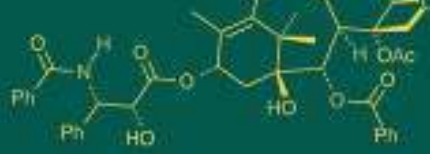
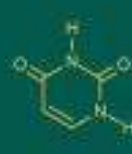


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Estimation of betacyanin and betaxanthin content in blended beverage of Bottlegourd, beetroot and Aloe vera

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Abstract

The present investigation entitled “Estimation of Betacyanin and Betaxanthin content in Blended Beverage of Bottlegourd, Beetroot and Aloe vera” was conducted at the laboratory of Department of Vegetable Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during the year 2023-2024. The investigation was performed with a view to assess the Betacyanin and Betaxanthin content of beetroot juice blended with Bottlegourd and Aloe vera with the help of spectrophotometer. The analysis was performed utilizing Completely Randomized Design with six treatment combinations replicated thrice. The prepared RTS was evaluated for Betacyanin and Betaxanthin content at an interval of 15 days up to 90 days of storage period and it was found that the treatment T₆ (50 part Bottlegourd: 25 part Beetroot: 25 part Aloe vera) recorded maximum value of Betacyanin and Betaxanthin content while the minimum value was recorded by treatment T₁ (75 part Bottlegourd: 0 part Beetroot: 25 part Aloe vera) having no Betacyanin and Betaxanthin content. It is evident from the findings that Betacyanin and Betaxanthin content decreases significantly with the advancement in storage period.

Keywords: Betacyanin, Betaxanthin, RTS, Bottle gourd, Beetroot, Aloe vera

Introduction

Fruits and vegetables tend to have very limited shelf life due to its perishable nature. In order to preserve, they are processed to Ready to Serve (RTS) beverages. RTS beverage is a non-fermented beverage prepared from fruits and vegetables of different concentrations with addition of sugar, water and additives (Rathinasamy *et al.* 2021) [8]. The bottle gourd, also called the white-flowered gourd (*Lagenaria siceraria* (Mol) Standl.), is a member of the Cucurbitaceae family. Bottle gourd or Lauki juice is an excellent remedy for the excessive thirst caused by diabetes, diarrhoea and over consumption of fatty foods (Bhattacharya and Das, 2012) [1]. The brilliant crimson beetroot (*Beta vulgaris* L.), sometimes referred to as chard, spinach beet, sea beet, garden beet, white beet and chukander (in Hindi), is a member of the Chenopodiaceae family. It is well-known for both its therapeutic qualities and highly prized juice. Geosmin is the reason why fresh beetroot juice has a muddy flavor. It comes in a variety of forms, with the bulb hues varying from yellow to red. The most widely consumed beetroots for human consumption are those with a deep red color, either cooked or raw for salad or juice. Betalain present in beetroot serve as an osmolyte (protecting cells against dehydration), an antioxidant (protecting cells against free radicals), a methyl group donor (lowering potentially harmful levels of homocysteine) and a vascular protectant which effect human health and function (Bloomer *et al.*, 2011) [2].

Aloe vera gel is used in the food business, processing the plant's leaf pulp has grown to be a significant global industry. It has been used as a source for functional food, particularly in the production of Aloe vera gel-based health drinks (Ramachandra and Srinivasa Rao, 2008) [7]. Vegetables are a major source of essential vitamins and minerals, such as vitamin A, vitamin C and potassium, needed for human wellbeing. They are, however, perishable living products that require coordinated activity by growers, storage operators, processors and retailers to maintain quality and reduce food loss and waste (Lipinski *et al.* 2013) [6].

