

## **A REVIEW ON *BETA VULGARIS***

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### **ABSTRACT**

*Beta vulgaris* usually known as beet root is an herbaceous biennial, hardly ever, perennial plant, its top upto 120 cm belonging to family Chenopodiaceae. The beet-root is native to Asia and Europe. It is grown broadly in Germany and France and in lesser amounts in other European countries, Africa, Asia, and South America and throughout India. Its active compounds are carotenoids, glycine betanine, betacyanins, anthocyanins, tannins, saponins, folates, flavonoids, vitamins, fatty acids and minerals. Beetroot additionally facilitates the human intercourse hormones and as an aphrodisiac. Traditionally, beet root have diverse medicinal properties together with anti-oxidants, anti-depressants, anti-microbial, anti-inflammatory, anti-carcinogenic, immunomodulatory, diuretic and also used to treat cough. It is used as nutritional supplement that's rich in vitamins, minerals, amino acid and vitamins and has particular phytoconstituents. It is beneficial in the growth of foetus in pregnancy. It is used as natural meals coloration in dairy and meat products. The intention of this evaluate is to provide the entire records together with morphology, distribution, phytochemistry, traditional use & pharmacological activities.

**Keywords:** *Beta vulgaris*, Beetroot, phytoconstituents, traditional use, pharmacological activities.

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### **INTRODUCTION**

Beetroot is widely known plant systematically called *Beta vulgaris* belonging to family chenopodiaceae. It is an erect annual herb with tuberous root stocks (Dim et al, 2013). It is an indigenous originated from Mediterranean location and extensively cultivated in America, Europe and during India (Chopra et al, 1956). There are 9 different species within the *Beta* genus and all have the common name beet, although *Beta vulgaris* is the most well-known and commercially important (NRCS, 2006). It is cultivated as a vegetable nearly during India. The varieties of *Beta* which might be generally grown in India are Crimson Globe and Detroit Dark Red, both having globular-oval roots (Anonymous, 1988). Beetroot is popular for its juice value and medicinal properties. It is thought with the aid of several common names like beet, chard,

spinach beet, sea beet, garden beet, white beet and Chukander in Hindi. Beetroot help to enhance human intercourse hormones and as an aphrodisiac in historical times. The juice of beetroot is used as an herbal remedy to expel kidney and bladder stones and extensively utilized for sexual weakness (Sharma et al, 2011). In current years, beetroot has won recognition to be an herbal meal to boost the strength in athletes (Ormsbee et al, 2013; Ormsbee et al, 2014). The leaves of beetroot have been used for faster healing of wounds this is advocated via the Father of Medicine "Hippocrates" (Singh et al, 2011). The roots are specially used for the treatment of haemagglutination, antifertility, antifungal, anti-mutagenic, anti-cancer, antiprotozoal, antiviral and diuretic and effect on breathing in Indian traditional systems of medicine (Ahmad et al, 2013). Beet root mainly contain Betaine

(Betacyanin pigment) which is responsible for its red coloration is used as natural meals colour in dairy and meat merchandise. In Early Greeks and Romans used *Beta vulgaris* leaves as vegetables and root for its medicinal properties. Beetroot broth or juices become endorsed as an easily digested food for the elderly and weak. In cyanide poisoning, Beets are used as an antidote (Kumar, 2015). During pregnancy, it may be taken as salad in diet because it's far helpful in the growth of foetus (Lee et al, 2005). In first growing season Beetroot produces green tops and swollen roots. It is fairly efficient and normally free of pests and illnesses (Ado, 1999). It is rich in several vitamins, minerals and a nutrient as a result beetroot is a super vegetable for health aware human beings (Joyah, 2008).

**Table1: Taxonomic classification of Beetroot** (Chawla et al, 2016).

S.No	Taxonomic Classification	
1	Kingdom	Plantae
2	Subkingdom	Tracheobionta
3	Super division	Spermatophyta
4	Division	Magnoliophyta
5	Class	Magnoliopsida
6	Subclass	Caryophyllidae
7	Order	Caryophyllales
8	Family	Chenopodiaceae
9	Species	Vulgaris
10	Genus	Beta

**Botanical description** (Chawla et al, 2016).

**Stem:** Stem produces simple leaves which can be arranged in a closed spiral. It is short and plate.

**Root:** Roots are true Binneal, stout, swollen forming a beet together with the hypocotyl, and a branched taproot.

**Lower leaves:** Oblong, obtuse, trowel shaped and up to 25 cm long.

**Upper leaves:** Lanceolate, Rhombicovate and heart shaped.

**Flowers:** Very small with a diameter of 3-5mm, Greenish or tinged reddish with five petals and bisexual Spikes Slender, 15 -45 cm long.

