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Development and Quality Evaluation of Pineapple Juice Blend with Carrot and Orange juice

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Abstract- Juice pineapple (Ananas comosus), carrot(Drocus carota), and orange(Citrus sinensis) were optimised to a blended beverage which was stored for 21 days in pet bottles (400 ml capacity) at refrigerated temperature. Physic-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 (1583µg) to be increased with increasing the proportion of carrot juice. Estimation of vitamin C content of sample (19.50mg) showed high improvement in nutritional value of pineapple juice incorporated with carrot and orange juice. The acidity increased (0.97-1.83) 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. The mean overall acceptability scores of more than 8 for juice samples up to 30% orange juice incorporation indicated the commercial scope for manufacturing good and nutritious pineapple juice blended with carrot and orange juice, which will also be helpful in providing dietry 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 21 days. The product is recommended children, youth and elderly persons to be used within 21 days.

Index Terms- Blended juice, Pineapple juice, carrot juice, orange juice.

I. INTRODUCTION

Fruits and vegetables are critical to good health, and certainly good for all age categories as it forms animportant portion of a healthy diet. Carrot (Daucuscarota) is a worldwide root vegetable that is highly nutritional, and an important source of $-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 (Bartolomeet 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 Carvalhoet al., 2008).Orange (Citrus cinensis)on the other hand, is a distinguished, widely consumed fruit, particularly appreciated for its fresh flavor, vitamin C, and its natural antioxidants source having healthbenefits (Campos et al., 2010; Gardner et al., 2000).Orange is extensively produced in Brazil, United States,Mexico, and China.

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 newproduct development through blending in the form of a natural health drink, which may also be served as an appetizer.

Table 1.Prepare juice blends as per following blending ratios

S.no	Juice	Blending ratios	Treatment symbol
1	Pineapple:carrot:orange	100:0:0	T0
2	Pineapple:carrot:orange	80:10:10	T1
3	Pineapple:carrot:orange	60:10:30	T2
4	Pineapple:carrot:orange	50:20:30	T3

II. MATERIALS AND METHODS

The fully matured, freshly harvested pineapple, carrot and orange were procured from the local market of Allahabadand were brought to the Vaugh School of Engineering and Technology of Sam Higginbottom Institute of Agricultural Technology And Sciences.

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 95ºC for 5min 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 and oranges were cleaned with tap water, peeled and then pineapple and orange juice were extracted using juice blender. After that the juice of carrot, pineapple and orange juices should be blended in different ratios of100:0:0, 80:10:10, 60:10:30, 50:20:30

respectively. Thenafter sugar and citric acid was added to juice properly and then mixture was filtered through muslin cloth. Three batches of juice mixture were prepared. The product was filled in PET bottles which was sterilized at 110^0C for 10 minutes, then sealed .After that bottles were pasteurized at 90^0C for 25sec cooled and stored at refrigerated temperaturet 5 ± 1^0C for 21 days.

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 byAmerine et al,1965.. The stastical analyses were carried out by Two- way ANOVA classification as described by Snedecor and Cochran 1968.

III. Results and Discussion

Sensory Evaluation

Overall sensory score of 4combinations was higher among 6 different ingredients compositions (Table 1). The intention was to incorporate the maximum possible quantity of pineapple juice in the juice mixture with higher sensory scores and adjustment of acidity to get good taste. It was observed that the highest sensory score (8.0) was obtained with maximum incorporation of 60% pineapple juice in the juice blend. Therefore, the ingredient compositions having 60% pineapple juice, 20% carrot juice and 30% of orange juice were selected as optimum and used for storage study.

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_2treatment, which was statistically superior to other treatments (Table 2). 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 acidity content during storage (Table 2). This might be due to the addition of citric acid and increase in the level of orange juice. It was observed that maximum acidity (1.36%) was recorded in the pineapple juice blended with carrot juice and orangejuice (T3). The minimum increase (1.38%) in acidity was showed in T2 treatment which might be due to addition of citric acid and increase in the level of orange juice as shown in Table 2.

pH

There was a significant decrease in pH during storage (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 (4.18) was recorded in the pineapple juice blended with carrot and orange 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.

Beta carotene content: Themeasurement of carotenoids was carried out according tothe method of (Liao et al. 2007) with a littlemodification, by measuring the *A*450 (absorbance at450 nm) 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 4.5

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 werebetter in ascorbic acid content. Maximumascorbic acid (33.09 mg/100 ml juice) was recorded in pineapple juice (80%) blended with carrotjuice that is 10% and orange juice that is 10% (T1). 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 beverages,it boosted their nutritional quality in terms of vitamin C content as shown in table 6.

