Development and Storage Studies of Therapeutic Ready to Serve (RTS) Made from Blend of Aloe vera, Aonla and Ginger Juice

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Abstract
In present investigation the efforts have been made to prepare a therapeutic ready-to-serve (RTS) made from blend of aloe vera, aonla fruits and ginger juice extracts. The blended juice extracts were prepared by using different proportions of aloe vera, aonla fruits and ginger juice as 50:25:25(A), 60:20:20(B), 70:15:15(C) and 80:10:10(D). The different blends were homogenized and pasteurized at 8000 rpm for 2 min and 85°C for 10 minutes respectively. The prepared therapeutic RTS is complying with Indian standards for RTS fruits beverages. The blended therapeutic RTS were analyzed for its different physicochemical as well as sensory quality and sensory quality evaluated by adopting 9 point hedonic scale. Among different blended ratio for therapeutic RTS, sample C blended ratio of 70:15:15 was reached with highest sensory scores for overall acceptability. The developed RTS could be recommended for the large scale production at industrial level.

Keywords: Aloe vera; Aonla fruit; Ginger; Therapeutic RTS; Beverages

Introduction
Recent scientific investigations on medicinal and therapeutic properties of aloe vera made it worldwide novel valuable ingredient for food, cosmetic and pharmaceutical industry. In food industry, it has been used as an ingredient for functional foods development and production of gel-containing health drinks, energy drinks and different type of beverages. In the cosmetic and toiletry industry, it has been used as base for creams, lotions, soaps, shampoos, facial cleansers and other products [1]. It is being extensively preferred as a natural product with medicinal and therapeutic properties [2].

Aloe vera (Aloe barbadensis Miller) belongs to Lileacea family traditional being utilized as contemporary folk remedy [3]. There are over 250 species of aloe vera grown around the world; however only two species viz. A. barbadensis Miller and A. aborescens are considered the most important one for processing point of view [4]. A fresh aloe vera leaves used to obtain two components, firstly bitter yellow latex from peripheral bundle sheath called aloe vera sap and a mucilaginous gel from parenchymatous tissue. The interest and use of gel has increased dramatically in the field of health care and cosmetics [5]. It can be utilized as a valuable ingredient for food application due to its biological activities and functional properties [6]. Aloe vera gel has a bitter taste which can be unpleasant in raw state and its palatability could be enhanced with addition of some other fruit juices.

Aonla or Indian gooseberry (Emblica officinalis) is the fruit of this deciduous tree found mainly in India. This plant belongs to the family Euphorbiaceae. The aonla fruit is greenish yellow in color with sour taste. The fruit possesses the highest level of heat and storage stable vitamin C known to man [7]. Pectin and minerals like iron, calcium and phosphorus are also found abundantly in the fruit. It is a very powerful anti-inflammatory herb [8]. Aonla is one of the three ingredients of the famous ayurvedic preparation, triphala, which is given to treatment for chronic dysentery, biliousness and other disorders. Aonla fruit is the richest source of natural vitamin C. It provides up to 900 mg/100g of juice of the fresh fruit. It has the same amount of ascorbic acid or vitamin C present in two oranges. Due to high Vitamin C content aonla has anti oxidative properties. Clinical in vivo and in vitro assays have shown that fruit juice extract has antioxidant and anti-inflammatory activities and create positive effects on glycemia, insulin, dyslipidemia, blood pressure and foam cell formation; additionally, some mechanisms of these effects have been reported [9]. Aonla is presently underutilized fruit, but has enormous potential in the world market. Many attempts have been reported on utilization of aonla in the formulation of various products but still there is a lot of scope to explore the possibility of its utilization in beverage industries.

Ginger scientifically known as Zingiber officinale belongs to the family Zingiberaceae. Ginger is contraindicated in people suffering from gallstones as the herb promotes the release of bile from the gallbladder. Ginger may also decrease joint pain from arthritis, though studies on comparison of vitamin C content in common fruits this have been inconsistent, and may have blood thinning and cholesterol lowering properties that may make it useful for treating heart disease [10] (Table 1).

Therapeutic RTS based on blends of aloe vera, aonla and ginger juice extracts continues to receive a considerable amount of attention reflecting a growing awareness of the potential of these products in the market place. These beverages have high nutritional quality and increased energy value especially therapeutic properties into the beverages. These could be particularly useful in place where there is lack of food and improper nutrition [10,11]. The development of any process for its economical utilization would be of great benefit to the

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therapeutic beverage industry, the development of nutritionally value added product could therapeutically help on improving the health of consumers. Introduction of new types of value added beverages might improve socio-economic status of the country [12].

