



“Formulation and Evaluation of Enriched with Functional Bioactive for Nutraceutical Beetroot Candy Health Benefits”

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ABSTRACT:

The increasing demand for functional foods has led to the development of novel, health-enhancing confectionery products. This study focuses on the formulation and evaluation of a nutraceutical beetroot candy enriched with bioactive compounds derived from beetroot juice, cornflower, and jaggery. Beetroot juice, known for its high content of betalains, nitrates, and antioxidants, was used as the primary active ingredient, while cornflower (*Centaurea cyanus*) was incorporated for its antioxidant properties. Jaggery, a natural sweetener, was selected not only for its taste but also for its higher nutritional value compared to refined sugar. Water was used as a solvent to facilitate the preparation process.

The study concludes that beetroot juice, cornflower, and jaggery can be successfully incorporated into a functional candy, offering a convenient and tasty way to promote health.

Keywords: Nutraceutical candy, antioxidant, formulation, functional food, evaluation.

Introduction:

What Are Nutraceutical Beetroot Candies?

Nutraceutical Beetroot Candy is manufactured by combining beetroot extracts with confectionary products.^{1,2} Beetroot is recognized for its rich supply of nitrates, the betalains, fiber, and important minerals such as potassium and magnesium.³ By adding beetroot to candies, manufacturers hope to improve the nutritional profile of the product, giving consumers a delicious opportunity to enjoy the beneficial health benefits of beets.^{4,5}

Consumers are becoming more sensitive of their health and the balance of nutrition in their meals, allowing them to seek out antioxidant-rich foods with natural and organic sources of nutrients.⁶ Their preference for natural food supplements has been observed to be growing in comparison to synthetic food supplements.⁷ Beetroot (*Beta vulgaris*) has been regarded as a "boon" for good health since ancient times. Beetroot juice includes a high quantity of biologically accessible antioxidants as well as many other health boosting substances such as potassium, magnesium, folic acid, iron, zinc, calcium, phosphorus, sodium, niacin, biotin, B6 and soluble fiber.⁸ The coloring pigments in beetroot, betacyanin and betaxanthin, are responsible for the purple and yellow colors, which are collectively known as betalains.⁹ these betalains possess the antioxidant properties found in beetroot. A few vegetables, particularly beetroot, have been found to have the greatest nitrate concentration. Beetroot being a very rich source of dietary NO₃⁻ has shown its potential in the reduction of blood pressure in human. Furthermore, beetroot has been demonstrated to contain an abundance of polyphenols.¹⁰⁻¹⁵

The primary goal of this study paper is to formulate and evaluate Nutraceutical Beetroot Candy for Health Benefits employing ingredients in varied proportions such as beetroot juice, cornflower, jaggery, and water.¹⁶ Thus, in the current study, we developed a nutraceutical beetroot candy that can be quickly produced using readily available ingredients. After testing, we discovered that the nutraceutical beetroot candy had good properties, was free of adverse effects, and retained its consistency even after being stored under stable conditions.¹⁷ All of the nutraceutical beetroot candy formulations were found to be satisfactory in physical parameters and free of adverse effects, leading us to infer that the nutraceutical beetroot candy has good physical qualities.¹⁸

The results showed that the beetroot candy retained high antioxidant activity, indicating that it could be a functional diet with cardiovascular and general health advantages.¹⁹ The candy also had a favorable sensory profile, indicating that it is suitable as a health-oriented confectionary product.²⁰

Material use for Nutraceutical Beetroot Candies:**2.1 Beetroot Juice:**

- Beetroot juice is the liquid extracted from beetroots, which are deep red root vegetables. It is known for its many health benefits and is often consumed as a natural energy drink or health tonic.²¹
 - Common Name: Beetroot Juice
 - Scientific Name: Beta vulgaris
 - Family: Amaranthaceae
 - Genus: Beta.²²
- **Uses:**
 - Lowers blood pressure.
 - Boosts stamina and energy.
 - Improves blood health.
 - Supports liver function.
 - Enhances skin glow.²³



Fig. No 1 Beetroot Juice

2.2 Corn Flour:

- corn flour: Cornstarch
- Scientific Name: Zea mays
- Family: Poaceae the grass family.
- Genus: Zea
- Uses: Used as a thickening agent, pharmaceuticals as a binder or filler.²⁴



Fig. No 2 Corn Flour

2.3 Jaggery:

Common Name: Jaggery

Scientific Name: *Saccharum officinarum* (for sugarcane-derived jaggery)

Family: Poaceae

Genus: *Saccharum*²⁵

Uses: Natural sweetener, Acts as a binding agent.



