

Development and Sensory Analysis of Beetroot Jelly

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Abstract: Beetroot grown in many countries and regularly eat in our normal diet. It is rich in several bioactive compounds and also rich in betalains, carotenoids, powerful dietary source. For making jelly pectin, acid, sugar(65%), water are four essential ingredients. 0.5-1% of pectin in extract is sufficient to produce good quality jelly. final jelly should contain at least 0.5% acid . In final product optimum pH value for jelly is 3.2. A good product is clear and firm. It should taste fresh and fruity. It is used to treat various diseases. In the present study attainment was made for development of beet root jelly and sensory attributes of the jelly prepared from beetroot, sugar, citric acid, pectin, was evaluated. Jelly was successfully developed using 2% pectin , 0.5% citric acid, and 61% sugar. Sensory evaluation of developed beet root jelly along with two variations in formulation was done.

Keywords: Sensory analysis, jelly, Beet root, pectin, sugar.

1. Introduction

Jellies are defined by CAC section 2-2 as the products brought to semisolid gelled consistency and made from the juice and / or aqueous extracts of one or more fruits or vegetables, mix with foodstuffs with sweetening properties with or without the addition of water [1].

Jellies are made by cooking fruit juice with sugar. A good product is clear and firm enough to hold its shape when turned out of its container yet quivers when moved. When cut, jelly should be tender yet retained the angle of the cut. Jelly should taste fresh and fruity.[2]

It should not be gummy, sticky, or syrupy or have crystallized sugar. The product should free from dullness with little or no syneresis and neither tough nor rubbery. Pectin, acid, sugar (65%) and water are four essential ingredient. Pectin test and determination of end-point of jelly formation is very important for the quality of the jelly. Pectic substances are present in the form of calcium pectate are responsible for the firmness of fruits and vegetables. Usually about 0.5-1.0 percent of pectin of good quality in the extract is sufficient to produce good jelly. If the pectin content is higher a firm and tough jelly is formed and if it is less the jelly may fails to set. The jelling of extract depends on the amount of acid and pectin present in the fruits and vegetables. The final jelly should contain at least 0.5% but not more than 1% acid because a large quantity of acid may cause syneresis and here citric acid was used . Sugar is essential constituent of Jelly imparts to it sweetness as well as body. If the concentration of sugar is high, the jelly retains less water resulting in a stiff jelly because of dehydration. [3].

Beet plant is cultivated all over India for its pleasing coloured and nutritious roots. There are various varieties of beets such as: Crimson globe, Egyptian early yellow, Sunset, Globe, Blood-red (long) etc. The beetroot is the taproot portion of the beet plant. It is several of the cultivated varieties of *Beta vulgaris* grown for their edible tap roots

and their greens. Other than as a food, beets have use as a food coloring and as a medicinal plant. Many beet products are made from other *Beta vulgaris* varieties, particularly sugar beet. The cellulose content of the beet acts as a bulk residue, increases peristalsis and eases the passage of stool, hence its regular use prevents habitual constipation and lowers blood pressure in hypertensive persons. Beet root wine helps the healing of gastric ulcer. It increases the urinary output due to its rich potassium content, and cures hypo-glycaemia. It is also helpful in treatment of jaundice, hepatitis, nausea and vomiting due to biliousness, piles, tuberculosis, cholera, diarrhoea, dysentery and lowered state of body resistant after major surgical operation etc. [4].

Beetroot is grown in many countries world and regularly done in our normal diet [5]. Beet root is botanically classified by an herbaceous biennial from *chenopodiaceae* family [6]. The root of beet have been used in traditional medicine to treat wide variety of diseases [7]. In food processing Beet root is used to improve the colour of sauces, soups, jams, etc. But it was not used as such in commercial production [8,9]. It claims that the therapeutic use of beet root include it's antitumor, carminative, emmenagogue, and hemostatic and renal protective properties and is a potential herb used in cardiovascular condition [7]. The juice of beet root is consume as natural remedy for sexual weakness and to expell kidney and bladder stone [10]. The beet root leaves also helps in faster healing of wounds [11]. Recent report indicates that beet root extract possess antihypertensive, hypoglycemic, antioxidant, anti inflammatory, and hepatoprotective activity [11, 12, 13, 14, 15]. Beet root extract has been demonstrated to be an effective multi organ tumor suppressing agent in lab animals [16]. Antioxidant activity of beet has been reported to enrich low density lipoprotein which increase the resistance to oxidation [17]. Beet root juice positively affect performance of athelic as it reduces the aerobic energy cost and increase the workload at anerobic threshold [18]. Beet root found to enhance Nitric oxide production in the skeletal muscle there by increasing blood flow and improving muscle oxygen deliverly [19]. Beet root is rich in several other bioactive compounds that

