

A Review on Medicinal Benefits of Turmeric

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ABSTRACT: *Turmeric is a Zingiberaceae (ginger) family herbaceous evergreen plant. Turmeric (Curcuma longa) is widely used in India, China, and Southeast Asia as a spice, food preservative, and coloring agent. Turmeric powder is well recognized as one of the primary components in curry spice; it also contributes to the vivid yellow color of ballpark mustard. Turmeric has long been utilized in traditional medicine throughout the globe, in addition to its culinary applications. The primary yellow bioactive component of turmeric, curcumin (diferuloylmethane), has been demonstrated to have a broad range of biological effects. Anti-inflammatory, antioxidant, anticarcinogenic, antimutagenic, anticoagulant, antifertility, antidiabetic, antibacterial, antifungal, antiprotozoal, antiviral, antifibrotic, antivenom, antiulcer, hypotensive, and hypocholesteremia properties are only a few of them. Turmeric was a great natural antibacterial, disinfectant, anti-inflammatory, and painkiller for ancient Ayurveda's, and it was also often used to assist digestion, enhance intestinal flora, and cure skin irritations.*

KEYWORDS: *Antibacterial, Anticarcinogenic, Curcumin, Ginger, Turmeric.*

1. INTRODUCTION

Turmeric is a Zingiberaceae (ginger) family herbaceous evergreen plant. It is widely grown throughout Asia, mostly in India and China. Turmeric is said to have originated in India and has been used there for at least 2500 years. Turmeric is a plant that grows in the tropics and subtropics of the globe. The plant's origin is unknown, although it is believed to have originated in south-east Asia, most likely in India. In India, the plant is grown across the country. Although India produces the majority of the world's turmeric, it is also grown in southern China, Taiwan, Japan, Burma, and Indonesia, as well as throughout the African continent. Turmeric's popularity in Brazil has grown as a result of its color and capacity to enhance food odor. In Europe, the commercially accessible material (turmeric powder) comes mostly from India and a little amount from other south-eastern Asian nations. Southern Asia, especially India, is the most frequent location [1].

Turmeric is a sterile plant that never produces seeds. The shrub may reach a height of 3-5 feet and produces dull yellow blooms. Turmeric's rhizome, which is an underground stem that is thick and meaty and ringed with the roots of old leaves, has medicinal potential. To produce the unique bright yellow spice, rhizomes are cooked, dried, and powdered. Turmeric powder has a faint smell that is evocative of orange and ginger and has a peppery bitter flavor. While turmeric powder is well recognized as one of the primary components in curry powder, it also contributes to the brilliant yellow color of ballpark mustard. Apart from its culinary applications, turmeric has long been utilized in Indian, Pakistani, and Bangladeshi traditional medicine for its many health benefits. Turmeric was a good natural antibacterial, disinfectant, anti-inflammatory, and painkiller for ancient Ayurveda's, and it was also often used to assist digestion, enhance intestinal flora, and cure skin irritations. It has also been used as a widely accessible antiseptic for wounds, burns, and bruises in South Asia. However, folk medicine

claims that it has a number of additional therapeutic qualities. In Ayurveda and traditional medicine, the rhizome is widely utilized. Turmeric oleoresin is used to make curcumin, the yellow color pigment found in turmeric. Turmeric is a widely used spice that has long been known for its therapeutic qualities in Indian and Chinese medicine. It has long been used to treat a variety of illnesses [2] [3].

Since the beginning of civilization, medicinal plants have offered a dependable source for the development of new medicines as well as the treatment of illnesses. Curcuma turmeric is widely considered as a universal panacea in herbal therapy, having a broad range of pharmacological activities, according to a thorough review of the literature. It contains a number of beneficial qualities, including antioxidant activity, and may help with inflammation, ulcers, and cancer. The presence of different metabolites such as curcuminoid, oil content, flavonoids, phenolics, certain essential amino acids, protein, and a high alkaloid content shows that there is a link between its therapeutic benefits and the existence of these metabolites. Table 1 shows the biochemical composition of dried turmeric rhizomes, whereas Table 2 shows turmeric's biological activity. It has antifungal, antibacterial, antiparasitic, antimutagen, antimicrobial, and renal properties, as well as antifungal, antibacterial, antiparasitic, antimutagen, antimicrobial, and antimicrobial properties for allergies, arthritis, Alzheimer's disease, and other chronic and difficult-to-cure diseases. Turmeric essential oils have been proven to have antioxidant and antibacterial effects in many investigations [4].

Table 1: Illustrates the Biochemical content in dried turmeric rhizomes.

Curcumin	3.1-3.4%
Anthocyanins Phenols	18.9-37.0 g/g
Tannins	0.15- 0.62%
Protein content Sugars	0.32-0.76%
Oil Ash Moisture	3.6-6.8%
Curcumin	20.5-43.4%
Anthocyanins Phenols	3.7-5.3%
Tannins	6.9-9.8%
Protein content Sugars	90.2-91.3%

Table 2: Illustrates the Biological activity of turmeric and its compound.