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Fruit beverages such as ready-to-serve (RTS) are becoming more and more popular in comparison to synthetic drinks, evidently because of their taste, flavor and nutritional value (Gaikwad et al., 2013) [4]. More than 20-25 per cent of fruits and vegetables in India perish before they are used. Even though India is the second-largest producer of fruits and vegetables in the world, just 1.5 per cent is processed. The advantage of RTS beverage is that there is no need to dilute it whereas squash, syrup, cordial, crush are diluted with water before use. Ready-to-serve beverages are made out of juice, sugar, water and consumed as such. Recently due to health consciousness among people there is shift of preference towards the consumption of vegetables and vegetables based products including beverages. Natural beverages could be substituted for those synthetic preparations, it would be desirable to the consumers as well as to the manufacturers.

Material and Methods

The present investigation was carried out in the laboratory of Department of Vegetable Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The present study is designed to prepare blended beverage of Bottle gourd, Beetroot and Aloe vera. The Experiment consist of six treatments viz. T₁ (75 part Bottlegourd: 0 part Beetroot: 25 part Aloe vera), T₂ (70 part Bottlegourd: 5 part Beetroot: 25 part Aloe vera), T₃ (65 part Bottlegourd: 10 part Beetroot: 25 part Aloe vera), T₄ (60 part Bottlegourd: 15 part Beetroot: 25 part Aloe vera), T₅ (55 part Bottlegourd: 20 part Beetroot: 25 part Aloe vera), T₆ (50 part Bottlegourd: 25 part Beetroot: 25 part Aloe vera). Bottle gourd and Beetroot were purchased from nearby market while Aloe vera was collected from IGKV grounds and necessary pre-treatments such as washing, grading, sorting etc., were carried out. The blended beverages was analysed in the Laboratory at 15 days interval and stored at ambient condition

Extraction of juice from Bottle gourd, beetroot and Aloe vera

Fresh and tender bottle gourd fruits were selected for the experiment. The fruits were then peeled, top 20 mm and bottom 15 mm of bottle gourd was cut and removed. The fruits were sliced (around 5mm thickness) using a stainless-steel knife and were immediately blanched at 80 °C for 3-4 min in order to deactivate enzymes and avoid browning. After blanching fruit pieces were used to extract juice by using a mechanical juice extractor. The peeled beetroots were cut into small slices and blanched. Blanching inactivates the enzymes and retains the colour of beetroots. The water blanching method described by Karla, 1990 was adopted. The cubes to be blanched were loosely tied in a muslin cloth and were dipped in hot water at 80 °C for 3-5 minutes. Immediately after blanching the cubes in muslin cloth were held under running tap water to prevent further cooking. The blanched beetroot was passed through mixer. Obtained pulp was passed through muslin cloth to get clear beetroot juice. The Aloe vera pulp was taken out by the traditional hand filleting method to avoid the contamination

of internal fillet with the yellows sap. The fresh, succulent, undamaged, mature (3-4 years), rot free leaves were selected for preparing the juice. The lower 1 inch of the leaf base, the tapering point of 2-4 inches of leaf top and the short, sharp spines along the leaf margins were removed by using a sharp knife. The pulp was then heated at 60-65 °C for 10 minutes and grinded in mixer-grinder. The mashed pulp was then strained using clean muslin cloth to get pure Aloe vera juice.

Preparation of RTS

After obtaining pure Bottle gourd, Beetroot and Aloe vera juice the RTS was prepared by blending all three juices in different concentrations as per the treatments and homogenization was done for all the treatments of RTS. After that, the prepared strained syrup solution (sugar + water + acid) was added into the mixture of juice and processed upto 85-90 °C for 20 minutes and filled into the pre-sterilized colourless glass bottles of 200 ml capacity and sealed air tight using crown caps with the help of a crown corking machine. The products were pasteurized in boiling water (90 °C) for 30 min. The recipe for preparation of RTS was sugar, according to TSS (10%), water 900 ml, citric acid @ 3gm/lit of RTS and sodium benzoate @ 0.1g/lit of RTS were added as a preservative.

