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# Development of Vitamin C Rich Value Added Beverage

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## ABSTRACT

Amla, a richest source of vitamin 'C' ranges upto 950 mg/100 g. Due to its astringent taste, it is not palatable for direct consumption, hence processing is essential. Present study was an effort to develop a suitable formulation for preparation of mixed amla–grape juice. The fruits juices were analyzed for its chemical composition and different formulations of mixed juices were prepared by different proportions of amla and grape juice. The prepared mixed juices were packed in glass bottle with cork cap and stored at room temperature for a period of 2 months. The products were analyzed for its keeping quality and acceptability at intervals of 10 days. The prepared, mixed juices were evaluated by a taste-testing panel for sensory attributes. Fruit mixed beverage having composition 50:50 juice, 0.4% acidity, 10% sugar (of amla juice), 15.24° Brix was found to be optimum among the other formulation.

**Key words:** Mixed juice, amla, grapes, shelf-life, vitamin C, storage

## INTRODUCTION

Fruit beverages are well relished by all age groups of the society. Fruit beverage is produced and consumed all over the world and over a very long time span. It can help to reduce high cholesterol levels in our blood. Functional beverages are drinks that have been enhanced with added ingredients to provide specific health benefits and disease preventing property beyond general nutrition. Amla have been reported to posses expectorant, purgative, spasmolytic, antibacterial, hypoglycemic activity (Jamwal *et al*., 1959; Jayshri and Jolly, 1993). The Indian gooseberry, also known as anola/amla (*Emblica officinalis*) is native to India and also grows in tropical and subtropical regions including Pakistan, Uzbekistan, Srilanka, South East Asia, China and Malaysia. The fruits of Amla are widely used as major constituents in several Ayurvedic preparation such as Chawanprash and Rasayana which promotes health and longevity (Rajkumar *et al*., 2001). A survey of the literature relating to the medicinal uses of *E. officinalis* fruit reveals it to be one of the widely used medicinal plants (Patel and Goyal, 2012). Amla (Indian gooseberry) fruits contain the highest ascorbic acid (Paul Shaha, 2004).

The ascorbic acid content of fresh Amla fruit ranges upto 950 mg/100 g which is said to be highest among all fruits next to Barbados cherry (Shankar, 1969). It is a rich source of vitamin C, minerals and phenolics and known for its therapeutic value (Jain and Khurdiya, 2002). It is also reported to posses expectorant, purgative, spasmolytic, antibacterial and hypoglycemic properties which helps to solve health related problems (Jamwal *et al*., 1959; Jayshri and Jolly, 1993). Several value added products have been prepared from amla such as amla sauce. Amla was

used to prepare ready-to-serve beverage (Deka *et al*., 2001), candy, jam, powder (Tripathi *et al*., 1988), Amla bar (Mishra *et al*., 2010). The Amla fruit, owing to its high acidity and astringent taste, is not preferred for direct consumption (Mishra *et al*., 2010), hence consumed mainly in processed form. Amla berries can be used as a valuable ingredient for the production of an herbal beverage. In addition to this, potent antioxidant, several active tannoid principles (Emblicannin A, Emblicannin B, Punigluconin and Pedunculagin) have been identified which appear to account for its health benefits (Rastogi, 1993; Rao *et al*., 1985).

Grapes (*Vitis vinifera* L.) are believed to have health benefits due to their antioxidant activity and polyphenols.Thus, scientists have conducted research to explore their positive effects on many chronic diseases (Atak *et al*., 2011) contains flavonoids, the powerful antioxidants, which can reduce the damage caused by free radicals and slacken ageing, to cure asthma, heart diseases constipation, indigestion, fatigue, kidney disorders, alzheimer's disease . In addition, the Muslim book the Holy Quran emphasizes the importance of grapes for humankind (Khafagi *et al*., 2006). It was reported that consumption of grape products at moderate level helps in prevention of aging related diseases(Iriti and Faoro, 2008). Moreover, owing to high acidity, astringency and such other factors in some of the fruits, the utilization of these fruits for preparation of various product become limited, dispite having their high nutritional quantities. Therefore, blending of fruit juices is practiced to overcome the high cost of some exotic fruit juices, scarcity or seasonal availability, balancing of strong flavors, high acidity, astringency, or bitterness, improving total soluble solids, bland flavor, improving and stabilizing color (FAO, 2001). Nutritional or phytochemical properties can be improved by blending which offers to adjust sugar/acid ratios and compensate undesirable juice consistency blending of two or more fruit juices and their beverages are through to be convenient alternative for its utilization in order to have some value added fruit drinks, which are of high quality in respect of both sensory and nutritional aspect. In the view of above health benefit of amla and grapes, present study was an effort to develop vitamin C rich fruit beverage (Balaswamy, 2011). The efficient methods for extracting phenolics from grape seeds have broad range of pharmacological activities, due to the special health promoting and disease preventing effects of polyphenols (Youssef and El-Adawi, 2006). Farbood *et al*. (2009) investigated the effects of Grape Seed Extract (GSE), as a potent antioxidant on spatial memory with Alzhimer's Disease (AD) and found that GSE could be useful agent to prevent neurogenerative disorders such as AD. El-Adawi *et al*. (2006) also found that GSE have obvious hypocholesterolemic effect that has important pharmaceutical applications in the prevention and treatment of cardiovascular disease atherosclerosis.