S.no.	Compound/ extract	Biological activity
1	Turmeric powder	Antitumor, Ant protozoan Anti inflammatory and Wound-healing
2	Methylcurcumin	Anti protozoan
3	Demethoxycurcumin and Bisdemethoxycurcumin	Antioxidant
4	Volatile oil	Anti-inflammatory, Antibacterial, Antifungal
5	Curcumin	Antibacterial, Anti protozoan, Antiviral, Antitumor and Antioxidant

Curcumin is a potent antioxidant as well. Free radicals damage cell membranes, interfere with DNA, and even trigger cell death. Antioxidants scavenge these chemicals in the body. Antioxidants may combat free radicals and assist to mitigate or even prevent some of the harm they cause. Curcumin also reduces the amounts of two inflammation-causing enzymes in the body. It also prevents platelets from aggregating and forming blood clots.

1.1. Increase the antioxidants in body:

One of the processes that causes aging and a variety of diseases is oxidative damage. This mechanism's free radicals have a strong reaction with organic substances in our bodies, which may be harmful. Curcumin not only inhibits free radicals, but it also activates the antioxidant system in our bodies. This is undoubtedly one of the most important turmeric health advantages. Curcumin's antioxidant properties have been known since 1975. It works as an oxygen free radical scavenger. It has the ability to protect hemoglobin against oxidation. Curcumin also reduces the formation of reactive oxygen species (ROS) in the body. This is accomplished by keeping antioxidant enzymes including superoxide dismutase, catalase, and glutathione peroxidase active. Curcumin protects against oxidative damage during indomethacin-induced gastric lesion not only via preventing inactivation of gastric peroxidase, but also by scavenging H₂O₂ and OH radicals directly (unpublished observation). Curcumin's strong antioxidant action has the ability to regulate illnesses caused by reactive oxygen species (ROS), which have been linked to the development of a variety of pathological disorders.

2. LITERATURE REVIEW

K. Soni et al. discussed the effect of certain food additives on aflatoxin production by *Aspergillus parasiticus*. At doses of 5-10 mg/ml, extracts of turmeric (*Curcuma longa*), garlic (*Allium sativum*), and asafoetida (*Ferula asafoetida*) significantly reduced aflatoxin formation (by more than 90%). At concentrations of 0.1 mM, butylated hydroxytoluene, butylated hydroxyanisole, and ellagic acid had similar effects. Curcumin, an antioxidant found in the turmeric plant *Curcuma longa*, had no impact on aflatoxin formation. Aflatoxins B₁ (AFB₁) (5 g/day for 14 days) was shown to cause liver damage in ducklings, while turmeric and curcumin were found to cure the damage. These dietary additives significantly reduced fatty alterations, necrosis, and biliary hyperplasia caused by AFB₁ [5].

Louay Labban et al. discussed turmeric, also known as *Curcuma longa*, is a perennial plant that belongs to the Zingiberaceae (ginger) family and is widely grown in Asian nations. The rhizome is a yellow powder that is used medicinally as an anti-inflammatory and for the treatment of flatulence, jaundice, menstruation problems, hematuria, hemorrhage, and colic. It may also be used as an ointment to treat a variety of skin disorders. The flavonoid curcumin (diferuloylmethane) and other volatile oils, such as tumerone, atlantone, and zingiberone, are the active ingredients in turmeric. Turmeric and its curcumin component have high antioxidant activity, similar to vitamins C and E, in both water and fat soluble extracts. Turmeric's hepatoprotective effects are mostly due to its antioxidant capabilities, which increase cellular resistance to oxidative damage and reduce the production of proinflammatory cytokines. When compared to controls, curcumin substantially reduced liver damage in test animals. In addition to the effect of turmeric and curcumin in correcting biliary hyperplasia, lipid alterations, and necrosis, turmeric extract reduced fungal aflatoxin formation by 90%. Oral administration of

curcumin has been shown to help with diabetes, cancer, gastrointestinal problems, and neurological illnesses in studies[6].

2.1. Medicinal and Pharmacological Properties of Turmeric

Figure 1 shows the diseases that can be prevented by the medicinal properties of turmeric such as cancer, heart attack, indigestion, obesity, diabetes, arthritis, skin diseases.

