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Effect of storage conditions on quality of mixed fruits Ready-to-serve (RTS) Beverages

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Abstract
Fruits are important foods for human consumption, providing almost all the essential nutrients required for human growth and development and control of the body and mind. The experiment involves 3 processes at the same time, 3 levels of mango and papaya pulp ratio (80:20), (70:30) and (60:40), citric acid 1 level and 3 levels of citric acid (0.3) according to the degree of acidity, and sugar adding (100gm, 110 g and 120 g) are respectively were copied three time in the RBD design Quality attributes include acidity, pH, optical density, TSS, ascorbic acid, total plate count, and sensory analysed by 9-point hedonic scale. For both fresh and stored RTS samples, the evolution of quality parameters was carried out at 0, 15, 30, 45, 60, 75, and 90 days of storage under various storage conditions. Mango and papaya RTS drinks came in glass bottles. The pH drops as papaya juice concentration rises, and after 90 days, the pH of the sample compositions (80:20), (70:30), and (60:40) was 4.18, 4.15, and 4.14, respectively, at room temperature.

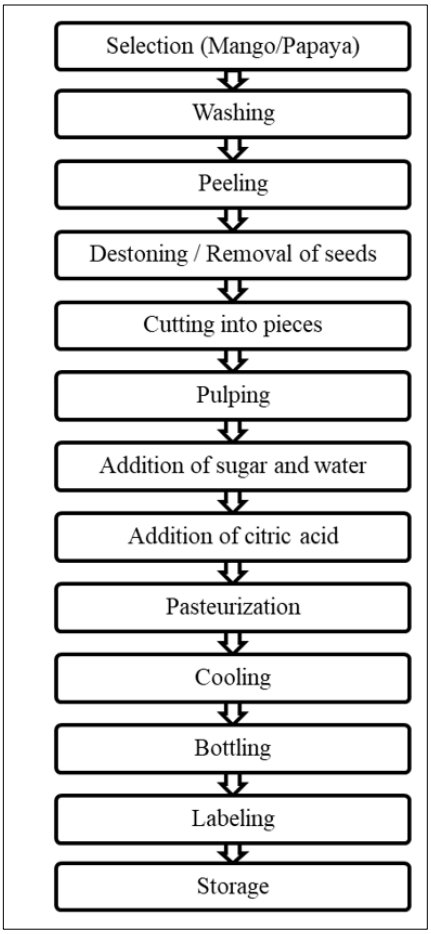
Keywords: Storage conditions, Ready-to-serve (RTS), fruits

1. Introduction
Soft drinks like RTS have become more popular due to their taste, flavor and nutritional value compared to synthetic soft drinks It is easy to digest, invigorating thirst-quenching appetizing and superior to almost all types of carbonated drinks that have little edible value (Shivanandam *et al*., 2008) [1]. Beverages is widely consumed worldwide and forms the basic basis of human nutrition every day. Their popularity is due to their many pleasant tastes and sensations, such as sweet, cold or refreshing (Gowda *et al*., 2004) [2]. But people also drink for health it a great way to get nutrients and bioactive compounds including vitamin, minerals, antioxidant, fatty acids etc. Fruit and vegetable juices are important sources of antioxidants. Apart from its health benefits, adding antioxidants to foods can prevent or delay the oxidation of food initiated by free radicals produced when exposed to the environment such as air, light various health-promoting ingredients. The ripe fruit can be used in the preparation of beverages jams, pumpkins, jellies, RTS and alcohol as it is effective in treating diabetes, inflammation, stomach ache and diarrhoea (Andre *et al*., 2011) [4]. Ready to serve soft drink have water content, which prevent dehydration and help maintain body balance. Fruit drinks contain most of the sugar provide some vitamin and minerals. Consumption of fruit drinks in the form of mixes and smoothies is increasing due to public awareness of the presence various health-promoting ingredients. Limiting sugar intake to less than 10% of total energy intake is beneficial, and reducing sugar intake to less than 5% of total energy intake will provide health benefits. Due to health concerns, the use of various synthetic/natural sweeteners instead of sugar is increasing day by day. Examine the benefits of sweets (Sediva *et al*., 2006) [5].

