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Review Paper On BEETROOT

Ms. Thombre Mamata Bhausaheb, Ms. Bansode Sakshi Vijay, Asst. Prof. More Ashwini
Mrs. Saraswati Wani College of Pharmacy, Ganegaon, Maharashtra

Abstract: *The taproot part of the plant is called the beetroot. It is a great food that is essential to the body's growth and development. It is abundant in nutrients and antioxidants. It functions as both a vegetable and a fruit. Beetroot in its fresh form is typically eaten in salads. It has betalain, which is vital for heart health. It also serves as a medicinal herb to treat a variety of ailments and as a natural colour in the textile industry.*
Consuming beetroot, which is high in nitrate, may improve sports performance and reduce muscular soreness during specific workouts. This review's goal is to present enough data to support the health advantages of beetroot, particularly with regard to biooxidation, neoplastic disorders, some chronic illnesses, and energy replenishment. With an emphasis on their biochemical components, extraction and stabilisation methods, health advantages, and possible uses in the food sector, this paper provides a thorough assessment of the state of knowledge regarding beetroot and its by-products. It emphasises the value and adaptability of red beetroot and its derivatives, urging more study into efficient processing techniques and creative applications to raise its nutritional and industrial worth..

Keywords: Beetroot, Uses, essential nutrients, super food

I. INTRODUCTION

Beta vulgaris L., or beetroot, is a member of the Chenopodiaceae family. Its tinge is pictorial sanguine. Common names for beetroot include beetroot, chard, spinach, ocean, theater, white and chukander. Its largely remedial rates have certain salutary goods on the mortal body. You can consume beetroot raw, boiling, fumed, or roasted. Red beetroot contains a lot of minerals. Beetroot has a variety of remedial uses and can help help heart complaint and some types of cancer, including colon cancer. Other salutary composites like glycine, betaine, betacyanin, carotenoids, folates, betanins, polyphenols, and flavonoids are abundant in beetroot.

Because beetroot contains the nitrogen color betalain, which gives it antioxidant parcels, it benefits consumers' health and well- being. In addition to its antibacterial and antiviral parcels, beetroot has the capability to stop mortal tumour cells from proliferating. Due to its high nitrate and sugar content, beetroot is a natural mess that increases energy situations. In addition to being high in minerals, vitamins, and other

rudiments, beetroot also contains special phytochemical substances(carotenoids, phenolic acids, and ascorbic acid) that have a variety of remedial operations, making it a great nutritive supplement. [1]

A significant portion of guests moment explosively favour" functional foods" in order to maintain their health and ameliorate their diet.As a result, fruits and vegetables are pivotal factors of a balanced diet that can help avoid a number of ails. The beetroot has gained fissionability lately as a possible" functional food" in this regard.

Indeed though beetroot has been a chief of European cookery for a long time, little is known about its practical counteraccusation’s.

Additionally, beetroot's nitrate has a high nutritional value. According to Webb et al. (2008), many customers use fresh beetroot juice orally as a nitrate supplement, which improves physiological response and lowers the risk of cardiovascular and cerebrovascular disorders. Since then, beetroot has been a popular vegetable for sportsmen looking to refuel. Due to its high nitrate and sugar content, it is one of the natural foods that gives athletes more energy. The red pigment betaine, which is found in beetroot root, is used as a natural food colouring in dairy and meat products. Because it aids in foetal growth, it can be consumed as a salad during pregnancy. The main market for beetroot in Tamil Nadu, India, is Mettupalayam Vegetable Commission Mandy. As a result, beetroot has gained a lot of interest as a functional food that promotes health.

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A diet rich in fruits and vegetables is likely to have endless health benefits. These include cardiovascular health, defence against free radicals, constipation, and the prevention of diabetes, obesity, diverticulosis (the formation of small, easily irritated pouches inside the colon), as well as cancers of the prostate, lung, mouth, and throat. Beta vulgaris subsp. vulgaris is the subspecies that includes all cultivated variants. The wild parent of these is Beta vulgaris subsp. maritima, also called the sea beetroot, which grows over the Mediterranean, the Atlantic coast of Europe, the Near East, and India. In the Indian traditional medical system, it is specifically utilised to increase sex hormone activity. In terms of antioxidant properties, it is one of the top ten vegetables. [2]

