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STUDIES ON FORMULATION AND DEVEOPMENT OF HERBAL RTS FROM BLEND OF AMLA, LEMON, MINT AND GINGER JUICE

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Abstract
The demand of Health beverage drinks is growing up day by day. The functional properties and therapeutic benefits of Amla, ginger and mint are known worldwide. Keeping this in view, an attempt was made to prepare a therapeutic ready- to – serve drink (RTS) from Amla, lemon, ginger and mint juice. The value of Amla, Lemon, Ginger, and mint in the formulated drink was used in samples T1, T2, T3 and T4 respectively. The products were subjected to standard physic-chemical, sensory and microbial analysis and accordingly variant T3 was found to be the most preferred with respect to taste, aroma and overall acceptability. RTS beverages were found to be good nutritional value. Microbial analysis of the RTS during storage period up to 60 days revealed that it was free from any spoilage.

Keywords: Ginger, Lemon, Amla, Mint, Herbal RTS, Sensory Evaluation.

Introduction

Ready to serve drink is popular among every children, young people and old man because of their refreshing nature and good taste and flavour. In recent years, there has been a growing interest in using herbal products as dietary adjuncts in the Food Industry. Functional beverages are one of its kinds which are tapping into consumer interest in health and wellness. People are now more health conscious and they want all good benefits in one drink. The demand for soft drinks always has an increasing trend and there is a great scope for development of value added beverages by utilizing nutritious food with medicinal properties. The functional properties and therapeutic benefits of Amla are known worldwide. It is a source of active substances including vitamins, minerals, enzymes, sugar, anthraquinones, lignin, saponins, sterols, amino acids and salicylic acid. The polysaccharides found in Aloe vera have been considered to the active ingredients for Aloe's anti-inflammation and immune modulation effects (Pugh *et al.,* 2001).

Its gel is transparent slippery mucilage containing bioactive polysaccharides mainly partially acetylated glucomannans. Besides, it is also a good source of vital nutrients (Rodriguez *et al.,* 2010). That's why the Aloe industry is flourishing and the gel is used in many products such as fresh gel, juice and other formulations for health, medical and cosmetic purpose (Enward and Benward, 2000). Ginger (*Zingiber officimale Rosc*.) is valued as a spice for ages and is also known for its medicinal properties such as to treat in rheumatoid arthritis, ulcer, preventing heart attack and stroke. Ginger is an aromatic tuber crop having volatile oils that account for the aroma of the tubers (Kikuzaki *et al.,* 1971). Not only this, the use of ginger as antiviral, anti-cancer and anti-ulcer genic drug has been widely accepted. The use of mint is gaining momentum not only because of its use for aroma and flavour characteristics, but also because of its potential health benefit (Chawla and Thakur, 2013). Mint has been reported to have pharmacological effect such as antimicrobial, anti-inflammatory, antispasmodic, antituesive, anticancer and analgesic. It contains minerals like calcium, potassium, sodium, magnesium, phosphorus and iron, as well as Vitamin A, C, K, folic acid, thiamine, riboflavin and niacin (Raghavan, 2006).

Materials and methods

Materials

The present study was conducted in the year 2025 at Centre of Food Technology, University of MPKV Rahuri India. The fresh raw materials like Aloe vera, lemon, amla, ginger and mint is procured from local market while other raw materials like sugar and citric acid is also procured from the local market. The glass bottle was used for the bottling of juice.

Extraction of juice

Fresh, fully ripe lemon, amla, Ginger, mint is used for extraction of juice. The fruits were cleaned, thoroughly washed, peeled with stainless steel and seeds were removed 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.

Aloe-Vera

Leaves were washed. Lower one inch of leaf base, the tapering points (2-4') of the leaf top and the short spine located along the leaf margin were removed by a sharp knife. Leaves were then cut longitudinally

and gel was scooped out. The gel was mashed with the hand beater and strained with muslin cloth to retrieve the Aloe Vera juice which was stored under refrigerated conditions for future use.

Preparation of extract

Extraction of mint juice: The mint leaves was washed properly and blended in a laboratory blender to paste with distilled water (1:8) and filtered through muslin cloth to obtain the juice extract.

