



## A Review on Cabbage – Anti-Inflammatory Activity

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### ABSTRACT

Cabbage (*Brassica oleracea* var. *capitata* f. *alba*), a cruciferous vegetable, is one of the most widely consumed vegetables worldwide. Red cabbage is a vegetable known for its enriched bioactive constituents. Generally among the population it is used as an ingredient in raw salads or coleslaws, pickle, boiled and steamed dishes for its impact on human health and low calorie, high fiber composition. Cabbage having a anti-inflammatory activity, and other activities also diabetic neuropathy, anticancer, antiulcer, antiplatelet. Cabbage is a source of vitamin A, C, K and B, thiamin, riboflavin, folate. Calcium, magnesium, manganese, iron, nickel, zinc and dietary fiber.

**Keywords** - Red cabbage, *Brassica oleracea* var. *capitata* f. *rubra*, pharmacological uses, antioxidant

### Introduction

Cabbage (*Brassica oleracea* var. *capitata* L.), which belongs to the family Brassicaceae, and it is one of the most common vegetables grown worldwide. In order to differentiate it from red cabbage, which shares the same scientific name, cabbage is frequently referred to as green cabbage. Because of its anti-inflammatory and antioxidant qualities. [1][2] The common herbal remedy for gastrointestinal conditions such as gastritis, peptic and duodenal ulcers, irritable bowel syndrome, sores, and mastitis is cabbage. [3][4]

Cabbage (*Brassica oleracea* var. *capitata*) is a popular vegetable in many countries, which has been reported with high nutritional value and distinct health benefits [5] There have also been recent reports on cabbage's anti-inflammatory, anti-pyretic, analgesic, and antioxidant qualities. In traditional medicine, cabbage is frequently used to treat small wounds and wounds, mastitis, and symptoms related to gastrointestinal problems (e.g., gastritis, peptic and duodenal ulcers, irritable bowel syndrome). [6] Red cabbage methanolic extract shown anti-inflammatory effect by considerably lessening paw oedema in rats that was caused by formaldehyde. Prostaglandin, serotonin, or histamine synthesis inhibition could be the fundamental mechanism of action. The Brewer's yeast pyrexia model demonstrated noteworthy antipyretic effect in the same investigation (MERC). Forty The percentage reduction of abdominal constriction revealed by the abdominal writhing test following intraperitoneal acetic acid injection in mice indicated the effectiveness of MERC and its potential utility in pain relief. [7] The components of phytochemistry Alkaloids, tannin, terpenoids, glycosides, flavonoids, saponin, and phytosterols. [8]

Additionally, it can chelate oxidative metal ions like lead, avoiding their build-up in different tissues; additionally, it improves haematological parameters, reduces inflammation, and protects and repairs cells. [9]

### SYNONYMS

English : red cabbage, purple cabbage, red kraut or blue kraut after preparation

Hindi : laal pattha gobi; kannada : kempu elekosu ;

Malayalam : cuvanna kabej ;

Tamil : civappu muttaikkos ;

Telugu : Erra kyabeji ;

Marathi and gujrathi : lal kobi .

Bangla : lal bamdhakap

The genus *Brassica* is classified as: <sup>[10]</sup>

Kingdom	Plantae
Subdivision	Spermatophyta
Class	Angiospermae
Subclass	Dicotyledonae
Subclass	Dicotyledonae
Order	Papaverales
Family	Cruciferae or Brassicaceae
Genus	<i>Brassica</i>
Species	<i>Brassica oleracea</i>
Subspecies/var.	Capitata F. Rubra

### Macroscopy :

Color : purple / white /Greenish

Taste :bitter

Odour : characteristic <sup>[11]</sup>



### Chemical constituents:

Anthocyanins, a phenolic molecule found in red cabbage, are more abundant than other flavonoids. <sup>[12]</sup>Red cabbage is said to possess the highest antioxidant capacity due to its anthocyanins, which have 150 flavonoids in their strength. <sup>[13]</sup>The compounds found in red cabbage that give it these qualities include polyphenols, isothiocyanates (glucosinolates). The primary anthocyanin pigments found in red cabbage are cyanidin 3-sophoroside-5-glucoside and its acylated forms with ferulic acid, sinapic acid, p-coumaric acid, and malonic acid. <sup>[14]</sup>

Its main GLSs are glucoiberin, sinigrin, and glucoraphanin. Glucoraphanin is one of them; it is converted to sulforaphane, a well-known cancer chemopreventive ITC. <sup>[15]</sup>Red cabbage contains thiamin, riboflavin, folate, and vitamins A, C, K, and B. Dietary fibre, calcium, magnesium, manganese, iron, nickel, and zinc <sup>[16]</sup> Vit E carotene , tocopherol. <sup>[17]</sup>

### Method of application:

Phytonutrients, anthocyanins, and glutamine found in cabbage leaves have potent anti-inflammatory properties that can effectively relieve joint discomfort, bruising, swelling, and minor strains. A perfect remedy for sore, tired and over-worked feet.

1. Compressing cabbage is a really simple process.
2. You can use any variety of cabbage, including green and savoy.
3. After properly cleaning and removing the outer leaves from the cabbage, blot dry with a paper towel.

4. Cut off the tough stem and remove the cabbage leaves with a knife.
5. To unleash the natural fluids, gently roll and bruise the leaves with a rolling pin or wine bottle. Ensure that the leaves are sufficiently pliable to conform to your feet.
6. Directly cover the feet with the cabbage leaves and secure with gauze or saran wrap. Place your feet up and let the cabbage compress in place for a maximum of one hour. The leaves can also be applied before bed and left on the night.
7. Before starting the above procedure, chill the cabbage for a cold compress.

