried cloth up-to 10 minutes. The clean fruits blanched in boiling water for 15 minutes. Then seeds were removed and segments were separated then passing through the juicer to get juice. The peel guava and pineapple fruits were crushed in a screw-type juice extractor machine for the extraction of juice. After juice extraction, guava and pineapple raw juice was heated separately at 96 °C for 2 minutes to inactivate enzymes. The bottle of RTS was stored in the refrigerator (10-12 °C). This was then subsequently used for periodical evaluation at 0, 30, 60, 90 days intervals for a period. The observation was recorded immediately after product preparation followed subsequent observation at an interval of 0, 30, 60, 90 days of storage on Total soluble solid (°Brix), Acidity (%), pH, Ascorbic Acid, Reducing Sugar (%) and in organoleptic test includes Colour and appearance score, Aroma, Flavor and taste, Overall acceptability

RESULTS

The results revealed that physio-chemical characteristics of Blended Beverages (RTS) Prepared from Guava and Pineapple of had the following performance.

Total soluble solid (°Brix)

The maximum T.S.S. (Total soluble solid) (15.06, 15.13, 15.25 and 15.50 °Brix) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum T.S.S. (Total soluble solid) (13.08, 13.16, 13.24 and 13.35°Brix) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during

Table 1. Treatments Details

Treatment notations	Treatment combinations
T1	Guava pulp (100%) + Pineapple juice (0.00%)
T2	Guava pulp (0.00%) + Pineapple juice (100%)
T3	Guava pulp (20%) + Pineapple juice (80%)
T4	Guava pulp (40%) + Pineapple juice (60%)
T5	Guava pulp (60%) + Pineapple juice (40%)
T6	Guava pulp (80%) + Pineapple juice (20%)
T7	Guava pulp (10%) + Pineapple juice (90%)
T8	Guava pulp (70%) + Pineapple juice (30%)
T9	Guava pulp (30%) + Pineapple juice (70%)
T10	Guava pulp (90%) + Pineapple juice (10%)

periods of storage at initial, 30, 60 and 90 days.

Acidity

The minimum Acidity (%) (0.26, 0.25, 0.25 and 0.24) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the maximum Acidity (%) (0.49, 0.49, 0.46 and 0.42) was observed in T2 Guava pulp (0.00 %) + Pineapple juice (100 %) during periods of storage at initial, 30, 60 and 90 days.

pH

The minimum PH (3.35, 3.65, 3.79 and 3.90) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the maximum pH (2.37, 2.51, 2.61 and 2.83) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during periods of storage at initial, 30, 60 and 90 days.

Ascorbic Acid

The maximum ascorbic acid (43.35, 42.33, 41.24 and 40.30) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum Ascorbic Acid (64.65, 63.28, 62.48 and 60.66) was observed in T2 Guava pulp (0.00 %) + Pineapple juice (100 %) during periods of storage at initial, 30, 60 and 90 days.

Reducing Sugar

The maximum reducing Sugar (%) (8.52, 8.78, 8.97 and 9.14) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum Reducing Sugar (%) (6.34, 6.52, 6.76 and 6.88) was observed in T1 Guava pulp (100%) + Pineapple juice (0.00%) during periods of storage at in initial, 30, 60 and 90 days.

Colour and Appearance Score

The maximum colour and appearance score (8.26, 8.47, 8.54 and 8.65) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum colour and appearance score (5.41, 5.73, 5.84 and 5.90) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during periods of storage at initial, 30, 60 and 90 days.

