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DEVELOPMENT AND QUALITY EVALUATION OF CARROT-PINEAPPLE BLENDED JUICE

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Abstract

Juice carrot (*Daucus carota*) and pineapple (*Ananas comosus*), were optimised to a blended beverage which was stored for 45 days in pet bottles (400 ml capacity) at refrigerated temperature. Physico-chemical and sensory analysis were evaluated. Marginal changes in pH, total soluble solids, acidity, vitamin C and beta-carotene were observed. The beta carotene content of juice was found (1697 µg) to be increased with increasing the proportion of carrot juice. Estimation of vitamin C content of sample (17.50mg) showed high improvement in nutritional value of carrot juice incorporated with pineapple juice. The acidity increased (0.47-1.45) and pH of the juice decreased progressively during the storage period. This may be due to the excessive fermentation and presence of lactic acid reducing micro-organism. It was found that the sample having ratio 65:35 (carrot-pineapple) had the best acceptability, which will also be helpful in providing dietary requirement of beta carotene to the consumer.Heat pasteurisation (90^0C for 25 sec) was more effective for inactivating the microbial flora. However, the shelf life of juice was established within 45 days. The product is recommended children, youth and elderly persons to be used within 45 days.

Key words : Carrot-pineapple blended juice, physico-chemical, sensory and microbial characteristics.

Introduction

Fruits and vegetables are critical to good health, and certainly good for all age categories as it forms an important portion of a healthy diet. Carrot (*Daucus carota*) is a worldwide root vegetable that is highly nutritional, and an important source of β-carotene besides its appreciable amount of vitamins and minerals often used for juice production (Walde *et al*., 1992; Demir *et al*., 2004). In recent years, a steady increase of carrot juice consumption has been reported in many countries (Schieber *et al*., 2001). Pineapple (*Ananas comosus*) has long been one of the most popular of the non-citrus tropical and subtropical fruits, largely because of its attractive flavor and refreshing sugar-acid balance (Bartolome *et al*., 1995). Pineapple juice is largely consumed around the world, mostly as a canning industry byproduct, in the form of single strength, reconstituted or concentrated and in the blend composition to obtain new flavors in beverages and other products (Arthey, 1995; and Carvalho *et al*., 2008).

Carrot-pineapple juice is builder and the regenerator of the body. It contains all the amino acids, minerals, salts, vitamins especially vitamin C needed by the human body. It is a powerful antioxidant that protects the cells against free radical damage that causes cell mutation such as cancer. It also improves eye sight.

Juice blending is one of the best methods to improve the nutritional quality of the juice. It can improve the vitamin and mineral content depending on the kind and quality of fruits and vegetables used (De Carvalho *et al*., 2007). Apart from nutritional quality improvement, blended juice can be improved in its effects among the variables, thus it cannot depict the net effects of various parameters on the reaction rate. Moreover, one could think of a new product development through blending in the form of a natural health drink, which may also be served as an appetizer.

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Table 1 : Prepare juice blends as per following blending ratios.

S. no.	Juice	Blending	Treatment symbol
1.	Carrot:pineapple	100:0	T_0
2.	Carrot:pineapple	60:40	T_1
3.	Carrot:pineapple	65:35	T_2
4.	Carrot:pineapple	70:30	T_3

Materials and Methods

The fully matured, freshly harvested carrot and pineapple were procured from the local market of Allahabad and were brought to the VaughSchool of Engineering and Technology of Sam Higginbottom Institute of Agricultural Technology and Sciences, Allahabad (U.P.), India.