Determination of Betacyanin and Betaxanthin content

The betalain content (Betacyanin and Betaxanthin) was quantified by a method described by Mobhamed et al. (2013). The beetroot juice was diluted (30 times) with distilled water and the absorbance of the diluted juice was read at 538 nm and 480 nm using a spectrophotometer. The betalain content were determined spectrophotometrically (UV visible single beam spectrophotometer) using an equation proposed by Cai and Corke (2000) [3].

The Betacyanin content was calculated as

$$\text{Betacyanin (mg/100 gm)} = \frac{A \times DF \times MW \times 1000 \epsilon \times}{L}$$

Wherein, A is the absorption value at betanin λ max (538 nm) DF is a dilution factor, MW is the betanin molecular weight (550 g mol⁻¹), ϵ is the betanin molar extinction coefficient (60,000 L mol⁻¹ cm⁻¹) and L is the path length (1.0 cm) of the cuvette.

Betaxanthin content was calculated as

$$\text{Betaxanthin (mg/100 gm)} = \frac{A \times DF \times MW \times 1000}{\epsilon \times L}$$

Wherein, A is the absorption value at indicaxanthin λ max (480 nm) DF is a dilution factor, MW is the indicaxanthin molecular weight (308 g mol⁻¹), ϵ is the indicaxanthin molar extinction coefficient (48,000 L mol⁻¹ cm⁻¹) and L is the path length (1.0 cm) of the cuvette

