

An Analysis of Health Benefits of Beetroot

Khyati Varshney¹, and Kirti Mishra²

^{1,2} Assistant Professor, School of Medical and Allied Sciences, Sanskriti University, Mathura, Uttar Pradesh

Correspondence should be addressed to Khyati Varshney; khyati.smas@sanskriti.edu.in

Copyright © 2022 Made Khyati Varshney et al. This is an open-access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT: beet root (*Beta vulgaris* L.), also acknowledged as chuk&er, is renowned due to its sweetness; it has higher sugar content but is low in calories. Beetroot is classified botanically as a herbaceous biennial of Chenopodiaceae family. Fresh beets provide a nutritional benefit in form of its green tops, which are high in beta-carotene, iron, & calcium. It essentially refers to cool-season vegetable crops that are produced all over globe. Beetroot is rich in antioxidants & minerals such as potassium magnesium, betalaine, , vitamin C, & sodium, & comes in a variety of hues ranging from yellow to red in bulb. Beetroots with a deep red hue are most widespread for human consumption, both cooked & raw in salads & juices. Carotenoids, saponins, betacyanines, betanin, polyphenols, & flavonoids are active chemicals found in beets. As a result, beetroot consumption may be regarded a cancer-prevention strategy. Betacyanins & betaxanthins are most common betalains found in beetroot. Betalains are a dietary supplement used to prevent & cure hypertension & cardiovascular disease. y have antibacterial & antiviral properties, as well as ability to suppress cell growth in human carcinoma cells. Osmotic dehydration may also be used to make beetroot c&y, which can be used in bread goods, confectionery, & ice creams, among or things.

KEYWORDS: Anemia, *Beta vulgaris*, Beetroot, Chuk&er, Medicine.

I. INTRODUCTION

With a pH of 7.5 to 8.0, beetroot (*Beta vulgaris*) is an alkaline food. taproot (bulb) of beet plant is what this is. It is a biennial plant that grows in temperate climates. beetroot & its juice are often eaten due to its delicious flavor, nutritional value, & flavor content. In India, it now produces 20-25 t/ha of fruit every year. People are getting more interested in usage of natural food colors se days, as syntic dyes are being increasingly scrutinized by consumers. Despite fact that betalains are water soluble & stable between pH 3 & 7, y are less frequently utilized in food processing than anthocyanins & carotenoids. Fresh beetroot or beet powder, or extracted pigments, are used to enhance red color of tomato pastes, sauces, jams, jellies, ice creams, desserts, & morning cereals. It is acknowledged to include antioxidants due to presence of nitrogen pigments termed betalains, which are mostly composed of red-violet colored betacyanins [1].

It is mostly cultivated in India for its juice & vegetable value. Vitamins A, B1, B2, B6, & C are all present. It essentially refers to cool-season vegetable crops that are

produced all over globe. Beetroot is rich in antioxidants & minerals such as potassium magnesium, betalaine, vitamin C, & sodium, & comes in a variety of hues ranging from yellow to red in bulb. Beetroots with a deep red hue are most widespread for human consumption, both cooked & raw in salads & juices. Carotenoids, saponins, betacyanines, betanin, polyphenols, & flavonoids are active chemicals found in beets.. Beets are often cultivated for use in pickles, salads, & juice. Betalains, which give beet roots its deep red color, are utilized as natural colorants in food industry & are gaining interest for its potential health benefits in humans, particularly its antioxidant & anti-inflammatory properties [2].

y have antimicrobial & antiviral properties, as well as ability to stop human tumor cells from proliferating. Beetroot may be found in abundance all throughout India, from hills of south India to frigid regions of north. India is world's second biggest producer of vegetables, accounting for about 15% of global vegetable production. Beetroot is cultivated extensively in Haryana Himachal Pradesh Uttar Pradesh, Maharashtra, , West Bengal, & in India. Dried beetroots may be eaten as chips as a replacement for conventional trans fatty acid-rich snacks, or as a component of quick meal following simple preparations. Because of its health benefits, this vegetable should be eaten on a daily basis in one form or another. As a result, appropriate processing & preservation techniques are required to get most advantages from beetroot. People nowadays are increasingly health-conscious, & y wanted to know benefits & drawbacks of foods y eat. In recent years, there has a greater emphasis on consumption of nutritious meals [3].

