



THE HEALTH BENEFITS OF CURCUMIN: A REVIEW

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ABSTRACT:

Turmeric, which means “Haldi” in Hindi, has been used in India since ancient times for its numerous health benefits. It has a veritably important place in Ayurveda. It belongs to the Zingiberaceae family. The most important part of the turmeric tuber is the curcuminoids, a group of bioflavonoids (curcumin, bisdemethoxycurcumin and demethoxycurcumin). Curcumin has numerous health benefits, including anti-inflammatory, anticancer and gastroprotective parcels. Turmeric has long been used as a home remedy for coughs, sore throats, and other respiratory infections. The end of this review is to emphasize the significance of curcumin for mortal health.

Keywords: Turmeric, curcumin, curcuminoids, anti-inflammatory, anticancer.

[1]INTRODUCTION:

Turmeric is an Indian medicinal rhizome (*Curcuma longa*) with well-known properties. Turmeric is a plant acknowledged for its medicinal purpose. It has been extensively used since the Vedic subculture of India nearly four thousand years ago, wherein it is used as a spice and had some non-secular significance.

Curcumin is understood and used in lots of forms around the globe and has many fitness blessings. For example, in India, turmeric (containing curcumin) is used in curries; In Japan, it is delivered in the form of tea; It is used as a preservative in Malaysia and as an anti-inflammatory agent in Pakistan. Curcumin is used in many paperwork, consisting of tablets, ointments, beverages, soaps, and lotions. Curcumin is a symmetrical molecule additionally known as diferuloylmethane. The IUPAC name of this compound is (1E-6E)-1,7-bis(four-hydroxy-three-methoxyphenyl)-1,6 heptadiene-3,5dione.

The medicinal value of turmeric is attributed to the presence of the major component curcumin. Curcumin, demethoxycurcumin (DMC) and bisdemethoxycurcumin (BDMC) are known as curcuminoids. These yellow curcuminoids are remoted from turmeric rhizomes. The major component is curcumin, a small molecular weight polyphenolic compound that is lipophilic in nature, insoluble in water and ether, but soluble in ethanol and different organic solvents. Curcumin is stable in the acidic pH of the stomach. Other additives present include crucial oils such as atlantone and zingerone, as well as sugars, proteins and resins. Curcumin is isolated from turmeric and offers its colour. Diferuloylmethane, it is a tautomeric compound observed inside the enol form in natural solvents and in the ketone form in water.

The chemical formula of curcumin is $C_{21}H_{20}O_6$ and its molecular weight is 368.385 g/mol. The shape of curcumin has 3 chemical entities: oxygen-substituted aryl moieties containing o-methoxyphenol OH-groups, linked to a seven-carbon chain consisting of α and β unsaturated β -diketone moieties. Curcumin has three major extracts- Curcumin (60–70%), demethoxycurcumin (20–27%), and bisdemethoxycurcumin (10–15%). In this review, we will thoroughly discuss about curcumin and its health benefits.

[2] HEALTH BENEFITS:

2.1 Antioxidant Activity:

Curcumin has been proven to enhance markers of oxidative stress by way of modulating the pastime of GSH, catalase, and SOD enzymes, which help to neutralize unfastened radicals. There is proof that it increases the activity of antioxidants along with superoxide dismutase (SOD). Effects of curcumin supplementation on all parameters of oxidative stress, including plasma interest of SOD and catalase and blood concentrations of glutathione peroxidase (GSH) and lipid peroxides. All research protected in the metanalysis used some components to conquer bioavailability problems, with piperine utilized in four of the six research. Curcumin's impact on free radicals is achieved through special mechanisms. It scavenges many varieties of free radicals, such as reactive oxygen species and reactive nitrogen species (ROS and RNS, respectively), and additionally inhibits ROS producing enzymes inclusive of lipoxygenase/cyclooxygenase and xanthine hydrogenase/oxidase. Curcumin is a lipophilic compound that makes it powerful towards peroxy radicals, and therefore, like nutrition E, curcumin is taken into consideration an antioxidant.

