

Versatile Food with Significant Therapeutic Applications: *Beta vulgaris*

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<https://doi.org/10.5281/zenodo.10569436>

Abstract

A naturally occurring root vegetable called *Beta vulgaris*, also known as red beetroot, is a great source of phytochemicals and bioactive substances. The taproot section of the plant, is what makes beetroot. It's an excellent diet essential for the growth and development of human body. Beetroot primarily serves as a food ingredient and functions as both fruits and vegetables. It is widely recognized for playing advantageous part in improving plenty of clinical and pathologic results. Minerals and antioxidants are often present in abundance in it. The biological activity of betalains and nitrates, which are found in beetroot, has drawn growing attention. Additionally, it has been discovered to have anticancer effects via reducing angiogenesis, apoptosis and autophagy in cells as well as suppressing cell growth. Beetroot, which is high in nitrates, may also improve athletic performance and lessen muscular soreness when used in certain workout regimens.

Keywords: Beetroot, Antioxidants, Antitumor activity, Anti-inflammatory

Introduction

Beta vulgaris subsp. *vulgaris conditiva*, also known as beetroot, is an annually or biennially cultivated version of the plant that originated in the Middle East and has spread around the world, from North America to Europe and Asia (Mirmiran *et al.*, 2020). The beet, chard, spinach beetroot, sea beetroot, garden beetroot, white beetroot and Chukander are all used as a synonym to beetroot. Although beetroot has long been a staple of European cuisine, but still little is known about its culinary applications. Many food products can benefit with the incorporation of beetroot as an ingredient. It can be consumed as fresh, cooked, steamed or roasted (Kour *et al.*, 2022). Its colouration is a vivid crimson. Nitrogen-containing water-soluble pigments called betalains are exactly what impart it its characteristic colouring. Magnesium, manganese, sodium, potassium, iron and copper are merely a few of the minerals abundant in beetroot (Chauhan *et al.*, 2020). Beetroot's nitrates have a tremendous nutritional value. Beetroot's bioactive phytonutrients have been demonstrated to be vital ingredients in the treatment of a wide range of chronic illnesses, which might include cancer, diabetes, chronic respiratory diseases, cardiovascular diseases, cerebrovascular diseases and others. Betalains, a type of potent

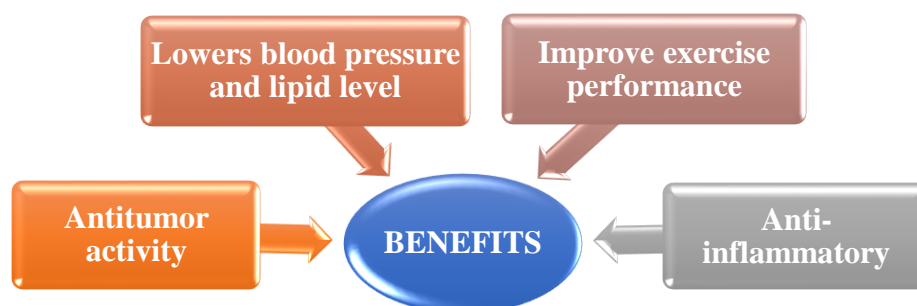
antioxidant isolated from beetroot, can lower the probability of certain diseases as well as liver and kidney damage. Beetroot is currently a widely consumed veggie that is frequently consumed by athletes for energy replenishment.

Nutritional profile

Beetroot is a popular root vegetable that has an amazing combination of nutrients that includes proteins, sugars, carbs, vitamins (B complex and vitamin C), minerals and fibre. Typically, fruit has a rounded shape. The average length, diameter and mass of beetroot are around 16.25 cm, 5.43 cm and 180 gm, respectively. As the fruit ripens or matures its colour changes to dark red. The edible index and waste index of beetroot is near about 91.03% and 8.07%, respectively (Chauhan *et al.*, 2020). They have a significant number of phenolic compounds, betalains and antioxidants such coumarins, carotenoids, sesquiterpenoids, triterpenes and flavonoids with well-known multifaceted health benefits. Alkaloids, tannins and, essential and non-essential amino acids, such as methionine, leucine, isoleucine, cysteine, histidine, arginine and others, are some additional known bioactive substances found in beetroot (Babarykin *et al.*, 2019). The water content of fresh beetroot is 87.58%. Protein, fat, fibre, carbohydrates and energy level of beetroot is 1.61 g, 0.17 g, 2.8 g, 9.56 g and 43 Kcal, respectively. Various mineral are present in beetroot like potassium (325 mg), phosphorus (40 mg), calcium (16 mg) and zinc (0.35 mg) (Mirmiran *et al.*, 2020).

