RESEARCH ARTICLE OPEN ACCESS

Effects of Refrigeration Storage on the Ascorbic Acid (VIT C) Content of Pear- Amla Based Ready-To-Serve (RTS) Beverages)

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ABSTRACT
High ascorbic acid Pear (*Pyruscommunis*) and Amla (*Emblicaphyllanthus*or *Emblicaofficinalis*) based RTS were prepared at various combinations (80:20,75:25 and 50:50) and various physico-chemical properties like pH, TSS, titrable acidity , reducing sugar and Ascorbic acid content were evaluated during storage period of 0, 7, 15 days. The study revealed that RTS-3 prepared with 50% Pear and 50% Amla juice scored maximum amount of ascorbic acid content (322.85 mg/100g).In this study increasing trend was observed in case of pH, TSS, Titrable acidity during the refrigeration storage of Pear- Amla based ready-to-serve (RTS) beverages over a period of 15 days but ascorbic acid content was decreased.
***Keywords*:** RTS, Pear, Amla, Ascorbic acid

I. INTRODUCTION

Now these days Ready-To-Serve (RTS) beverages have been popular throughout the country due to higher content of nutritional, medicinal and calorific properties over the non- fruit based beverages (Tiwari and Deen, 2015). Fruit based RTS beverages are rich source of essential minerals and vitamins. RTS also have good taste and flavor. Fruit based Ready-To-Serve (RTS) beverages are commonly acceptable beverages throughout the country.

Pear (*Pyruscommunis*) belongs to family *Rosaceae*. It is seasonal fruit and rich in phelonics. The phenolic compounds are useful for preventing some diseases like cardiovascular and inflammatory diseases and carotenoids avoid age-related macular degeneration (Scalbert and Williamson, 2000; Daly, et al., 2010).Vitamin C is useful for reducing the risk of several cardiovascular, neurodegenerative diseases (Harrison and May, 2009). Pear is a good source of vitamins, minerals, pectin, dietary fibers and phytochemicals. Pears juice is beneficial for the people those are suffering from acidity and diabetics.

Tulsi (*Ocimumtenuiflorum, Ocimum sanctum*), is an aromatic plant in the family Lamiaceae which is native to the Indian subcontinent and widespread as a cultivated plant throughout the Southeast Asian tropics. (Warrier, P.K., 1995). The tulsi leave extracts with methanol, water, and acetone were used to monitor the anti-bacterial property against clinically isolated MDR bacterial strains (Staples, George; Michael S. Kristiansen, 1999). Juice or infusions of tulsi are useful for the treatment of bronchitis, digestive problems, arthritis, hypertension, heart attack, cancer, viral hepatitis, diabetes etc. It is an excellent rejuvenator, which has been known to reduce anxiety, stress and relaxes the mind. Tulsi plant is valued for its anti-toxic (Sharma et al., 2002); antitussive (Nadig and Laxmi, 2005); hypoglycaemic and hypolipidemic properties thereby making it useful for diabetic patients (Rai et al., 1997). The aqueous extract of Tusli shows antimicrobial properties (Geeta et al., 2001; Singh et al., 2005) and also helps to reduce blood sugar in normal, glucose fed hyperglycemic and streptozotocin, induced diabetic rats (Chattopadhay, 1993; Pandey and Madhuri, 2010).

Amla (*Emblicaphyllanthus*or *Emblicaofficinalis*) is one of the most medicinal herbs and widely used in ayurvedic medicines. The amla act as antioxidants (Chopra et al., 1956); and protect against oxidative stress in ischemic reperfusion injury (Raja, k. et al., 2004). Amla is one of the richest sources of vitamin- C, amino acids and minerals (Srivasuki, K.P., 2012). Due to high vitamin C content this is liable for keeping body cells, increases red blood cells and promotes good health (Kapoor, L.D., 1990). It also contains several chemicals like tannins, alkaloids and phenols (Zhang, L.Z.et al., 2003). The fresh juice of amla acts as diuretic and helpful in burning urinary infection and when mixed with other ingredients are used to cure fits and insanity (Jayaweera, D.M.A., 1980).

On the basis of all these fruits health benefits and nutritional values the present study is focused on the preparation and storage stability of Fruit based Ready- To- Serve (RTS) beverages.

II. MATERIALS AND METHODS

2.1 Raw materials

Fresh and mature fruits were procured from local market of Premnagar, Dehradun, Uttarakhand and were used for the preparation of RTS. All the chemicals used to evaluate the quality parameter were analytical grade.

2.2 Preparation of Juices

2.2.1Preparation of Pear juice

Fresh and mature Pear fruit were washed in fresh water to remove the surface impurities. After washing peeling was done by knife and juice were extracted mechanically by using Havells Juicer. After extraction juice is stored at 4 ± 1°C until use.