The development of novel RTS blends is required for meeting the demands of the consumers and also for the growth of food processing industry. A beverage prepared by blending of fruits, vegetables and products from medicinal plants is an emerging sector in food industry.

Titratable acidity, pH and total sugar:

The juice was analyzed for its total soluble solid (TSS), acidity (as citric acid), pH, and total sugar which were determined according to Ranganna (1986).

Ascorbic acid Sample solution equivalent to 0.2 mg ascorbic acid/ml 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 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 were analyzed by hand Refractometer. 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.

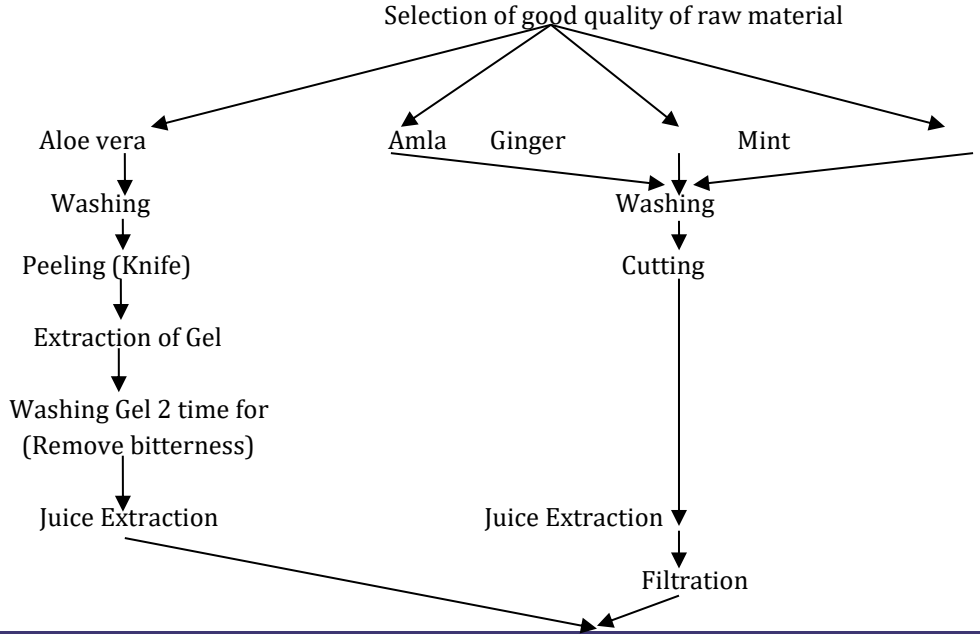
Determination of antioxidant activity

Free radical scavenging activity of extracts was measured by the slightly modified method of Alothman et al. (2009). The antioxidant capacity of the extracts was studied through the evaluation of the free radical scavenging effect on the 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical. An aliquot (100 µl) of fruit extract was mixed with 3.9 ml of 0.1 mM DPPH methanol solution. The mixture was thoroughly vortex-mixed and kept in the dark for 30 min. The absorbance was measured later, at 515 nm, against a blank of methanol without DPPH. Results were expressed as percentage of inhibition of the DPPH radical.

Formulations and preparation of RTS

The RTS was prepared with the Food Product Order Specification of Juice (10% of fruit juice; TSS 10 °Brix; Acidity 0.3%). The procedure for the preparation of RTS is given in Figure 1. The prepared aloe Vera and mint-medicinal herb mixed RTS was divided into 4 batches coded as T1, T2, T3 and T4. Mint juice added to the juice was kept constant at 6% of the RTS while T. cordifolia varied from 0.5, 1, 1.5, 2 and 2.5% respectively. The mixtures of herbs were added to the juice on replacement basis of the lemon juice. The different combinations of RTS were prepared keeping the final volume of the juice constant in the RTS. Four different treatments coded as T1, T2, T3 and T4 were prepared using different combinations of T. Flow chart shows (Table 1). The juices used for the preparation of RTS were centrifuged for settling the heavy particles. The final TSS of the beverage was kept