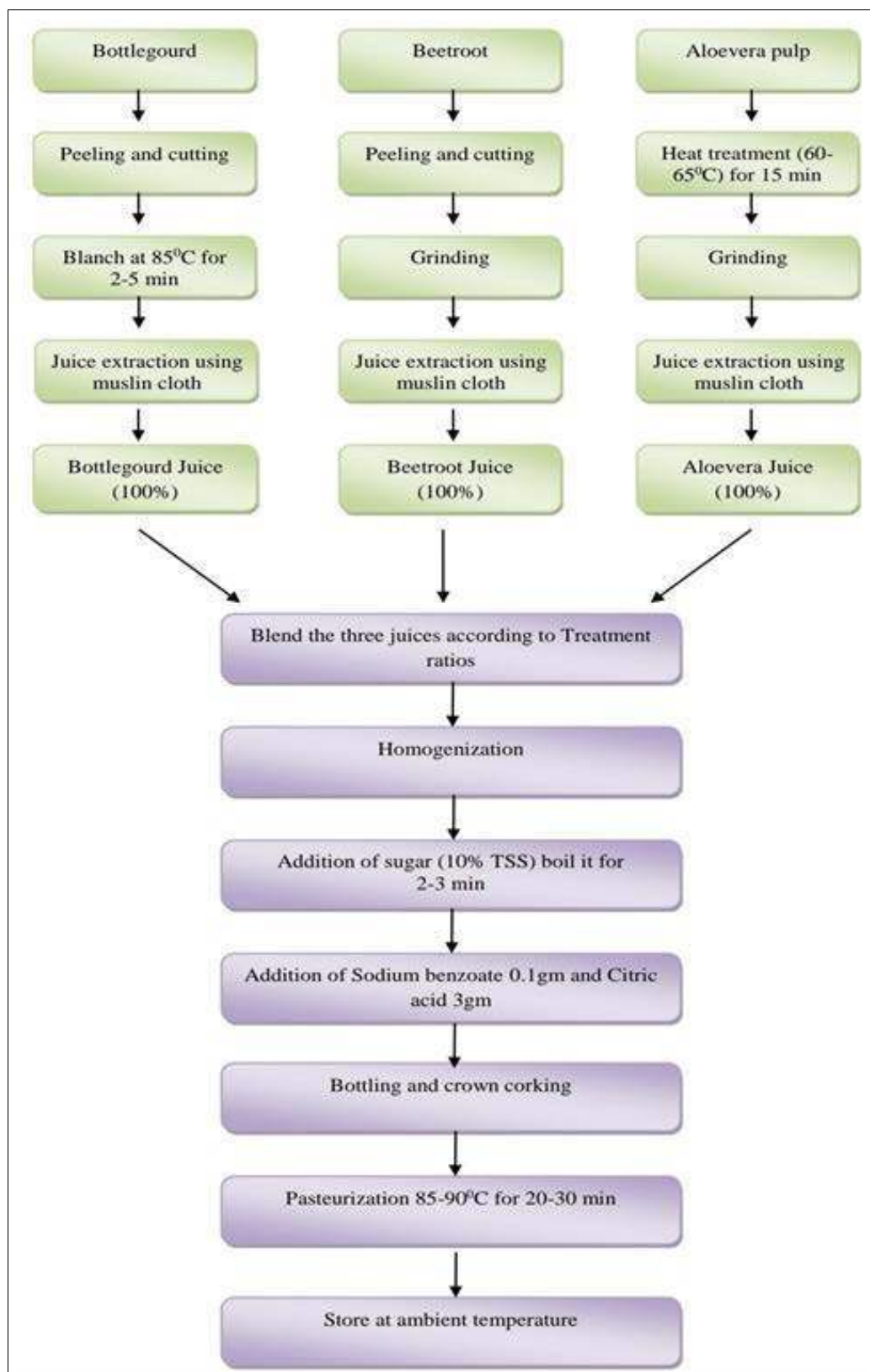


Fig 1: Flowchart for Preparing Bottlegourd, Beetroot and Aloe vera RTS

Results and Discussion

Among the different treatment, Treatment T₆: 50 part Bottlegourd: 25 part Beetroot: 25 part Aloe vera, exhibited maximum betalain (betacyanin and betaxanthin) content followed by treatment T₅: 55 part Bottlegourd: 20 part Beetroot: 25 part Aloe vera while the minimum value was recorded by treatment T₁ (75 part Bottlegourd: 0 part Beetroot: 25 part Aloe vera) having no Betacyanin and Betaxanthin content. The concentration of Betacyanin in T₆

decreased from 6.05 mg/100 gm at 0 days to 3.94 mg/100 gm at 90 days of storage period. and Betaxanthin content in T₆ decreased from 2.44 mg/100 gm at 0 days to 1.17 mg/100 gm at 90 days of storage period. The Significant reduction in betalain (betacyanin and betaxanthin) content of RTS was observed during storage. This decrease in betalain content might be due to their high susceptibility to auto-oxidative degradation and poor stability during storage.