Table 1: Sensory quality scores ofpineapple-carrot-orange juice blend (60:10:30) blend during storage.

	0 days	7^{th} day	14^{th} day	21^{st} day
Colour	**7.2**	**8.0**	**7.6**	**3.0**
Flavor	**7.6**	**8.2**	**8.0**	**6.7**
Taste	**8.2**	**7.8**	**7.6**	**4.5**
OA	**8**	**8.6**	**8.6**	**7.6**

OA=overall acceptiblity,

Table 2: Titrable Acidity

Treatments	0 days	7th days	14th days	21st days
T_0	0.95	1.43	1.46	1.44
T_1	0.83	1.08	1.24	1.33
T_2	0.97	1.12	1.36	1.38
T_3	0.54	1.23	1.34	1.36
Overal Mean	**0.82**	**1.22**	**1.35**	**1.38**
F- test	S	S	S	S
S. Ed. (±)	0.039	0.046	0.054	0.014
C. D. (P = 0.05)	0.082	0.098	0.114	0.030

Table 3: pH

Treatments	0 days	7th days	14th days	21st days
T_0	4.21	4.14	4.03	3.98
T_1	4.18	4.12	4.04	4.00
T_2	4.09	4.03	3.95	3.88
T_3	4.02	3.98	3.87	3.64
Overal Mean	**4.13**	**4.07**	**3.97**	**3.88**
F- test	S	S	S	S
S. Ed. (±)	0.008	0.034	0.042	0.039
C. D. (P = 0.05)	0.017	0.073	0.089	0.082

Table 4: Beta carotene

Treatments	0 days	7th days	14th days	21st days
T_0	6.65	6.43	6.35	5.95
T_1	1624.00	1126.00	1117.00	1101.00
T_2	1107.00	1617.00	1605.00	1583.00
T_3	1594.00	1576.00	1564.00	1542.00
Overall Mean	**1082.91**	**1081.36**	**1073.09**	**1057.99**
F- test	S	S	S	S
S. Ed. (±)	385.757	342.758	338.237	333.403
C. D. (P = 0.05)	817.805	726.647	717.062	706.814

Table 5: Vitamin C content

Treatments	0 days	7th days	14th days	21st days
T_0	32.50	28.90	25.03	18.90
T_1	46.90	43.10	40.10	33.09
T_2	41.30	36.20	29.70	19.50
T_3	45.40	38.10	33.20	28.90
Overal Mean	**41.53**	**36.58**	**32.01**	**25.10**
F- test	S	S	S	S
S. Ed. (±)	0.200	0.078	0.486	1.173
C. D. (P = 0.05)	0.424	0.166	1.030	2.486