Fig. No. 1 Beetroot

Botanical Profile of Beetroot (Beta vulgaris L.)
Scientific Classification
Taxonomic Rank Description
Kingdom : Plantae
Subkingdom : Tracheobionta (Vascular plants)
Division : Magnoliophyta (Angiosperms)
Class : Magnoliopsida (Dicotyledons) Order Caryophyllales
Family Amaranthaceae (formerly Chenopodiaceae) Genus Beta
Species Beta vulgaris L.
Common Name Beetroot, Garden beet, Table beet
Botanical Description
Plant Type:
Biennial herb (commonly grown as an annual).
Root: Fleshy, swollen taproot, usually red to purple due to the pigment betanin (a type of betalain).
Stem: Short, erect, and branched at the flowering stage.
Leaves: Simple, alternate, petiolate; ovate to heart-shaped with prominent veins and green to reddish coloration.
Flowers: Small, greenish, and inconspicuous; borne in dense spikes; bisexual and wind-pollinated.
Fruit: A dry nutlet, often clustered together forming a seed ball (aggregated fruit).
Seeds: Small, rough, and brown; germination occurs in 5–10 days under favorable conditions.

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Habitat and Distribution
Origin: Believed to have originated in the Mediterranean region.
Distribution: Cultivated worldwide in temperate and tropical regions.
Soil C Climate: Prefers well-drained, fertile loamy soil; grows well in cool climates with moderate rainfall.
Phytochemical Constituents
Beetroot is rich in: Betalains (betacyanins and betaxanthins) – antioxidant pigments.
Phenolic compounds – ferulic acid, caffeic acid.
Flavonoids – rutin, kaempferol.Saponins and tannins.
Vitamins and minerals: Vitamin C, folate, potassium, iron, and magnesium.
Medicinal and Pharmacological Properties
Antioxidant – protects against oxidative stress.
Anti-inflammatory – reduces inflammation markers.
Hepatoprotective – supports liver health.
Antihypertensive – due to nitrate content improving blood flow.
Antimicrobial and anti-acne – betalains and phenolics inhibit bacterial growth.

Uses
Culinary: Consumed as a vegetable, salad ingredient, and natural food colorant.
Cosmetic: Used in herbal and polyherbal formulations for skin glow and acne management.
Medicinal: Employed traditionally for detoxification, anemia, and blood purification.[3-5]

History of Beetroot
Some Roman fashions confirm the propositions put out by Zohary and Hopf that beetroot kinds were also grown during that time. The Mediterranean is where beets began. Indeed however beetroot leaves have been used since before written history, they were primarily used as medicine until the French realised their eventuality in the 1800s, at which point they came a popular dish. A lot of foods can be coloured with beetroot cream. Beetroot cream is used to colour tomato sauce on some frozen pizzas. Although deep red ruby is the most popular theater beetroot, thing requests also carry pusillanimous, white and candle arrows. Beets are generally known to as beetroot outside of the United States. roughly two- thirds of marketable beetroot crops are allowed to be canned.[1]
The Mediterranean is where beets began. The leaves have been consumed since before written history, but until the French realised their eventuality in the 1800s, beetroot was primarily utilised as medicine. A variety of refections can be coloured with beetroot cream. In the ancient Middle East, the Egyptians, Greeks, and Romans cultivated beets for their foliage, which led to its domestication. It's believed that they were also grown for their roots by the time of the Romans. Beetroot has been used since the Middle ages to treat a wide range of affections, particularly those affecting the blood and stomach. Beetroot and garlic were suggested by Bartolomeo Platina as a way to neutralize the affects of" garlic- breath."[6]
Outside of the United States, beets are generally appertained to as beetroot. It's estimated that two- thirds of marketable beetroot crops are canned. They claim that the beetroot was first recorded in writing in Mesopotamia in the eighth century. The plant is mentioned by Aristotle as well, and the Greek Peripatetic Theophrastus subsequently likens beets to radishes. roughly two- thirds of marketable beetroot crops are canned, per posterior German and English sources. also, these documents show how common beetroot planting was throughout mediaeval Europe.[2]
The names of beets are Bitrut in Telugu, Birrut in Malayalam, Bitarta in Marathi, Bitano Kanda in Gujarat, Pitrut in Tamil, Chukandar in Hindi, and Kukadala in Pu njabi. Although they are low in fat, beets are high in protein, answerable fibre, carbs, and brio and low in calories. Beetroot roots are rich in vitamins A, C, E and K. Triterpenes, sesquiterpenoids, carotenoids, coumarins, flavonoids(including tiliroside, astragalin, rhamnocitrin, rhamnetin, and kaempferol), betalains, and phenolic mixes are among the strong antioxidants they contain, along with considerable situations of folic acid. also, they contain significant situations of amino acids(threonine, valine, cystine, methionine, isoleucine, leucine, lysine, phenylalanine, histidine, arginine, glutamic acid, proline, alanine, and tyrosine- in leaves), alkaloids, saponins, and B-vitamins(B1 thiamine, B2 riboflavin, and saponins).[7]