Fig. No 3 Jaggery

Formulation Profile of Nutraceutical Beetroot Candies:

Table No – 1 Ingredients Profile

Sr. No	Ingredients	Quantity	Role
1.	Beetroot Juice	200 ml	Active Ingredient
2.	Corn Flour	150 gm.	Binder
3.	Jaggery	16 gm.	Sweetener
4.	Water	100 ml.	Vehicle

1. Applications of Nutraceutical Beetroot Candies:²⁶⁻²⁹

- Anemia condition and Iron Support.
- Beetroot is a natural source of iron and folate, both needed for red blood cell production.
- Rich in betalains and polyphenols, which have antioxidant and anti-inflammatory qualities.
- May helps in decreasing oxidative stress and promoting liver detoxification.
- Formulated with dietary fibers or probiotics to improve digestion.
- Provides natural antioxidants.
- Improves iron levels (helps with anemia).

2. Procedure for Preparing Nutraceutical Beetroot Candies:

- Beet roots and Jaggery were procured from the local market at Sakri, Maharashtra, India.

Step - 1. Extraction of Beetroot Juice -

- Wash and peel fresh beetroots.
- Cut into the small pieces and add small amount of water.
- Turn on the mixer and grind for around 10 minutes.
- Filter the mixture using muslin cloth to get clear beetroot extract.

Step - 2. Melting the Jaggery -

- Take jaggery in a bowl and add a small amount of water (about 50 ml).
- Heat gently until jaggery melts completely.

Step – 3 Preparing Corn flour Slurry -

- In a separate bowl, mix corn flour with 50 ml water to make a lump-free slurry.
- Stir well and kept aside.

Step – 4 Mixing step -

- In a thick-bottomed bowl, combine Beetroot juice, Melted jaggery syrup and Corn flour slurry.
- Provide heat and stirring continuously.
- The mixture will begin to thicken and turn glossy.

Step -5 Molding and Cooling -

- Pour the thickened mixture into molds.
- Kept in refrigerator for 1 hours.

Step -6 Packaging -

- Remove candies from mold and cut into small pieces.
- Keep in airtight polyethylene plastics bag.
- Store in a cool, dry place to avoid melting.

3. Evaluation Parameter of Nutraceutical Beetroot Candies:

- The following physical parameters have been studied for the formulation of Nutraceutical Beetroot Candies. Color, odor, and appearance. Texture, pH, shape, stability, consistency, spreadable capacity, and weight measurement.³⁰



Fig. No 4 Evaluation sample of nutraceutical beetroot candies.

4. Result of Nutraceutical Beetroot Candies:

Table No – 2 Result of Nutraceutical Beetroot Candies.

Sr. No	Parameter	F1	F2	F3	F4	F5	F6
1.	Color	Deep Red	Deep Red	Deep Red	Deep Red	Deep Red	Deep Red
2.	Oduors	Fragrant	Fragrant	Fragrant	Fragrant	Fragrant	Fragrant
3.	Appearance	Soft	Soft	Soft	Soft	Soft	Soft
4.	Texture	Smooth	Smooth	Smooth	Smooth	Smooth	Smooth
5.	pH	7.7	7.8	7.8	7.6	7.7	7.6
6.	Shape	Rectangle	Rectangle	Rectangle	Rectangle	Rectangle	Rectangle
7.	Stability	Stable at Room Temp.	Stable at Room Temp.	Stable at Room Temp.	Stable at Room Temp.	Stable at Room Temp.	Stable at Room Temp.
8.	Consistency	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid	Semisolid
9.	Weight Test	1.7 gm	1.7 gm	1.6 gm	1.7 gm	1.8 gm	1.6 gm
10.	Spread ability	Uniform	Uniform	Uniform	Uniform	Uniform	Uniform
11.	Taste	Sweet	Sweet	Sweet	Sweet	Sweet	Sweet

5. Formulated Nutraceutical Beetroot Candies:



Fig. No 5 Formulated sample of Nutraceutical Beetroot Candies.

Conclusion:

Nutraceutical beetroot candies provide a healthy and delectable alternative to traditional sweets by combining beetroot's natural benefits with the convenience of candy form. These candies contain critical nutrients such as iron, antioxidants, and natural nitrates, which promote heart health, stamina, and immunity. The inclusion of natural components like beetroot juice, jaggery, and maize flour assures that the food is both healthful and devoid of chemicals. After evaluation, we discovered that the Nutraceutical Beetroot Candies had good qualities, were devoid of adverse effects, and retained their consistency even after being stored in stable settings. The results further show that the Nutraceutical Beetroot Candies created are safe for human consumption and have good physical features; they were also detected in considerable quantities in this investigation. Overall, nutraceutical beetroot candies hold strong potential in the growing functional food market as an easy-to-consume and beneficial supplement.

Conflict of Interests:

The authors declare that they have no known competing financial interests or personal relationship that could have appeared to influence the work reported in this paper.

Acknowledgment:

The authors are grateful to Prof. Ravindra Nikam College of Pharmacy Dhule. the necessary facilities and support to carry out this work.

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