



## CURCUMIN – A SALUBRIOUS ASSET TO IMMUNE SYSTEM

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### ABSTRACT

Ayurveda is the holistic and philosophical system of medicine which has been developed over thousands of years with usage of different types of herbs to cure diseases and ailments. India is the home of Ayurveda promotes natural health by herbs and spices. Turmeric, traditionally called as “Indian saffron” common ingredient used as spice in Indian cooking derived from the rhizomes of *Curcuma longa*, which is a member of ginger family (Zingiberaceae). Turmeric is the dried ground rhizome of *Curcuma longa* Linn. Curcuminoids comprise about 2-9% of turmeric. Curcumin is the most abundant curcuminoid in turmeric, consisting 75% of the total curcuminoids, while demethoxycurcumin provides 10-20% and bisdemethoxycurcumin, the polyphenol natural product generally provides < 5%. Curry powder contains turmeric along with other spices, but the amount of curcumin in curry powders is variable and often relatively low. Curcumin extracts are also used as food-coloring agent. Turmeric, derived from the plant *Curcuma longa*, is a gold-coloured spice widely used in the Indian subcontinent for health care as well as for the preservation of food and as a yellow dye for textiles. Since from the time of Ayurveda (1900 Bc) wide enormous therapeutic activities have been allocated to turmeric for a different types of diseases and conditions, including those of the skin, pulmonary, and gastrointestinal systems, wounds, sprains, liver disorders, aches and pains. This review encompasses about the origin and growth of turmeric along with its wide usage and key biological activities of curcumin. Advancements in modern science paved the basis for the practice of using curcumin therapy against many human diseases.

**Key words:** Turmeric, *Curcuma longa*, Indian saffron.

### INTRODUCTION

Turmeric is a member of the *Curcuma* botanical group belongs to the ginger family of herbs, the *Zingiberaceae*. By crushing and powdering the roots and rhizomes of *Curcuma longa* plant stem, ground turmeric with brown skin is obtained. Ground Turmeric is used worldwide as a seasoning and is the source of Curcumin. Curcumin which is brightly yellow coloured is the active ingredient in turmeric the traditional herbal remedy and dietary. Indian Turmeric is a common spice used to colour and flavour foods such as curries for many thousand years. The curcuminoids are natural phenols impart the yellow colour of turmeric. Curcumin is brightly yellow colored and may be used as a food colouring. Two centuries ago Vogel and Pelletier reported the isolation of “yellow coloring-matter” from the rhizomes of *Curcuma longa* (turmeric) and named it curcumin One of today’s most promising natural disease-fighting agent. Derived from the turmeric, curcumin has been used for millennia to target disease and promote good health [1-4].

### Chemical composition of Curcumin

*Curcuma longa* is the most chemically investigated species of *Curcuma*. 235 compounds, primarily phenolic compounds and terpenoids have been identified, including diarylheptanoids (including commonly known as curcuminoids), diarylpentanoids, monoterpenes, sesquiterpenes, diterpenes, triterpenoids, alkaloids, and sterols, etc [5].

### Benefits of Curcumin

Curcumin has been shown to be a powerful suppressor of chronic inflammation-mediated disease process and also for its anti-aging and medicinal benefits. Turmeric may be combined with good fats such as coconut oil, milk or olive oil and adding black pepper enhances curcumin uptake and better absorption.

- Has powerful anti-inflammatory action
- Ease the pain of tendinitis
- Strong anti-oxidant protecting the cells from radical

- damage by producing the master anti-oxidant glutathion
- Provides strong immune system support
- Helps to support your neurological system with stress reduction
- Maintains normal blood sugar levels
- Healthy liver functioning
- Assists to keep cholesterol levels normal
- Promotes healthy digestion
- Helps to remove toxins from your system
- Acts as a natural antiseptic and antibacterial agent
- Protects brain cells against damage (e.g. Alzheimer's and Parkinsons)
- Promotes healthy skin to prevent dermatitis, eczema, acne and psoriasis
- Provides anti-Tumor support Curcumin is undergoing clinical trial as an alternative for cancer treatment. Curcumin extract could be beneficial in many kinds of cancer such as breast cancer, colon cancer, skin cancer as well as prostate cancer
- Helps prevent Autism
- Reduces weight gain and suppresses fat production
- Supports a healthy female reproductive system
- Improves Cell Communication throughout the whole body [5-10]