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Origin Of Beetroot

By hybridising with B. patula, Beta vulgaris L. ssp. maritima gave rise to beetroot root. The crop's origin is most likely in Europe. before kinds had long roots, analogous to those of carrots. Palak, sweet beetroot and beetroot root are allcross-compatible and members of the B. vulgaris species. It was first used for a variety of purposes by the ancient Babylonians. The leaves were utilised as vegetables and the root as drug by the ancient Greeks and Romans. As time went on, beetroot came decreasingly significant in drug.

Beetroot juice or broth was advised as an fluently digestible diet for the senior, frail, or ill in England. According to tradition, Aphrodite ate beets to maintain her beauty.[3]

The beetroot's origin Beetroot's roots can be set up in the wild ocean beetroot Beta vulgaris subsp. maritima), which was originally grown in the Mediterranean and Middle East and grew along plages from Britain to India. The ocean beetroot, which is indigenous to North Africa and Eurasia, was traditionally gathered substantially for its comestible leaves, with its roots being used in early husbandry.[8]

It began in North Africa and spread throughout Europe, Asia, and the americas via the Mediterranean Sea route. The cultivated forms of beetroot are primarily biennial, with roots that are dark red, white, or unheroic and relatively to explosively blown and fleshy, or brown, stringy, sometimes blown and woody in the wild species. Beetroot is a herbaceous biennial(flowering in the alternate time of growth) or, in rare cases, imperishable factory up to 120 cm(up to 200 cm in the alternate time) in height.[9]

Nutritional Composition Of Beetroot :

It is the tenth most potent vegetable with antioxidant qualities and contains a variety of nutrients, such as sodium, magnesium, potassium, vitamin C, betalain, and Fogantioxidants. It also contains phenolic compound, carotenoids, betalain, vitamins, and minerals that are significant bio compounds and micronutrients. [10]

