



TURMERIC, THE GOLDEN SPICE – A SHORT REVIEW ON THE APPLICATIONS OF TURMERIC

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ABSTRACT

Many of these natural products have pharmacological or biological activity that can be exploited in pharmaceutical drug discovery and drug design turmeric is one of the best used natural products. Turmeric (*Curcuma longa* Linn) is extensively used as a spice and grown widely throughout Indian subcontinent. Turmeric plant has been used in traditional medicine as a remedy for various diseases including cough, diabetes and hepatic disorders. For the last few decades, extensive works have been done to establish the pharmacological actions of Turmeric and its extracts. Curcumin is the main chemical compound of Turmeric and proven for its anti-inflammatory, antioxidant, antimutagenic, antidiabetic, antibacterial, hepatoprotective, expectorant and anticancerous pharmacological activities.

KEYWORDS: Turmeric, Curcumin, Anti-inflammatory, hepatoprotective.

INTRODUCTION

Turmeric (*Curcuma longa* L.) is a medicinal plant extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases. *C. longa* L., botanically related to ginger (Zingiberaceae family), is a perennial plant having a short stem with large oblong leaves and bears ovate, pyriform or oblong rhizomes, which are often branched and brownish-yellow in colour. Turmeric is used as a food additive (spice), preservative and colouring agent in Asian countries, including China and South East Asia. It is also considered as auspicious and is a part of religious rituals. In old Hindu medicine, it is extensively used for the treatment of sprains and swelling caused by injury. In recent times, traditional Indian medicine uses turmeric powder for the treatment of biliary disorders, anorexia, coryza, cough, diabetic wounds, hepatic disorders, rheumatism and sinusitis. In China, *C. longa* is used for diseases associated with abdominal pains. Natural plant products have been used throughout human history for various purposes. Having co-evolved with animal life, many of the plants from which these natural products are derived are billions of years old. Tens of thousands of these products are produced as secondary metabolites by higher plants as a natural defense mechanism against disease and infection. Many of these natural products have pharmacological or biological activity that can be exploited in pharmaceutical drug discovery and drug design.

Chemical composition of turmeric

Turmeric contains protein (6.3%), fat (5.1%), minerals (3.5%), carbohydrates (69.4%) and moisture (13.1%). The Essential oil (5.8%) obtained by steam distillation of rhizomes has α -phellandrene (1%), sabinene (0.6%), cineol (1%), borneol (0.5%), zingiberene (25%) and sesquiterpines (53%).^[1] Curcumin (diferuloylmethane) (3–4%) is responsible for the yellow colour, and comprises curcumin I (94%), curcumin II (6%) and curcumin III (0.3%).^[2] Demethoxy and bisdemethoxy derivatives of curcumin have also been isolated^[3] (Figure 1). Curcumin was first isolated in 1815 and its chemical structure was determined by Roughley and Whiting⁹ in 1973. It has a melting point at 176–177°C; forms a reddish-brown salt with alkali and is soluble in ethanol, alkali, ketone, acetic acid and chloroform.

Biological activity of turmeric and its compounds

Turmeric powder, curcumin and its derivatives and many other extracts from the rhizomes were found to be bioactive (Table 1). The structures of some of these compounds are presented in Figure 1. Turmeric powder has healing effect on both aseptic and septic wounds in rats and rabbits.^[4] It also shows adjuvant chemoprotection in experimental forestomach and oral cancer models of Swiss mice and Syrian golden hamsters.^[5] Curcumin also increases mucin secretion in rabbits.^[6] Curcumin, the ethanol extract of the rhizomes, sodium curcumin, [feruloyl-(4-hydroxycinnamoyl)-methane] (FHM) and [bis-(4-hydroxycinnamoyl)-