2.2 Anti-Inflammatory Activity:

Oxidative pressure is associated with many diseases, and its pathological process is closely associated with the inflammation of one disorder and can lead to another. In reality, it is regarded that inflammatory cells purpose oxidative pressure by way of secreting many reactive chemical substances within the infection location, displaying the relationship among oxidative stress and inflammation. In addition, numerous reactive oxygen species/ reactive nitrogen species can provoke intracellular signalling cascades, thereby increasing gene expression. Inflammation has been proven to be associated with the development of many illnesses and conditions. These sicknesses encompass Alzheimer's disease (AD), Parkinson's disorder, multiple sclerosis, epilepsy, mind ailment, heart sickness, metabolic ailment, most cancers, allergic reaction, bronchial asthma, bronchitis, colitis, arthritis, renal ischemia, psoriasis, diabetes, weight problems. Tumour necrosis factor alpha (TNF α) is the main healing agent of inflammation in most diseases and acts by way of activating nuclear transcription factor [NF- κ B]

Although TNF α is stated to be the most amazing inhibitor of NF- κ B, TNF α expression is also regulated through NF- κ B. In addition to TNF α , many of the cytokines additionally reason Gram negative micro-organism; other causal factors. Therefore, capsules that downregulate NF κ B and products regulated by means of NF κ B have the capability to be effective in many of these illnesses. Curcumin has been proven to prevent activation of NF κ B through several different stimuli. Curcumin has additionally been proven to inhibit inflammation through numerous mechanisms supporting its mechanism of motion as an anti-inflammatory agent.

2.3 Anticancer activity:

Transcription factor of NF- κ B performs an essential position in the development of tumours and infection, and most chemists and entomologists makes intention to reduce its overuse. Curcumin blocks IKK activation, phosphorylation and I κ -B α degradation. Various curcumin analogs were taught in the laboratory to increase their effectiveness in blocking NF- κ B. Curcumin inhibits the production of androgen-independent prostate cancer cells through ERK1/2 and SAPK/JNK-mediated p65 inhibition after reducing MUC1-C protein expression. MUC1-C is a protein overexpressed in prostate cancer. To check the anticancer activity, growth of the bioavailability of curcumin nanoparticles were observed and study its impact on cytotoxicity in opposition to tumour cells, e.g. Breast cancer cells (MDA-MB 231). Within forty-eight hours of curcumin management, more than 50% of brain cells died.

2.4 Antibacterial properties:

Antibacterial research on curcumin shows that curcumin can inhibit the development of various microorganism and *Porphyromonas gingivitis* Arg- and Lys-specific proteinase (as RGP and KGP). Additionally, curcumin avoided *P. gingivitis homotypic* and *Streptococcus gordonii* biofilm formation in a single dose. At low curcumin concentrations, bacterial growth is sort of absolutely inhibited. Curcumin at a concentration of 20 μ g/mL inhibited *P. aureus*. The amount of biofilm formation in gingivitis is over 80%. On the opposite hand, 100 μ g/mL curcumin did not inhibit the increase of *A. actinomycetes*. Additionally, at excessive concentrations of curcumin, it goals microorganism such as *E. coli*.

2.5) Prevention of diabetes:

Diabetes mellitus (DM) has reached epidemic proportions and lots of studies have been completed to develop fewer antidiabetic drugs. Curcumin is promising for stopping diabetes, and curcumin intervention in prediabetic people may reduce the danger of type 2 diabetes. Additionally, curcumin is any other way to prevent and treat diabetes and different headaches including diabetic retinopathy. Enzymes that manage high blood sugar. Curcumin additionally has a useful effect on insulin producing and insulin responsive tissues along with liver, skeletal muscle and adipose tissue. Computerized molecular docking confirmed that curcumin has a higher impact on alpha amylase than different herbal ingredients including quercetin and berberine. After hyperglycaemic mice took curcumin, their common blood sugar degrees dropped. Additionally, diabetic rats confirmed development in glucose tolerance and insulin sensitivity after curcumin remedy. At the identical time, curcumin accelerated Akt phosphorylation degree and glucose transporter type 4 (GLUT4) transcription in skeletal muscle. In addition, in diabetic rats dealt with with curcumin for 12 weeks, the absence of lymphocyte infiltration in the pancreatic islets and the increase in the islets of Langerhans near the pancreatic ducts imply that the pancreatic disease has advanced. (Surbhi Rathore, 2020)

2.6) Anti-arthritis activities:

Osteoarthritis (OA) is a joint disease associated with continual ache and infection. It affects extra than 250 million humans worldwide, inflicting expanded healthcare costs, impairment of activities of daily living (ADLs), and ultimately decreased great of existence. Although OA turned into as soon as notion to be frequently a degenerative and non-infectious ailment, it is now thought to be inflammatory with high tiers of cytokines and may be related to inflammation. Although there is no cure, many medicines are available; However, many techniques are high priced and have negative side effects. Therefore, there is hobby in alternative remedies, which include weight loss program and herbs. Several research have shown that curcumin has anti-inflammatory residences in patients with OA and rheumatoid arthritis (RA). (January, 2020)

2.7) Prevention of obesity:

Curcumin, which improves outcomes, forms the idea of research on overweight people with the aid of improving the blood lipid profile and fat content of handled human beings. Only some clinical studies have reported the effect of curcumin on obesity. The first study investigated the consequences of oral curcumin supplementation on lipid parameters, BMI, and blood sugar in obese individuals. The effects showed that once 30 days of curcumin management, handiest

TG stages changed considerably, even as others remained unchanged. BMI and weight reduction were additionally recorded in NAFLD sufferers in this have a look at. Results showed that turmeric supplementation at a dose of two.8 g in step with day for 4 weeks did not regulate oxidative pressure or inflammatory diseases in obese/overweight women and did now not cause major adjustments in the normal metabolic profile. (Surbhi Rathore, 2020)

2.8) Wound healing:

Invented curcumin maintenance critical aspects of wound recovery, which include epithelial regeneration, neovascularization, collagen synthesis and granulation tissue formed. It can also inhibit the increase of micro-organism in the course of the fourteenth day remedy duration, along with *Pseudomonas aeruginosa*, the primary micro-organism inside the isolation takes a look at. It is powerful towards burns and promotes wound recovery in mice. Growth factors play a function within the curcumin-inspired wound recovery system.

[3] SIDE EFFECTS OF CURCUMIN:

Living with curcumin through day-by-day food regimen for hundreds of years seems to have reassured people of its safety. Curcumin has turn out to be one of the global's maximum famous dietary supplements, with an increasing number of purchasers choosing herbal plant derived components. Several clinical studies assist the safety and effectiveness of curcumin. Although its safety has been confirmed, a few bad side results were mentioned. In a scientific study, seven humans taking 500 to12,000 mg and monitored for 72 hours experienced diarrhoea, headaches, bloating, and yellow stools. In another study, some humans taking 0.45 to three.6 grams of curcumin each day for one to 4 months mentioned nausea, diarrhoea, and elevated degrees of blood alkaline phosphatase and lactate dehydrogenase.

CONCLUSION:

Curcumin has gained worldwide attention due to its numerous health benefits, which appear to work substantially through its antioxidant and anti-inflammatory parcels. The results are achieved when curcumin is combined with medicines similar as piperine, therefore adding its bioavailability. exploration shows that curcumin helps control oxidation and inflammation, metabolic pattern, arthritis, anxiety, and hyperlipidaemia. It may also help manage exercise induced pain and muscle soreness, therefore perfecting recovery and postexercise performance in active individuals.

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