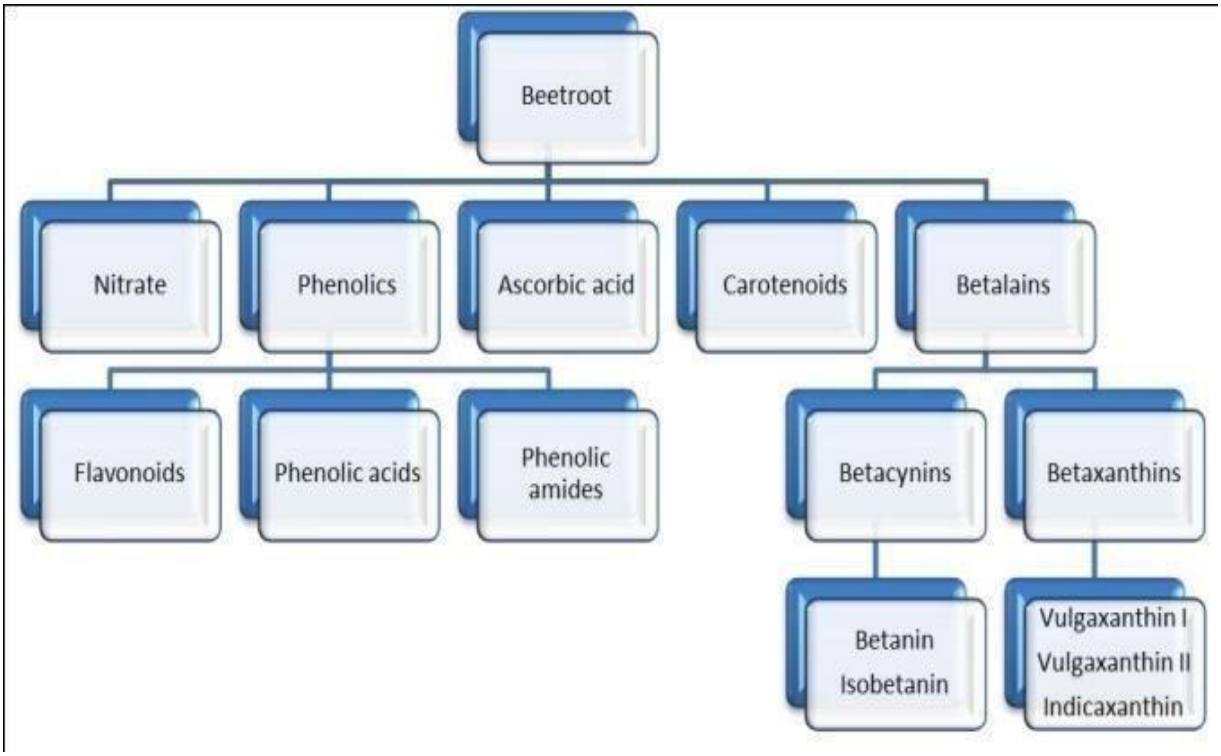

Fig. no. 2 Nutritional Compositions Of Beetroot

The mineral content varies depending on how beetroot root is consumed. Iron (Fe), zinc (Zn), potassium (Na), sodium (Na), potassium (K), magnesium (Mg+2), phosphorus (P), and magnesium (Mg–2) are the metal amounts. The majority of the folic acid in 100 grammes of raw beetroot is present. Five milligrams of vitamin C, twenty milligram's of beta-

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carotene, 0.12-0.10 mg of beetroot, 0.03-0.04 mg of vitamin B6, a dosage of 0.01-0.04 milligram's of thiamine, 0.01-0.02 milligram's of riboflavin, and 0.1 milligram's of niacin, in varying amounts. Vitamins B12, D, and retinol are present in trace levels. The main ingredient that gives beetroot root its red hue is betalains. In addition, it contains 1.0% trimethylglycine and betaine, 34% sucrose, and 13% proteins.

Dihydroxyphenylalanine, or Cyclo-DOPA, is also found in beetroot root.

L-tryptophan, beta vulgaris, flavonoids, phenolic amides, potassium coumarate acid, ferulic acid, feruloyl glucose, and the amino acid carboxyl dihydroxyindole. High performance liquid chromatography was used to make these discoveries (HPLC). The term "blood building tonic" is its traditional name. It has also been shown that beetroot root possesses ant proliferative properties. The Mettupalayam Vegetable Commission in Mandy, Tamil Nadu, is the primary beetroot market in India. Beetroot has therefore attracted a lot of attention as a health-promoting functional food. There are 35 calories in a typical beetroot. Betacyanin is the pigment that gives beetroot its deep red colour. Colon cancer is prevented in this way. Its rich silica content aids in the body's optimal utilisation of calcium, which is necessary for strong, healthy bones, skin, and hair. [11]

Significance Of Beetroot :

A multipurpose wonder, beetroot (Beta vulgaris) has use in the fields of cooking, nutrition, medicine, and industry. See the profound elements that highlight beetroot's extraordinary

Powerhouse of Nutrition:

With important vitamins (including C and B-complex), minerals (such potassium, magnesium, and iron), and dietary fibre, beetroot is a veritable gold mine of nutrition. Its vibrant colour indicates the presence of antioxidants and phytonutrients like betalains. Essential elements such as manganese, which supports bone health, magnesium, potassium, sodium, phosphorus, iron, zinc, copper, boron, silica, and selenium are abundant in beetroot roots.

Heart Health:

Beetroot's nitrates reveal a symphony of possible cardiovascular advantages, coordinating blood vessel dilatation, improved blood flow, and controlled blood pressure to support the best possible heart health.

Exercise Results:

A portion of beetroot juice, which is high in nitrates, is said to improve endurance, increase oxygen utilisation, and improve exercise performance. Enticed by its possible advantages for performance, athletes use beetroot in their diet.

Anti-Inflammatory Properties:

Beetroot's crimson tapestry is adorned with bright pigments called betalains, which are known for their well-researched anti-inflammatory and antioxidant properties. These characteristics work together to promote general health and wellbeing.

Liver Health:

Through substances like betaine, which aid in detoxification procedures, beetroot reveals its support for liver health. Research supports this story by showing that eating beetroot improves liver function.

Digestive Health:

Beetroot, a nutritional fibre powerhouse, promotes regular bowel motions and a healthy gut environment, which improves digestive health.

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Natural Food Colouring:

Beetroot's inherent pigments, particularly betalains, are highly prized natural food colouring agents that go beyond their vegetable classification. Beetroot extracts provide a vibrant red masterpiece in the food business without the use of artificial dyes.

Sugar Production:

A prominent participant in the commercial sugar industry, the renowned sugar beetroot, which resembles beetroot, commands the stage. One of the most important chapters in the history of sugar is the extraction of sugar from these beets.

Applications in Industry:

Beetroot makes a lasting impression on industrial landscapes in addition to the gastronomic canvas. Its high sugar content makes it a viable candidate in the search for biofuel sources, and its natural hues adorn fabrics. [12]

Benefits Of Beetroot :

Advantages of beetroot Among the many health :

1. beetroot are heart health support, blood pressure reduction, improved exercise performance, inflammation reduction, and antioxidant protection.