2.2.2 Preparation of Amla juice

Fresh and mature Amal fruit were washed in fresh water and any surface defect is removed by knife. After washing remove the stone of Amla and juice were extracted mechanically and stored at 4 ± 1°C until use.

2.2.3 Preparation of Tulsi Extract

Fresh Tulsi leaves were washed properly in fresh water and blended in a laboratory blender. Then the extract was filtered with water through muslin cloth to obtain the Tulsi Extract.

2.2.4 Preparation of Pear - Amla Based RTS

Pear –Amla based RTS were prepared by mixing the previously prepared juices by using various blend combination such as 80:20, 75:25 and 50:50 with 5ml of Tulsi Extract and 5 ml of sugar solution. All the combination were prepared 200 ml and filled in previously sterilized glass bottels.

2.3 Physicochemical analysis of raw Juices and prepared RTS's

Raw juices and Prepared RTS with different combination of Pear and Amla Juice (80:20, 75:25 and 50:50) i.e. RTS-1 [Pear:Amla Juice(80:20)], RTS-2[Pear:AmlaJuice (75:25)],RTS-3[Pear:AmlaJuice (50:50)] were analyzed for various physico-chemical properties like pH, TSS, titrable acidity, reducing sugar and Ascorbic acid content. pH of all juices were analyzed by handy pH meter, TSS were measured in °Brix by handy refractometer (ERMA), titrable acidity was measured by the standard method of Rangana, 2010 ,by using N/10 NaOH and expressed in terms of percentage of citric acid. Reducing sugars were determined by the method of Lane and Eynon, 1923. Ascorbic acid in raw as well as RTS were measured by standard method of Sawhney, S.K. and Singh, R., 2015.

III. RESULTS AND DISCUSSION

3.1Physicochemical analysis of Pear (*Pyruscommunis*) and Amla (*Emblicaphyllanthus or Emblicaofficinalis*) Juice

pH, of Pear and Amla juice were reported to 4.6 & 3.0, TSS of Pear and Amla juice were reported to 12.1 & 8.1, Titrable Acidity (% citric acid) of Pear and Amla juice were reported to 0.576 & 2.608 , % Reducing Sugar of Pear and Amla juice were reported to 6.9% & 8.33%, Ascorbic acid (Vit C) mg/100 ml of Pear and Amla juice were reported to 1.71 and 821.1 mg/100 ml , Moisture Content of Pear and Amla juice were reported to 86.45 & 90.43 and Ash content of Pear and Amla juice were reported to 1.49 & 2.42 respectively as Shown in Table 1.

pH, TSS, Titrable Acidity, % Reducing Sugar , Ascorbic acid (Vit C) mg/100 ml , Moisture Content and Ash content of Pear Juice (Pyruscommunis) are similar to some extent as reported by Mohammed I. Talib et. al., 2016.

pH, TSS, Titrable Acidity, % Reducing Sugar , Ascorbic acid (Vit C) mg/100 ml , Moisture Content and Ash content of Amal (Phyllanthusemblica) Juice are similar to some extent as reported by Karpagavalli, B. et. al., 2014. Ascorbic acid (Vit C) mg/100 ml of Amla is similar to some extent as reported by Sasi Kumar et al., 2013.

Physicochemical changes during refrigeration storage of RTS are presented in Table 2. which shows that pH increased gradually after 7, 15 days in case of RTS-1 from 2.9 to 3.4, in case of RTS-2 from 2.8 to 3.2 and in case of RTS-3 from 2.5 to 3.0 as shown in Figure 1 . The similar result in increased pH during storage was found by Kayshar, M.S. et al., 2014.

Total soluble solids increased gradually after 7 to15 days in case of RTS-1 from 11.3 to 11.9 ºbrix, in case of RTS-2 from 12.0 to 12.8 ºbrix and in case of RTS-3 from 12.4 to 13.2 ºbrix as shown in Figure 2.The changes in TSS may be due to the conversion of polysaccharides into sugars. Similar trend of increasing in TSS during storage was reported in Aloe- vera based Ready to Serve Soft drink (Mohammed I. Talib et al., 2016) and in bael and Aloe- vera blended RTS (Tiwari, D. K. and Deen, B., 2015). The increasing trends in TSS of RTS may be possible due to the conversion of polysaccharides into sugars.

The titrable acidity of RTS also increased gradually during refrigeration storage. Titrable acidity increased gradually after 7 to15 days in case of RTS-1 from 0.59 to 0.64 % citric acid, in case of RTS-2 from 0.48 to 0.72% citric acid and in case of RTS-3 from 0.84 to 1.26 % citric acid as shown in Figure 3. The changes in titrable acidity may be due to the degradation of pectic substances could be the reason to increase the acidity of processed fruit products (Conn and Stumf, 1976).