Juice preparation

The carrots were washed with tap water, and peeled using sodium hydroxide (40 g/l) at 95ºC for 1 min then washed again in tap water. This was followed by blanching in citric acid solution (60 g/l) at 40ºC for 5 min then cooled in iced water to inactivate their endogenous enzymes and soften their tissues. At the end, they were sliced and grounded with addition of distilled water 1:1 (v/w) and filtered on cheese cloth under vacuum to get fresh juice. Then, the pineapples were cleaned with tap water, peeled and then pineapple juice were extracted using juice blender. After that the juice of carrot and pineapple should be blended in different ratios of 100:0, 60:40, 65:35, 70:30, respectively. Then sugar, citric acid and ascorbic acid were added to juice properly and then mixture was filtered through muslin cloth. Sugar was added at the rate of 200g/litre and ascorbic acid was added as a preservative at the rate of 2g/litre of blended juice. Another preservative such as citric acid was also added at the rate of 1g/litre of blended juice. After that juice was filled in PET bottles which were sterilized at 110^{0}C for 10 minutes, then sealed. After that bottles should be pasteurized at 90^{0}C for 25 sec, respectively. PET bottles should be cooled at room temperature and then stored under refrigeration at 4 ±1^{0}C.

Total acidity (as % citric acid) and vitamin C were determined by titrimetric method (Ranganna 1986). TSS were determine directly with a refractometer ATAGO (0-50^0 Brix). Values for pH were measured by pH meter (AOAC, 1985). Beta carotene was determined by the method given be all estimations were carried out in triplicate at 7 days interval and the mean values reported. A panel of 10 semi-trained members carried out the overall acceptance test for the juice 9-point Hedonic scale, where 9 is "like extremely" and 1 is "dislike extremely" as described by Amerine *et al*. (1965). The stastical analyses were carried out by Two-way ANOVA classification as described by Snedecor and Cochran (1968).

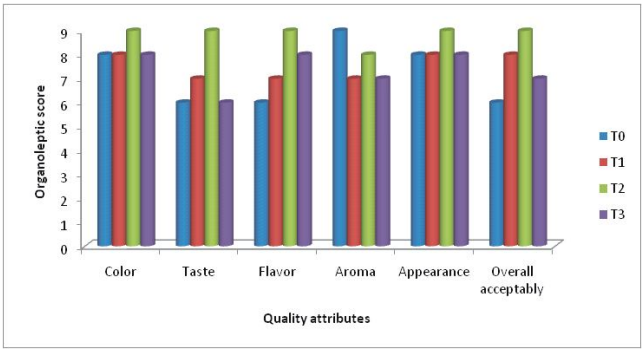

Fig. 1 : Sensory quality attributes of blended juice.

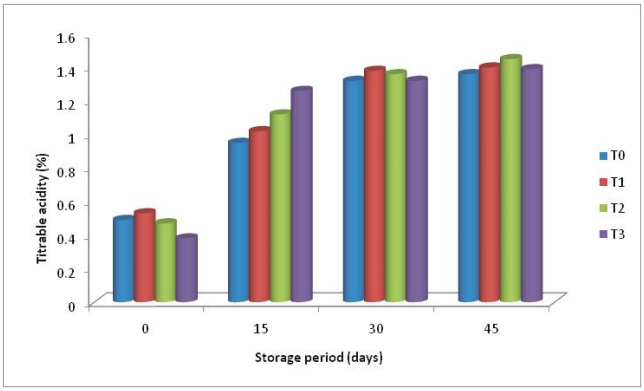

Fig. 2 : Effect of storage period on titrable acidity of plain and blended juice.

Results and Discussion

Sensory evaluation

It was found that the juice sample having ratio of 65:35 (carrot : pineapple) had highest overall acceptability. Sensory evaluation was done on 9-point hedonic scale. The evaluation of juice was done on the basis of color,

Table 2 : Sensory quality scores of carrot -pineapple blended juice.

Organoleptic score						
Sample	**Color**	**Taste**	**Flavor**	**Aroma**	**Appearance**	**Overall acceptably**
T_0	8	6	6	9	8	6
T_1	8	7	7	7	8	8
T_2	9	9	9	8	9	9
T_3	8	6	8	7	8	7

Table 3 : Titrable acidity.

Treatments	Storage period (days)			
	0	15	30	45
T_0	0.49	0.95	1.32	1.36
T_1	0.53	1.02	1.38	1.40
T_2	0.47	1.12	1.36	1.45
T_3	0.38	1.26	1.32	1.39
Overall mean	**0.46**	**1.08**	**1.34**	**1.40**
F- test	S	S	S	S
S. Ed. (±)	0.010	0.039	0.015	0.016
C. D. (P =0.05)	0.021	0.081	0.032	0.034

taste, aroma, flavor and overall acceptability.

