



Fortification of functional value of pineapple Ready-to-Serve (RTS) beverage by the addition of Amla and Giloy

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Abstract

An experiment was conducted to develop beverage that can ready to use fruit based drink that use as such without addition of water known as RTS formulated with blending of fruit juice of Amla, in different proportions (0 to 50 %) and Giloy (Satva) in various percentage (0 to 2%) for the preparation and standardization of Pineapple RTS beverages. The prepared RTS beverages were organoleptically evaluated by adopting nine point Hedonic scale. Among the different recipes tried for RTS beverages, fifteen percent blended juices (Pineapple 80 % + Amla 20 %) and 0.5 % Giloy satva in recipe was found to be the best based on overall sensory score. Fortification of this RTS in terms to increase functional value by the addition of Amla and Giloy both possess health protective properties. Hence, Fifteen per cent blended juices were used for preparation of ready-to-serve (RTS) beverages having 12.01 degrees Brix, 0.36% acidity. Fruit mixtures present a series of advantages, such as the combination of different aromas and flavors and the sum of their nutritional components. Qualitative estimation of phytochemicals revealed that phytochemicals present in original Giloy satva survived fruit juice processing and were found to be present in final Pineapple RTS beverage at the level of 0.5%. Changes in physico-chemical properties during storage till one month. The model developed through this study might help in future for predicting the economically feasible blending ratio of fruit juices for the beverages on a commercial scale.

Keywords: RTS beverage, physico-chemical properties, phytochemicals, thin layer chromatography, storage

1. Introduction

Fruit beverages such as RTS are becoming increasingly popular in comparison to synthetic drinks, evidently because of their taste, flavour and nutritive value. These are easily digestible, highly refreshing, invigorating, thirst quencher, appetizer and superior to almost all kinds of aerated drinks which have practically no food value.

Aonla/amlam (*Emblica officinalis Gaertn.*) also known as 'Indian gooseberry' is one of the oldest minor fruits of India. It belongs to the family *Euphorbiaceae*; sub family *Phyllanthoidae* and is native of India, Srilanka, Malaysia and China [1]. Aonla is a quite hardy, prolific bearer and highly remunerative even without much care. Being adapted to dry region and salt affected soils [2] aonla is worth cultivating in wastelands.

Giloy Satva (*Tinospora cordifolia* linn. of family *Menispermaceae*) and *Curculigo orchioides gaertn.* (Family *Amarylladaceae*) are potent antioxidants found in ayurveda also reported in Rasayana. *Tinospora cordifolia* is one of the constituents of several ayurvedic preparations used in general debility, dyspepsia, fever and urinary diseases. The extract of its stem is useful in skin diseases. A bark of *T. cordifolia* has anti-spasmodic, anti-pyretic, anti-allergic, anti-inflammatory and anti-leprotic properties. It is an important ingredient of many Ayurvedic preparations and is considered to have aphrodisiac, immunostimulant, hepatoprotective, and antioxidant, anticancer and antidiabetic activities. Hence present study explores the antioxidant activity of the plant extract of *Curculigo orchioides gaertn* and traditional

formulation [3]

Pineapple (*Ananas comosus* var. *comosus* (L.) Merril) belongs to the bromeliaceae, monocotyledonae family, originated from warm climates in the Americas, being the main producers: Thailand, Brazil, Philippines, india and China. Pineapple juice's composition varies depending on geography, season, process and time of harvest. Its balance of sugar and acid contributes to the fruit's refreshing flavor [4]

Pineapple is a wonderful tropical fruit having exceptional juiciness, vibrant tropical flavor and immense health benefits. Pineapple contains considerable amount of calcium, potassium, vitamin C, carbohydrates, crude fibre, water and different minerals that is good for the digestive system and helps in maintaining ideal weight and balanced nutrition. Pineapple is a common fruit in Bangladesh and it has minimal fat and sodium [5].

The fruits are particularly rich in ascorbic acid and tannins. The ascorbic acid content of fresh aonla fruit varies from 200-900 mg/ 100 g pulp as reported by several workers [6]. Various types of tannins are responsible for the peculiar taste of astringency in the fruit and thus responsible for the flavour.

The juices of two or more fruits are mixed to yield well balance, rightly flavoured drink, which is rich in essential minerals and vitamins. Besides, the blending of two or more juices helps in utilization of astringent and too acidic fruits like lime, sour palm, sour cherry, and kinnow etc. These fruits and spice are also famous for excellent quality with pleasant flavour, rich in sugar, vitamin C and minerals. Therefore, blending of two or more fruit juices for the preparation of

ready-to-serve beverage appears to be a convenient and economic alternative for utilization of aonla. Sandhu and Sindhu. [7] have reported that two or more fruit juices/pulp may be blended in various proportions for the preparation of nectar, RTS beverage, etc.

2. Materials and methods

2.1 Procurement of raw material

Fresh and ripe fruits Pineapple, Amla and Giloy were procured from local markets of Varanasi. Raw materials are devoid of blemishes, any visible sign of microbial infections, insect infestation and physical injury.