The reducing sugar increased continuously during refrigeration storage period of 7 to15 days in case of RTS-1 from 14.71 to 16.0 %, in case of RTS-2 from 12.1 to 14.0 % and in case of RTS-3 from 13.15 to 15.30 % as shown in Figure 4. This increasing trend may be due to due to inversion of non-reducing sugars into reducing sugars. This result in present study, similar to Nidhi et al. 2007.

Ascorbic acid (Vit C) content was decreased continuously from the first day to the last day of refrigeration storage of 7 to15 days in case of RTS-1 from 154.85 to 88.57 mg/100g, in case of RTS-2 from 231.43 to 116.0 mg/100g and in case of RTS-3 from 423.71 to 322.85 mg/100g as shown in Figure 5. The oxidation of ascorbic acid into dehydro ascorbic acid may be the reason in decreasing trend in Ascorbic acid (Vit C) content. The similar trend of decreasing Ascorbic acid (Vit C) content was determined by Mandal, P., 2003 in fruit based beverages.

IV. CONCLUSION

In this study a similar trends of decreasing in Ascorbic acid has been found in case of RTS-1, RTS-2, and RTS-3. The study revealed that RTS-3 prepared with 50% Pear and 50% Amla juice scored maximum amount of ascorbic acid content (322.85 mg/100g).In this study increasing trend was observed in case of pH, TSS, Titrable acidity during the refrigeration storage of Pear- Amla based ready-to-serve (RTS) beverages over a period of 15 Days.

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Table 1. Physicochemical analysis of Pear (Pyruscommunis) and Amla(Emblicaphyllanthus or Emblicaofficinalis.)Juice

S. No.	Parameters	Pear	Amla
1.	**pH**	4.6	3.0
2.	**TSS (°Brix)**	12.1	8.1
3.	**Titrable Acidity (% citric acid)**	0.576	2.608
4.	**Reducing Sugar (%)**	6.9	8.33
5.	**Ascorbic acid (Vit C) mg/100 ml**	1.71	812.1
6.	**Moisture Content**	86.45	90.43
7.	**Ash content**	1.49	2.42

Table 2. Effect of refrigeration storage on physicochemical parameters of Pear-Amla based ready-to-serve (RTS) beverages

RTS (Pear: Amla Juice)	Refrigeration Storage Period (Days)	pH	TSS (°Brix)	Titrable Acidity (% citric acid)	Reducing Sugar (%)	Ascorbic acid (Vit C) mg/100 ml
RTS-1 (80:20)	**0**	2.9	**11.3**	**0.59**	**14.71**	**154.85**
	7	**3.3**	**11.4**	**0.60**	**15.2**	**134.00**
	15	**3.4**	**11.9**	**0.64**	**16.0**	**88.57**
RTS-2 (75:25)	**0**	2.8	**12.0**	**0.48**	**12.1**	**231.43**
	7	**3.2**	**12.5**	**0.59**	**14.80**	**165.71**
	15	**3.2**	**12.8**	**0.72**	**15.30**	**116**
RTS-3 (50:50)	**0**	2.5	**12.4**	**0.84**	**13.15**	**423.71**
	7	**2.9**	**12.9**	**1.10**	**14.80**	**357.14**
	15	**3.0**	**13.2**	**1.26**	**15.30**	**322.85**