Fig 1. Flow chart – Development of herbal RTS



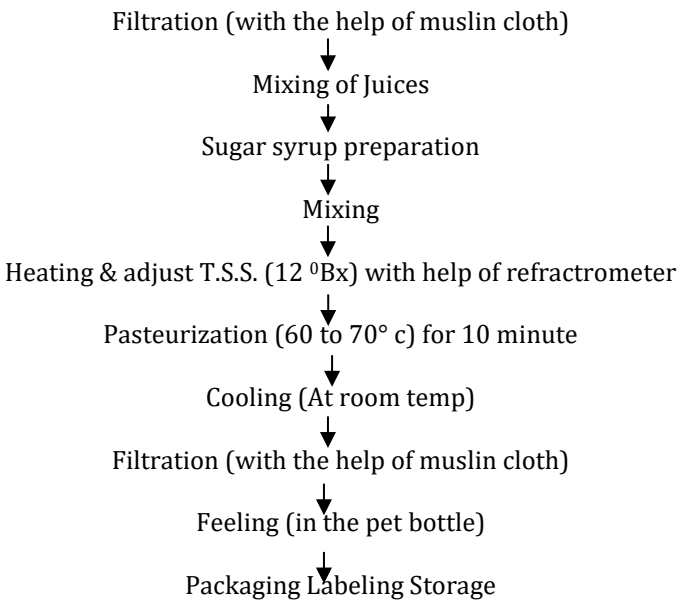


Table 1. Raw ingredients used in Herbal RTS formulation

INGRADIENTS	T_1	T_2	T_3	T_4
Aloe-Vera Juice	3 ml	2 ml	1 ml	0.5 ml
Mint Juice	1 ml	1 ml	2 ml	3 ml
Lemon Juice	2 ml	3 ml	3 ml	3 ml
Ginger Juice	1 ml	2 ml	1 ml	3 ml
Amla juice	3 ml	2 ml	3 ml	0.5 ml
Water	30 ml	30 ml	30 ml	30 ml
Sugar	60gm	60 gm	60 gm	60 gm

Constant at 12 °Brix. The prepared juice was stored in glass bottles at room temperature for the period of 60 days.

Sensory analysis

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

Microbiological studies

The prepared beverage 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).

Storage studies RTS beverages were subjected to storage studies at room temperature for a period of 60 days by drawing samples at bimonthly intervals to evaluate changes in chemical and organoleptic parameters. The products were also evaluated for sensory qualities namely: 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 analyzed statistically by ANOVA using SPSS to evaluate the significance at $P< 0.05$

Results and discussion

The formulation optimized on the basis of sensory evaluation (Table 2) was T3 formulation with is good then other T_2, T_1, T_4, formulation of based RTS blended with Aloe Vera, lemon, ginger and mint juice was prepared as per the flow chart given in fig. 1 and table 1. The RTS was prepared in four different variations Trials as T_1, T_2, T_3 and T_4. The calculated amount of sugar and citric acid was added to maintain a constant14°brix and 0.3 % acidity. KMS @ 100 ppm was added and pasteurized at 72°C and kept at ambient temperature for 60 days for further analysis.

Table 2. Physico-chemical analysis of raw ingredients used in Herbal RTS formulation

S. no.	Constituent	Aloe-vera	Lemon	Mint	Amla	Ginger

01	Moisture (%)	98.5	90	95	88	90
02	pH	5.2	2.0-3.0	6.0	2.85	5.6
03	Acidity (%)	1.4	5.0	0.19	2.5	0.8
04	TSS(°Brix)	1.6-1.85	7.0	2.0	7.9	3.0
05	Vitamin C	6.7	53mg	29.4	600mg	1.38

The physic-chemical compositions of the studied raw **i**ngredients juice were presented in Table 2 which reveals that the total soluble solid was 1.6-1.85,7.0,2.0,7.9,3.0 aloe Vera, lemon, mint, amla, ginger respectively. Acidity was 1.4,5 .0.19, 2.5, 7.9,3 aloe Vera, lemon, mint, amla, ginger respectively. The pH was determined with the help of a digital pH meter; TSS was measured with the help of hand refractometer and values were expressed as °brix. Acidity of various samples was determined by titration methods against 0.1 N NaOH according to AOAC (1995) method. Ascorbic acid content was determined by the titration method using 2, 6-diclorophenol dye as recommended by (Ranganna, 2001).