A. Medical Benefits

Anti-oxidant affect & Chemo-prevention of Cancer:

Beta vulgaris is considered to be one of most powerful antioxidant vegetables. antioxidant activity of apple, & red beetroot peel & pulp was studied, & findings indicated that *Beta vulgaris* specific impact was smaller than that of grapes at maximum activity. Antioxidant elements found in fruits & vegetables are well recognized for its importance in maintaining human health & neutralizing harmful effects of oxidative stress. Oxidative stress is a kind of oxidative process that occurs when there is a mismatch between synthesis & manifestation of reactive oxygen species & capacity of a biological system to quickly detoxify reactive intermediates or repair harm y cause. Oxidative stress is linked to a variety of illnesses in humans, including atherosclerosis,

neurological diseases, myocardial infarction, cancer, & aging [3].

Antioxidants are found in many plant pigments. main secondary plant pigments found in red beets vary from those seen in or fruits & vegetables. Many studies have focused on health benefits of natural pigments, particularly carotenoids & anthocyanins, which have widely researched for ir antioxidant qualities. Although betalains, red beet pigments, have not extensively studied as bioactive chemicals, many studies have shown ir potential as antioxidants. . At acidity > 4, betanin is 1.5 to 2.0 times more effective than some anthocyanins, which are well-known oxygen radicals phagocytes. Utilizing Sephadex LH-20 chromatographic, antioxidants & stage II protease abilities of hydroalcoholic & leaf extract of root cells of red & rich pigmentation beet variants were evaluated. Red & yellow carotenoids were found in active portions, while or ingredients stayed unknown. 4 beet (*Beta vulgaris*) varieties, white, orange, & elevated red—were investigated for unrestricted shielding, lowering, & stage Ii enzyme-inducing capabilities in leaves extract. Excerpts of red & large red phenotypes inhibited beta-carotene decomposition most. Infusion of carotenes from red beets demonstrated radioprotective impact in mice that had bombarded with ⁶⁰Co in vivo. After 10 days of beta-ray radiatorapy, beet extract consumption in mice decreased DNA damage in splenocytes, enhanced conversion of hematopoietic cells in burst-forming units-erythroid, enhanced hematocrit, & upgraded hematocrit & haemoglobin levels.[4].

Heavy metal poisoning may be treated with red beetroot juice. Chronic cadmium (Cd) poisoning produces an increase in Cd content in blood, liver, & kidney, resulting in an increase in oxidative processes in organs & a suppressive immunological response in chickens indicated by changes in cell & humoral immunity markers. Cellular oxidative indicators (ventricular & renal malon-dialdehyde levels, hepato glutathionperoxidase function, & blood enzymatic activity) were nearly restored in Cd-exposed hens, as were metabolic & immunologic indicators separated by membrane separation red beet juice per os for ten days.. Cd-treated hens were given fractionated red beetroot juice, which reduced oxidative effects of heavy metal & had an immune-modulating effect [5].

B. Beetroot detoxifies liver

According to researchers, chemicals contained in beetroot cleanse liver & have potential to treat digestive system disorders in humans. It promotes liver cleaning, enhances liver function, & protects liver from harmful effects of excessive alcohol use. Beetroot juice has potential to treat liver & kidney disorders, especially fatty liver deposits caused by alcohol misuse, protein insufficiency, or diabetes. In addition, beetroot juice may dissolve kidney stones & relieve discomfort [6].

C. Beetroot combats high blood pressure

Blood pressure may be reduced in as little as 60 minutes after consuming two cups of beetroot juice, with a peak decrease happening 3-4 hours after consumption. decrease in blood pressure was seen for up to 24 hours after juice was consumed.

Beetroot juice can provide protection against birth defects:

It's a fantastic source of folic acid (also called folate). Doctors advise pregnant women to include B vitamin folate in ir diet to reduce risk of birth abnormalities. Folic acid is an important vitamin for normal fetal development since it aids in formation of infant's spinal column & brain. Folate is essential for formation of new cells as well as preservation of existing ones.

D. Stamina Increase

Beetroot juice increases stamina & may extend exercise duration by reducing oxygen absorption & refore boosting stamina. Beets are a great source of energy because of ir natural & unprocessed quantity of carbs. When Betaline pigment is absorbed into blood, it is said to enhance blood's oxygen-carrying capacity by up to 400%.