Warm leaves in the microwave for 15 to 30 seconds to make a compress. The heat will release the cabbage's juices, so there's no need to roll the warm leaves.<sup>[18]</sup>



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### Other applications:

#### *Anti-tumor*

Red or white cabbage was tested for its anticancer properties using human cervical cancer (HeLa) and hepatocarcinoma (HepG2). When compared to HepG2, the study showed that HeLa cells were more sensitive to the anticancer agent. In treated human cancer cells, it was discovered that red cabbage (RC) extract is a strong inducer of apoptosis via the caspase-dependent intrinsic and extrinsic pathways as well as the caspase-independent pathways. The ability to cause cell cycle arrest and apoptosis was present in RC extract. The primary method by which RC extract induced G1 cycle arrest involved the use of CDK inhibitor proteins (p21, p27, p53). The study additionally demonstrated elevated TNF $\alpha$  levels and implies that the growth inhibition observed in HepG2 and HeLa cells could partially stem from TNF's anticancer effects.<sup>[19]</sup>

Red cabbage may benefit liver cancer patients if their dietary consumption is increased, according to a study on a rodent model of the disease. The study's findings showed that red cabbage protected rats from developing hepatocellular carcinoma.<sup>[20][21]</sup>

Red cabbage's anticancer properties were further investigated in relation to human colon cancer cells, human hepatocellular carcinoma cell line, and human Caucasian breast adenocarcinoma.<sup>[22]</sup>

### **Hypnotic**

Red cabbage has been used in traditional medicine for its sedative, hypnotic, and anticonvulsive properties. It is also used in aromatherapy to treat insomnia and reduce stress.<sup>[23]</sup> Based on intensifying sleep, research was done on the hypnotic effect of red cabbage hydroalcoholic extract (HAE) and its fractions. When assessed using the rotarod test, it was discovered that the hypnotic effect of red cabbage HAE was similar to that of diazepam but did not reduce motor movement or have the same effect on muscular relaxation. The study also proposed that flavanoids' potentiation of the GABAergic system is the mechanism by which red cabbage's HAE prolongs sleep. According to the study's findings, red cabbage increases pentobarbital hypnosis without having any harmful side effects.<sup>[24]</sup>

### **Antiplatelet And Antioxidative Activity On Platelet**

The study demonstrated the antiaggregatory ability of anthocyanins in the presence of thrombin by clearly lowering 2 generation and blocking the metabolism of arachidonic acid, which produces malondialdehyde. The results of the same investigation showed that ATH extract of red cabbage reduced protein oxidation and nitration and had a protective impact on lipid peroxidation in blood platelets when the human blood platelets were subjected with strong oxidising agents, peroxynitrite and hydrogen peroxide. One way that anthocyanins protect cells from oxidative damage and preserve membrane integrity is through their antiradical action, which is achieved by preventing lipid peroxidation. It might be said that red cabbage's anthocyanins have antioxidative and antiplatelet properties, which may help prevent cardiovascular issues.<sup>[25]</sup>

### **Diabetic Nephropathy**

Red cabbage extract showed antihyperglycemic action in its treatment of diabetic nephropathy. It led to weight loss, the restoration of renal function, and the prevention and suppression of nephropathy symptoms. Malondialdehyde increased was reduced, and the effects of non-enzymatic antioxidants like glutathione and enzymatic antioxidants like superoxide dismutase enzyme and catalase were enhanced.<sup>[26]</sup>

### **Anti Inflammatory, Antipyretic And Analgesic**

Red cabbage methanolic extract shown anti-inflammatory effect by considerably lessening paw oedema in rats that was caused by formaldehyde. Prostaglandin, serotonin, or histamine synthesis inhibition could be the fundamental mechanism of action. The Brewer's yeast pyrexia model demonstrated noteworthy antipyretic effect in the same investigation (MERC). Forty The percentage reduction of abdominal constriction revealed by the abdominal writhing test following intraperitoneal acetic acid injection in mice indicated the effectiveness of MERC and its potential utility in pain relief.<sup>[27]</sup>

### **Hyperthyroidism**

Red cabbage extract was discovered to have a thyroid function-suppressive effect in a hyperthyroid mouse model. The extract boosted TSH and decreased the elevated levels of T3 and T4, which were changed after thyroxin, a drug that induces hyperthyroidism, was administered. There was an increase in the decreased body weight. Red cabbage extract, which the author speculates may be because of procyanidins, enhanced HMG-CoA reductase activity and normalised total cholesterol and triglyceride levels. Due to the red cabbage's anthocyanin content, several biochemical assessments carried out during the experiment revealed that the extract had a protective effect against renal and hepatocellular damage.<sup>[28]</sup>

### **Ulcerative Colitis**

The polyphenolic fraction extracted from red cabbage (PBO) demonstrated a noteworthy anti-inflammatory and cytoprotective effect when tested on lipopolysaccharide-stimulated HT-29 colonocytes and in a rodent model of ulcerative colitis. This was demonstrated by a notable decrease in inflammatory markers and cytokines. Rat colonic mucosa regenerates, goblet cells and mucin content increases when oxidative damage is prevented. These findings highlight the significance of PBO as a treatment for ulcerative colitis that reduces inflammation.<sup>[29]</sup>

### **Antiulcer**

Significant antiulcer activity was produced by the red cabbage methanolic extract when it was examined in ulcerogenic rats. The acquired data indicated lower lesion index values. In the pylorus ligation model 99, there was a notable decrease in gastric volume, total acidity, ulcer index, and an increase in the pH of the gastric juice. In ulcers caused by acetyl salicylic acid, 44% curation was seen, demonstrating its gastroprotective properties.<sup>[30]</sup>

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