The raw ingredients used for the preparation of Herbal RTS formulations were analyzed for important physico-chemical characteristic and result is presented in table.3, it is apparent that Aloe vera pulp had highest moisture content followed by mint and ginger. Highest Vitamin C content was observed Amla (600 mg/ 100 g). The pH was recorded highest in Aloe Vera juice (5.2). Highest and Lowest acidity was recorded Aloe-vera (1.4%) and Mint (0.19%) respectively. The selection of Mint and ginger was done to mitigate the astringency of Aloe-Vera juice apart from flavour enhancement. Similar effort to alleviate the bitter taste of aloe Vera juice have been made earlier also (Ramchandran and Natrajan, 2014).

The prepared beverages formulations were studied for microbial load. The total microbial load was calculated by standard plate count (SPC) method. The SPC was done according to the method described earlier (APHA, 1967).

Sensory analysis of Herbal RTS formulation

Sensory evaluation The fresh and stored beverages samples prepared with varying levels of Aloe Vera, ginger and mint were served chilled for sensory evaluation which was carried out by semi – trained panel of twenty judges on a 9.0 point Hedonic scale. (Lawless and Klein, 1991) Statistical Analysis Data were subjected for analysis of variance and T-test to know the significant difference among various treatments (Pansey and Sukkhatme, 1961).

Table 3. Sensory analysis of Herbal RTS formulation

Trials SAMPLE	Color	Taste	Texture	Aroma	Appearance	Overall Acceptability
T1	6.5	5.5	7.7	6.2	7.3	6.2
T2	7.3	8.2	7.7	7.5	8.3	7.9
T3	8.2	9. 0	8.1	9.0	8.2	8.3
T4	6.3	7.5	7.1	7.6	7.8	7.2

Means with different superscript letters are significantly different at P < 0.05.

Result of Sensory evaluation of prepared RTS is presented in Table 3. The result clearly indicates that T3 scored significantly higher scores with respect to Aroma, taste and overall acceptability. The addition of ginger and mint juice had to improve taste, flavour and aroma sensory attributes of RTS. Ramchandram and Nagrajan (2014) also reported the development of spiced papaya and aloe Vera based RTS blend.

The result clearly indicates that the variation T3 was the best formulation with respect to Aroma, Taste and over all acceptability. Sensory quality revealed that successfully incorporated Aloe-vera, ginger and mint juice in the development of blended refreshing RTS with improved sensory quality.

Storage studies:

Table 4. Storage studies of herbal RTS

Sr. no.	No. of days	Total plate count (Cfu/g)
1	0	2.25
2	15	2.36
3	30	2.45

4	45	3.01
5	60	3.02

The optimized mixed RTS beverages were pasteurized at 70°C for 25 sec cooled and stored at refrigerated temperature 5°C for 60 days. The sensory parameters, TSS, titrable acidity, pH, vitamin C content and antioxidant activity of these RTS were studies for a period of 60 days, after every 15 day intervals. The overall acceptability of the RTS beverages did not show significant difference during storage ($p>0.05$). In microbiological study, immediately after preparation of juice, the total number of viable count was not uniform. It also showed that the count increased during the storage period. The initial microbial load was found to be 2.25 (log CFU g -1) which was not increased significantly during the storage period. The resistance to microbial activity was assumed because of the lemon and ginger content as they are potent antimicrobials.

Conclusion It was concluded from the study that RTS beverage with incorporation various juice extract was acceptable having the T3 sample. On the basis of above results revealed in the present study it may be concluded that the formulation of mixed blend juice beverage is possible to satisfy consumer taste and preferences. Utilization of the medicinal plants in diet or by incorporation and optimizing their use in fruit beverages, an individual will get all the benefits related to health.

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