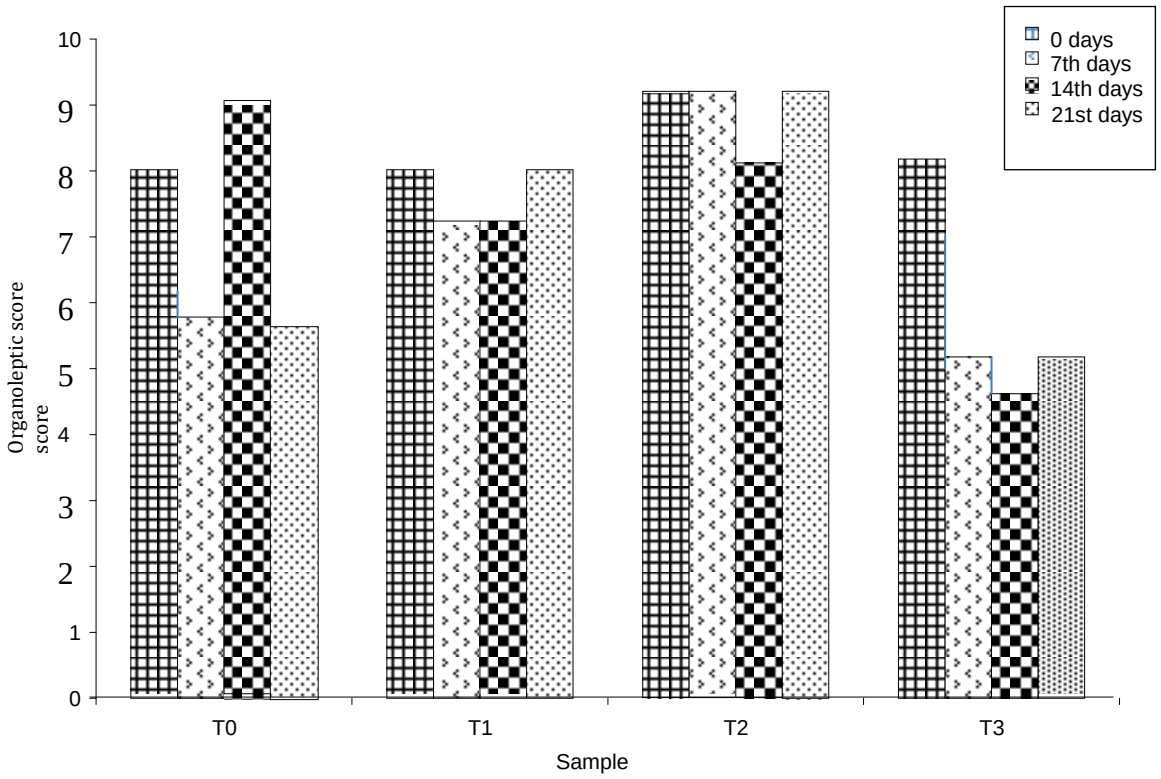

Fig.1 sensory quality attributes of blende juice.