### Sources of Curcumin

Curcuminoids exist as:

- Turmeric (*Curcuma longa*) - 22.21 - 40.36mg/g in the rhizomes and 1.94mg/g in the tuberous roots and in other *curcuma* species such as *phaeoacaulis* (0.098mg/g)
- Common Ginger (*Zingiber officinale*) and shampoo ginger (*Zingiber zerumbet*)

Commercially available extracts of 'curcumin' may not be wholly curcumin, instead a blend comprising of 77% curcumin (17% demethoxycurcumin, 3% bisdemethoxycurcumin, last 3% not classified but assumed to possess a cyclocurcumin content). Curcumin known to be NCB-02 (a standardized mixture of curcuminoids) or E100 (the code for curcumin in the usage of food coloring) [11-13].

### Extraction of curcuminoids

New rhizomes were selected, cleaned and washed with deionised water. It is then sliced suitably and sun dried for one week. It is dried at 50°C in a hot air oven for 6 hr. Selected rhizomes subjected to drying were cut in small pieces, powdered by electronic mill. Six gm of sample were taken into a thimble and placed in a Soxhlet apparatus, were set up with various solvent from non polar to polar. 250 ml of solvent was added and extracted according to their boiling point for seven hours. The solvents used were chloroform (B.P. =61°C), ethyl acetate (B.P. =77°C), methanol (B.P. =65°C) and acetone (B.P. =56.53°C). After completion of extraction the dark brown extract obtained was cooled, concentrated using rotary evaporator to get a crude dried extract. Each raw sample of turmeric was extracted by the same method [14].

### Therapeutic uses of curcumin

### Anti-inflammatory Activity

The metabolism of arachidonic acid in cell membranes plays an important role in the inflammatory response by generating potent chemical messengers known as eicosanoids. In inflammatory cells, such as macrophages, iNOS catalyzes the synthesis of nitric oxide, which can react with superoxide to form peroxynitrite, a reactive nitrogen species that can damage proteins and DNA. By modulating the activation of various transcription factors, curcumin regulates the expression of inflammatory enzymes, cytokines, adhesion molecules and cell survival proteins. Curcumin has been found to inhibit NF-κB-dependent gene transcription and the induction of COX-2 and iNOS in cell culture and animal studies [15-16].

### Anticancer Activity

Curcumin acts as immune - restorer in cancer prevention and treatment has emerged as one of the most avidly researched aspects of curcumin's potential benefits. Pancreatic cancer is a malignant neoplasm originating from transformed cells arising in tissue forming the pancreas. Curcumin potentiates the apoptosis in tumor cells by activation of caspase enzymes and diminishes the activation of many transcription factors involved in tumorigenesis [17]. Till now, most of the controlled clinical trials of curcumin supplementation in cancer patients have been at Phase I trials.

### Alzheimer's disease

Alzheimer's disease considered the most common form of dementia, which is defined as a serious loss of cognitive function in previously unimpaired persons, beyond what is expected from normal aging. Curcumin is capable of enhancing the clearance of the pathological amyloid-beta plaque in Alzheimer's disease patients and that in combination with vitamin D<sub>3</sub> the neurorestorative process is further enhanced. Mechanically Curcumin may be able to reduce the Beta-amyloid build up in neutral tissue. Researchers added low doses of curcumin to human Beta-amyloid proteins in a test tube, the compound kept the proteins from aggregating and blocked the formation of the amyloid fibers that make up Alzheimer's plaques [18,19].

### Antioxidant Activity

Curcumin may function indirectly as an antioxidant by inhibiting the activity of inflammatory enzymes or by enhancing the synthesis of glutathione, an important intracellular antioxidant. Curcumin acts as a free radical scavenger and antioxidant, inhibiting lipid peroxidation and oxidative DNA damage. Curcuminoids induce glutathione S-transferase and are potent inhibitors of cytochrome P450 [20]

### Amount of curcumin present in Turmeric

Curcumin is one of several curcuminoids, which are polyphenolic compounds, present in turmeric. Pure turmeric powder had the highest Curcumin concentration, averaging 3.14% by weight. Turmeric contains

approximately 2 percent Curcumin by weight, so a tablespoon of turmeric, which weighs 6.8 gms, contains about 0.136 gm Curcumin, or 136 mg.

In addition to Curcumin, turmeric also contains smaller amounts of the curcuminoids demethoxycurcumin and bisdemethoxycurcumin. Researchers have strong belief that Curcumin is to be the most biologically active curcuminoid in turmeric [21].