Health Benefits

Worldwide demand for natural products with medical qualities is rising due to their capacity to treat a range of ailments (Gupta *et al.*, 2022). Beetroot, one of the most popular edible plants with unique natural food components which offers' significant health benefits. It has numerous essential antioxidant, vitamin and mineral components and also act as antibacterial, antidepressant and anticarcinogenic.



Antitumor activity: Cancer is still one of the world's leading causes of mortality. Currently, traditional interventions like chemotherapy, surgery and radiation are all frequently prescribed to aid cancer patients. However, due to safety concerns, there is a huge need to hunt for effective and safe cancer treatment options. According to surveys conducted (Bozza *et al.*, 2018), some



complementary and alternative medical treatments may be able to treat cancer with fewer side effects. It is envisaged that the anticancer activity of the active ingredient in beetroot will in fact become a workable measure for the treatment of cancer in the future. However, beetroot that had been enriched in betanin had no clear effects on normal cells but exhibits strong cytotoxicity towards cancer cells.

Anti-inflammatory: The beneficial impact of beetroot extract may be related to their anti-inflammatory potential, as the effects of beetroot juice on inflammation play a significant role in the onset and progression of numerous clinical disorders, including heart disease and cancer (Chauhan *et al.*, 2020). The capacity of betalains to interact with NF- κ B, which is crucial for the activation & transcription of gene targets responsible for modulating the inflammatory response, also contributes to some of their anti-inflammatory effects (Milton-Laskibar *et al.*, 2021).

Lower blood pressure and lipid level: Hyperglycemia, high blood pressure and high blood lipids are now non-negligible chronic disorders that pose a severe threat to human health due to changes in social living habits, nutrition, living conditions and other variables (Chen *et al.*, 2021). According to reports, beetroot can treat numerous illnesses and in contrast to manufactured medications, has no negative side effects. Beetroot's ability to decrease blood pressure is attributed to dietary nitrate, a chemical that has been extracted from beetroot. In obese people who had just completed a moderate intensity aerobic workout, the lowering of BP was similarly improved by beetroot supplementation (De Lima Bezerra *et al.*, 2019). Although beetroot is generally thought to play a role in decreasing blood pressure, the main issue with it is to clarify its role in treating hypertension. The naturally occurring nitrates that exist in beetroot reduce blood pressure, increase stamina and are extremely high in essential minerals such as potassium, manganese, vitamin C and fibre.

Improve exercise performance: Nitric oxide insufficiency has long been known to be associated with cognitive impairment. As a source of nitric oxide, beetroot has drawn more and more attention. Nitrate-rich beetroot thus garner a lot of interest due to the recognized effects of dietary nitrate on athletic performance. It has been determined that dietary nitrate breaks down into nitrite, which eventually transforms into nitric oxide and other nitrogen-active intermediates that impact athletic persons' physical performance. Beetroot consumption had minimal impact on exercise efficiency when there was no or little oxygen present, eliminating the chance of increasing anaerobic exercise's endurance. In addition to this, it was determined that beetroot supplementation was ineffective with all forms of exercise, even under aerobic conditions. Acute beetroot (Wickham *et al.*, 2019) consumption boosted peak power and reduced the time it took for resistance-trained athletes to attain their full strength.



Conclusion

Beetroot is a remarkable vegetable that possesses excellent nutritional attributes, health-promoting effects, along with functional benefits due to its phenolic compounds, flavonoids, carotenoids, ascorbic acids, vitamins, minerals, nitrate and most crucially, betalains, which serve as the most significant colouring substances. Beetroot is a tasty veggie that is abundant in protein, carbohydrates and antioxidants. The extension or proliferation of liver and colon cancer cells can be effectively stopped by the high antioxidant content of beetroot. Additionally, they aid in regulating blood pressure, reducing triglyceride levels, enhancing athletic performance and easing muscle stiffness. The bioactive substances that exist in beetroot are vital to the mechanistic pathways and ultimately give rise to desirable therapeutic outcomes.

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