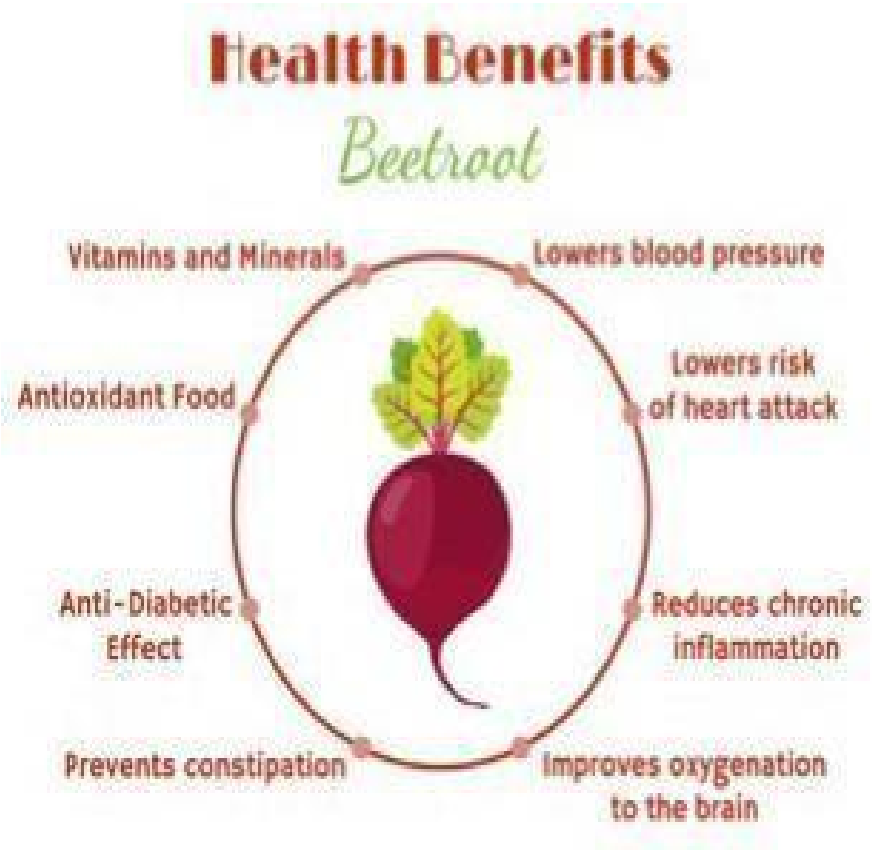

Fig no.3 Health benefits

2. Antioxidants like betalains and anthocyanins, which are found in beetroot, fight oxidative stress and may help fend off chronic illnesses like some types of cancer.

3. The vegetable has a lot of dietary nitrates, which naturally lower blood pressure by widening blood vessels. Stroke and heart disease risk may be reduced as a result.

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4. Beetroot is a popular supplement among athletes since it may enhance exercise performance by boosting oxygen supply to muscles and stamina.
5. Its anti-inflammatory qualities, which are ascribed to substances such betalains, can lessen the chance of developing chronic illnesses and improve joint pain. By aiding in the body's detoxification and lowering lipid deposits, beetroot promotes liver health.
6. Beetroot's fibre enhances gut health, encourages fullness, supports the gut, and may help with weight loss and digestion. may enhance blood flow to the brain, promoting cognitive performance and brain health while possibly slowing agerelated decline.
7. may improve skin health by providing vitamin C and antioxidants that keep the skin looking young and radiant.
8. In addition to decreasing blood pressure, it may help control cholesterol levels and promote cardiovascular health.
9. It is a food that can be eaten raw, boiled, juiced, or added to smoothies and sauces as beetroot powder.[13]

II. CONCLUSION

Beetroot (Beta vulgaris L.) is a nutrient-rich vegetable with a wide range of health promoting properties attributed to its bioactive compounds such as betalains, nitrates, vitamins, and minerals. It has demonstrated antioxidant, anti-inflammatory, antitumor, and cardiovascular benefits, including blood pressure regulation and improved exercise performance. Additionally, beetroot has applications beyond nutrition, serving as a natural food colorant and additive in various products. Although much of the current evidence is based on cellular and animal studies, and clinical trials are limited, the potential of beetroot as a functional food and therapeutic agent is promising. Further clinical research is warranted to fully elucidate its mechanisms and confirm its health benefits, making beetroot a valuable addition to both diet and medical care.

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