2. Materials and Procedures
2.1 Sample Preparation and Pretreatment
Collect fresh fruits and wash thoroughly with water and peel the fruit with a stainless-steel knife cut it in half and remove the seeds by hand. Wash fresh mango fruit and peel and remove the seeds using a peeler. Then the papaya and mango are cut into large and large pieces so that the pulp can be removed. The pulp is extracted separately using a fruit processor and then filtered through muslin to remove fibrous particles. The filtrate containing clarified papaya juice is used to prepare ready-to-drink RTS.

Table 1: Combination of mango and papaya treatments.

Treatment symbols	sample	Detail
T1	M80:P20	M_{80} =Mango juice +P_{20} =Papaya juice
T2	M70:P30	M_{70} =Mango juice +P_{30} =Papaya juice
T3	M60:P40	M_{60} =Mango juice +P_{40} =Papaya juice



Flow chart 1: Process flow chart for preparation of papaya-mango blended RTS beverage

2.2 Physicochemical

Evaluation of the quality of the device has completed three months of storage and quality evaluation. Periodic analysis of biochemical quality was evaluated by opening three vials per storage. Biochemical and microbiological tests were performed every 15 days. Biochemical analysis included pH, TSS, total sugar, and ascorbic acid. pH was measured using a digital pH meter (ELICO, India). TSS was determined using a handheld analyzer (Atago 2363 MASTER 500, range 0.090.0% Brix value) at 20 °C. Total reducing sugars were determined using phenol-sulfuric acid. Ascorbic acid content (AA) was determined using the 2,6- dichloroindophenol titration method. In the microbial analysis, the number of microbial bacteria in the nutrient agar medium was counted by the plate counting method, while the numbers of yeast and mold were determined in the potato dextrose medium.

2.3 Sensory analysis

Descriptive analysis was carried out according to the quantitative evaluation process using trained personnel repeated meetings and self-assessment of standards for administration and additional costs. The hedonic scale approach was explained by Steel was used for organoleptic evaluation of RTS for colour, flavour and taste by a panel six judges at 0, 15, 30 days and so on up to 3 months storage period.

2.4 Statistical analysis

Central tendency test was performed on all biochemical and microbiological properties of the RTS design, and the mean and standard deviation of biochemical properties were determined. Analysis of variance (ANOVA) for biochemical masses was performed using Microsoft Excel (version 2013). All assays were performed in triplicate.

3. Results and Discussion

Several parameters to evaluate the RTS quality of mango and papaya, *viz*. TSS, pH, optical density, vitamin C (ascorbic acid), acidity and microbial research (TPC) and index were selected. RTS samples were packaged in sterile glass bottles. The parameters were evaluated after 0, 15, 30, 45, 60, 75 and 90 days under different conditions for fresh samples and well-stored samples. Experimental data of the room temperature response to options for different storage times are presented in the table 2.

Table 2: Effect of Storage Condition on Different Quality Characteristics of the prepare RTS

Physicochemical properties	Days	T_1	T_2	T_3
TSS	0	15.21	14.00	13.10
	15	15.22	14.10	13.14
	30	15.21	14.13	13.16
	45	15.23	14.17	13.18
	60	15.24	14.21	13.20
	75	15.25	14.25	13.22
	90	15.26	14.27	13.25
Optical density	0	0.035	0.029	0.025
	15	0.035	0.031	0.027
	30	0.039	0.033	0.029
	45	0.041	0.035	0.031
	60	0.044	0.037	0.033
	75	0.046	0.039	0.037
	90	0.048	0.040	0.041
Acidity	0	0.2	0.1	0.2
	15	0.3	0.1	0.2
	30	0.4	0.2	0.3
	45	0.5	0.3	0.4
	60	0.6	0.4	0.4
	75	0.6	0.5	0.5
	90	0.7	0.5	0.8
p^H	0	4.03	4.01	4.05
	15	4.05	4.03	4.06
	30	4.06	4.05	4.06
	45	4.09	4.07	4.07
	60	4.11	4.08	4.08
	75	4.14	4.08	4.08
	90	4.18	4.09	4.09
Ascorbic acid	0	17.50	17.00	16.50
	15	18.66	17.45	16.55
	30	18.83	17.53	16.64
	45	18.99	17.59	16.72
	60	19.21	17.65	16.81
	75	19.76	17.74	16.89
	90	19.83	17.81	17.00
Microbial growth	0	ND	ND	ND
	15	1.06	1.03	1.02
	30	1.06	1.04	1.03
	45	1.07	1.04	1.04
	60	1.08	1.05	1.04
	75	1.08	1.06	1.05
	90	1.09	1.07	1.06

