

PREPARATION OF BITTER GOURD READY-TO-SERVE BEVERAGE AND EFFECT OF STORAGE TEMPERATURE ON ITS KEEPING QUALITY

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ABSTRACT

Bitter gourd ready-to-serve (RTS) beverage was prepared by optimizing the levels of fruit juice, sugar and citric acid and also keeping quality of RTS beverage was studied. The fresh bitter gourd RTS had on an average 13.00° Brix TSS, 0.3 per cent titratable acidity, 4.50 per cent reducing sugars and 9.80 per cent total sugars. The recipe for fresh RTS was standardized as juice 15mL, sugar 15g, citric acid 0.29 g and water 76mL. It was observed that there was overall increase in TSS and reducing sugars, while decrease in acidity and total sugars content during storage of RTS beverage at ambient ($27 \pm 5^\circ\text{C}$) and refrigerated ($5 \pm 1^\circ\text{C}$) temperature. The score for overall acceptability of bitter gourd RTS also decreased during storage. The RTS with stored at refrigerated temperature was found to be more acceptable after 3 months of storage.

INTRODUCTION

Bitter gourd (*Memordica charantia*) or Karela belongs to family Cucurbitaceae. It is a most common vegetable cultivated throughout India during warm season. Native to India or China, the fast growing vine is grown throughout Asia and is becoming popular worldwide. Depending on location, bitter gourd is also known as bitter melon, Karela or Balsam pear. The immature fruits and tender vine tips are used in a variety of culinary preparations. The fruit is available during warm season at cheaper rate to common masses.

The vegetable is a good source of ascorbic acid and fair source of protein, minerals, while poor source of sugar (Kalra *et al.*, 1988). Much of the work is done for preservation of bitter gourd by different methods such as steeping preservation, processing of bitter gourd into rings (Kalra *et al.*, 1983), sun drying and dehydration of bitter gourd (Raman and Manimegalai, 1998), hot air drying of bitter gourd slices (Lidhoo, 2007) etc.

Bitter gourd has excellent medicinal virtues. The medicinal value of bitter gourd in the treatment of infectious diseases and diabetes is attracting the attention of scientists worldwide. Bitter gourd is anti-diabetic, stimulant, stomachic, laxative, blood purifier and control diabetes (Raman and Lau, 1996).

As bitter gourd is bitter in taste and not liked by masses. It needs to be processed and fortified to make it palatable and acceptable. Presently ready-to-serve beverages have been increasingly gaining popularity among masses. Beverages are consumed by people of all the groups to quench the thirst

and as health food. Therefore, there is need to prepare ready-to-serve (RTS) beverage from bitter gourd which has nutritional as well as pharmacological significance. However, information on optimization of various ingredients and quality evaluation with respect to functional and sensory properties during storage of RTS beverage of bitter gourd is scanty. The present investigation was studied for the utilization of bitter gourd juice for preparation of ready-to-serve beverage.

MATERIALS AND METHODS

Bitter gourd fruits (Phule Green Gold cultivar) were obtained from the experimental field of Department of Horticulture, Mahatma Phule Krishi Vidyapeeth, Rahuri. The fully matured, healthy and uniform size fruits were carefully selected for further experimentation.

Extraction of juice

A known quantity of freshly harvested, fully matured bitter gourd fruits were washed and cleaned. The weight of fresh fruit was recorded and the pulp was extracted by using pulper. The pulp was heated to 60°C for 15 min and juice was extracted and filtered through muslin cloth.

Preparation of RTS beverage

The levels of juice, TSS and acidity in the RTS beverage were standardized by conducting preliminary trails with levels of juice as 7.5, 10, 12.5, 15, 17.5 per cent, 11, 13, 15, 17°Brix TSS and 0.30, 0.35, 0.40 per cent acidity. In all treatments the TSS and acidity were adjusted by adding cane sugar and citric

Table 1: Physico-Chemical Composition of Fresh Fruits and Juice

Parameters	Mean values
A. Physical constituents	
Colour	Dark green
Length/fruit (cm)	15
Diameter/fruit (cm)	3
Weight/fruit (g)	35
Juice yield (%)	68.5
B. Chemical constituents	
Moisture (%)	91.0
TSS (°Brix)	3.2
Acidity (%)	0.03
Reducing sugars (%)	2.5
Total sugars (%)	2.8
Ash (%)	0.8
Chlorophyll (mg/L)	10.9
Phosphorus (mg/100g)	69.0

Each observation is a mean of four determinations

acid respectively. The RTS beverage with juice 12.5 per cent, TSS 13.00°Brix and acidity 0.30 per cent scored maximum for overall acceptability. The RTS beverage with 100ppm sodium benzoate was pasteurized and hot filled in presterilized glass bottles. Crown corking of glass bottles was immediately done. Such bottles were further used for storage studies at ambient ($27 \pm 5^\circ\text{C}$) and refrigerated ($5 \pm 1^\circ\text{C}$) temperature respectively.

Physical properties of fruit

The colour, length, diameter, weight and juice yield was calculated as per standard procedures by use of the weights of fruits, pulp, seeds, etc. and results expressed as percentage.

