

# Formulation and Standardization of Palak Beet Mixture

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**Abstract**—The study focused on developing a nutritious and value-added snack by incorporating palak (spinach) and beetroot into a traditional Indian mixture. The objective was to enhance the product's nutritional profile, sensory quality, and market potential while maintaining affordability and consumer acceptability. Spinach (*Spinacia oleracea* L.) is a rich source of vitamins A, C, and K, iron, folate, and antioxidants such as lutein and beta-carotene, whereas beetroot (*Beta vulgaris* L.) provides dietary nitrates, betalins, and essential minerals beneficial for cardiovascular and cognitive health. The incorporation of these ingredients offered a unique balance of colour, flavour, and nutrition. The preparation involved cleaning, blanching, and extracting juices from spinach and beetroot, which were then used in the dough for omapodi and kara boondi (traditional South Indian snacks). Three formulations were developed with varying proportions of palak and beetroot extracts and were evaluated for sensory characteristics, nutrient composition, cost, and shelf stability. Sensory evaluation using a five-point hedonic scale assessed colour, appearance, flavour, taste, and texture. Among the samples, Sample C achieved the highest overall acceptability score (4.6), preferred for its balanced flavour and vibrant colour. Nutritional analysis of the standardized mixture (per 100 g) showed 161.25 kcal energy, 51.86 g carbohydrates, 8.28 g protein, and good levels of calcium, phosphorus, and iron. With a production cost of ₹31.20 and a selling price of ₹50, the product proved economically viable.

**Index Terms**—Palak, Beetroot, Snack, Nutrition, Sensory Evaluation

## I. INTRODUCTION

Palak (*Spinacia oleracea*) and beetroot (*Beta vulgaris*) are nutrient-rich vegetables known for their high content of vitamins, minerals, antioxidants, and bioactive compounds. Palak is a valuable source of iron, calcium, folic acid, vitamin C, and carotenoids, which contribute to improved haemoglobin levels,

bone health, and antioxidant activity. Beetroot contains betalains, dietary nitrates, fibre, and essential minerals that support cardiovascular health, enhance blood circulation, and exhibit strong antioxidant properties. The incorporation of palak and beetroot into a traditional snack mixture offers an effective strategy for value addition by enhancing nutritional quality without compromising consumer acceptability. The natural pigments present in these vegetables also improve product appearance and reduce the need for synthetic colourants. Therefore, the present study aims to formulate and standardise a Palak Beet Mixture and to evaluate its sensory acceptability, nutritional composition, shelf-life potential, and cost effectiveness, thereby developing a healthier alternative to conventional snack mixtures.

## II. Materials and Methods

### 2.1 Raw Materials

Fresh palak leaves and beetroot were procured from the local market, while gram flour, rice flour, foxtail millet flour, groundnut, cashew nut, poha, horse gram, roasted Bengal gram, curry leaves, spices, and edible oil were obtained from standard sources. Palak and beetroot were cleaned and ground separately to obtain extracts. Three formulations were prepared by varying palak extract concentration, while beetroot extract was kept constant. Omapodi and kara boondi were prepared, mixed, and seasoned. Sensory evaluation was conducted using a five-point hedonic scale, and nutritional and cost analyses were performed using standard methods.

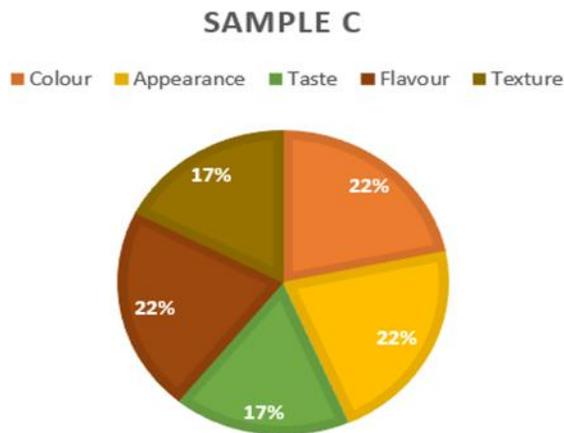
### 2.2 Standardisation and Formulation

Three formulations were developed:

- Sample A: 30% Palak extract
- Sample B: 40% Palak extract
- Sample C: 50% Palak extract

Sensory evaluation of the Sample C

III. RESULTS



2.3 Sensory Evaluation

The samples were assessed on appearance, colour, flavour, texture, taste, and overall acceptability by a semi-trained panel of ten people using a five-point hedonic scale (1 = Dislike very much, 5 = Like very much).

2.4 Nutrient Analysis

Using standard AOAC (2010) procedures, the proximate composition energy, carbs, protein, and micronutrients (calcium, phosphorus, iron, vitamin C, and carotene) was examined.

Nutritional value for Palak beet mixture per 100g:

Nutrients	Nutritive value
Energy (kcal)	161.25
Carbohydrates (g)	51.86
Protein (g)	8.28
Fat (g)	5.22
Fiber (g)	1.7
Calcium (mg)	116.15
Phosphorous (mg)	145.5
Iron (mg)	3.66
Vitamin C (mg)	19.25
Choline(mg)	132.2
Carotene (mg)	3184.5
Riboflavin(mg)	0.23
Folic acid(mg)	81.15
Niacin (mg)	2.1

2.5 Cost Analysis

The cost of ingredients and packaging was used to determine the production cost per 100 g.

Sensory evaluation of the three formulations of Palak Beet Mixture showed notable differences in acceptability. Sample C recorded the highest overall acceptability score of 4.6, followed by Sample B (4.2) and Sample A (4.0) on a five-point hedonic scale. Sample C also achieved higher scores for appearance (5.0), colour (5.0), flavour (5.0), taste (4.0), and texture (4.0), indicating superior sensory quality. The nutritional analysis of the standardised Palak Beet Mixture (Sample C) per 100 g revealed an energy value of 161.25 kcal, carbohydrates 51.86 g, protein 8.28 g, fat 5.22 g, and fibre 1.7 g. The product also contained appreciable amounts of calcium (116.15 mg), phosphorus (145.5 mg), iron (3.66 mg), vitamin C (19.25 mg), and carotene (3184.5 µg). Cost analysis indicated that the production cost of the Palak Beet Mixture was approximately ₹31.20 per 100 g, with a market price of ₹50 per 100 g, demonstrating economic feasibility compared to commercially available snack mixtures.

IV. DISCUSSION

The Palak Beet Mixture showed good sensory and nutritional qualities. Among the three samples, Sample C recorded the highest overall acceptability due to better colour, flavour, and texture. Increased palak content enhanced visual appeal and taste. Nutrient analysis confirmed that the product is rich in energy, carbohydrates, protein, fibre, calcium, iron, and carotene. The incorporation of palak and beetroot significantly improved the micronutrient content of the mixture. The product remained stable during storage when packed in stand-up pouches, indicating suitable shelf life. Cost analysis showed that the developed mixture is economical and comparable with commercial products. Hence, Palak Beet Mixture can be considered a nutritious and acceptable snack product.

V. CONCLUSION

The present study successfully developed and standardised a Palak Beet Mixture with improved nutritional value. Sample C showed the highest sensory acceptability among all variations. The product was rich in essential nutrients such as protein, fibre, calcium, iron, and carotene. Shelf-life and cost

analysis confirmed that the mixture is stable and economical. Hence, Palak Beet Mixture can be recommended as a nutritious value-added snack with potential for commercialisation.

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