Review Article

A REVIEW ON PHARMACOLOGICAL ACTIVTIES OF *BASSICA OLERACEA*

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ABSTRACT

Red cabbage is a kind of cabbage, also known as purple cabbage, red kraut, or blue kraut after preparation. Red cabbage is one of the most important vegetables grown worldwide*Brassica oleracea*leaves (red cabbage) is commonly used as a food. On the basis of its usage in folk medicine *Brassica oleracea*leavesare used to treat alzheimer's disease. In India it is grown mainly as rabi crop during winter. But in around Nasik(Maharashtra), Madras and in semi parts of Kerala it is grown as Kharif crop also due to its antioxidant, anti-inflammatory and antibacterial properties, cabbage has widespread use in traditional medicine, in alleviation of symptoms associated with gastrointestinal disorders (gastritis, peptic and duodenal ulcers, irritable bowel syndrome) as well as in treatment of minor cuts and wounds and mastitis.Red cabbage have been found to have antioxidant, antihyperglycemic, anticancer ,hypocholesterolemic properties and protect against alzheimer's disease.

Keywords: *Brassica olaracea,* Anti-inflammatory, Anti-oxidant, Anticancer, Anti-hyperglycimic, Alzheimer's.

INTRODUCTION

The **red cabbage** (purple-leaved varieties of *Brassica oleracea* Capitata Group), also known as **purple cabbage**, **red kraut**, or **blue kraut** after preparation. Its leaves are coloured dark red/purple. However, the plant changes its colour according to the pH value of the soil, due to a pigment belonging to anthocyanins. In acidic soils, the leaves grow more reddish, in neutral soils they will grow more purple, while an alkaline soil will produce rather greenish-yellow coloured cabbages. This explains the fact that the same plant is known by different colours in various regions. Furthermore, the juice of red cabbage can be used as a home-made pH indicator, turning red in acid and green/yellow in basic solutions. It can be found in all Europe, throughout the Americas, in China and especially in Africa. On cooking, red cabbage will normally turn blue. To retain the red colour it is necessary to add vinegar or acidic fruit to the pot.

AVAILABITY

Red cabbage needs well fertilized soil and sufficient humidity to grow. It is a seasonal plant which is seeded in spring and harvested in late fall. Red cabbage is a better keeper than its "white" relatives and does not need to be converted to sauerkraut to last the winter. In India it is grown mainly as rabi crop during winter. But in around Nasik(Maharashtra), Madras and in semi parts of Kerala it is grown as Kharif crop also. The major cabbage producing states are Uttar Pradesh, Odisha, Bihar, Assam, West Bengal, and Karnataka. It is generally grown in most of the European countries, mainly France and Italy, as well as Africa and mainly in Minor Asia. It can be also found in Northern Europe, throughout the Americas, and in China. Red cabbage needs well fertilized soil and sufficient humidity to grow[1].

PLANT

The plant belongs to the Cruciferae family (Brassicaceae). It belongs to the large species Brassica oleracea, to the group of the variety capitata. This plants bears a compact head of red leaves. This plant bears flower spikes quite easily in cold weather.

FRUIT

Colour: Purple, magenta or dark purple colour
Size: 18 inches tall, 24 inches wide
Shape: The leaves are tightly arranged forming a headed cabbage, having a flat-topped, cylindrical, spherical or oval shape. They usually have even leaves, with a rounded shape and average size.

Image of *brassica oleracea fruit* (Red Cabbage)

CHEMICAL CONSTITUENTS

Red cabbage (*Brassica oleracea*) is an excellent source of food colorant. Cruciferous vegetables contain high levels of vitamins that can act as antioxidants, compounds that may protect against several degenerative diseases. α-carotene, β-carotene, α-tocopherol, γ-tocopherol, and ascorbate are the active constituents. It also have highest levels of vitamins, anthocyanins and carotenes followed by broccoli and Brussels sprouts with intermediate levels and then by cabbage and cauliflower, with comparatively low concentrations.[2]

The major constituents of red cabbage are isothiocyanates (glucosinolate), vitamins A, B, C and anthocyanins. The vegetable contains glucosinolates, flavonoids, vitamins and mineral nutrients. It is suggested that cabbage can regulate and thus optimize its concentrations of Ca, P, Ni, Mn, Cu, and Fe. The major fatty acids were palmitic, linoleic, and linolenic acids with a high compositional ratio of unsaturated fatty acids, signifyies nutritional value.