2.2 Preparation of Giloy satva

Select clean thumb sized stem of Giloy herb and cut into small part and crushed well, after added 16 part of water and heated till ¼ water rest. Filtered to solidify and exposed to dry and collect in power form.

2.3 Standardization of juices and Giloy satva for the RTS preparation

For the preparation of Pineapple RTS beverage initially standardize the fruit juice (Pineapple and Amla). After the standardization the best ratio used for the standardization of Giloy satva percentage. Standardization of recipe for preparation of RTS beverages from mixed fruit juice of Pineapple and Amla and Giloy satva.

Blending of Pineapple and Amla fruit juice in different proportion

Group A	Treatment	Proportion
Pineapple : Amla	T ₁	100:0
	T ₂	90:10
	T ₃	80:20
	T ₄	70:30
	T ₅	60:40

Addition of Giloy satva in different percentage

Group B	Treatment	Proportion
Giloy Satva	T ₁	0.0 %
	T ₂	0.5 %
	T ₃	1.0 %
	T ₄	2.0 %

2.4 Juice Extraction, Preparation of RTS Beverages

For juice extraction, Pineapple after peeling removing crown and Amla fruits were blanched, seed removed manually, and segments were fed to centrifugal juice extractor. The juice was strained through the muslin cloth and pasteurized at 90 °C for 1 min, filled in sterilized glass bottles, crown corked, and air cooled Juice. The bottled juice was stored in cool storage (4±1 °C) until further use. The Amla juice was mixed with Pineapple juice in the ratio of 0:100, 10:90, 20:80, 30:70, 40:60, and in this standardize ratio added the Giloy satva in different percentage. All the blends were then adjusted with requisite proportion of water, sugar, and citric acid in order to contain 15% juice, 12% TSS, and 0.30% acidity except. All the blends were pasteurized at 90 °C for 1 min before packing

in sterilized glass bottles of 200 ml capacity.

2.5 Physico-chemical and Sensory Analysis

The pH was measured using a pH meter [8]. Titratable acidity was determined according to IAL, [10]; soluble solids using a digital refractometer Atago (Atago refractometer model N-50E, USA), at standard temperature (20 °C), and the results were expressed in °Brix.; ascorbic acid level (mg.100 g-1 of pulp) was determined according to Cox and Pearson [9], which is based on the reduction of 2,6-dichlorophenolindophenol (DCPIP) by ascorbic acid; the reducing sugars were determined by AOAC, [8], Ranganna, [15]. To determine the non-reducing sugars, an acid inversion was carried out in the sample extracts according to AOAC [8].

2.6 Sensory evaluation

Sensory evaluation of the juice was carried out with a set of 20 panelists. Commercial orange juice (chi vita brand) products were used as the controls. The panelist consisted of randomly selected staff and students (both males and females) from College of Applied Food Sciences and Tourism. The evaluation was carried out in the food laboratory of the Department of Home economics. The judges evaluated the products using a seven point hedonic scale where 7 = like very much and 1 = dislike very much. Panelists scored the sample for four sensory attributes – flavour, colour, consistency and over all acceptability. The order of presentation of the sample to the judges was randomized. A cup of potable water was given to the panelist to rinse his/her mouth after each tasting.

2.7 Qualitative test for Phytochemicals

Chemical tests were carried out on the aqueous extract and on the powdered specimens using standard procedures to identify the constituents (Tannins, Flavonoids, Steroids, Terpenoids, Alkaloids, as described by Sofowara, [12]; Trease and Evans [14]; Harborne [13]. TLC of alcoholic extract on silica gel plate was done for confirming the presence of different phytochemicals.

3. Result and discussion

The observation during experimentation and results which are obtain have been described under the various heading and have also been shown by the tables and figures.

3.1 Physico-chemical characteristic of fruit juice for RTS Preparation

After extraction of juice of pineapple and Amla were subjected to physic-chemical analysis for Total soluble solid, Acidity, pH, Ascorbic acid.

3.2 Physio-chemical analysis of the Pineapple juice

Total soluble solid in mixed pineapple juice found was 8 °Brix, acidity % 0.30, pH 3.1 and Vitamin C was recorded as 41 mg/100g represented in given Table 1.

3.3 Physio-chemical analysis of the Amla juice

In mixed Amla juice T.S.S was recorded 5 °Brix., acidity % 1.8, pH 2.2 and Vitamin C was 593.88 mg/100g represented in given Table 1.