Aloe vera, aonla and ginger are the cheapest sources from every rural area in India and they are presently underutilized fruits, but have enormous potential in the world market. Many attempts have been reported on utilization of aloe vera, aonla and ginger juice extracts in different combinations with other fruits and made out various types of beverages and its products. Blended drinks are good alternative for development of new products to provide benefit of taste, nutrition as well as medicinal properties. It has been reported that utilization of aloe vera gel or juice in the formulation of a beverage with other fruit juices. Hence, present work was carried to optimize level of aloe vera, aonla and ginger juice extracts in development of blended therapeutic RTS with desirable characteristics.

Material and Method

Preparation of Aloe vera juice

The chemical composition of juices depends majorly upon the method of juice extraction [13]. Aloe vera gel was extracted using cold extraction method and processed into juice as per the method reported by Satwadhar et al. [14]. Freshly harvested aloe vera leaves were dipped into 500 ppm of potassium metabisulphite (KMS) solution and washed thoroughly with tap water and kept for flash cooling to 5°C for gel stabilization. Further leaves were cut vertically into two half and gel was separated using stainless steel knife, it was allowed to settle for 12hrs and then homogenized using mixer grinder and enzymatically treated with 1% pectolytic enzyme at 50°C for 20 minutes. Then it was filtered and pH was adjusted to 3.0 by adding citric acid and ascorbic acid to control browning while high heat treatment. Further it was deaerated, pasteurized, flash cooled and stored. During the pasteurization pectolytic enzyme was inactivated. The obtained juice was stored refrigerated temperature until further use.

Preparation of aonla and ginger juice

Fresh, fully ripe, sound aonla and ginger were used for extraction of juice [15]. The each fruit was 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 refrigerated temperature separately (Figures 1 and 2).

Physico-chemical qualities

Physico-chemical qualities of the RTS beverages were analyzed using recommended standard of Association of Official Analytical Chemists (AOAC) methods (2005). The titrable acidity was determined by titrating the RTS beverages of various pulp concentrations with standard alkaline and the results were expressed as percentage of anhydrous citric acid. Ascorbic acid content of beverages was titrimetrically estimated by indophenol dye method. The pH was determined by an Electronic pH meter (Mettler Toledo, UK). Lane-
in one liter of distilled water. The controlled RTS beverage having ratio
50:50 of aonla fruit and ginger juice without *Aloe vera* juice (Control).
The undamaged, disease free, mature and ripe fruits were obtained from Pantnagar, District of Udham Singh Nagar, Uttarakhand (Figure 3).

**Sensory quality evaluation**

The beverage samples were evaluated as described by Larmond [16] for their sensory characteristics namely appearance, color, taste, flavor and overall acceptability by a trained panel comprising of 20 panelists drawn from faculty members and post graduate students of the Department. The panelists were asked to record their observations on the sensory sheet based on a 9 point hedonic scale (9 and 1 points showing like extremely and dislike).

**Storage studies**

The therapeutic RTS beverage with best blending combination and their ratio (on the basis of sensory evaluation) were packed in glass bottles and kept at refrigerated temperature and changes were determined during storage at monthly intervals up to 6 months. TSS, pH and acidity during storage was measured by standard method and overall acceptability was measured on 9 Point Hedonic Scale by 20 semi-trained panel members.

**Result and Discussion**

**Yield of *Aloe vera* gel**

The *Aloe vera* gel is relatively new novel ingredient for processing into beverages. Hence, it was preferred to collected the data pertaining to yield of gel from different structure of leaf obtained results are presented in Table 2.

It is observed from (Table 2) that long developed *Aloe vera* leaves recorded maximum weight (112.4 g) as gel yield (45.37%) while minimum weight of leaf (89.3 g), weight of gel (31 g) and gel yield (34.71%) was recorded for small spotted leaves. The difference in leave structures and gel yield may be due to different growing stages, morphology and maturity profile of *Aloe vera* leaves. On the basis of obtained results, it could be suggested that long fully developed *Aloe vera* leaves should be preferred for extraction of gel for maximum yield.

**Physical properties of aonla fruit and ginger juices**

Prepared *aonla vera*, aonla and ginger juices were analyzed for their physical parameters and obtained results are depicted in (Table 3).

Physical properties of fresh fruits of aonla and ginger juice observed from (Table 3) that recorded the juice extract (51%) and (40%) respectively. The difference in juice extract percentage may be due to variety, growing stage and maturity of fresh fruits. On the basis of obtained results, it could be suggested that fresh fruits and well matured with certain physical properties should be preferred for extraction of juices for maximum percentage.