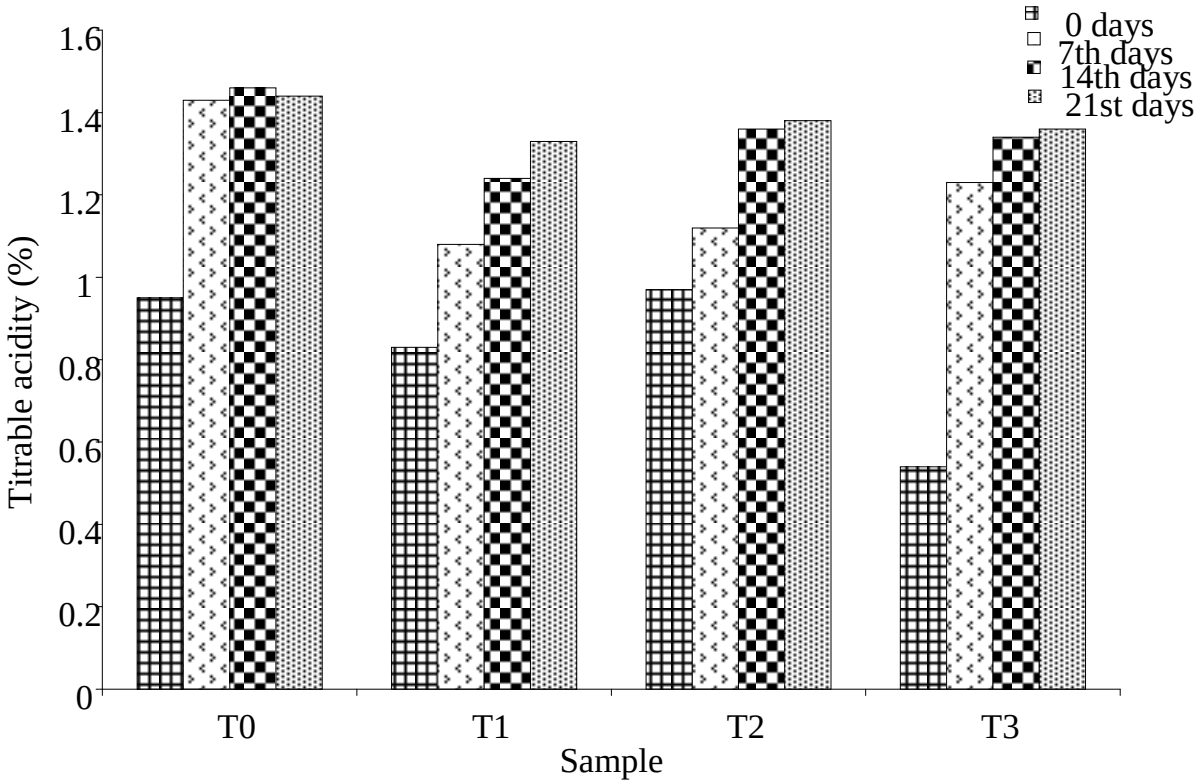

Fig.2: titrable acidity of plain and blended juice during storage per

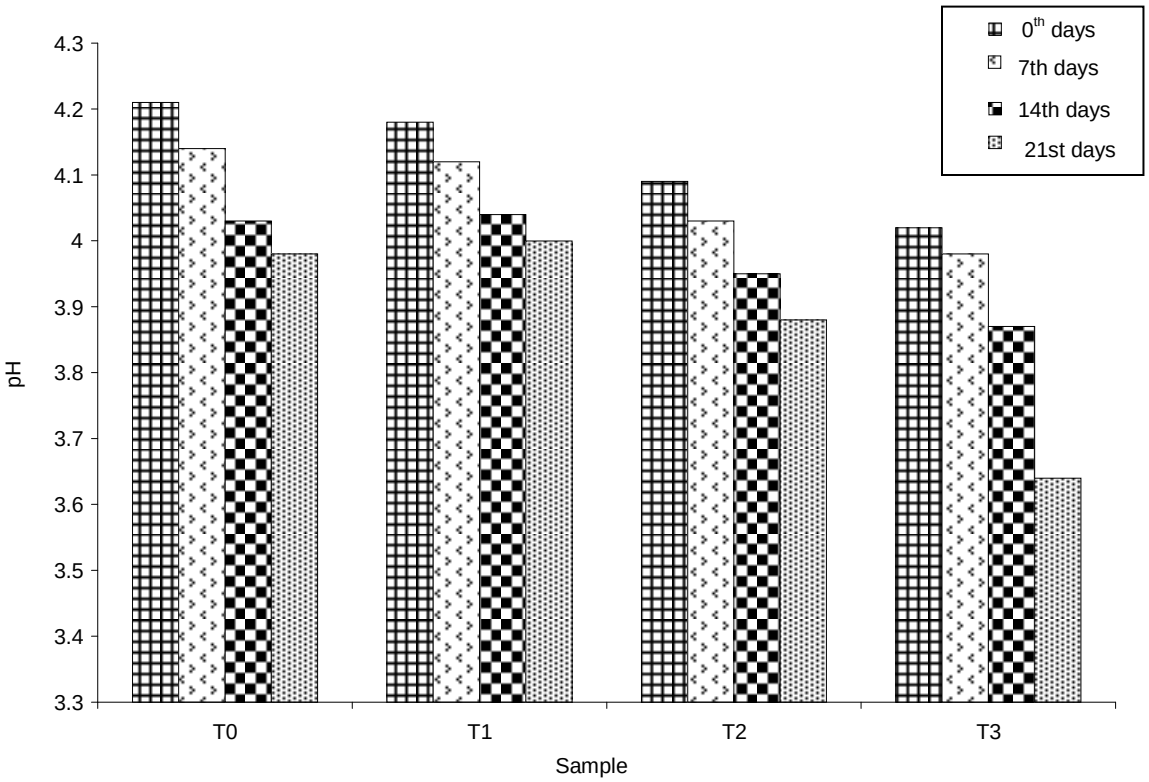

Fig 3: pH value of plain and blended juice during storage period

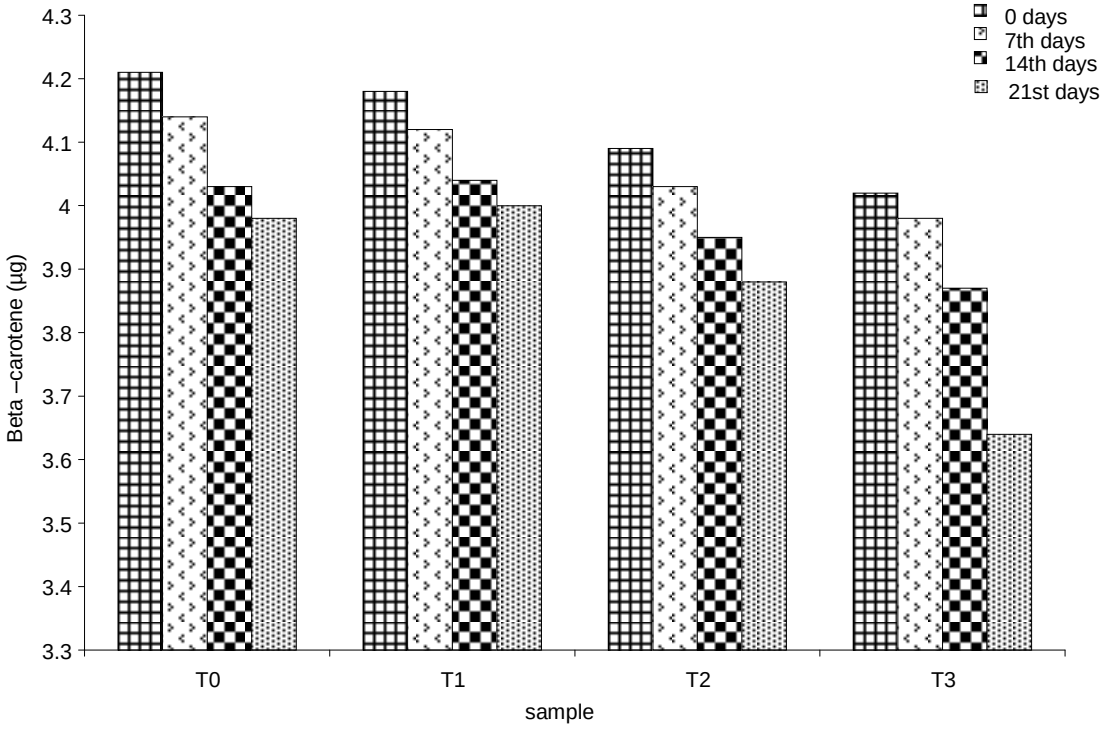

Fig.4: beta carotene content of plain and blended juice during storage period

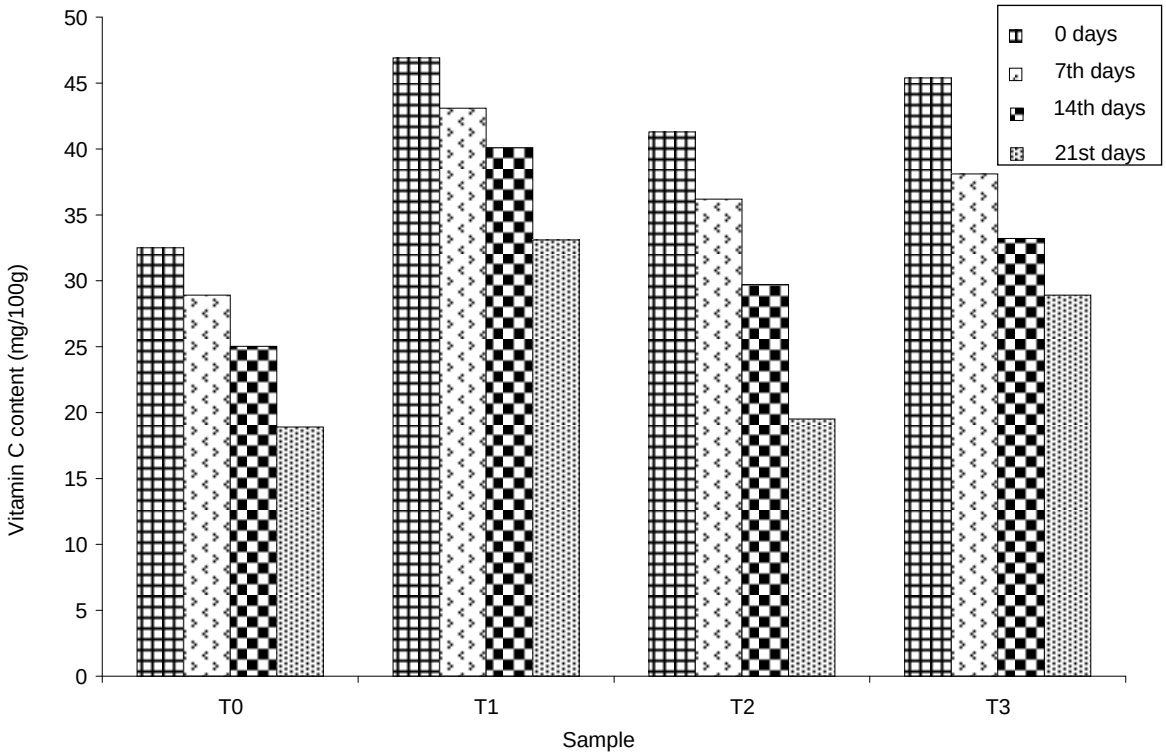

Fig.5: vitamin C content of plain and blended juice during storage period

IV. CONCLUSION

It was concluded that the pineapple juice blend: carrot juice: orange juice (60:10:30) was most effective juice blend for minimum change in TSS (10 brix to 12 brix), acidity (0.97-1.83), vitamin C (19.50), and beta carotene (1583µg). Sensory evaluation was also higher and better consistency score up to the end of storage. The population of bacteria (1.7×10^3), mold and yeast (11×10^3) at the end of storage 21 days. On the basis of above results revealed in the present study it may be concluded that the formulation of mixed blend juice beverage is possible to satisfy consumer taste and preferences. The product was microbiologically safe during 21 days of storage with good acceptability. So this juice blend could be stored for 21 days.

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