Amla fruit and grapes are two common nutritious juicy fruits. Amla is a rich source of ascorbic acid, antioxidant, polyphenol and many other bioactive compounds but due to its high acidity and astringency it is not palatable for direct consumption particularly among children (Mishra *et al*., 2010). Hence, blending of amla juice with the grape juice which is also a good source of bioactive components can be used to reduce its acidity as well as increase its acceptance in senesce of consumers.

They are wonderful for their colour, flavour and taste, hence present study was an effort to develop RTS beverage utilizing the nutritional properties of both the fruits and keeping in mind that the astringency of amla juice can be over come by the addition of grape juice.

## MATERIALS AND METHODS

**Materials:** Present study was conducted in the year 2010 at Centre of Food Technology, University of Allahabad, Allahabad, U.P., India. The fresh amla of chakaiya varieties and grapes were

procured from local market. Other raw material like sugar and spices were also procured from the local market and citric acid was procured from Science Corporation, Allahabad. The glass bottle was used for the bottling of juice.

**Extraction of amla and grape juice:** Fresh, fully ripe, sound amla and grapes were used for extraction of juice. The each fruits were cleaned, thoroughly washed, blanched and blended in a laboratory blender to a pulp and the juice was extracted by filtering through muslin cloth and stored separately for future use.

**Titratable acidity, pH and total sugar:** These juices were analyzed for its total soluble solid (TSS), acidity (as citric acid), pH and total sugar were determined according to Ranganna (1986).

**Ascorbic acid:** Sample solution equivalent to 0.2 mg ascorbic acid $mL^{-1}$ was prepared in water containing 3% (w/v) metaphosphoric acid. It was titrated against standard 2, 6 dichlorophenol indophenol (2,6 DCIP) solution of 0.5 mg $mL^{-1}$ concentration until the pink color developed completely. The operation was repeated with a blank (Indian Pharmacopoeia, 1996).

**Total soluble solids:** Total Soluble Solids (TSS) of fruit juice was analyzed by Digital Refractometer (Rudolph,USA). The fruit pulp was extracted and filtered through muslin cloth. A drop of filtrate was placed on a refractometer prism and the total soluble solids were recorded as °Brix (B).

**Sensory analysis:** To carry out the initial optimization of ingredients, the prepared formulation were judged by a trained panel of 15- member using a 9 point Hedonic rating (9-like extremely and 1-dis like extremely) (Murray *et al*., 2001) for color, flavor, texture and overall acceptability.

**Formulations and preparation of mixed juice:** Five different treatments coded as $T_1$, $T_2$, $T_3$, $T_4$, $T_5$, were selected for the study. The treatments were as follows:

- $T_1$ = 100% amla juice+0% grape juice +10% sugar of amla juice+2% spices of amla juice
- $T_2$ = 75% amla juice+25% grape juice +10% sugar of amla juice+2% spices of amla juice
- $T_3$ = 50% amla juice+50% grape juice +10% sugar of amla juice+2% spices of amla juice
- $T_4$ = 25% amla juice+75% grape juice +10% sugar of amla juice+2% spices of amla juice
- $T_5$ = 0% amla juice+100% grape juice +10% sugar of amla juice+2% spices of amla juice

The juices used for the preparation of RTS were centrifuged for settling the heavy particles. The mixed fruit beverage was prepared as the procedure given in Fig. 1. The optimized formulation taken for storage study on the basis of sensory evaluation (Table 1) was T3 formulation. The final TSS of the beverage was kept constant at 15.24°B. The prepared juice was stored in glass bottles at room temperature for the period of 60 days.

**Microbiological studies:** The prepared juice was studied for microbial load. The total microbial load was calculated by standard plate count method. The standard plate count was done according to the method described in recommendation method for the microbiological examination of food (APHA, 1967).