Table 1: Physico-chemical composition of fruit Pineapple and Amla juice for RTS beverage:

Fruit juice	T.S.S. (^o Brix)	Acidity (%)	pH	Ascorbic acid (mg/100g)
Pineapple	8.0	0.3	3.1	41.00
Amla	5.0	1.8	2.2	593.88

3.4 Standardization of recipe for the preparation of RTS beverage

The organoleptic rating of recipes of different treatment of pineapple: amla juices for the preparation of RTS beverage was done by an expert panel of ten judges. There were five different ratio of juices that contain same total soluble solid (12^oBrix), mix fruit juice 15 % and titrable acidity(0.3%).the mean value presented in table 2 (A) clearly indicated that the recipe of T₃ (juice 15 %, T.S.S. 12.01%, and acidity 0.36% with ratio 80:20) secured maximum score 8.20 followed by recipe of T₂ (juice 15%, T.S.S. 12.12%, and acidity 0.33% with ratio 90:10), T₄ (juice 15%, T.S.S. 11.19%, and acidity 0.38% with ratio 70:20), T₅ (juice15 %, T.S.S. 11.89%, and acidity 0.39% with ratio 60:40).

Table 2(A): Standardization of recipe for the preparation of RTS beverage from mix fruit juice (pineapple: Amla):

Treatment	Ratio	T.S.S (^o Bri)	Acidity (%)	Score	Rating
T ₁	100:0	12.32	0.31	7.9	Like very much
T ₂	90:10	12.12	0.33	7.7	Like very much
T ₃	80:20	12.01	0.36	8.2	Like very much
T ₄	70:30	11.19	0.38	6.91	Moderately
T ₅	60:40	11.89	0.39	6.35	Like slightly

Table 2(B): Standardization of Giloy (*Tinospora cordifolia*) percentage in standardize ratio of juice for Pineapple RTS beverage:

Treatment	Giloy (%)	T.S.S (^o B)	Acidity (%)	Score	Rating
T ₁	0.0	12.21	0.34	8.35	like very much
T ₂	0.5	12.07	0.36	8.05	like very much
T ₃	1.0	12.56	0.34	7.45	like moderately
T ₄	2.0	12.12	0.33	7.20	like moderately

3.6 Physico-chemical characterization of Standardized recipe

Standardization of different recipe of sample showed that the recipe containing ratio of juice 80:20 (Pineapple: Amla) and 0.5 % Giloy satva was found ideal. The T.S.S. 12.07 (^oBrix), acidity 0.36 percentage, pH 3.0, ascorbic acid 11.61mg/100g,

reducing sugar 7.32 percent, non-reducing sugar 8.42 percent and total sugar 15.74 percent was recorded in finalized sample. The standardized sample obtained in studies are shown as Fig. 5 it was represented in pie-chart. Data presented are averages of triplicate determinations.

Table 3: Physico-chemical characterization of Standardized recipe:

T.S.S. (^o Brix)	Acidity (%)	pH	Ascorbic acid (mg/100g)	Reducing sugar (%)	Non-reducing sugar (%)	Total sugar (%)
12.07	0.36	3.0	11.61	7.32	8.42	15.74

3.7 Qualitative analysis of the phytochemical in RTS beverage

The study carried out on the plant samples and food ready to serve revealed the presence of medicinally active constituents. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids, and phenolic compounds. The phytochemical characters of medicinal plants quantitatively analysed are summarized in Tables-4. Alkaloids, steroid, terpenoid and flavonoids were present in Giloy satva and tannin were absent. In RTS beverage, Tannins, alkaloids, steroid, terpenoid and flavonoids

phytochemicals were present. In RTS beverage the presence of tannin may come from Amla.

TLC for Steroids

In TLC qualitative test show the presence of steroid with greenish colour in Pineapple RTS beverage.

TLC for Alkaloids

In TLC qualitative test show the presence of steroid with orange-brown colour in Pineapple RTS beverage.

Table 4: Qualitative analysis of the phytochemical in RTS beverage:

S. No.	Phytochemical	Giloy satva	RTS beverage
1.	Alkaloids	+	+
2.	Steroid	+	+

5. Conclusion

In this mixed RTS beverage showed good sensory acceptance and a high vitamin C content. RTS beverage formulated with a higher proportion of Pineapple fruit juice will maintain their sensory acceptance because of their strong flavour. Amla juice contained the highest vitamin C, it boosted their nutritional quality in terms of vitamin C content. Pineapple RTS beverage by mixing of Amla and Giloy satva (80:20:0.5%) were found Best.

Phytochemicals in original Giloy satva were alkaloid, flavanoid, steroid, terpenoid but absence of Tannins. While survived in juice processing and were found to be present in Giloy satva at 0.5% level with including tannin and the presence of tannin possible by Amla juice. Thin TLC results provided a confirmation for the presence of these phytochemicals in Pineapple RTS beverage. Giloy satva in 0.5% is not affecting the palatability of fortified Pineapple RTS beverage.

Physico-chemical properties during storage one month. The Total Soluble Solid (T.S.S) increased gradually, acidity was significantly decreased, Percentage of Ascorbic acid % found 11.61 and it started decreasing during storage, reducing sugar, total sugar content increasing except non-reducing sugar in storage period. The organoleptic quality of RTS beverage deteriorate gradually with increasing storage period.

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