Nutrition value for Red cabbage (per 100 gram) : Carbohydrates (6.94g), Sugar (3.32g), Protein (1.51g), Total Fat (0.09g), Cholesterol (0g), dietary fibre (2.60g), Vitamin A equiv (2 µg), Beta carotene (20 µg), Folate -B_9 (24 µg), Vitamin C (34.4 mg), Vitamin K (47.6 µg), Potassium (262 mg)

Brassica oleracea contains large amounts of polyphenols specially flavonoids.[3] It also contains ascorbic acid, vitamins C and E, amino acid, the flavonols quercetin and kaempferol, lutein, and the glucosinolates.[4]

THERAPEUTIC USES

B. oleracea is a human food crop plant, used because of its large food reserves, which are stored over the winter in its leaves. It is rich in essential nutrients including vitamin C. A diet rich in cruciferous vegetables (e.g., cabbage, broccoli, cauliflower) is linked to a reduced risk of several human cancers. It is having cleansing qualities, as well as a mild laxative, an anti-inflammatory, and treatment for glaucoma and pneumonia.

1. **Anti-ulcer:** Anti-inflammatory properties in red cabbage can treat stomach ulcer and fasten its healing process. It protect stomach lining from stomach acid which can make the ulcer worst. Consuming red cabbage in some amount during the day will make your stomach feel better.
2. **Skin disorder:** The antioxidant and anti-inflammatory properties which presence in red cabbage can be an effective treatment for skin disorder such as eczema. This benefits is also supported by the presence of sulfur in red cabbage. Sulfur is mineral which is well known as ingredients of many skin medication.
3. **Antihypertensive: Red** cabbage contains some amounts of potassium that can help to maintain normal blood pressure. As we know that hypertension is one of serious health problem that suffered by most people nowadays and people who suffer from hypertension must choose their food well. Red cabbage is not only delicious but it can be a great snack and food for hypertension patient**.**

PHARMACOLOGICAL ACTIVITIES

1. **Antidiabetic effect:** *Brassica oleracea* **was** screened for anti diabetic activity**.** *Brassica oleracea* blood glucose levels above 200 mg/dl were considered diabetic. Diabetic rats that daily ingested polar extract of RC (1 g/kg body weight) showed improvement in diabetic polyuria that almost disappeared by the end of experimental period. Food and water consumption also declined when diabetic rats ingested RC extract. RC extract also abridged the weight gain loss in diabetic rats, as well as blood glucose levels at the end of the experimental period. Rats that ingested RC extract showed no significant changes as compared with control rats in any of the parameters considered.[4]
2. **Analgesic effect:** Dose-dependent reductions in the number of abdominal onstrictions induced by intraperitoneal administration of acetic acid were observed withmethanolic extraction of red cabbage(MERC). At doses of 50, 100, 200 and 400 mg per kg body weight, MERC was observed to reduce the number of constrictions, respectively, by 7.4, 22.2, 37.0, and 55.6%. The results obtained with 50 mg per kg MERC were not statistically significant. A standard analgesic drug, aspirin, when administered to experimental animals at doses of 200 and 400 mg per kg body weight, reduced the number of constrictions by 37.0 and 55.6%, respectively. Thus, a dose of 200 mg/kg MERC was equivalent to 200 mg/kg aspirin, while

a dose of 400 mg/kg MERC was equivalent to 400 mg per kg aspirin.[5]