**Seed:** Horizontal with skinny seed coat, floury albumen and annular embryo.

**Indian synonyms**

Bengali: Bitagacha; Gujarati: Salada; Hindi: Cuqander; Kannada: Gajarugadde; Malayalam: Bit; Marathi: Bitā; Tamil: Carkkarivali, Kilankuceti; Telgu: Dumpamokka; Punjabi: Beet

**Table 2. Global distribution of the genus *Betaspecies*** (Parastouk, 2006).

Species	Distribution
<i>Beta corolliflora</i>	Caucasus, Asia Minor, Black sea coast
<i>Beta intermedia</i>	Persia Asia, Minor to Hungary
<i>Beta macrocarpa</i>	India
<i>Beta macrorhiza</i>	Caucasus, Asia Minor, Black sea coast
<i>Beta patellaris</i>	Southern Spain, Northwest African coast, Islands
<i>Beta patula</i>	Northwest Africa, Mediterranean, western Europe
<i>Beta procumbens</i>	Northwest African coast, Canary and Cape Verde Islands,
<i>Beta trygina</i>	Caucasus, Asia Minor, Black sea coast
<i>Beta vulgaris</i>	Canary Islands, European Atlantic coast to India, Mediterranean, Near East, Madeira, North sea, Middle and South America
<i>Beta webbiana</i>	North-west African coast, Canary and Cape Verde

**Phytochemical constituents**

(Odoh and Okora, 2013; Mroczek et al, 2012)

1. **Alkaloid:** Calystegine B1, Calystegine B2, Calystegine B3, Calystegine C1, Ipomine
2. **Amino acids:** Threonine, Valine, Cystine, Methionine, Isoleucine, Leucine, Lysine, phenylalanine, Histidine, Arginine, Glutamic acid, Proline, Alanine, Tyrosine.
3. **Anthocyanins:** Carotenoids(beta-carotene)
4. **Carbohydrates:** Dietary fiber, Starch, Sugars (glucose, Fructose, sucrose).
5. **Coumarins:** Cyanidins, Esculetin, Peonidin, Scopolatin, Umbelliferone.
6. **Fatty acids:** Linolenic acid, Pentadecylic acid, Palmitic acid, Stearic acid, Palmitoleic acid, Oleic and vaccenic acid.
7. **Flavonoids:** Astragaloside, Kaempferol, Rhamnocitrin, Rhamnetin, Tiliroside.
8. **Minerals:** Calcium, Copper, Iron, Manganese, Magnesium, Phosphorous, Potassium, Sodium, Zinc.
9. **Phenolic compounds:** N-cis-Feruloyl 3-o-methyldopamine, N-cis-Feruloyltyramine, N-trans-Feruloyl 3-o-methyldopamine, N-trans-Feruloyltyramine.
10. **Saponins:** Hedragenin glycone, Oleanolic acid.
11. **Sesquiterpenoids:** 4-hydroxy-dehydro myoporone, 6-myoporol and ipomeamarone
12. **Triterpenes/Steroid:** Beta-amirin acetate, Boehmerylacetate, Friedelin.
13. **Vitamins:** Cholesterol, Panthotenic, Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3 (Niacin), Vitamin B6, Vitamin C, Vitamin E and Vitamin K.
14. **Volatile constituents:** Pyridine, 4-picolene.
15. **Traditional uses:** In ancient time, beetroot juice is used to expel the kidney and bladder stones. Beetroot help to enhance human intercourse hormones and as an aphrodisiac. Traditionally the roots of beetroot are used as expectorant, diuretic and as a treatment for intellectual issues.

**Cosmetic uses:**

**Beet for Hair:** Carotenoids are present in Beetroot juice which improves the quality, thickness, shine and growth of the hair.