Aroma Score

The maximum Aroma score (8.27, 8.48, 8.59 and 8.70) at initial, 30, 60 and 90 days respectively was

Table 2. Effect of various treatment combinations on Total soluble solid (^oBrix), Acidity, pH of blended beverages (RTS) prepared from guava and pineapple at initial, 30, 60 and 90 during storage

Treatment notations	Total soluble solid (^o Brix)				Acidity				pH			
	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days
T1	13.31	14.06	14.15	14.03	0.49	0.48	0.44	0.41	2.50	2.64	2.77	3.92
T2	13.08	13.16	13.24	13.35	0.49	0.49	0.46	0.42	2.37	2.51	2.61	3.83
T3	14.83	14.91	15.05	15.24	0.39	0.38	0.36	0.34	3.08	3.18	3.23	3.48
T4	15.06	15.13	15.25	15.50	0.26	0.25	0.25	0.24	3.55	3.65	3.79	2.90
T5	14.87	14.86	14.94	15.04	0.39	0.38	0.36	0.35	3.28	3.46	3.60	2.66
T6	14.63	14.74	14.82	14.95	0.47	0.46	0.43	0.34	3.43	3.55	3.61	2.69
T7	14.67	14.82	14.96	15.06	0.40	0.39	0.36	0.34	3.30	3.60	3.77	2.90
T8	14.63	14.95	14.71	14.84	0.42	0.39	0.38	0.37	3.20	3.51	3.66	3.71
T9	14.33	14.54	14.65	14.79	0.35	0.34	0.33	0.32	3.24	3.45	3.66	3.86
T10	14.39	14.63	14.86	14.93	0.37	0.36	0.35	0.34	3.24	3.53	3.68	3.78
F-Test	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed. (+)	0.149	0.132	0.101	0.046	0.019	0.006	0.005	0.004	0.068	0.056	0.027	0.046
C.D. at 0.5%	0.149	0.187	0.143	0.065	0.026	0.008	0.007	0.006	0.095	0.079	0.37	0.065

observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum Aroma score (5.43, 5.74, 5.86 and 5.92) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during periods of storage at initial, 30, 60 and 90 days.

Flavor and Taste

The maximum Flavor and taste score (8.25, 8.45, 8.71 and 8.77) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum flavor and taste score (5.38, 5.72, 7.90 and 7.99) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during periods of storage at initial, 30, 60 and 90 days.

Overall acceptability

The Maximum Overall acceptability score (8.26, 8.47, 8.61 and 8.71) at initial, 30, 60 and 90 days respectively was observed in T4 Guava pulp (40%) + Pineapple juice (60%). Whereas the minimum Overall acceptability score (5.41, 5.74, 5.89 and 5.93) was observed in T2 Guava pulp (0.00%) + Pineapple juice (100%) during periods of storage at initial, 30, 60 and 90 days.

DISCUSSION

The results showed that the TSS was found gradually increased with increase in storage period.

Table 3. Effect of various treatment combinations on Ascorbic acid, Reducing sugar, colour and appearance score of blended beverages (RTS) prepared from guava and pineapple at initial, 30, 60 and 90 during storage

Treatment notations	Ascorbic Acid				Reducing Sugar				Colour and appearance score			
	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days
T1	65.30	64.21	63.34	61.61	6.34	6.52	6.76	6.88	5.54	5.75	5.86	5.92
T2	64.65	63.28	62.48	60.66	6.43	6.69	6.85	6.91	5.41	5.73	5.84	5.90
T3	49.48	48.34	47.40	46.41	7.36	7.63	7.87	7.94	7.51	7.60	7.75	7.88
T4	43.35	42.33	41.24	40.30	8.52	8.78	8.97	9.14	8.26	8.47	8.54	8.65
T5	46.45	45.53	44.47	43.31	8.38	8.47	8.66	8.81	7.70	7.82	7.92	8.05
T6	48.67	47.30	46.63	45.39	8.33	8.41	8.61	8.67	7.41	7.65	7.84	8.03
T7	48.85	47.33	46.47	45.50	7.68	7.77	7.86	8.07	7.54	7.69	7.88	8.13
T8	49.23	48.54	47.30	46.08	7.54	7.69	7.60	8.16	7.53	7.80	7.89	8.09
T9	49.51	48.44	46.63	45.15	7.73	7.93	7.54	8.26	7.50	7.84	7.89	8.13
T10	49.55	48.21	47.18	45.67	7.48	7.62	7.55	8.05	7.34	7.59	7.76	8.08
F-Test	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed. (+)	0.301	0.111	0.170	0.281	0.112	0.037	0.030	0.063	0.112	0.046	0.037	0.037
C.D. at 0.5%	0.426	0.157	0.241	0.397	0.159	0.052	0.042	0.089	0.172	0.065	0.052	0.053