Table 1: Sensory score for the developed formulation (p>0.5%)

| Formulations | Flavor | Color | Overall acceptability |
|---|---|---|---|
| T1 | 5.5 | 7.2 | 6.5 |
| T2 | 6.9 | 7.6 | 7.2 |
| T3 | 8.6 | 8.1 | 8.4 |
| T4 | 8.0 | 7.8 | 8.0 |
| T5 | 7.8 | 7.4 | 7.6 |

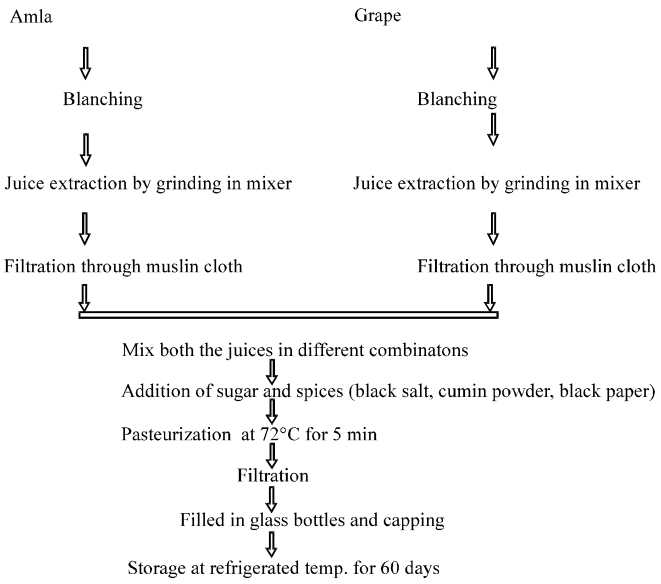


Fig. 1: Flow diagram for the preparation of amla-grape beverage

**Storage studies:** RTS beverages were subjected to storage studies at room temperature for a period of 3 months by drawing samples at bimonthly intervals to evaluate changes in chemical and organoleptic parameters. The products were also evaluated for sensory qualities viz., colour, flavour, taste and overall acceptability by a panel of 10 judges using a 9-point Hedonic scale where, score 1 is for 'dislike extremely' and 9 for 'like extremely' (Pangborn and Roessler, 1965). Sensory scores were analysed statistically by ANOVA using SPSS to evaluate the significance at $p<0.05$.

## RESULTS AND DISCUSSION

**Physico-chemical parameters of processed mixed juices:** The physico-chemical composition of studied amla and grape juice were presented in the Table 2 which reveals that the total soluble solid 14.1 and 12.40, acidity 3.8 and 1.01%, total sugar 7.65 and 12.15%.

**Vitamin-C, total soluble solids (TSS) and acidity:** Vitamin C or ascorbic acid content of optimized mixed juice was observed to be high (Fig. 2). Figure 2 showed that vitamin C or ascorbic acid was reduced from 134 to 62.6 mg/100 g in mixed juice after 60 days of storage due to the oxidation of vitamin C (Mishra *et al.*, 2011; Puranik *et al.*, 2011).

The total soluble solids initially adjusted in formulations showed a negligible change throughout 3 months of storage period at room temperature (28-32°C). From the Fig. 3, it was observed that

Table 2: Physico-chemical analysis of amla and grape juice

| Particulars | Amla juice | Grape juice |
|---|---|---|
| Color | Greenish | Greenish |
| °Brix | 14.1 | 12.40 |
| Acidity (%) | 3.8 | 1.01 |
| pH | 3.38 | 3.16 |
| Total sugar (%) | 7.65 | 12.15 |

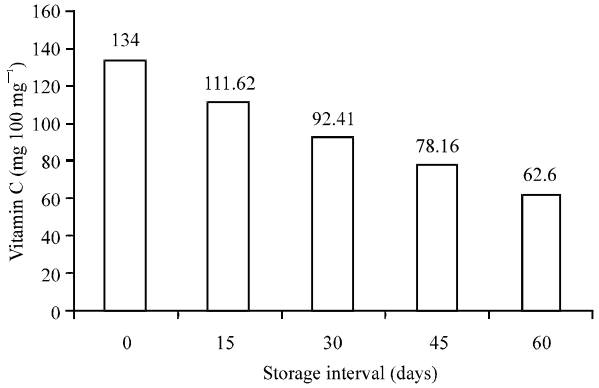


Fig. 2: Changes in vitmin C content during storage

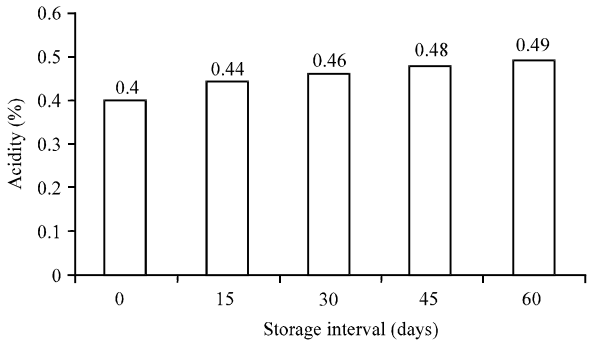


Fig. 3: Changes in acidity during storage

the initial TSS range was found to be 15.24°Brix and during storage of two months the TSS range to 15.02°Brix, which does not show any significant difference during storage, similar result was reported by Vidhya and Narain (2011) during storage of wood apple bar.