Physico-chemical analysis

Total soluble solids

The TSS increased with gradual passage of storage time,which might be due to hydrolysis of polysaccharides into monosaccharide and oligosaccharides. The minimum increase (10 Brix to 12 Brix) in TSS was recorded in T_2 treatment, which was statistically superior to other treatments. Similar results were also reported by Deka and Sethi (2001) in juice blends and Deka (2000) found an increasing trend in total soluble solids during storage at ambient and low temperature in lime-aonla and mango-pineapple spiced RTS beverages.

Titrable acidity

There was a significant increase in titratable aciditycontent during storage (table 2). This might be due to the addition of citric acid and increase in the level of pineapple juice. It was observed that maximum acidity (1.39%) was recorded in the carrotjuice blended with pineapple juice (T_3). The minimum increase (1.45%) in acidityw as showed in T_2 treatment, which might be due to addition of citric acid and increase in the level of pineapple juice as shown in table 2.

pH

There was a significant decrease in pH during storage

Table 4 : pH.

Treatments	Storage period (days)			
	0	15	30	45
T_0	5.23	5.10	4.98	4.9
T_1	5.10	5.01	5.08	5.0
T_2	5.20	5.15	5.01	4.9
T_3	5.29	5.23	5.12	4.0
Overall mean	**5.20**	**5.12**	**5.04**	**4.7**
F- test	S	S	S	S
S. Ed. (±)	0.01394	0.01333	0.04422	0.08472
C. D. (P =0.05)	0.02892	0.03765	0.09172	0.17571

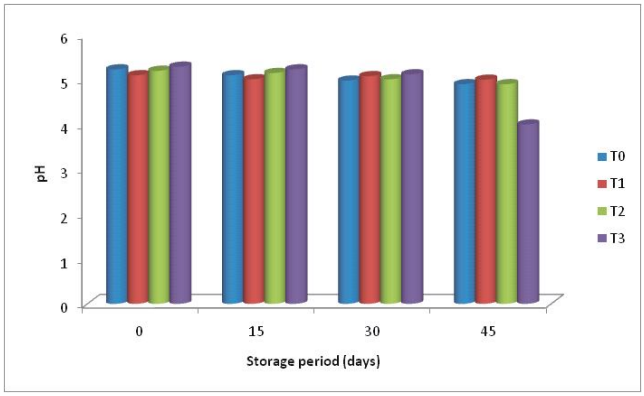

Fig. 3 : Effect of storage period on pH content of plain and blended juice.

Table 5 : Beta carotein.

Treatments	Storage period (days)			
	0	15	30	45
T_0	1790	1760	1744	1729
T_1	1724	1702	1690	1665
T_2	1735	1722	1705	1697
T_3	1649	1680	1665	1660
Overall mean	**1724.5**	**1716.0**	**1701.0**	**1687.75**
F- test	S	S	S	S
S. Ed. (±)	8.47	4.42	8.47	7.71
C. D. (P =0.05)	17.57	9.17	17.57	16.00

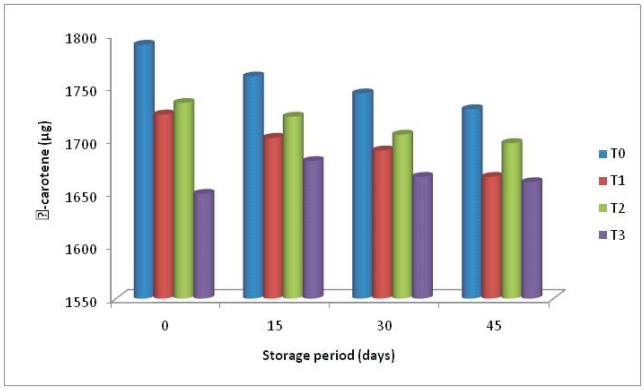

Fig. 4 : Effect of storage period on â carotein content of plain and blended juice.