Figure1. Effect of Refrigeration storage period on pH

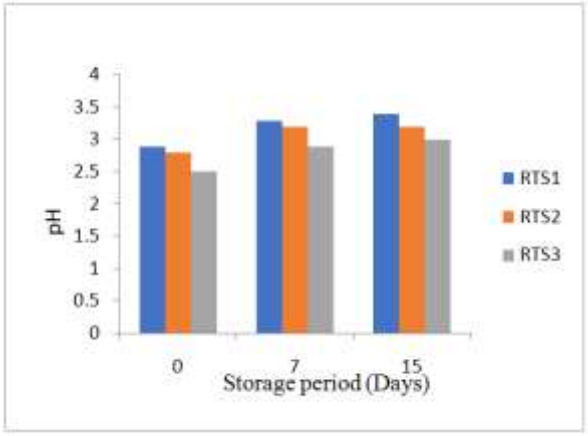


Figure 2. Effect of Refrigeration storage period on TSS

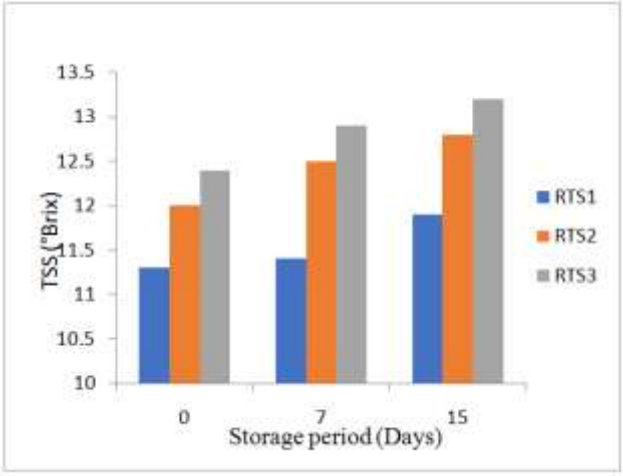


Figure 3. Effect of Refrigeration storage period on Titrable acidity

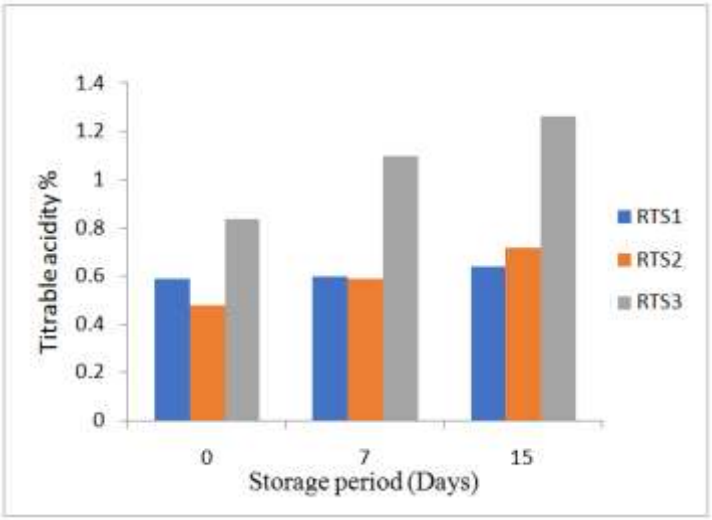


Figure 4. Effect of Refrigeration storage period on Reducing Sugar

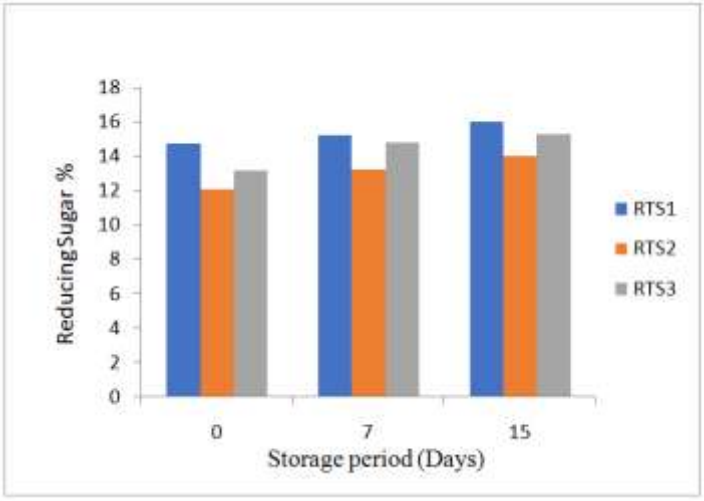
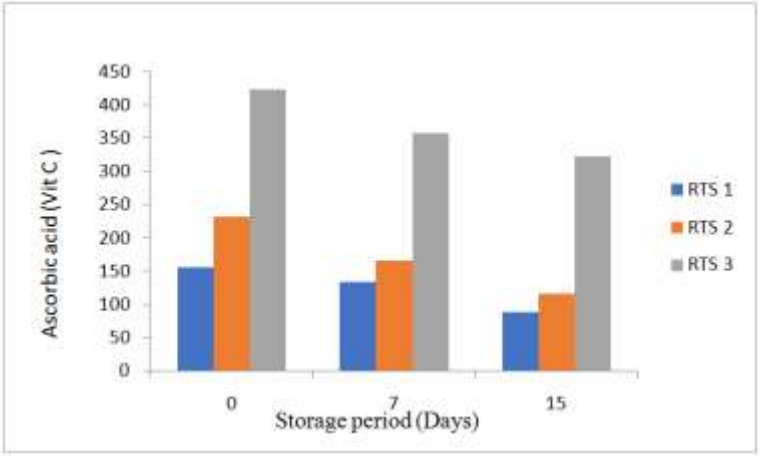


Figure 5. Effect of Refrigeration storage period on Ascorbic acid (Vit. C)



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