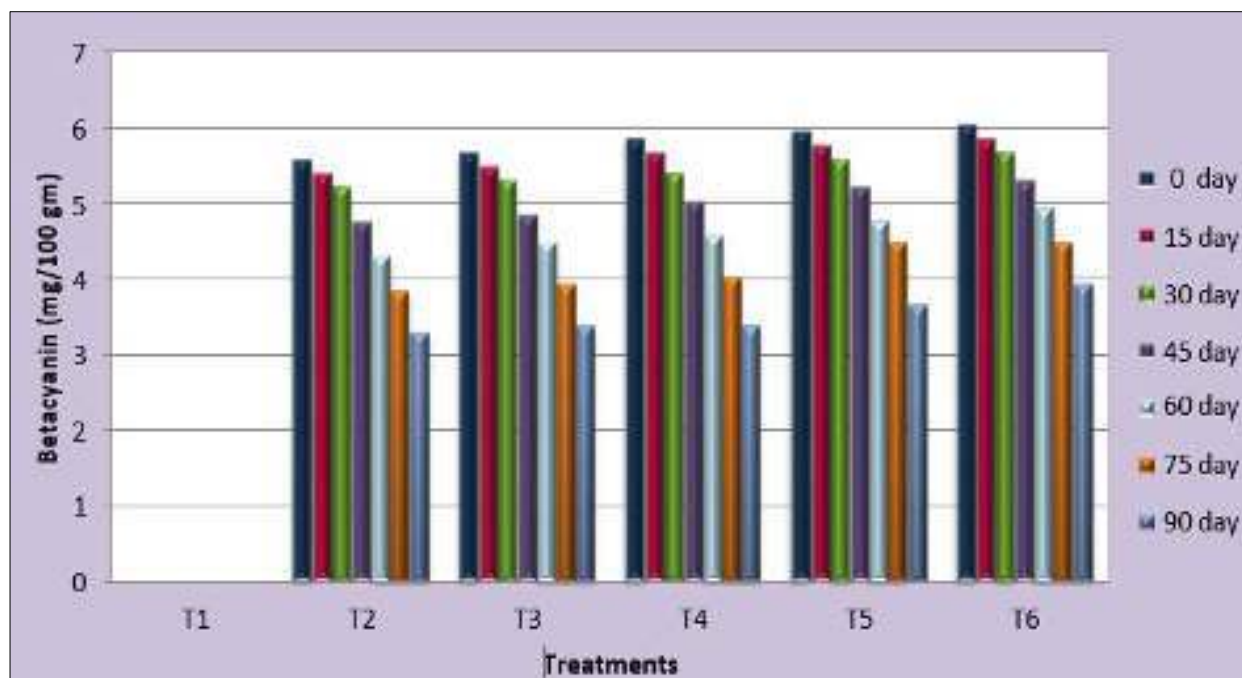


Fig 2: Betacyanin (mg/100 gm) content in Bottlegourd, beetroot and Aloe vera blended RTS during storage under ambient condition

Table 1: Betacyanin (mg/100 gm) content in Bottlegourd, beetroot and Aloe vera blended RTS during storage under ambient condition

Treatment	Betacyanin (mg/100 gm)						
	Storage period (in days)						
	0	15	30	45	60	75	90
T ₁ (75 BG:0 BR: 25 A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T ₂ (70 BG:5 BR: 25 A)	5.59	5.41	5.23	4.77	4.31	3.85	3.30
T ₃ (65 BG:10 BR: 25 A)	5.68	5.50	5.32	4.86	4.49	3.94	3.39
T ₄ (60 BG:15 BR: 25 A)	5.87	5.68	5.41	5.04	4.58	4.03	3.39
T ₅ (55 BG:20 BR: 25 A)	5.96	5.78	5.59	5.23	4.77	4.49	3.67
T ₆ (50 BG:25 BR: 25 A)	6.05	5.87	5.68	5.32	4.95	4.49	3.94
SE(m) ±	0.099	0.092	0.118	0.099	0.099	0.099	0.075
CD at 5%	0.305	0.282	0.365	0.305	0.305	0.305	0.231