**Beet for Skin:** Mixture of clay husk like multanimitti with Beetroot juice is used to keep the skin flawless and fair. This resourceful fruit can be eaten raw, used as a juice and in salads. Betanin extract of Beetroot is commonly used as an herbal colorant especially in dairy merchandise, cattle products, beverages and candies.

**Pharmacological activities**

**Anti-Anemic:** The ethanolic extracts of *Beta vulgaris* initiate to be rich in ascorbic acid, folic acid, and iron. The RBCs and the hemoglobin concentration decreased by 62.51% and 69.64%, respectively which induce anemia. The administration of standard hematinic preparation and BVEE (200 mg/kg) which significantly increase ( $P < 0.001$ ,  $P < 0.01$ ) in the number of erythrocytes as well as hemoglobin concentration whilst as compared to the untreated phenyl hydrazine-induced anemic rats. Ethanolic extract increased the extent of hemoglobin and erythrocyte count at dose 200 mg/kg (Jaswal et al, 2014)

**Antibacterial activity:** The study revealed that *Beta vulgaris* extract shows antibacterial activity. In the disc diffusion method, *Beta vulgaris* L. (beetroot) extract had a slight antibacterial activity against only three tested strains, because of the extent amount of extract (15 µl) used. In the agar well diffusion method, the tested extract inhibits the growth of all tested Gram negative bacteria in a volume of 100 µl. For *Citrobacter freundii* and *Salmonella typhimurium* the inhibition was present when 50 µl was applied. Among all tested bacteria *Staphylococcus aureus* and *Bacillus cereus* were the most susceptible, because halo zones appeared, which indicate bactericidal activity of tested extract. (Velicanski et al, 2011).

3.

**Anticancer:** The anticancer activity of juice of *Beta vulgaris* was determined by estimating

antioxidant potential by DPPH and Nitric oxide scavenging assay, followed by effect on cell proliferation by MTT assay, tumor volume, survival time, change in body weight hematological parameters and antioxidant enzyme in Ehrlich Ascites Carcinoma induced mice. The CAT, GSH and SOD level was decreased in EAC bearing mice due to the liver damage. The inhibition of CAT, GSH and SOD activity results in tumor growth. Administration of beetroot juice increases significantly CAT, GSH and SOD antioxidant activity which can be due to free radical scavenging property of phytoconstituents present in the *Beta vulgaris*. It may be concluded that beetroot has anticancer activity (Sumanth and Shayeghi, 2016).

**Antidepressant activity:** The methanolic extract of *Beta vulgaris* alone and in combination with fluoxetine indicate antidepressant effect by usage of behavioral models in mice. The antidepressant effect was initiated in given mixed doses of 200 or 400 mg/kg/day of BV methanolic extract with 10 mg/kg/day fluoxetine via serotonergic effect. The BV also contains folate which can help to reduce the threat of anxiety and depression (Invally et al, 2016).

**Antihypercholesterolemic:** This study shows that the lyophilized aqueous *Beta vulgaris* extract indicates protective effect against cholesterol rich diet-induced hypercholesterolemia in rats. To increase cholesterol level in rats via feeding 1% cholesterol rich diet for 10 weeks. Hypercholesterolemic rats demonstrate substantial growth in total cholesterol and triglycerides and decrease in high-density lipoprotein-cholesterol (HDL-C) levels. In 7 consecutive days BVE on the doses of 250 and 500 mg/kg suggests a significant decrease in total cholesterol, triglycerides and increase in HDL-C level (Dasari, 2011).

4. **Antihyperglycemic activity:** To determine antihyperglycemic activity by using oral glucose tolerance test. The methanolic extract

of roots of beetroot at doses of 50, 100, 200 and 400 mg/kg in mice that reduced blood glucose levels by 17.5, 33.2, 40.2, and 51.7%, respectively as compared to control animals (Mandal et al, 2014).

