

Evaluation of Functional Properties of Beetroot Powder (*Beta vulgaris*) and its Suitability in Developing a Candy by Incorporate

Indirani K¹., Manimegalai C²., Vikaashini U T³

¹Assistant Professor, Department of Clinical Nutrition and Dietetics,
PSG College of Arts & Science, Coimbatore

²PG Students, Department of Clinical Nutrition and Dietetics, PSG College of Arts & Science, Coimbatore

³PG Students, Department of Clinical Nutrition and Dietetics, PSG College of Arts & Science, Coimbatore

Corresponding Author: Indirani K

ABSTRACT

Beetroot, that is extensively cultivated in cool weather conditions at the temperature ranges from 18-21°C. It found to be a potentially therapeutic agent with good source of bio-active principle in the form of anti-oxidants. In addition, the anti-inflammatory, anti-histamine, and anti-asthmatic efficacy of the beta vulgaris underlines the potential application of the vegetable in the development of the food products. The objective of present study was to formulate and standardize the beetroot powder through a sundry method (traditional method) to develop an innovative food product with nutritional properties. In additional to this some of the major components were evaluated which characterize the beetroot powder in terms of Phytochemical properties (especially antioxidant). Further, candy was prepared and subjected to sensory evaluation. Phytochemical screening confirmed the presence of the Phyto-constituents like phenol and antioxidant assay namely Ferric reducing antioxidant power (FRAP) assay confirmed the antioxidant activity of the powder. From the sensory attributes such as colour, flavour, taste, texture and overall acceptability assessed for the beetroot candy prepared at 3 variations namely 25%, 50% and 75% as V1, V2 & V3, it was concluded that the candy made with 25% of beetroot powder scored highly significant value. So, this food product when we consumed in our regular diet will be most benefit at a cheap cost by using a confectionery by own traditional method. It also helps to improve our health status with bioactive properties and nutrients. It is mostly

beneficial to a degenerative disease patient and school students.

Key words: Beetroot, anti-histamine, antioxidant, Phytochemical, FRAP, Degenerative disease

INTRODUCTION

Beetroot, also called red beet, (*Beta vulgaris* L) and is a taproot portion of the beet plant. Beetroot is one of the popular vegetable in many parts of the world including India. Beetroot contains high amounts of bioactive substances including betalains and inorganic nitrate which may provide many health benefits.^[1] So, the high concentration of betalains, which are water soluble pigments and it responsible for the deep red colour of beetroots, especially beta-cyanins and betaxanthins.^[2,3] Besides the high number of antioxidants, beetroot contains many other nutrient compounds like soluble fibre, minerals and vitamins.^[2] In many fields like food industries using the beetroots as a source of natural colorants.^[4] Since many possible benefits for human health have been reported especially their antioxidant and anti-inflammatory activities.^[5] Now a day's people prefer in preventing the initiation of any disease rather than curing a disease. Beetroot also act as a powerful dietary source of health promoting agents in several pathological disorders.^[6] In addition to this it also helps

in improving efficiency and performance in various sports events.^[7] However, it is a seasonal crop in India, owing to its high moisture content. One of the ways of ensuring beetroot preservation is drying. Even the results of the present study revealed that beetroot can be added successfully in the form of powder in traditional foods, bakery products and confectionary etc. ^[8] It demonstrates the potential application of nutritious beetroot powder as a value-added ingredient for functional foods. This is beneficial for enhancing the consumption of beetroot in the regular diet among the community to get health benefits. The present study aims at developing beetroot powder incorporated candy.

MATERIALS AND METHODS

Development of beetroot powder

The fresh beetroots were obtained as raw material in a local market. After purchased of beetroot were washed with tap water to remove dust and sticky particles. Beetroot was peeled by using peeler and then grated into slices by using grater. The sliced materials allowed for sun dry completely (dehydrates) for 2 days in 37 °C. Then dehydrated beetroot pieces are grind and made into fine powder so that they can be stored for longer periods of shelf life.



Figure 1: Beetroot Powder

Analysing chemical properties of the beetroot powder

The parameters of analysis were pH activity of the powder and phytochemical

properties that are assessment of total antioxidant by using FRAP method. Ferric Reducing Antioxidant Power Assay (FRAP) is used to measure total antioxidant capacity in foods, beverages and nutritional supplements which is containing polyphenols.^[9] Total plate count was analysed by using standard plate count methods to estimate the number of viable microorganism cells in beetroot powder.^[10]

Food product development and sensory evaluation

Candy was prepared by incorporating the Beetroot Powder at various proportions (V1, V2, & V3). Understanding the nutritional significance of beetroot and its health benefits that can be used for food formulations. The beetroot fine powder was substituted at 25%, 50%, and 75% respectively. The candy prepared were evaluated for their sensory characteristics like colour, texture, taste, flavour and overall acceptability by the panel consisting of 30 semi trained panel members. The panel members (young upcoming nutritionist) were instructed to taste the candy and to fill the five points hedonic score card for the product.

Statistical analysis

The results obtained from the study were interpreted using statistical tools. Tools such as mean, standard deviation, t-test and ANOVA were carried out between organoleptic scores of the beetroot powder incorporated product by using SPSS Software Version (16.0).