E. Impact on Gastrointestinal System

Consumption of red beet products has a substantial impact on virtually all digestive organs, including pancreas, liver, & colon. Red beetroot has a moderate laxative effect & is well-acknowledged as a "internal cleaning" ingredient. Because of vast body of research that has looked at physiological & nutritional effects of *Beta vulgaris* on people & animals, it is widely assumed that dietary fiber improves intestinal peristaltic function. re are no variations in effects of red & sugar beets. Pectin, cellulose, & arabinose polymers are three major components of beet fiber, & y may help you lose weight. It's worth noting that laxative effects may be obtained from both fiber-rich red beet products & fiber-free *Beta vulgaris* juice. Blood cholesterol levels are also reduced by drinking red beet juice. Intestinal excretion of cholesterol & cholesterol metabolites is stimulated by a red beet pomace extract containing polyphenols & dietary fiber. hypocholesterolemic impact of beet products is most likely due to this mechanism. Higher cellulose content & red beet fiber in diet substantially decreased occurrence of precancerous lesions in colon, acknowledged as aberrant crypt foci . impact of red beet on carbohydrate metabolism, specifically dynamics of glycemia, has recently actively investigated in both normal & diabetic circumstances. extract of *Beta vulgaris* cicla, when given by gavage, lowers blood glucose levels through regeneration of pancreatic beta-cells, according to morphological & biochemical findings obtained in an experiment in streptozotocin-diabetic rats. Soluble dietary fiber consumption is linked to lower postpr&ial glucose & insulin responses, suggesting that it may help with metabolic syndrome. Extracted Swiss chard (*Beta vulgaris* cicla) has hypoglycemic properties. In a controlled single-blind cross-over design, sixteen healthy people were selected to eat test meals in an Australian research. After red beetroot juice intake, post-pr&ial insulin response was substantially reduced in early phase (0-60 minutes) & glucose response was significantly lower in early phase (0-30 minutes) (P 0.05). juice of red beets has a hepatoprotective effect. To begin with, it was shown in experimental models of toxic hepatitis. goal of referenced research was to see how long-term beetroot juice feeding (28 days) affected phase I & phase II enzymes, DNA damage, & liver injury in rats caused by

hepato-carcinogenic N-nitrosodiethylamine (NDEA). Beetroot juice has shown to protect against oxidative liver damage when fed over long periods of time. Anor research looked at two toxicants: NDEA & carbon tetrachloride. injection of eir toxicant alone or in comparison to control reduced all of studied antioxidant enzymes by 26 percent to 77 percent. Pretreatment with juice resulted in a 35 percent & 66 percent recovery of glutathione peroxidase & glutathione reductase activity, respectively. Similarly, DNA damage induced by eir toxicant in blood leukocytes was significantly reduced in rats given with juice before NDEA administration, by 20% [7].

F. Effects on Iron Metabolism

majority of research papers on red beets focus on ir antioxi-dative properties in human body. Beet root, on or h&, may have a different impact. First & foremost, role of red beet in iron metabolism must be mentioned. Because iron may be present in virtually all meals, dietary iron intake is linked to energy consumption. However, its absorption availability is very varied, & low bioavailability is a key cause of nutritional iron deficiency anemia's high incidence (IDA). body's dem& for iron is determined by organism's physiological state (pregnancy, old age, frequent exercise stress). Nutritional iron insufficiency occurs when dietary iron absorption is insufficient to meet physiological needs. Secondary iron deficiency is caused by a variety of clinical diseases. Iron-related anemia comes in a variety of hereditary types. Iron deficiency anemia (IDA) is one of major causes of disability & mortality globally, with prevalence ranging from 7.2 percent to 14.0 percent in industrialized EU nations to 60 percent among Asian women of reproductive age. Targeted iron supplementation with medicines is common, although consumption of pe-roral iron salts may induce nausea, vomiting, & abdominal discomfort. Oral iron supplementation raises blood hemoglobin levels, but it also raises oxidative stress levels. Many efforts have made to increase dietary iron bioavailability by adding fruits & vegetables to diet. Ascorbic acid, as well as or organic acids, is one of most significant plant components that aid in iron absorption. Increased fruit & vegetable intake, however, is not a cure-all. Plant-specific effects do not necessarily aim to enhance iron bioavailability. influence on iron metabolism is part of red beetroot health impacts that has received least attention. Red beets are linked with good health in traditional medicine (red blood). Traditional medicine in all European nations recommends red beet juice as an iron source for treating anemia. Some traditional medicine traditions acknowledge beets as a rapy for blood loss or "weak" blood conditions.