4. TSS (°Brix): The effect on TSS content in mango and papaya RTS beverages increased in all treatments and the duration of increase was as long as 90 days. Similar view an increase in TSS content was observed in guava RTS and squash with increasing storage time also made similar observations (Pandey *et al*., 2004) [6]. The total soluble content in the mixed juice of each treatment increased significantly during storage; This may be due to hydrolysis of polysaccharides (starch) to monosaccharides (sugar) and dehydration and breakdown of pectin in the juice into monosaccharides (sugar) (Jain *et al.*, 2003) [7].

4.1 Effect of optical density
The optical density of samples containing fresh mango and papaya juice in the ratio of (80:20) is 0.035,0.035, 0.039, 0.041, 0.044, 0.046 and 0.048 respectively, during storage. This shows that there is an increase in every model.

4.2 Effect of acidity
With extended processing time, the acidity of mango and papaya increased in all treatments up to 90 days. A significant increase in the acidity of the juice during storage was detected in different proportions of juice. An increase in acidity values was observed with increasing mango juice or decreasing papaya juice in the RTS formulation. During storage, the acidity of all samples was evaluated to increase on days 0, 15, 30, 45, 60, 75 and 90 of storage. After 90 days of storage at room temperature, the highest acidity of 0.80 was found in the 70:30 sample. However, in general, higher acid values were observed in all storage areas after 90 days. (Sasikumar, 2015) [8] also reported similar results. In aloe vera and aonla juice as RTS drink

4.3 Effect on pH value
The pH value of mango and papaya samples decreases with the increase of papaya juice and the loss of pH value or percentage of papaya juice and produced RTS decreases during storage. A significant change in pH of the juice mixture was observed during the storage period. The pH of the mixed juice gradually increased with each treatment. Similar results have been reported in pomegranate juice (Prasad and Mali, 2000) [9] and grape juice (Mehta and Bajaj, 1983) [10]. A significant increase in the pH of nectar prepared from mixed fruit juices was also observed during the experiment. The maximum pH occurred when treated at 80°C for 5 min. Beneficial effects may be due to inhibition of enzymes that convert acids to sugars during storage. Similar findings have been reported in (Deka *et al*., 2004) [11] in lime aonla spiced drink (Tiwari, 2000) [12].

4.4 Effect of ascorbic acid
The effect of ascorbic acid of mango and papaya RTS drinks with different composition the effect of ascorbic acid was found during the storage period, the amount of mango and papaya muscles with storage period and new patterns of ascorbic acid levels to increase.

4.5 Effect on microbial growth
The microbial growth (TPC values) of different mango and papaya RTS samples were 1.009×10^5 cfu/ml, 1.016×10^5 cfu/ml and 1.011×10^5 cfu/ml, respectively. 80:20, 70:30 and 60:40 at room temperature after 15 days. (Saravana and manimeglai, 2005) [14] Similar data show that the microbial load per gram of RTS beverage mixed with papaya juice as whey is $1\text{-}2 \times 10^6$ bacteria, $1\text{-}2 \times 10^4$ fungi and 1×10^5 yeast. It is safe to eat when stored in the refrigerator for up to 90 days.

5. Conclusion
It was concluded that the variety with 70% mango + 30% papaya pulp and 3gm citric acid + 100gm sugar per liter of RTS was god and overall acceptance was better. The study also concluded that mixed RTS prepared using this technology can be stored for longer periods of time with better recognition, better quality and commercialization, and without microbial growth at room temperature. The acidity of the mango-papaya mixed fruit RTS drink increased as mango pulp increased or papaya pulp decreased in the RTS formulation. The pH value of mango-papaya mixed fruit RTS drink increased during storage. TSS and optical density of mango and papaya mixed fruit RTS drink increased during storage.

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