RESULT AND DISCUSSIONS

Nutritional analysis

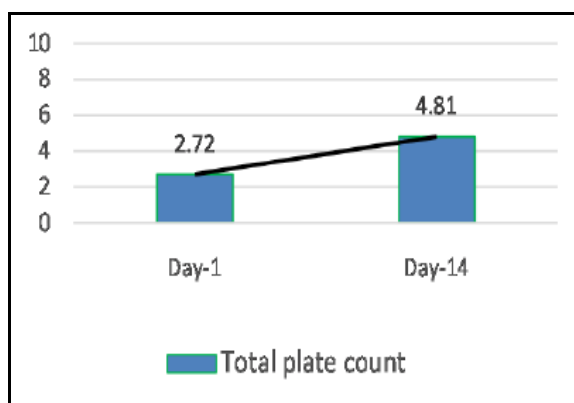
The chemical analysis of beetroot powder was given in the table-1. The 40g of beetroot powder gave the value as 3650µg total antioxidant and 5.94 pH. The present investigation reveals that beetroot powder is a good source of total antioxidant like betalaine, rutin, epicatechin and caffeic acid and mild acidic in nature. The total antioxidant analysis (TAA) showed high

intensity of antioxidant components in beetroot powder due to sundry method. As a conclusion revealed in a study that heat application might have a protecting or an enhancing effect on TAA content.

Table1: Chemical analysis of beetroot powder

S.No	Parameters	Beetroot powder
1.	Total antioxidant activity (µg/g)	3650
2.	pH	5.94

Hence the microbial count was taken for the first day of 1st week and last day of 2nd week. Total plate count was 2.72×10^5 in day-1 and 4.81×10^5 in day 14 respectively. Graph-1 reveals that the total plate count got increased from day-1 to day-14 when it was closed with the aluminium zip lock cover even for about two weeks. So, another new technology of preservation or packaging method is needed to prevent the microbial growth and increase the shelf life for more than a month



Graph1: The total plate count of the beetroot powder

Organoleptic evaluation

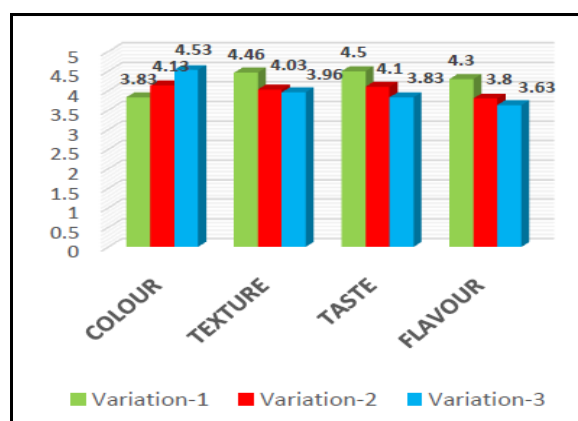
Table 2: Mean organoleptic score of beetroot candy

S. no	Criteria	Mean score of variations		
		V1	V2	V3
1	Colour	3.83±0.46	4.13±0.43	4.53±0.68
2	Texture	4.46±0.77	4.03±0.55	3.96±0.76
3	Taste	4.5±0.62	4.1±0.57	3.83±0.69
4	Flavour	4.3±0.65	3.8±0.66	3.63±0.88
5	Overall acceptability	4.3±0.74	3.9±0.71	3.6±0.72

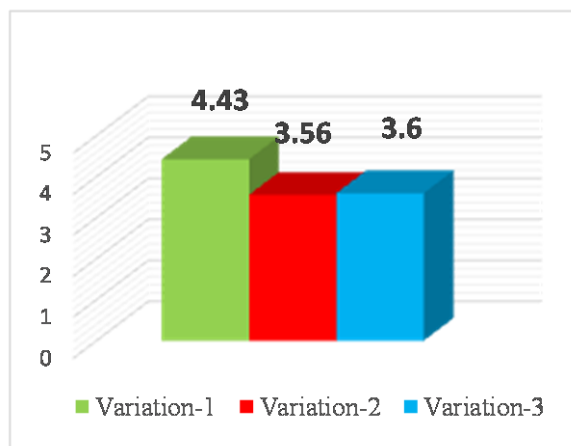
On the basis of sensory evaluation of beetroot candy obtained by incorporating 25%, 50% and 75% of beetroot powder, the overall acceptability was found quite satisfactory as compared to other variations. The mean score and standard deviation obtained by three variations (V1, V2, and V3) for the colour, texture, taste, flavour

and overall acceptability was given in the table-2.

The colour characteristic of V3 was good then the other variation due to the addition of beetroot powder for 75% in standard ingredients of candy. By addition of 25% of beetroot powder (V1) in candy had prime influence on the texture, taste, flavour as shown in graph-2. And also Variant having 25% of incorporated beetroot powder was most acceptable as shown in graph-3.



Graph 2: Mean score of beetroot candy



Graph 3: Overall Acceptability

CONCLUSION

This study concluding that the newly developed food product by incorporating the beetroot powder in three variations is high in antioxidant and phenolic when compared to fresh beetroot. This is due to the sun drying and dehydrating the fresh beetroot. The beetroot powder is rich in physiochemical and phytochemical properties which was analysed in laboratory.

With respect to the antioxidant activity, the beetroot candy was helps to improvement the nutritional value of consumers especially school children and sports persons.

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