However, iron content of beet juice is too low (0.1-0.8 mg/100ml) to have a substantial anti-anemic impact. Only one scientific article has identified that provides solid evidence of red beetroot's effect on iron metabolism. "...evident rise blood level modest increase in hemoglobin & ferritin after eating 8 g of beetroot for 20 days, refore it can be concluded that beetroot may have some rapeutic qualities for iron deficiency" on eight volunteers in 2018. re is some indirect evidence for link between beets & blood. First & foremost, excessive intake of Beta vulgaris var. rubra may lead to metal (iron included) buildup in

liver. Cu, Fe, Mg, Mn, Zn, & P were observed to accumulate significantly in livers of healthy rats given a lyophilized table beet root powder (2 g/kg b.w.) added to rat chow for 10 days. high mineral concentration of red beetroot was used to explain this occurrence. This viewpoint is difficult to accept since iron content of dried beetroot is about 170 mg/kg & rats in referenced study got only 68 g of iron per day, which is insufficient to induce iron overload. most probable reason is that or red beetroot chemicals have an effect on iron absorption.

G. C&y preparation

C&ied fruit is a complete fruit or its parts that have saturated with cane sugar or glucose syrup & n drained of syrup & dried. Osmotic dehydration is anor name for this process. method for producing c&ied fruit is almost identical to that for preparing preserves. main difference is that fruit is impregnated with a sugar or glucose syrup with a greater sugar or glucose content. Cane sugar is replaced with a small quantity (25-30%) of invert sugar or glucose, such as confectioner's glucose (corn syrup, crystal syrup, or commercial glucose), dextrose, or invert sugar. To avoid fermentation, overall sugar content of impregnated fruit is maintained at about 75%. After appropriate dilution for sweetening, syrup left over from c&ying process may be utilized to c&y anor batch of same kind of fruit. Controlling pace & degree of sugar crystallization offers a wide range of textural options in c&y manufacturing. delicate textures of fondants & fudges, where crystallization is reduced, to hard c&ies, when crystallization results in a desirable grainy or crystalline structure, are examples. Sugar is necessary for perceiving texture of meals, often acknowledged as "mouthfeel." Given significance of osmotically dehydrated product acceptance in c&y-making process, it is essential to regulate amount of sugar gain & moisture content in end product so that it is acceptable to customers.

II. LITERATURE REVIEW

Clifford T et al. discussed Red beet supplement has potential to be profitable in both wellness & sickness. that has highlighted how bioactivity of red beetroot (*Beta vulgaris rubra*) & its possible benefits as a mental wellbeing & illness-prevention functional ingredients has attracted interest in recent years As nitrates resource, beetroot consumption is natural way to increase in vitro nitric oxide (NO) existence & has surfaced as a viable method for preventing & managing conditions linked with poor NO permeability, including that of hypertensive & endolial functioning. Beet is also being investigated as a potential rapeutic rapy for a variety of clinical illnesses related with inflammatory cytokines. In vitro & in vivo, its components, particularly betalain pigments, exhibit significant antioxidant, anti-inflammatory, & chemo-preventive potential. objective of this section is to examine at bioactivity of beets & to assess data from studies that looked at influence of beetroot supplements on inflammatory.[8].

Domínguez R et al. discussed Effects of beetroot juice supplementation on cardio breathing durability in athletes in which y discussed how Nutritional supplementation is used by athletes to increase benefits of training & improve ir athletic performance. Nitric oxide (NO) is

produced when beet juice is consumed, & it has a variety of activities including enhanced blood flow, xchgase, & muscular contraction strengthening. se biomarker improvements suggest that beetroot juice supplementation may have ergogenic benefits on cardiorespiratory endurance, which may help athletes perform better. goal of this literature analysis was to see how beetroot juice consumption, as well as beetroot juice combined with or supplements, affected cardiorespiratory endurance in athletes [9].

Sulaiman R et al. discussed Development of beetroot (Beta vulgaris) powder using foam mat drying in which y discussed how In food business, beetroot (Beta vulgaris) is often utilized as a natural food colorant. objectives of this study are to identify unique types (egg albumen & fish gelatine) & densities of foaming agents affect foam attributes of foam mat drying beetroot, as well as to evaluate physical & chemical properties (colour, pH, Brix, bulk density, water content, hygroscopicity, & moisture content) of foam dried beetroot powder. Beetroot foam was dispersed at a thickness of 3 mm in a cupboard drier & hot air dried for 6 hours at 50 °C. As foaming agents in beet pulp, egg albumen & fish gelatine can be employed, which can n be hot air dried & crushed into powder [10].