**Chemical properties of *aonla vera*, aonla fruits and ginger juices**

Chemical properties of *aonla vera*, aonla fruits and ginger juices have direct effect on ultimate quality and storage stability of therapeutic RTS beverages [17]. *Aloe vera*, aonla fruits and ginger juice were analyzed for different chemical properties such as Moisture, pH, acidity, TSS, Vitamin C. The obtained data on chemical properties of *aonla vera*, aonla fruits and ginger juice extracts is presented in (Table 4).
well compatibility for blending or mixing and preparing therapeutic RTS with three different physicochemical characteristics juices and resulted balanced final therapeutic RTS remains major contributor of total solids content of final beverage.

**Sensory quality evaluation of blended RTS beverage**

Sensory quality of blended RTS beverage were determined on 9 Point Hedonic Scale and presented in figure 4. It could be observed from the figure 4 that appearance, color, taste, flavor and overall acceptability of beverage improved with increase in concentration of aloe vera gel up to the level of 70% with decrease in concentration of aonla fruits juice up to the level of 15% and 15% of ginger juice extracts were excellent sensory score.

**Storage studies**

The data on changes in chemical properties and overall acceptability of blended juices of aloe vera, aonla fruits and ginger on therapeutic RTS during 6 months of storage is presented in table 5.

Results pertaining to chemical changes during storage revealed that total soluble solids increased gradually during storage. Increase in TSS during storage might be attributed in conversion of polysaccharides and other constituents of juice into sugar [17]. Acidity of blended therapeutic RTS decreased with increase in storage period similar increase in acidity during storage has been reported by AOAC [18].

The pH of blended therapeutic RTS could be correlated inversely with the acidity of RTS and found to decrease with increase in storage periods as reported by AOAC [18]. Variations in pH during storage may be due to changes in chemical properties which are affected by storage conditions [19].

![Figure 4: Sensory quality of therapeutic RTS blended with different ratio of aloe vera, aonla fruits and ginger juice.](Image)

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Constituents</th>
<th>Aloe vera Juice</th>
<th>Aonla Juice</th>
<th>Ginger Juice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Moisture (%)</td>
<td>97.6</td>
<td>82.5</td>
<td>81.9</td>
</tr>
<tr>
<td>2</td>
<td>pH</td>
<td>4.4</td>
<td>3.1</td>
<td>3.9</td>
</tr>
<tr>
<td>3</td>
<td>Acidity (%)</td>
<td>1.2</td>
<td>2.6</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>TSS (<em>Brix</em>)</td>
<td>2.1</td>
<td>2.8</td>
<td>2.4</td>
</tr>
<tr>
<td>5</td>
<td>Vitamin C (mg)</td>
<td>7</td>
<td>900</td>
<td>2</td>
</tr>
</tbody>
</table>

*Each value is average of minimum three determinations.

**Summary and Conclusion**

In present investigation, efforts were made to develop blended therapeutic RTS using aloe vera, aonla fruits and ginger juices. Long developed aloe vera leaves were found suitable for extraction of gel due to its higher yield (45.37%). Aloe vera gel contained high moisture content while aonla fruits juice dominated in its vitamin C content; TSS, Acidity and pH are very similar characteristics. Sensory quality revealed that aloe vera gel could be successfully incorporated with aonla fruits and ginger juices in development of blended therapeutic RTS with improved sensorial quality profile up to the level of 70% while with 15% aonla fruits juice and 15% of ginger juice extracts. The storage studies revealed that blended therapeutic RTS made from aloe vera gel aonla fruits and ginger juices extracts could be successfully stored for the period of 4 months without significant change in chemical and sensory qualities.

**References**


**Table 4: Chemical properties of aloe vera, aonla and Ginger juice.**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Storage period (month)</th>
<th>TSS (<em>Brix</em>)</th>
<th>Acidity (%)</th>
<th>pH</th>
<th>Overall acceptability</th>
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<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>12.0</td>
<td>0.30</td>
<td>4.90</td>
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<td>2</td>
<td>1</td>
<td>12.1</td>
<td>0.31</td>
<td>4.88</td>
<td>8.41</td>
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<tr>
<td>3</td>
<td>2</td>
<td>12.4</td>
<td>0.32</td>
<td>4.85</td>
<td>8.33</td>
</tr>
<tr>
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<td>3</td>
<td>12.8</td>
<td>0.32</td>
<td>4.80</td>
<td>8.25</td>
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<tr>
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<td>4.76</td>
<td>8.12</td>
</tr>
<tr>
<td>6</td>
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<td>13.7</td>
<td>0.34</td>
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<td>7.92</td>
</tr>
<tr>
<td>7</td>
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<td>14.4</td>
<td>0.36</td>
<td>4.50</td>
<td>7.81</td>
</tr>
</tbody>
</table>

*Values of TSS, acidity and pH are average of 3 determinations while sensory score value is average of minimum 20 evaluations.