

## Preparation of therapeutic RTS beverage from *aloe vera* gel and aonla fruit juice and evaluation of storage stability

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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*, and aonla fruit juice. The blended juice of different ratio of *aloe vera* and aonla fruit juice 60:40(A), 65:35(B), 70:30(C) 75:25(D) and 80:20(E) with 15% of sugar, 0.3% of acidity and 100 ppm of Potassium metabisulfite and blends were homogenized and pasteurized. The prepared therapeutic RTS is complying with Indian standards for RTS fruits beverages. The blended therapeutic RTS were analyzed for its different physicochemical, storage stability and sensory qualities. Among different blended ratio for therapeutic RTS, sample D was reached with highest sensory scores for overall acceptability. The developed therapeutic RTS could be recommended for the large scale production at industrial level.

**Key words:** Aloe vera juice, Aonla fruit juice, Ready-to-Serve, Storage studies, Therapeutic beverage.

### INTRODUCTION

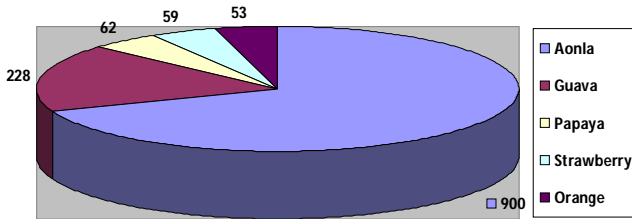
*Aloe vera* (*Aloe barbadensis* Miller) belongs to Liliaceae family traditional being utilized as contemporary folk remedy (Volger and Ernest, 1999). There are over 250 species of *aloe vera* grown around the world; however only two species viz. *A. barbadensis* Miller and *A. aborescens* are considered the most importance one for processing point of view (Valverde, *et al.* 2005). 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 (Devi and Rao, 2005). It can be utilized as a valuable ingredient for food application due to its biological activities and functional properties (Kojo and Qian, 2010). *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 (Damame *et al* 2002). Pectin and minerals like iron, calcium and phosphorus are also found abundantly in the fruit. It is a very powerful anti-inflammatory herb (Dachiya and

Dhawan, 2001). 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/100 g 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 by Singh *et al.* (2004). 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.

Therapeutic RTS based on blends of *aloe vera*, and aonla 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 (Eshun (2003). The

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**FIG 1:** Vitamin C content comparison chart in different fruits (Vitamin C content mg/100gram of fresh fruit juice)

development of any process for its economical utilization would be of great benefit to the 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.

*Aloe vera* and aonla fruits 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* and aonla fruit juices 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* and aonla fruit juice in development of blended therapeutic RTS with desirable characteristics.

## MATERIALS AND METHODS

**Preparation of *Aloe vera* juice:** The chemical composition of juices depends majorly upon the method of juice extraction by Ramachandra and Srinivasa (2008). *Aloe vera* gel was extracted using cold extraction method and processed into juice as per the method reported by Gaikwad and Shakya (2013) 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.

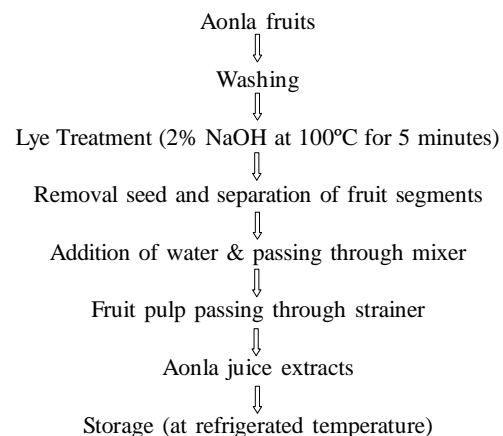
**Preparation of aonla fruit juice:** Fresh, fully ripe, sound aonla was used for extraction of juice by Dachiya and Dhawan (2001). The each fruit was cleaned, thoroughly washed, blanched and blended in a laboratory blender to a pulp and the juice was extracted by filtering through muslin cloth and stored refrigerated temperature separately.

**Physicochemical analysis:** Physicochemical analyses of the RTS beverage were analyzed using recommended standard (AOAC 2002). 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-Eynon method was performed to determine the total sugar content of the beverages. Hand-held refractometer (ATAGO-S-28E model) was used to estimate the total soluble solids (TSS) and the values were expressed as °Brix. The analyses were replicated thrice.