III. DISCUSSION

Natural chemicals as protective or rapeutic agents have gotten a lot of interest in recent years all around globe. Recent research have revealed that red beetroot & its active components betalains (also betanin) offer a range of health advantages, including antioxidative, anti-inflammation, anticancer, blood pressure & cholesterol lowering, as well as antidiabetic & anti-obesity properties. Betanin is a betalain glycosidic pigment that is a key component of red beetroot & is used as a food ingredient. This paper summarises rapeutic potential of red beetroot & its active components (betalains) as prospective choices for supplementary rapies in a variety of disorders.

IV. CONCLUSION

Mammalian intake of red beetroot products, including native juice & fractions, showed numerous nutritional benefits. Beet juice seems to be most effective anti-anemic, anti-ischemic, anti-inflammatory, antioxidant, & anticancerogenic substance available. usage of red beet root products may also help to improve intestinal peristaltic function & lipid metabolism. beetroot is a nutritious vegetable that is high in vitamins & minerals. Beetroot is mostly used in production of juice, vegetables, salads, & powders, but it is also utilized in production of sweets, jam, & or products. Beetroot peel has more antioxidant components, implying that it will be used more extensively in food & nutraceuticals. Beetroot is used as a food color in commercial world. It only works in ice cream, c&ies, & or confectionery since it changes color when heated, but it's inexpensive & has no acknowledged allergic adverse effects. Almost every component of this plant, including leaf, fruit, seed, bark, & root, is used to treat a wide range of illnesses. We believe fractionated red beetroot juice is beneficial for

preventing senile sarcopenia, senile cognitive decline, & Alzheimer's disease.

REFERENCES

- [1] Domínguez R, Maté-Muñoz JL, Cuenca E, García-Fernández P, Mata-Ordoñez F, Lozano-Estevan MC, et al. Effects of beetroot juice supplementation on intermittent high-intensity exercise efforts. *Journal of International Society of Sports Nutrition*. 2018.
- [2] Raikos V, McDonagh A, Ranawana V, Duthie G. Processed beetroot (Beta vulgaris L.) as a natural antioxidant in mayonnaise: Effects on physical stability, texture & sensory attributes. *Food Sci Hum Wellness*. 2016;
- [3] Hobbs DA, Kaffa N, George TW, Methven L, Lovegrove JA. Blood pressure-lowering effects of beetroot juice & novel beetroot-enriched bread products in normotensive male subjects. *Br J Nutr*. 2012;
- [4] Vasconcellos J, Conte-Junior C, Silva D, Pierucci AP, Paschoalin V, Alvares TS. Comparison of total antioxidant potential, & total phenolic, nitrate, sugar, & organic acid contents in beetroot juice, chips, powder, & cooked beetroot. *Food Sci Biotechnol*. 2016;
- [5] Kazimierczak R, Siłakiewicz A, Hallmann E, Średnicka-Tober D, Rembalkowska E. Chemical composition of selected beetroot juices in relation to beetroot production system & processing technology. *Not Bot Horti Agrobot Cluj-Napoca*. 2016;
- [6] Carmo EL do, Teodoro RAR, Félix PHC, Fern&es RV de B, Oliveira ÉR de, Veiga TRLA, et al. Stability of spray-dried beetroot extract using oligosaccharides & whey proteins. *Food Chem*. 2018;
- [7] Ormesher L, Myers JE, Chmiel C, Wareing M, Greenwood SL, Tropea T, et al. Effects of dietary nitrate supplementation, from beetroot juice, on blood pressure in hypertensive pregnant women: A r&omised, double-blind, placebo-controlled feasibility trial. *Nitric Oxide - Biol Chem*. 2018;
- [8] Clifford T, Howatson G, West DJ, Stevenson EJ. potential benefits of red beetroot supplementation in health & disease. *Nutrients*. 2015.
- [9] Domínguez R, Cuenca E, Maté-Muñoz JL, García-Fernández P, Serra-Paya N, Estevan MCL, et al. Effects of beetroot juice supplementation on cardiorespiratory endurance in athletes. A systematic review. *Nutrients*. 2017.
- [10] Ng ML, Sulaiman R. Development of beetroot (Beta vulgaris) powder using foam mat drying. *LWT*. 2018;