(table 3). This might be due to increase in titrable acidity, as acidity and pH are inversely proportional to each other. It was observed that the maximum pH (5.29) was recorded in the carrot juice blended with pineapple juice T3. The decrease in pH was due to increase in titrable acidity which affects the organoleptic quality of juice as discussed by Bhardwaj *et al*. (2005).

Betacarotene content

Themeasurement of carotenoids was carried out according tothe method of (Liao *et al*., 2007) with a littlemodification, by measuring the *A*450 (absorbance at

Table 6 : Vitamin c content.

Treatments	Storage period (days)			
	0	15	30	45
T_0	22.40	18.70	15.03	8.90
T_1	36.20	33.45	30.10	23.09
T_2	34.30	29.20	21.70	17.50
T_3	28.40	21.10	16.20	11.90
Overall mean	**30.325**	**25.6125**	**20.75**	**15.34**
F- test	S	S	S	S
S. Ed. (±)	0.804	2.45	1.22	2.043
C. D. P=(0.05)	1.668	5.085	2.545	4.23

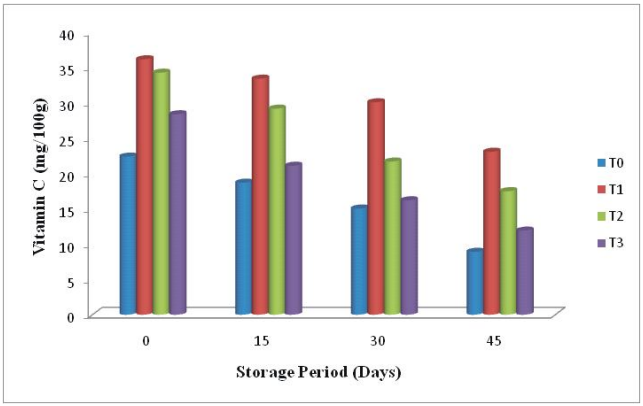

Fig. 5 : Effect of storage period on vitamin c content of plain and blended juice.

450nm) at ambient temperature by a spectrophotometer. The beta carotene content of the juice decreased during storage with the advancement of storage period, which was probably due to the fact that beta carotene is sensitive to heat. The gradual decrease in the β carotene value may be due to increasing temperature and heating time as discussed by Chen *et al*. (1996). It shows that beta carotene is sensitive to heat as shown in table 4.

Ascorbic acid

The ascorbic acid (vitamin C) content of the juice decreased during storage with the advancement of storage period, which was probably due to the fact that ascorbic acid being sensitive to oxygen, light and heat was easily oxidized in presence of oxygen by both enzymatic and non-enzymatic catalyst (Mapson, 1970). Among the beverages prepared with pineapplejuice were better in ascorbic acid content. Maximumascorbic acid (36.20 mg/ 100 ml juice) was recorded in carrot juice (60%) blended with (40%) pineapple juice that is (T_1). These findings are in conformity with the studies of Jain and Khurdiya (2005) reported that the Indian gooseberry juice contained the highest vitamin C (478.56 mg/100 ml. juice). Hence,when gooseberry juice was blended with other fruit juicesfor the preparation of blended ready-to-serve beverage,it boosted their nutritional quality in terms of vitamin C content as shown in table 6.

Conclusion

It was concluded that the ratio of carrot and pineapple juice *i.e.* (65:35) was most effective juice blend for minimum change in TSS (10 brix to 12 brix), acidity (1.45), vitamin C (17.50mg) and beta carotene (1697µg). Sensory evaluation was also higher and better consistency score up to the end of storage. The microbial count is less, mold and yeast (11×10^3) at the end of storage *i.e.*, 45 days. On the basis of above results revealed in the present study it might be concluded that the formulation of mixed blend juice beverage was possible to satisfy consumer taste and preferences. The product was microbiologically safe during 45 days of storage with good acceptability. So this juice blend could be stored for 45 days.

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