**Bioavailability of Curcumin**

It has a poor oral bioavailability and thus should be enhanced with other agents such as black pepper extract contains piperine.

**Dosage form**

Curcumin capsules are used for treatment of skin diseases and wound healing encapsulated in vegetarian shell. Best Curcumin C3 Complex supplies 95% total curcuminoids, including curcumin, bisdemethoxycurcumin and demethoxycurcumin.

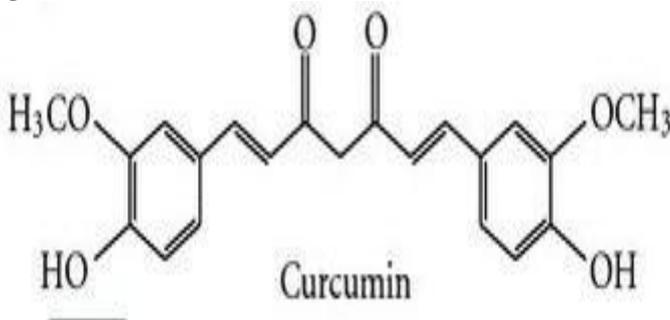
**Stability of Curcumin**

Curcumin is unstable at basic pH and degrades within 30 min to trans-6-(40-hydroxy-30-methoxyphenyl)-2,4-dioxo-5-hexenal, ferulic acid, feruloylmethane and vanillin. Above pH 7, curcumin's colour is pale yellow and more red [22].

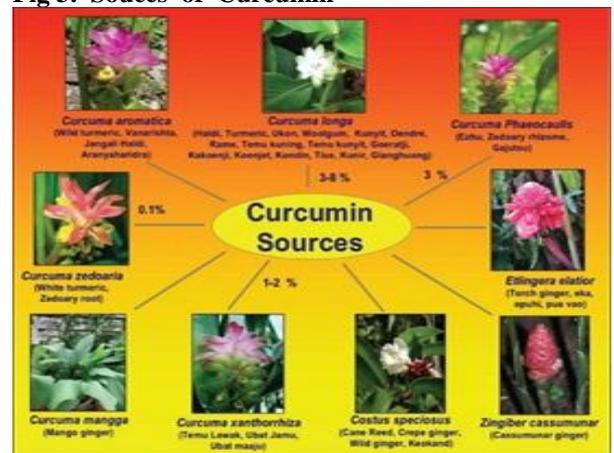
**Fig 1. Turmeric**



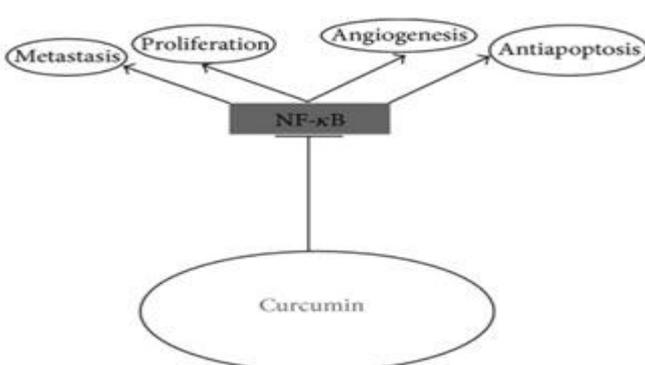
**Fig 2. Structure of Curcumin**



**Fig 3. Sources of Curcumin**



**Fig 4. Molecular targets of curcumin in pancreatic cancer cells**



**Fig 5. Role of curcumin in cancer cells**



**Fig 6. Curcumin capsules**



## CONCLUSION

Curcumin is impressing scientists around the world with its remarkable multiple health benefits. Extensive research over the last half century has revealed several important functions of Curcumin and its related chemicals (collectively known as curcuminoids) help to prevent and fight a wide range of diseases (from cancer to cardiovascular disease) through a variety of mechanisms. Many clinical trials evaluating the safety and efficacy of

Curcumin against human ailments and other research activities are still ongoing. Moreover, Curcumin is used as a supplement in several countries, including India, Japan, the US, Thailand, China, Korea, Turkey, South Africa, Nepal and Pakistan. Although inexpensive, apparently well tolerated and potentially active. Hence curcumin is helping to support our body against stress and providing immune system support in efficient way.

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