may provide health benefits, particularly for disorder characterized by chronic inflammation.[12]. Beet root is also one of the few vegetables that contains a group of highly bioactive pigments known as betalins [21,22]. Beet root appears to be a powerful dietary source of health promoting agents that holds potential treatment for several pathological disorder [23, 24]. Beet roots are rich in valuable active compounds such as carotenoids [25].

2. Materials and Methods

2.1. Materials Procurement

Beet roots pectin, citric acid and sugar were procured from the local market at Nashik, Maharashtra. Fresh Beetroots were subjected to cleaning, sorting and grading operations and were further utilized for further processing.

2.2. Preparation of Beet Root Extract

Cleaned and graded beet roots were peeled with peeler and then size reduction operations were carried out on them. Then all the beet root shreds were added in 1.5 times water and then boiled for 15-20 minutes. The beet extract was then strained off and collected for further use. The boiled slices were then strained using muslin cloth to obtain beet root juice (BRJ) extract and then again filtered and added to the drained juice to obtain clear juice extract.

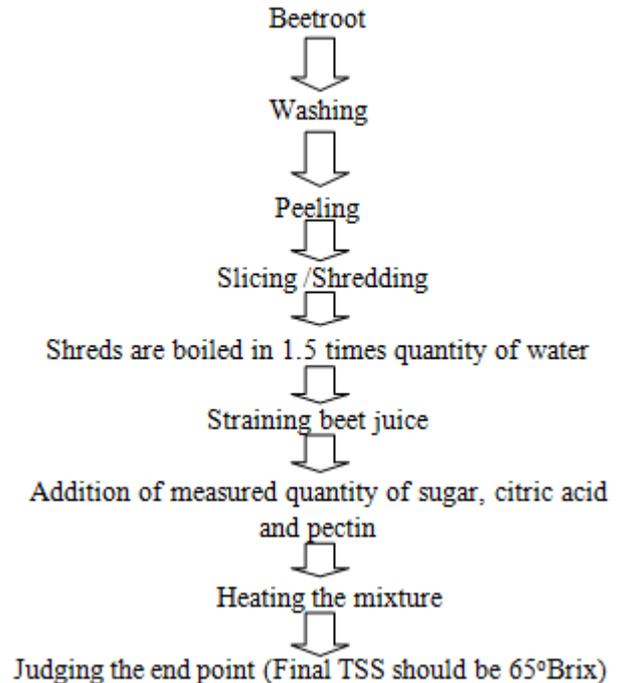
2.3 Preparation of beet root jelly

100 ml of the clear beet root juice extract was heated and 2% pectin, 61 % sugar and 0.5% citric acid was added to the extract while heating. Heating was continued with constant stirring uptill the TSS reached to 65°Brix and desired consistency was reached. Alcohol test was carried out to determine the pectin content and amount of sugar to be used as described by R. Srivastava and S. Kumar [3].

2.4 Alcohol Test

One teaspoon of strained juice extract was taken in a glass beaker and cooled and to that 3 teaspoon of methylated spirit was poured gently down on the side of beaker, which was shaken and allowed to stand for few minutes. As the extract was poor in pectin, numerous small clots were seen, so half the amount of sugar was added with respect to the amount of extract, i.e. Juice extract: Sugar is 1:0.5 [3].

2.5. Basic Procedure:



3. Variation in Beet Root Jelly Formulation

Three variations in formulations were carried out which mainly varied in citric acid, pectin and sugar concentration.

