



Review Article

THE AMAZING PHARMACOLOGICAL PROPERTIES OF HARIDRA- A SHORT REVIEW

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ABSTRACT

Curcuma longa L. is commonly called as *Haldi*, it is frequently used as spice in our kitchen. In India, turmeric is used in almost all curries and gravy dishes. It gives a rich colour and a unique flavour to the food. Women in India use turmeric in skin products such as creams and body scrubs to boost the glow factor. It has many therapeutic properties like Hepato-protective, Gastro-protective, Anti-cancerous, Anti-inflammatory, anti-oxidant and skin glow enhancing etc. The wide range of turmeric health benefits come mainly from its main ingredient, curcumin. Curcumin (diferuloylmethane) is a polyphenol responsible for the yellow colour of turmeric. In vitro, curcumin exhibits anti-parasitic, anti spasmodic, anti-inflammatory and gastrointestinal effects, and also inhibits carcinogenesis and cancer growth. In vivo, there are experiments showing the anti-parasitic, anti-inflammatory potency of curcumin and extracts of *Curcuma longa* L. by parenteral and oral application in animal models. This widely researched component of turmeric is highly therapeutic and is used in various drugs and pharmaceuticals. This article briefly reviews the pharmacological and various therapeutic aspect of turmeric.

INTRODUCTION

There are many herbal medicines, which are also use as a spice in our Kitchen. These herbs has many active constituents along with minerals, vitamins, oils present which definitely useful for human beings and animals. Either there are so many herbal medicines individually or in combination which are being used in various medical treatise for the cure of different ailments. *Curcuma longa* L. is one of them which are commonly used in Ayurvedic and unani system.

Vernacular Names

Hindi Name	: Haldi, Hardi
Telugu Name	: Pasupu, Pasupu kommulu
English Name	: Turmeric
Tamil Name	: Manjal
Kannada Name	: Arishina
Punjabi Name	: Hardal
Bengali name	: Halud
Gujarati name	: Haladar
Marathi name	: Halad
Arabian name	: Kumkum
Farsi name	: Zardchob
Binomial name	: <i>Curcuma longa</i>
Family	: Zingiberaceae
Genus	: <i>Curcuma</i>

Species : *C. longa*

Sanskrit Synonyms: *Haridra*, *Kanchani*, *Nisha*, *Yoshitpriya*, *Varavarnini*, *Hattavilasini*, *Krimighni*, *Peeta*, *Gauri*.^[1]

Classical Categorization^[1]

As per Charaka: *Lekhaneeya gana*, *Kushtaghna*, *Kandughna*, *Krimighna*, *Shirovirechana gana*.

As per Sushruta: *Haridradi*, *Mustadi*, *Slesmashamana gana*.

As per Vagbhata: *Haridradi*, *Mustadi gana*.

Morphology

Turmeric is an erect perennial herb, but is grown as an annual. The leaves shoots rarely exceed 1m in height and are erect, bearing 6-10 leaves with the leaf sheaths forming a pseudo-stem. The thin petiole is rather abruptly broadened to the sheath.

Lamina is lanceolate, acuminate and thin, dark green above and pale green beneath with pellucid dots. It is usually up to 30cm long and 7-8 cm wide, and is rarely over 50 cm long.^[2]

Leaves

The leaves are borne in a tuft, and are about 2 feet tall, but frequently shorter. They are thin,

rather flaccid, and light green in colour, lanceolate acuminate, with rather a long leaf stalk. There are usually six to ten to a tuft and several tufts to a rhizome.^[2]

Inflorescence

Cylindrical spike, 10-15 cm long and 5-7 cm wide which is terminal on the leaf shoot with the scope partly enclosed by the leaf sheaths.

The spikes are shorter than the leaves and supported by a stout peduncle. They consists of a great number of thin, greenish-white, ovate bracts, the upper most being usually pink and rather longer than the lower ones. The upper bract is sterile and white or white streaked with green, pink-tipped in some cultivars.^[2]

Flowers

In each bract there are two flowers opening one at a time Flowers are thin -textured and fugacious, white or yellowish white, with a broad yellow band down the centre of the lip.^[2]

The calyx is short, unequally toothed and split nearly half-way down one side. The corolla is tubular at the base with the upper half cup-shaped with three unequal lobes inserted on the edge or the cup lip; it is whitish, thin and translucent with the dorsal lobe hooded.

There are two lateral staminoides, elliptic-oblong, creamy white in colour, and with the inner edges folded under the hood of the dorsal petal. The lip or labellum is obovate with a broad thickened yellow band down the centre and thinner creamy white side-lobes up curved and over lapping the staminoides.

The filament of the stamen is short and broad, united to a versatile another about the middle of the parallel pollen sacs.

The ovary is inferior and trilocular with a slender style passing between other lobes and held by them.

Rhizome

The plant possesses an underground stem or rhizome, which is thick and rounded, with short blunt fingers.

It also emits slender branches, which develop into thickened tuberous portions.

The outside of the rhizome, which is usually rather closely ringed, is brown and scaly.