**Antihypertensive:** The antihypertensive activity of methanolic extract of *Beta vulgaris* was determined with dexamethasone that induces hypertension in rats. Dexamethasone administered in rats raised systolic blood pressure, vascular reactivity changes to Catecholamine as compared to control group. The extract of *Beta vulgaris* at doses (100, 300 mg/kg/day, p.o.) given for 14 days in dexamethasone administered rats to reduced systolic blood pressure, vascular reactivity changes to catecholamines in comparison to dexamethasone administered group. The rats treated with dexamethasone together with *Beta vulgaris* (100 and 300 mg/kg p.o. for 14 days) showed a significant decrease in heart rate as compared to dexamethasone treated group (Patel, 2017).

**Anti-inflammatory activity:** The anti-inflammatory effect of *Beta vulgaris* was determined using carageenan induced rat paw oedema and an aqueous extract of leaves of *Beta vulgaris* decreased the paw oedema at 1000 mg/kg dose. The anti-inflammatory activity is a biphasic in which the first segment is due to release of serotonin and histamine and in the second segment there may be release of leukotrienes and prostaglandin. The anti-inflammatory effect of the extracts on the proliferative segment of inflammation, cotton pellet granuloma formation was used. The aqueous extract of BV at a dose 500 and 1000 mg/kg indicates an enormous inhibitory effect on granuloma formation. This study exhibits that the aqueous extract of *Beta vulgaris* was active against the inflammation which induced by a foreign body (Jain and Sharma, 2011).

**Anti-nephrotoxicity:** The ethanol extract of *Beta vulgaris* extensively reduced the quantity of cleaved caspase 3 and Bax, protein expression and increased the Bcl-2 protein

expression and also ameliorated the extent of histologic injury and decreases the inflammatory infiltration in renal tubules. This study exhibits that BVEE attenuates renal disorder and structural damage through the reduction of inflammation, oxidative stress and apoptosis in the kidneys (Gamal et al 2014).

**Antinociceptive activity:** The antinociceptive activity was determined by decreasing abdominal constrictions by using acetic acid induced pain model in mice. The methanolic extract of roots of beetroot at 50, 100, 200 and 400 mg/kg.i.p. doses administered in mice to decrease the number of abdominal writhing 35.5, 41.9, 45.2, and 48.4% respectively (Mandal et al, 2014).

**Antioxidant:** The beet root pomace extracts have phenolic compounds, betalains and a substantial radical scavenging activity towards stable DPPH and highly reactive superoxide and hydroxyl anion radicals. This shows that a positive relationship between the contents of total phenolics, anthocyanin, betaxanthins, flavanoid and antiradical effects of beet root pomace. This study revealed that beet root pomace is an inedible waste product in juice manufacture however it is probably a potent source of antioxidants (CB et al, 2011).

**Antithyroid:** The study shows that administration of T<sub>4</sub> for more than 12 days in mice enhances the levels of serum T<sub>4</sub> and T<sub>3</sub> (triiodothyronine) both as well as the hepatic Lipid peroxidation with a parallel decrease in the levels of antioxidants (SOD and CAT) and serum lipids. After the treatment of peel extract of beet root in hyperthyroid animals, LPO level decrease and the level of CAT, GSH and SOD were increased in liver tissues with a concomitant lower in serum thyroid hormone levels, revealed the antithyroid role of beet root (Sunhre et al, 2017).

7. **Hepatoprotective:** The methanolic extract of *Beta vulgaris* was determined against carbon tetrachloride induced toxicity in liver by using rat model exhibits hepatoprotective effect. In

this study the rats are treated with MEBV restored the enzyme activities of the liver ALT, AST, Bilirubin, WBC, RBC, PCV and hepatic lobule architecture to near normal level. The MEBV at dose 300 µg/ml against CCl<sub>4</sub> induced hepatotoxicity and amelioration of the hepatic remediation to near normal level in rat liver functions. The amelioration may be due to the total flavanoids, phenolic and different antioxidants composition within the plant extracts (Rose et al, 2014).

## CONCLUSION

Plants are the rich source of medication in traditional system of medicine, folk medicines, modern medicines, pharmaceutical intermediates, nutraceuticals, food dietary supplements and chemical entities for synthetic drugs. Plants play an essential role in drug discovery. Beet root provides strength to the body and boosts up immune system. Overall, it is a versatile super food, which has numerous uses like medicinal uses, cosmetic uses as well as cuisine uses. In present review paper pharmacological activities discussed which will give a new way for the initiation of novel compounds which would be beneficial for research and development.

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