Table1: Variation in jelly formulation

Samples	Juice	Sugar	Pectin	Citric acid
A	500 ml	240gm	5gm	0 gm
B	500 ml	244 gm	10 gm	2.5gm
C	500 ml	225gm	7.5gm	5.0 gm

3.1. Sensory Analysis Protocol

9-point hedonic scale was used for analyzing different sensory attributes like appearance, color, flavor, texture and overall acceptability by a panel of 10 trained members having experience in sensory evaluation of fruits and vegetable products. Average scores were calculated accordingly.

4. Results and Discussions

4.1 Sensory Evaluation

The hedonic scale was used and average scores were obtained accordingly. It was observed that Sample A and Sample C had same average scores but was lower than Sample B which had an maximum color score of 7.8, Similar trend was seen in other attributes like texture and flavour. Although there was a marked difference in the scores of the taste attributes, highest score was obtained by sample B. Overall, all the sensory attributes indicated higher average score of B. So sample B was selected for further formulation.

Table 2: Average Scores of Sensory Analysis

Sample	Sensory Attributes					Overall Acceptability
	Colour	Appearance	Texture	Flavour	Taste	
A	7.3	6.5	6.6	6.5	6.5	6.9
B	7.8	8.4	8.0	7.6	8.8	8.3
C	7.3	6.8	6.7	6.6	6.6	7.1

After conducting sensory analysis by prescribed number of panelist using hedonic scale rating it was decided that sample “B” was satisfactorily accepted.

4.2 Problems Observed during Jelly Preparation

Formulation with less than 2% pectin showed failure to set. It is necessary to observe T.S.S. minimum 65° brix, for proper setting of jelly. Excess sugar (T.S.S.) can formed crystals or over concentration of jelly. Avoid prolonged cooking since it destroyed coagulation property of pectin. During boiling of mixture scum forms over the surface, if not removed it results in the formation of cloudy jelly. Care should be taken during pouring.

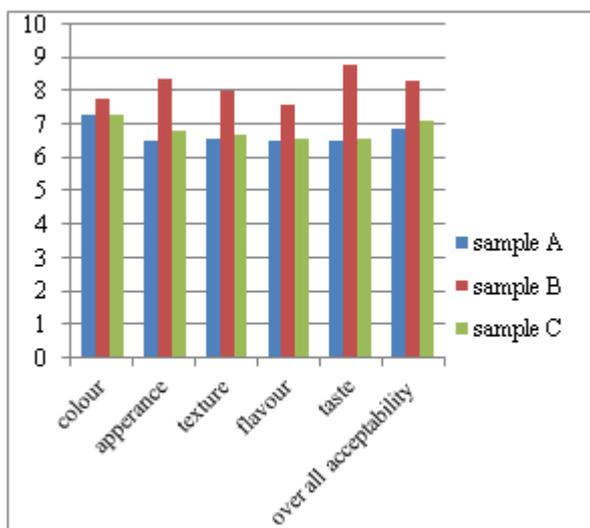


Figure 1: Graph of Sensory Evaluation

Table 3: Sensory Score for Colour of Beet root Jelly

Sample	Colour
A	7.3
B	7.8
C	7.3

Table4: Sensory Score for Appearance of Beet root Jelly

Sample	Apperance
A	6.5
B	8.4
C	6.8

Table 5: Sensory Score for Texture of Beet root Jelly

Sample	Texture
A	6.6
B	8.0
C	6.7

Table 6: Sensory Score for Flavour of Beet root Jelly

Sample	Flavor
A	6.5
B	7.6
C	6.6

Table7: Sensory Score for Taste of Beet root Jelly

Sample	Taste
A	6.5
B	8.8
C	6.6

5. Conclusion

Beet root is a vegetable having good therapeutic and nutritional value. It is rich source of folic acid. Use of beet root in food processing is limited up to sugar manufacturing. In order to make value addition, in the present study beet root jelly was developed successfully. For the development of beet root jelly formulations was standarization using 2% pectin , 0.5% citric acid, and 61% sugar. These beet root jelly has more space to be popular among all age group. Standarization of beet root jelly was done. Formulation of beet root jelly scored highest in sensory evaluation with 8.3 overall acceptability.

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