3. **Antioxidant and Anti-inflammatory:** *Brassica oleracea* was screened for antioxidant and antiflammatory activity. Red heads had the highest total antioxidant contents followed by Savoy, Chinese and green heads. The Chinese variety had the highest ABTS (2,2-azino-di-(3-ethylbenzthiazoline-sulfonic acid) antioxidant activity, was 5.72 µmol TE/g fw (Trolox equivalent). The green variety had the highest DPPH (free radical scavenging activity) antioxidant activity, which was 91.2 µmol TE/g fw. The red variety had the highest FRAP (ferric reducing antioxidant power) antioxidant activity, which was 80.8 µmol TE/g fw. The total phenol amounts were 17.2–32.6 mMtrolox equivalent antioxidant capacity (TEAC) and the total flavonoid amounts were 40.0–74.2 mg quercetin per gram. Methanolic extracts of different cabbage heads showed different anti-inflammatory activity values. Chinese, Savoy and green heads had the highest anti-inflammatory activity, while red heads had the lowest.[6]
4. **Antioxidant Activity**: Antioxidant Activity and Polyphenol Content of Brassica oleracea Varieties were studied. The reasons for beneficial medicinal benefits to humans from cabbage (*Brassica oleracea* L. var. *capitata*) needs clarification. The research examined beneficial phytochemicals in cabbage that activate and stabilize antioxidant and detoxification mechanisms in humans. Methanolic extracts of red cabbage (*B. oleracea* L. var. *capitata f. rubra* [MERC]), green cabbage (*B. oleracea* L. var. *capitata* [MEGC]), cauliflower (*B. oleracea* L. var. *botrytis*[MEC]), and broccoli (*B. oleracea* L. var. *italica* [MEB]) were analyzed for antioxidant activity (AA) using different in vitro assays and polyphenol content. The AA was tested by radical scavenging activity of extracts against 1,1-diphenyl-2-picrylhydrazyl (DPPH) and hydroxyl radical, ferric reducing power, and ferrous ion chelation assay. The antioxidant activity from all assays was in the order MERC > MEGC > MEB > MEC. Total phenolic and flavonoid contents were highest and lowest for MERC (2.26 mg gallic acid equivalent [GAE]·g^{-1} fresh weight [FW] and 1.43 mg rutin equivalent [RE]·g^{-1} FW) and MEC (0.83 mg GAE·g^{-1} FW and 0.42 mg RE·g^{-1} FW), respectively, as were antioxidant assays. High-performance liquid chromatography analyses of extracts indicated presence of phenolic acid and flavonoid compounds confirming in vitro antioxidant behavior[7].
5. **HYPNOTIC EFFECT OF RED CABBAGE**: The hydro alcoholic extract of red cabbge was studied for its hypnotic effect. The results showed increased sleep duration at doses of 50–200mg/kg ($P < 0.001$). This observed hypnotic effect was comparable to that of diazepam (3mg/kg) ($P < 0.001$ in comparison with control group). The results suggest that red cabbage potentiates pentobarbital hypnosis without any toxic effect. The main component(s) responsible for this effect is most likely to be intermediate polar agent(s) such as flavonoids, which are found in ethyl acetate fraction of this plant. The reference drug diazepam was able to increase duration of sleep. The HAE at doses of 50, 100, and 200mg/kg could significantly increase sleep duration. As expected, pretreatment of mice with flumazenil decreased the sleep-prolonging effect of diazepam. Similarly, the effect of HAE on sleep duration was significantly inhibited by flumazenil[8].

CONCLUSION

In conclusion, red cabbage has several phytochemicals or compounds that are proven to reduce the risk of several major diseases including cancers, neurodegenerative disorders, diabetes etc. Various research suggest that cabbage could contribute as sources of important antioxidant and anti-inflammatory related to the prevention of chronic diseases associated to oxidative stress, such as in cancer and coronary artery disease. Furthermore, the major fatty acids were palmitic and linolenic acids with a high compositional ratio of unsaturated fatty acids, there by signifying the nutritional value of these fatty acids that are responsible for the promotion of human health in a number of different ways.

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