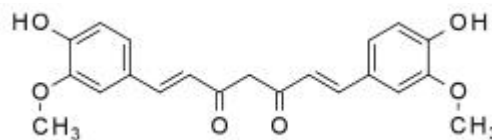
The inside is of a bright orange colour, and possesses a very distinct odour and taste. The rhizome is the portion used as a spice, under the name of turmeric.

The main part of the rhizome is known as long turmeric. The tuberous portions are known as round turmeric.

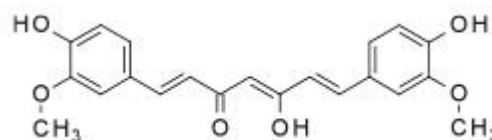
Biochemical composition

The most important chemical components of turmeric are a group of compounds called

curcuminoids, which include curcumin (diferuloylmethane), demethoxycurcumin and bisdemethoxycurcumin. The best studied compound is curcumin, which constitutes 3.14% (on average) of powdered turmeric.^[3] In addition there are other important volatile oils. such as turmerone, atlantone, andzingiberene. Some general constituents are sugars, proteins and Resins.^[4]



Curcumin keto form



Curcumin enol form

Curcumin (diferuloylmethane), a polyphenol compound responsible for the bright yellow color of turmeric, is believed to be the principal pharmacological agent. It is prepared from the roots of *Curcuma longa*.^[5] In addition to curcumin, turmeric contains the curcuminoids atlantone, bisdemethoxycurcumin, demethoxycurcumin, diarylheptanoids, and tumerone. Turmeric also contains sesquiterpenoids and the constituent ar-tumerone^[6]. Other constituents include sugars, resins, proteins, vitamins, and minerals (including iron and potassium).

Pharmacodynamics/Kinetics

Absorption: Animal research shows that the absorption of curcumin after oral administration varies from 25-60%, with most of the absorbed flavonoid being metabolized in the intestinal mucosa and liver.^[7] The remainder is excreted in the feces.^[8]

Distribution: Based on a clinical trial, Garcea et al. report that a daily dose of 3.6g curcumin may achieve pharmacologically efficacious levels in the colorectum with negligible distribution of curcumin outside the gut.^[9]

Pharmacodynamics: In rats, curcumin is reported to be a potent inhibitor of cytochrome P450 (CYP) 1A1/1A2, a less potent inhibitor of CYP 2B1/2B2, and a weak inhibitor of CYP 2E1.^[10] Inhibition of cytochrome P450 has also been demonstrated in vitro. Turmeric may decrease hepatocyte glutathione levels^[11]; curcumin appears to induce glutathion-S-transferase activity in mice^[12].

Curcumin, a constituent of turmeric, completely inhibited mycelial growth of *Aspergillus alliaceus* isolate 791 at 0.1% (w/v) and decreased ochratoxin A production by approximately 70% at 0.01% (w/v).^[13]

In the checkerboard test, the ethyl acetate extract of *Curcuma longa* L. markedly lowered the MICs of ampicillin and oxacillin against methicillin-resistant *Staphylococcus aureus* (MRSA).⁴ In the bacterial invasion assay, MRSA intracellular invasion was significantly decreased in the presence of 0.125-2mg/mL of *Curcuma longa* extract compared to the control group.

Uses of Turmeric

Turmeric is considered as a digestive bitter and a carminative. It can be added into foods including rice and bean dishes to improve digestion, reduce gas and bloating. It is a cholagogue, stimulating bile production in the liver and encouraging excretion of bile via the gallbladder. This improves the body's ability to digest fats. It is commonly used as a food coloring and is one of the basic ingredients in curry powder. To heal many health disorders like liver problems, digestive disorders, treatment for skin diseases and wound healing turmeric has long been used in Medicinal as an anti-inflammatory.

Turmeric is anti-inflammatory to the mucous membranes, which coat the throat, lungs, stomach and intestines. Regular use of turmeric can benefit from Colitis, Crohn's disease, diarrhea, and post-giardia or post salmonella conditions. The itching and inflammation that accompanies hemorrhoids and anal fissures can reduce by use of turmeric. Turmeric can also benefit skin conditions including: eczema, psoriasis and acne, for those it is potent detoxifier.

Apart from therapeutic uses, turmeric is also used as an important spice, in beauty products and in spiritual ceremonies.

In India, turmeric is used in almost all curries and gravy dishes. It gives a rich color and a unique flavor to the food.

Turmeric is a great pesticide. Sprinkle turmeric (powder) water near all the entry points of house in order to prevent entry of insects, ants and termites.

Adding turmeric to meat can reduce the levels of cancer causing heterocyclic amines (HCAs) by up to 40 percent, according to researchers from Kansas State University.

Women in India use turmeric in skin products such as creams and body scrubs to boost the glow factor.

Turmeric has an important place in Indian weddings. Turmeric paste is applied to the bride and the groom as part of the *Haldi* ceremony just before the wedding to give them fresh glowing skins and to ward off the evil eye. Turmeric is considered a symbol of purity, prosperity, and fertility. Turmeric water is poured / offered to the gods in the temples as a part of Hindu ritual called *Abhishekam*.