Table 4. Effect of various treatment combinations on Aroma, Flavour and taste, overall acceptability of blended beverages (RTS) prepared from guava and pineapple at initial, 30, 60 and 90 during storage

Treatment notations	Aroma				Flavor and taste				Overall acceptability			
	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days	Initial	30 Days	60 Days	90 Days
T1	5.65	5.76	5.87	5.94	5.59	5.68	5.95	6.06	5.59	5.72	5.88	5.97
T2	5.43	5.74	5.86	5.92	5.38	5.72	5.93	5.97	5.41	5.74	5.89	5.93
T3	7.66	7.61	7.77	7.89	7.66	7.58	7.90	7.99	7.61	7.60	7.81	7.92
T4	8.27	8.48	8.59	8.70	8.25	8.45	8.71	8.77	8.26	8.47	8.61	8.71
T5	7.73	7.86	7.93	8.08	7.71	7.74	7.98	8.11	7.71	7.81	7.94	8.08
T6	7.45	7.66	7.86	8.05	7.40	7.69	7.93	8.17	7.42	7.66	7.88	8.08
T7	7.59	7.76	7.90	8.16	7.45	7.83	8.02	8.13	7.53	7.76	7.93	8.14
T8	7.56	7.82	7.90	8.10	7.32	7.77	7.99	8.18	7.47	7.80	7.92	8.13
T9	7.57	7.86	7.91	8.13	7.33	7.86	7.97	8.20	7.47	7.85	7.92	8.15
T10	7.56	7.61	7.78	8.11	7.50	7.76	8.10	8.21	7.47	7.65	7.88	8.14
F-Test	S	S	S	S	S	S	S	S	S	S	S	S
S.Ed. (±)	0.135	0.044	0.042	0.041	0.123	0.070	0.072	0.042	0.116	0.050	0.038	0.033
C.D. at 0.5%	0.191	0.062	0.059	0.058	0.174	0.100	0.102	0.060	0.164	0.070	0.053	0.046

This might be due to the conversion of polysaccharides into sugars during hydrolysis process. Increase in TSS might also be attributed to the reduction in moisture content of the product with storage. Acid gives the characteristic sourness to the product. Citric acid is the major acid in kinnow and aonla juice that enhance the characteristic flavor of kinnow-aonla blended RTS. Highest acidity in aspartame treated sample was due to acidic nature of aspartame. This might be attributed to chemical reactions between organic constituents of fruit juice induced by temperature and action of enzymes during storage. Similar observations were also reported by Satwadhar *et al.*, (2011).

Aggarwal and Sandhu (2003) in kinnow juice and Chandan *et al.*, (2001) in aonla RTS beverages. Ascorbic acid content reduced considerably during storage period might be due to the oxidation or irreversible conversion of L-ascorbic acid into dihydro ascorbic acid oxidase (ascorbinase) because of heat processing and the presence of air at the head space of glass bottles.

CONCLUSION

Based on findings of the present experiment it is concluded that T4 Guava pulp (40%) + Pineapple juice (60 %) was found superior in respect of the physio chemical parameters like Total soluble solid (0Brix), Acidity (%), pH, Ascorbic Acid and Reducing Sugar (%). With respectively sensory attributes like Colour and appearance, Aroma, Flavor and taste and Overall acceptability also T4 Guava pulp (40%) + Pineapple juice (60%) was found as best.

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