Acidity was calculated on the basis of titrable acidity as citric acid. Acidity for the optimized formulation was calculated at an interval of 15 days during storage period of 60 days. The value of acidity observed at the interval of 15 days was given in Fig. 4. The initial acidity of optimized mixed fruit beverage was 0.4% which was increased to 0.49% after storage for 60 days, similar result was reported by (Yadav *et al.*, 2010). From the Fig.2-4 it was indicated that vitamin C, TSS, acidity all were gradually decreased during storage and all these three factor have strong correlation. Since vitamin C is soluble in water and oxidation sensitive. Which is gradually decreased and this is the main reason for lowering the value of acidity and TSS (Simsek, 2011).

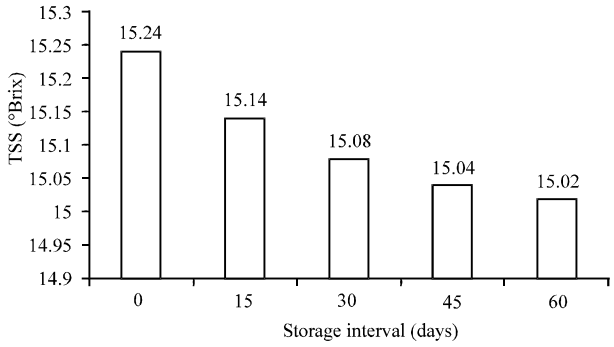


Fig. 4: Changes in total soluble solids (TSS) during storage

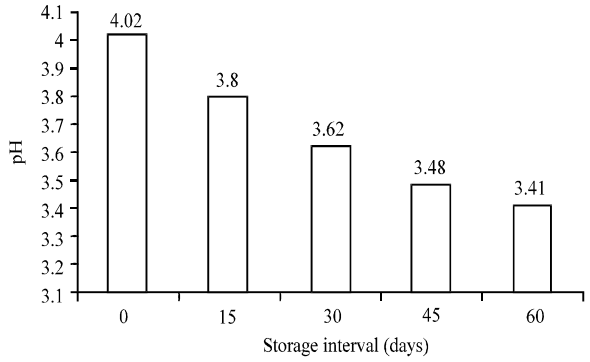


Fig. 5: Changes in pH during storage

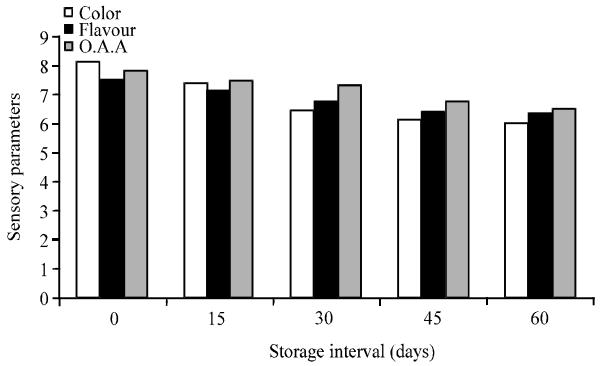


Fig. 6: Changes in sensory parameter during storage

**pH:** The pH of the mixed beverage show decrease in value during storage from 4.02 to 3.41 after 60 days of storage as the acidity of the mixed juice is increasing (Majumdar *et al.*, 2011) (Fig. 5).

**Storage studies:** The optimized mixed juice were stored at ambient temperature (28-32°C). The colour, flavour, overall acceptability, TSS, acidity, pH and microbial load (Standard plate count) in the mixed juice were observed during the storage period of 2 months. The overall acceptability (Fig. 6) of the mixed fruit beverage does not show significant difference during storage ($p>0.05$). In microbiological study, immediately after preparation of juice, the total no. of viable count were

Table 3: Microbiological analysis of amla and grape juice (p>0.5)

| No. of days | Total plate count (CFU $g^{-1}$) |
|---|---|
| 0 | 2.53 |
| 15 | 2.78 |
| 30 | 2.91 |
| 45 | 3.17 |
| 60 | 3.65 |

not uniform. It also showed that the total colony count increased slightly with the increase of storage period. The initial microbial load of the beverage were found to be 2.53 (log CFU $g^{-1}$) which was not increased significantly after two months of storage. The microbial load was also very low and far below the safety level (Zurowietz, 1996) (Table 3).

## CONCLUSION

Fruit mixed beverage having composition 50:50 juice, 0.3% yeast, 0.4% acidity,10% sugar of amla juice, 15.24°Brix was found to be optimum among the other formulation. It is concluded that amla berries can be used as a valuable ingredient for the production of mixed fruit beverage with all the important properties and medicinal characteristics of amla and grape fruits. This can thus, prove to be a good health drink with phenolics and vitamin C as antioxidants.

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