Sensory evaluation

The RTS beverages of bitter gourd juice were evaluated for sensory attributes by a panel of 10 semi-trained judges, as described by Amerine *et al.* (1965) using a 9 point Hedonic scale system for different parameters like colour and appearance, flavour, taste and overall acceptability. The mean values of 10 semi-trained judges were considered for evaluating the quality.

Proximate composition

The TSS, total ash, moisture content of juice and RTS beverage was determined as per A.O.A.C. (1995) methods. The titratable acidity, reducing sugars, total sugars, chlorophyll and total phosphorus content were estimated as per Ranganna (1986) methods.

Storage studies

Table 2: Comparison of Ratings of Various Parameters for Rts Beverage before and After Storage at Ambient Temperature ($27 + 0.5^\circ\text{C}$) and Refrigerated Temperature ($5 + 1^\circ\text{C}$)

Test	Fresh RTS	After 90 days storage		S.E. +	CD at 5 %
		A	B		
Colour and appearance	7.3	6.1	6.4	0.204	0.615
Flavour	7.7	6.2	7.0	0.242	0.728
Taste	7.5	5.8	6.3	0.233	0.701
Overall acceptability	7.6	5.7	6.1	0.296	0.891
TSS	13.00	14.14	14.06	0.156	0.480
Titratable acidity	0.30	0.23	0.25	0.242	0.747
Reducing sugars	4.50	4.74	4.65	0.212	0.653
Total sugars	9.80	9.93	9.87	0.168	0.519

Each observation is a mean of four determinations; A-Ambient temperature, B- Refrigerated temperature

The beverage samples were stored as per treatments at ambient ($27 + 0.5^\circ\text{C}$) and cold temperature ($5 + 1^\circ\text{C}$) for 90 days. The samples were drawn at an interval of 15 days and evaluated for chemical and sensory quality.

Statistical analysis

The data obtained was analyzed statistically to determine statistical significance of treatments. Completely Randomized Design (CRD) was used to test the significance of results (Panse and Sukhatme, 1967).

RESULTS AND DISCUSSION

Standardization of RTS

The preliminary trials were conducted to assess the optimum level of ingredients for the beverage. The optimum levels of juice, stevia leaves powder, sugar, citric acid and water were selected on the basis of sensory evaluation done by a panel of 10 semi-trained members. The better combination levels of juice 12.5 per cent, sugar -15g, citric acid 0.29g and water 76mL for 100mL RTS beverage were standardize.

Physico-chemical composition of fruit and fresh juice

The data on physico-chemical composition of fresh fruits and juice are presented in Table 1. The data reveal that fruits were dark green in colour with an average length 15 cm, diameter 3 cm and weight 35 g/fruit. The recovery of juice was 68.5 per cent. Among the chemical composition of fresh juice the mean value for TSS was 3.2°Brix, acidity 0.03 percent, reducing sugars 2.5 per cent, total sugars 2.8 percent, ash 0.8 percent, chlorophyll 10.9 mg/L and phosphorus 69.0 mg/100 g. The values obtained for various physico-chemical characteristics of fresh bitter gourd fruit and juice are within the range reported in literature (Raman and Manimegalai, 1998).

Proximate composition

The data on chemical composition of fresh RTS beverage are presented in Table 2. The data indicates that TSS, titratable acidity, reducing sugars and total sugars of fresh RTS beverage were 13.00°Brix, 0.30 per cent, 4.50 per cent and 9.80 per cent respectively.

Sensory evaluation

The data regarding sensory evaluation of fresh RTS beverages are presented in Table 2. The data indicate that the colour and appearance score of fresh RTS beverage was 7.3 while flavour score was 7.7, taste score was 7.5 and overall acceptability

score was 7.6. The appearance of RTS was influenced by the TSS levels. However, addition of citric acid contributed towards better flavour. The taste of RTS was greatly attributed to the appropriate sugar-acid blend in the product. Similar results were reported for RTS beverage prepared from aonla-mango mixed pulp (Bhosale et al., 2000) and from RTS carbonated beverage from jamun fruit juice (Pandurnikar, 2004).

Storage studies

Table 2 also reveals the changes in the chemical and sensory quality of RTS beverage during storage. The TSS, reducing sugars and total sugars in RTS increased from 13.00 to 14.14°Brix and from 4.50 to 4.74 per cent and 9.80 to 9.93 per cent respectively. This increase may be due to hydrolysis of some carbohydrates into sugars. The acidity decreased from 0.30 to 0.23 per cent. The decrease in acidity was faster in case of ambient temperature storage as compared to refrigerated temperature storage. This decrease could be attributed to the chemical interaction between organic constituents of the beverage induced by temperature and action of enzymes. Similar results have been reported in mixed fruit juice beverage due to gradual inversion of sugars by hydrolysis (Vaidya et al., 1998).

The sensory score of all parameters decreased continuously during storage. The overall acceptability score of RTS decreased from 7.2 to 5.9. This decrease may be due to degradation of colour and changes in flavour and taste of stored samples. However, a better retention of colour, taste and flavour was observed for treatment (B). Similar results were reported for mixed fruit juice RTS beverage (Kumar and Manimegalai, 2001) and karonda fruit product (Jadhav et al., 2004).

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