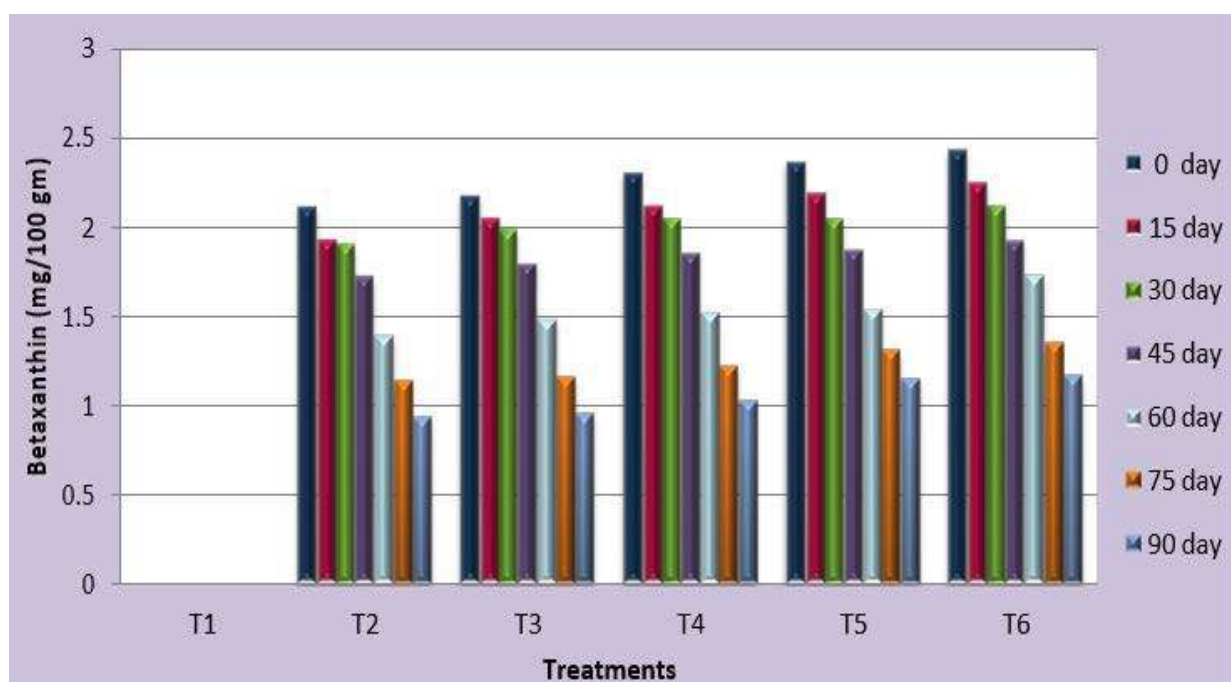


Fig 3: Betaxanthin (mg/100 gm) content in Bottlegourd, beetroot and Aloe vera blended RTS during storage under ambient condition

Table 2: Betaxanthin (mg/100 gm) content in Bottlegourd, beetroot and Aloe vera blended RTS during storage under ambient condition

Treatment	Betaxanthin (mg/100 gm)						
	Storage period (in days)						
	0	15	30	45	60	75	90
T ₁ (75 BG: 0 BR: 25 A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
T ₂ (70 BG: 5 BR: 25 A)	2.12	1.93	1.91	1.73	1.39	1.14	0.94
T ₃ (65 BG:10 BR: 25 A)	2.18	2.05	1.99	1.8	1.48	1.16	0.96
T ₄ (60 BG:15 BR: 25 A)	2.31	2.12	2.05	1.86	1.52	1.22	1.03
T ₅ (55 BG:20 BR: 25 A)	2.37	2.19	2.05	1.88	1.54	1.31	1.15
T ₆ (50 BG:25 BR: 25 A)	2.44	2.25	2.12	1.93	1.73	1.35	1.17
SE(m) ±	0.05	0.04	0.05	0.04	0.03	0.03	0.02
CD at 5%	0.14	0.12	0.14	0.11	0.08	0.08	0.07

Conclusion

Bottlegourd is a rich source of nutrition thereby having numerous applications in dietary and medicinal products. Keeping in view its nutritional and therapeutic values, Bottlegourd blended RTS was prepared along with beetroot and Aloe vera. The Bottlegourd was added in different proportion in different treatments with beetroot and Aloe vera. The present findings confirm that the Betacyanin and Betaxanthin content decreases significantly with the advancement in storage period from 0 to 90 days. The maximum Betacyanin content (6.05 mg/100gm) was recorded in treatment T₆: 50 part Bottlegourd: 25 part Beetroot: 25 part Aloe vera while the maximum Betaxanthin content (2.44 mg/100gm) was recorded in treatment T₆: 50 part Bottlegourd: 25 part Beetroot: 25 part Aloe vera. The concentration of Betacyanin and Betaxanthin increases from treatment T₁ to T₆ due to increase in concentration of beetroot juice with decrease in concentration of Bottlegourd juice in each treatment.

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