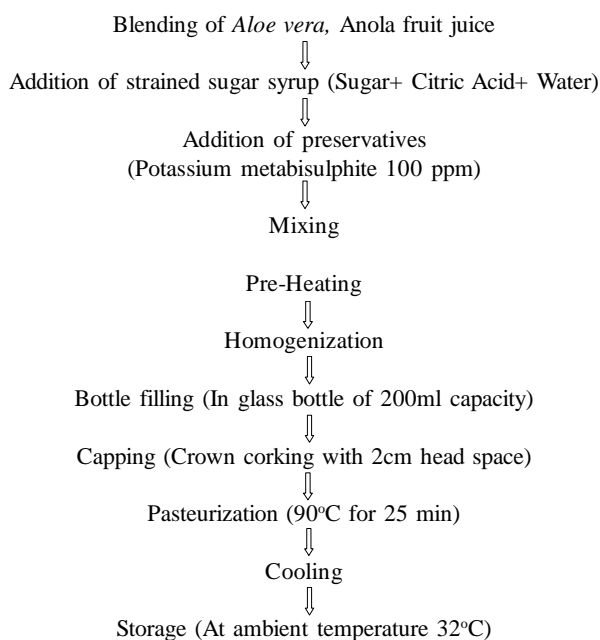
## Standardization of blended therapeutic (RTS) beverage

**preparation:** Blended therapeutic RTS beverages were prepared using 15% of blended juice extracts of *aloe vera* and aonla fruit juice, 15% of total soluble solid (TSS) and 0.3% of acidity at the time of preparation in all the formulated blends. The blended juice of different ratio of *aloe vera* and aonla fruit juice 60:40(A), 65:35(B), 70:30(C) 75:25(D) and 80:20(E) respectively with 15% of sugar, 0.3% of acidity as % of anhydrous citric acid and 100 ppm of KMS one liter of treated water. The controlled RTS beverage having 100 per cent *aloe vera* gel without aonla juice (Control). The undamaged, disease free, mature and ripe fruits were obtained from Pantnagar. District of Udham Singh Nagar, Uttarakhand

**Sensory quality evaluation:** The beverage samples were evaluated for their sensory characteristics namely appearance,



**Fig 2:** Process Flow chart for Aonla fruits juice



**FIG 3:** Process flowchart for preparation of therapeutic RTS from *Aloe vera*, Anola fruit and Ginger juice based.

colour, taste, flavor and overall acceptability by a trained panels 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.

## RESULTS AND DISCUSSION

The results obtained during present investigation are presented and discussed under suitable headings in view of available relevant scientific literature.

**Yield of *Aloe vera* gel:** It is observed from (Table 1) that long developed *Aloe vera* leaves recorded maximum weight

(112.4g) as gel yield (45.4%) while minimum weight of leaf (89.3g), weight of gel (31g) and gel yield (34.7%) was recorded for small spotted leaves. The difference in leaf 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 and chemical properties of aloe vera and aonla fruit juice:** Physical properties of fresh fruits of aonla juice observed from (Table 2) that recorded the juice extract (51%). 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 *aloe vera* and *aonla fruit juice* have direct effect on ultimate quality and storage stability of therapeutic RTS beverages by Boghani *et al.* (2012). *Aloe vera* and *aonla fruit juice* were analyzed for different chemical properties such as Moisture, pH, acidity, TSS, Vitamin C. The obtained data on chemical properties of *aloe vera*, aonla fruit juice is presented in (Table 2).

It could be observed from the (Table 2) that moisture content of aloe vera (*A Bvera*) gel more than aonla fruit juice, from this point of view it could be predicted that chance of spoilage will be more when moisture content is increased. Aonla fruit juice falls under the category of low acidic fruit while *aloe vera* gel is observed to be slight acidic fruit. Total soluble solid content of *aloe vera*, and aonla fruit juices are observed that there is not much more difference among the juices. The vitamin C content of aonla fruits juice was observed to be 900mg/100gm of fresh fruit juice while *aloe vera* gel was found very low (i.e. 7mg). It could be predicted that *aloe vera*, aonla fruit juices are well compatibility for blending or mixing and preparing therapeutic RTS with two different physicochemical characteristics juices and resulted balanced final therapeutic RTS beverages 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

**TABLE 1:** Yield of *aloe vera* gel from different structure leaves.

Structure of Leaf	Physical properties		
	Weight of leaf (g)	Weight of Gel (g)	Gel yield (%)
Long developed	110.5	50	45.2
Medium developed	101.3	44	43.4
Small developed	92.7	38	40.9
Small spotted	88.6	30	33.8