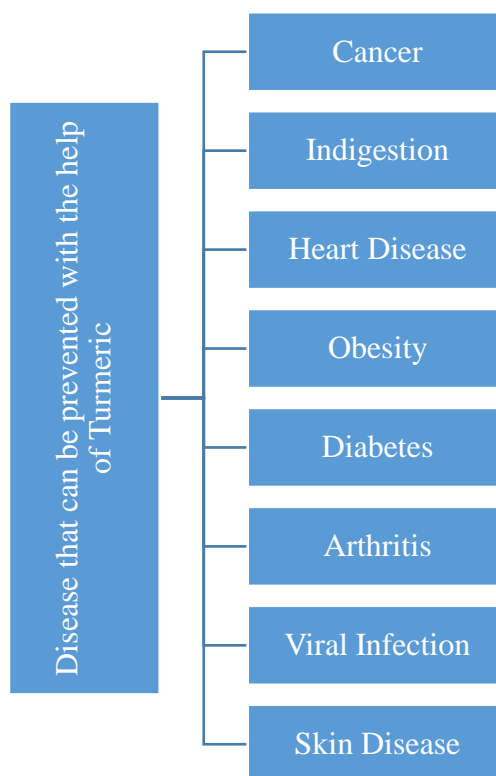


Figure 1: Illustrates the disease that can be prevented with consumption of turmeric.

2.1.1. Cancer:

Cancer Turmeric's anti-cancer effects have been studied extensively, although the findings are still preliminary. Cancer should be treated using standard treatments. Curcumin has been proven to be effective in the treatment of cancer utilizing herbs in many trials. On a molecular level, it may affect cancer cell proliferation, development, and dissemination. Curcumin is a powerful anticarcinogenic agent. Induction of apoptosis is one of the mechanisms that contributes to its anticarcinogenic properties. In rat aortic smooth muscle cells, it promotes apoptosis and slows cell-cycle progression, both of which are important in limiting malignant cell development. Curcumin also prevents colon cancer by stopping the cell cycle from progressing without inhibiting prostaglandin production. Curcumin inhibits human breast cancer in a variety of methods. Curcumin inhibits proliferation in a variety of leukemia, nontransformed haematopoietic progenitor cells, and fibroblast cell lines in a nonselective manner. Nitric oxide (NO) and its derivatives are important in the stimulation of tumor growth. After a lengthy period of therapy, curcumin enhances NO generation in NK cells, resulting in a greater tumoricidal impact. Curcumin also inhibits tumor development in a variety of ways. Curcumin-induced apoptosis in human colon cancer cells and the involvement of heat shock

proteins (hsp) in this process was recently discovered⁹⁴. SW480 cells were transfected with hsp 70 cDNA in either the sense or antisense direction in this research, and stable clones were chosen and evaluated for curcumin sensitivity. Curcumin was found to be ineffective in causing apoptosis in cells with hsp 70, but antisense hsp 70 cells were highly sensitive to apoptosis induced by curcumin, as measured by nuclear condensation, mitochondrial transmembrane potential, release of cytochrome c, activation of caspase 3 and caspase 9, and other apoptosis-related parameters [7].

2.1.2. Indigestion:

Curcumin increases the production of bile in the gallbladder, which some believe may aid digestion. Turmeric has been authorized for digestive issues by the German Commission E, which decides which plants may be safely administered in Germany. Turmeric also decreased bloating and gas sensations in individuals with indigestion, according to a double-blind, placebo-controlled research. Turmeric powder has a stomach-friendly effect. In rabbits, it stimulates mucin production, perhaps acting as a gastroprotectant against irritants. Curcumin's antiulcer activity, on the other hand, is a source of debate. Curcumin has been shown to have antiulcer and ulcerogenic properties, although further research is needed.

2.1.3. Heart Disease:

Maintaining a healthy cholesterol level is critical for avoiding cardiovascular problems and other severe health issues. People are constantly searching for methods to reduce their cholesterol levels since they may be extremely harmful to their health. The simple act of seasoning your meal with turmeric has been demonstrated in studies to substantially reduce blood cholesterol levels. Early research indicated that turmeric may help prevent atherosclerosis, which is the buildup of plaque in arteries that can lead to heart attack or stroke. An extract of turmeric reduced cholesterol levels and prevented LDL "bad" cholesterol from forming in blood arteries in animal experiments. Turmeric may prevent blood clots from forming along the walls of arteries by preventing platelets from clumping together. However, a placebo-controlled, double-blind research showed that consuming curcumin, the key component in turmeric, at a dosage of up to 4 g per day had no effect on cholesterol levels. In hypercholesteremic rats, curcumin exerts a substantial hypocholesteremic impact [8].

2.1.4. Management of Obesity:

People who want to shed a few pounds or treat obesity or other similar conditions may benefit from turmeric powder, which can aid in maintaining a healthy body weight. Turmeric contains a compound that aids in the production of bile, which is necessary for the breakdown of dietary lipids.

2.1.5. Controlling Diabetes:

Turmeric improves blood sugar management and enhances the effectiveness of diabetic medicines. It also reduces the body's insulin resistance, which may help prevent Type 2 diabetes.