The color yellow is considered sacred and auspicious in India. The cloths dyed in turmeric are

considered pure.

Researches and studies

Alzheimer's effects

Beta-Amyloid (betaA)-induced oxidative stress is a well-established pathway of neuronal cell death in Alzheimer's disease.^[14] Three curcuminoids from turmeric (*Curcuma longa* L.), including curcumin, demethoxycurcumin, and bisdemethoxycurcumin, were found to protect PC12 rat pheochromocytoma and normal human umbilical vein endothelial (HUVEC) cells from betaA(1-42) insult. These compounds may protect the cells from betaA(1-42) insult through antioxidant pathways. Other animal studies of Alzheimer's disease also suggest that curcumin may reduce levels of amyloid and oxidized proteins and prevent cognitive deficits.^[15]

Anti-inflammatory effects

Turmeric has been associated with the inhibition of tumor necrosis factor- α , interleukin-8, monocyte inflammatory protein-1, interleukin-1B, and monocyte chemotactic protein-1^[16]. Turmeric and its constituent curcumin have been found to inhibit lipoxygenase and cyclo-oxygenase in rat tissues and in vitro, as well as thromboxane B219 and leukotriene B4 formation^[17]. Based on animal study, oral administration of curcumin may reduce expression of several cytokines, chemokines, and proteinases known to mediate aneurysmal degeneration.^[18] In rat macrophages, curcumin inhibits the incorporation of arachidonic acid into membrane lipids, as well as prostaglandin E2, leukotriene B4, and leukotriene C4, but does not affect the release of arachidonic acid.^[19] Curcumin also inhibits the secretion of collagenase, elastase, and hyaluronidase.

Anti-oxidant effect

Turmeric has been reported to possess anti-oxidant properties in vitro and in animal studies.^[20] Turmeric preparations have been found to scavenge free radicals (peroxides) and phenolic oxidants, inhibit lipid peroxidation induced by chemical agents and inhibit iron-dependent lipid peroxidation in rat tissues.^[21]

Anti-platelet aggregation effects

Curcumin inhibits thromboxane A2 without affecting the synthesis of prostaglandin I2^[22]. In vitro, curcumin inhibits platelet aggregation induced by ADP, epinephrine, or collagen.^[23] Turmeric appears to inhibit arachidonic acid incorporation into platelet phospholipids, degradation of phospholipids, and cyclo-oxygenase.^[24]

Anti-cancerous effects

Multiple pre-clinical studies have explored potential anti-cancer mechanisms of curcumin.^[25] In a rat model, the effects of 0.2% or 0.6% dietary curcumin were evaluated on chemically induced colon adenocarcinoma. Histological examination after

one year revealed both preventative and therapeutic benefits of curcumin when compared to animals not receiving curcumin, with better response at higher doses. Histological examination revealed evidence of apoptosis of cancer cells.^[26] In mice, six weeks of a 2% curcumin diet was found to decrease cellular proliferation and increase apoptosis of implanted androgen-dependent LNCaP prostate cancer cells. 45 Dietary turmeric extract given to mice (2% or 5% of diet) significantly inhibited chemically-induced skin and gastric tumors.^[27]

Lipid-lowering effects

In rat models of hyper-lipidemia, a diet of 0.5% curcumin for eight weeks significantly lowered serum low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), total cholesterol, and triglyceride levels, possibly by enhancing the activity of hepatic cholesterol-7 α -hydroxylase and increasing cholesterol catabolism.^[28] The turmeric constituents demethoxycurcumin, bisdemethoxycurcumin, and acetylcurcumin appear to inhibit -stimulated lipid peroxidation in rat tissues and liver microsomes.^[29]

Gastro-protective effects

Oral administration of turmeric to rats (500mg/kg) significantly reduces the incidence of chemically-induced duodenal ulcers and is associated with an increase in intestinal wall mucus and non-protein sulfhydryl content.^[30]

Gallbladder effects

Gallbladder contraction over the two-hour period following the administration of 20mg curcumin has been demonstrated in humans.^[31] Animal research reports that curcumin in the diet reduces the incidence of chemically-induced gallstones in mice.^[32]

Hypoglycemic effects

Based on animal study, both curcuminoids and sesquiterpenoids in turmeric may exhibit hypoglycemic effects via PPAR- γ activation.^[33]

Hepato-protective effect

Turmeric is beneficial for its influence on the liver. Animal studies have reported the reversal of hepatonecrosis and fatty changes associated with turmeric, with reversal of aflatoxin-induced liver damage.^[34]

CONCLUSION

The various experimental studies on *Curcuma longa* has shown its different activities such as hepato-protective, Anti-inflammatory, Anti-cancerous, hypo-lipidemic, Gastro-protective, Hypoglycemic and Anti-Alzheimer effect. All this prove that Turmeric is not only spice for Kitchen but very beneficial medicine also. However most of the therapeutic properties are proved in animal experiment model, therefore it is very necessary to conduct controlled clinical studies so that more clinical data in support of effectiveness of medicine can be collected.

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