\* Each value is average of 10 determinations

**TABLE 2:** Physical and chemical properties of fresh *aloe vera* and aonla fruit juice

Physical properties		Chemical properties		
Physical Parameters	Aonla Fruit	Constituents	Aloe vera Juice	Aonla Juice
Shape	Oval to Round	Moisture (%)	97.6	82.5
Colour	Light green with yellowish	pH	4.4	3.1
Length	2.1cm	Acidity (%)	1.2	2.6
Breadth	2.5cm	TSS (°Bx)	2.1	2.8
Weight of fruit	17gm	Vitamin C (mg)	7	900
Juice	51%	-----	-----	-----

\* Each value is average of minimum three determinations

**TABLE 3:** Changes in physicochemical and overall acceptability of *aloe vera* and aonla fruit juice based therapeutic RTS beverages during storage

Storage period (month)	TSS (°Brix)	Acidity (%)	pH	Overall acceptability
0	12.0	0.30	4.90	8.50
1	12.1	0.31	4.88	8.41
2	12.4	0.32	4.85	8.33
3	12.8	0.32	4.80	8.25
4	13.2	0.33	4.76	8.12
5	13.7	0.34	4.68	7.92
6	14.4	0.36	4.50	7.81

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

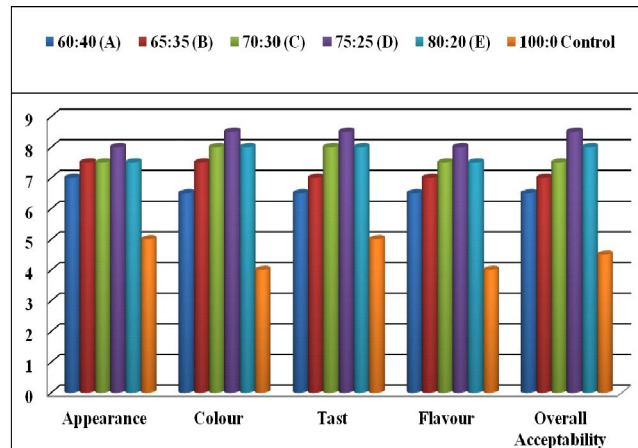
on 9 Point Hedonic Scale and presented in (Figure 4). It could be observed from the Figure-4 that appearance, colour, taste, flavor and overall acceptability of beverage improved with increase in concentration of aonla fruit juice and with decreasing concentration of *aloe vera* gel up to the ratio of 25:75 beverages were excellent sensory score.

**Storage studies:** The data on changes in chemical properties and overall acceptability of blended juices of *aloe vera* and aonla fruit juice on therapeutic RTS beverages during 6 months of storage is presented in (Table 3).

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 by Singh and Kumar (1995). Acidity of blended therapeutic RTS decreased with increase in storage period similarly increase in pH during storage has been reported by Gomez and Khurdiya (2005).

The pH of blended therapeutic RTS beverages could be correlated inversely with the acidity of RTS beverages and found to decrease with increase in storage periods as reported by Girdharilal (1988). Variations in pH during storage may be due to change in chemical properties which are affected by storage conditions.

The sensory quality profile of blended therapeutic RTS beverage is a prime factor to consider the marketability of product. During storage it was observed that overall sensory

**FIG 4:** Sensory quality of therapeutic RTS beverages with different ratio of *aloe vera* and aonla fruit juice.

quality profile of blended therapeutic RTS beverage slightly decreased during storage of 4 months yet remained under the consideration of “Like very much” by panel members. However, after 6 month the overall acceptability felt to “Like moderately”. Decrease in sensorial profile of blended therapeutic RTS beverages during storage is also reported in other investigators (Larmond, 1985).

## CONCLUSION

In present investigation, efforts were made to develop blended therapeutic RTS beverages using *aloe vera* and aonla fruit juices. Long developed *aloe vera* leaves were found suitable for extraction of gel due to its higher yield (45.2%). *Aloe vera* gel contained high moisture content while

aonla fruit 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 fruit juice in development of blended therapeutic RTS beverages with improved sensorial quality profile up to the ration of 75:25 aloe vera gel with aonla fruit juice. The storage studies revealed that blended therapeutic

RTS beverages made from aloe vera gel and aonla fruit juices could be successfully stored for the period of 4 months without significant change in chemical and sensory qualities.

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