2.1.6. Relieve from arthritis:

Turmeric contains anti-inflammatory and antioxidant qualities that help to remove free radicals, which are responsible for cell damage in the body. People who suffer from arthritis may benefit greatly from consuming turmeric because of its characteristic.

2.1.7. Bacterial and Viral Infections:

Turmeric has been shown to destroy germs and viruses in test tubes and on animals. However, scientists are unsure if it would work in humans. Turmeric rhizome aqueous extract possesses antimicrobial properties. In vitro, curcumin inhibits the development of *Helicobacter pylori* CagA+ strains. Curcumin and the oil fraction both inhibit the development of germs such as *Streptococcus*, *Staphylococcus*, *Lactobacillus*, and others. Curcumin has been shown to have antiviral properties. It is an effective Epstein-Barr virus inhibitor (EBV). Curcumin is also anti-HIV (human immunodeficiency virus) because it inhibits the HIV-1 integrase, which is required for viral replication. It also stops HIV gene expression from being triggered by UV light¹²⁷. As a result, curcumin and its analogues may be used to create new HIV drugs [9].

2.1.8. Antifungal Property:

Extracts of ether and chloroform, as well as turmeric oil, have antifungal properties. Antifungal action is also shown in crude ethanol extract. *Aspergillus flavus*, *Aspergillus parasiticus*, *Fusarium moniliforme*, and *Penicillium digitatum* are all susceptible to turmeric oil.

2.1.9. Skin Treatments:

Turmeric offers many skin advantages, including speeding up the healing process of wounds and relaxing pores on the face to decrease acne. It contains antioxidant and anti-inflammatory qualities, making it ideal for treating skin issues.

3. DISCUSSION

Another difficulty in interpreting research on healthy individuals is defining what it means to be healthy, particularly when persons who do not have an official diagnosis may nevertheless engage in activities or encounter circumstances that disrupt their everyday physiological homeostasis. An unfamiliar workout regimen, for example, may induce inflammation, oxidative stress, and subsequent pain. In a recent research, 28 healthy people who didn't undertake any resistance training were randomly allocated to receive either curcumin (400 mg/day) or placebo for two days before and four days after doing an eccentric exercise intended to cause muscular soreness. When compared to the placebo, curcumin administration resulted in substantially lower increases in creatine kinase (CK) (48%) TNF- (25%) and IL-8 (21%) after exercise. There were no significant changes between the conditions in terms of IL-6, IL-10, or quadriceps muscle pain. Curcumin intake decreased biological inflammation but not subjective quadriceps muscle pain after workout recovery, according to the results. This may aid in reducing recuperation time and therefore increasing performance during future workouts.

Twenty healthy, moderately active male volunteers were randomized to consume either 1 g curcumin twice day (200 mg curcumin twice daily) or a placebo 48 hours before and 24 hours after a downhill running test in a comparable randomized placebo-controlled single-blind pilot study. Curcumin-treated participants reported substantially reduced discomfort in the right and left anterior thighs. The curcumin group had significantly fewer individuals with MRI evidence of muscle damage in the posterior or medial compartments of both thighs. Increases in indicators of muscle injury and inflammation were lower in the curcumin group, although only interleukin-8 showed a meaningful difference at 2 hours after exercise. There were no changes in oxidative stress indicators or muscle histology. These findings support the theory that curcumin may help to reduce exercise-induced muscular pain (DOMS).

Curcumin has a long history of being safe. Curcumin's Allowable Daily Intake (ADI) value is 0–3 mg/kg body weight, according to JECFA (The Joint United Nations and World Health Organization Expert Committee on Food Additives) and EFSA (European Food Safety Authority) studies. Curcumin's safety and effectiveness have been shown in a number of studies on healthy people. Despite the fact that the drug's safety has been proven, certain undesirable side effects have been recorded. In a dosage response trial, seven individuals who received 500–12,000 mg and were monitored for 72 hours suffered diarrhea, headache, rash, and yellow stool. In another research, those who took 0.45 to 3.6 g of curcumin per day for one to four months had nausea and diarrhea, as well as an elevation in blood alkaline phosphatase and lactate dehydrogenase levels [10].

4. CONCLUSION

Turmeric has been utilized in Ayurvedic medicine for thousands of years and has a wide range of biological applications. Researchers are now interested in using natural products to treat a variety of illnesses. Although some work has been done on potential medical applications, there hasn't been much research done on medication development as of yet. Curcumin is a non-toxic, high-potential natural antioxidant with a broad range of biological activities. Curcumin is now accessible in pure form, demonstrating a broad range of biological activities. Following considerable research into its mechanism of action and pharmacological effects, it will be simpler to create new medicines based on this molecule. Curcumin is anticipated to be used as a new medication to treat a variety of diseases, illnesses, and oxidative stress in the near future.

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