methane] (BHM) and their derivatives, have high antiinflammatory activity against carrageenin-induced rat paw oedema.^[7,8] Curcumin is also effective in formalin-induced arthritis.^[9] Curcumin reduces intestinal gas formation^[10] and carbon tetrachloride and D-galactosamine-induced glutamate oxaloacetate transaminase and glutamate pyruvate transaminase levels.^[11,12] It also increases bile secretion in anaesthetized dogs^[13] and rats^[14], and elevates the activity of pancreatic lipase, amylase, trypsin and chymotrypsin.^[15] Curcumin protects isoproterenol-induced myocardial infarction in rats.^[16] Curcumin, FHM and BHM also have anticoagulant activity.^[17,18] Curcumin and an ether extract of *C. longa* have hypolipemic action in rats^[19] and lower cholesterol, fatty acids and triglycerides in alcohol-induced toxicity.^[20] Curcumin is also reported to have antibacterial^[21],

antiamoebic^[21] and antiHIV^[22] activities. Curcumin also shows antioxidant activity.^[23-26] It also shows antitumour^[27-29] and anticarcinogenic^[30-33] activities. The volatile oil of *C. longa* shows antiinflammatory^[34], antibacterial^[35] and antifungal^[36] activities. The petroleum ether extract of *C. longa* is reported to have anti-inflammatory activity.^[37] Petroleum ether and aqueous extracts have 100% antifertility effects in rats.^[38] Fifty per cent ethanolic extract of *C. longa* shows hypolipemic action^[39] in rats. Ethanolic extract also possesses antitumour activity^[40]. Alcoholic extract and sodium curcumin can also offer antibacterial activity.^[41-42] The crude ether and chloroform extracts of *C. longa* stem are also reported to have antifungal effects.^[43] A *C. longa* fraction containing ar-turmerone has potent antivenom activity fig1.

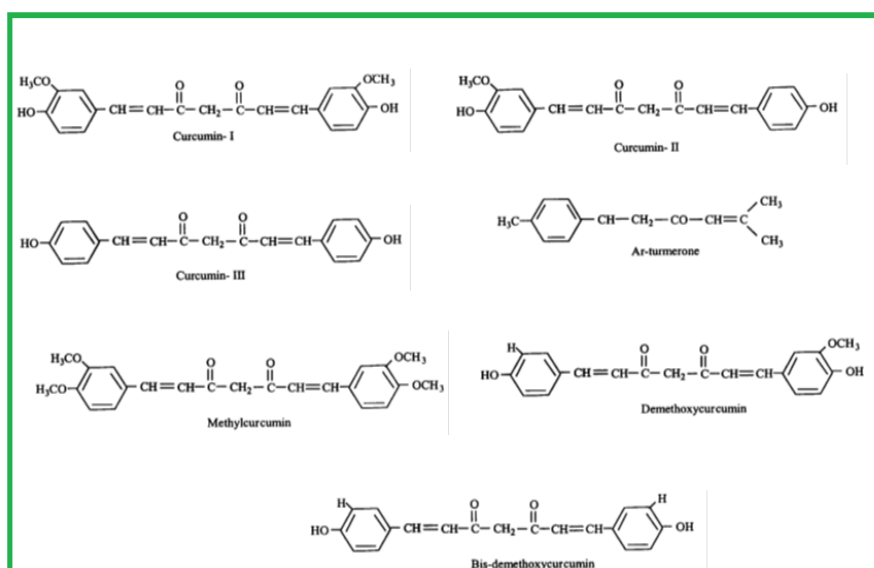


Fig: 1 Showing chemical compounds of turmeric

Medical studies of turmeric

Turmeric has been tested against various diseases in humans (table 1). In one study, the ant mutagenic effects of turmeric were examined in 16 chronic smokers (Polasa et al. 1992). Turmeric was given in doses of 1.5 g/day for 30 days, and this was found to significantly reduce the urinary excretion of mutagens in these smokers. In six nonsmokers, on the other hand, no change in urinary excretion of mutagens was noted. These results suggest that dietary turmeric is an effective antimutagen and may be useful in chemoprevention. In another study, the effect of turmeric was examined on patients with irritable bowel syndrome. When 1 or 2 tablets of a standardized turmeric extract were given

daily for 8 weeks, the prevalence of irritable bowel syndrome was significantly decreased, as was the abdominal pain/discomfort score (Bundy et al. 2004). Alcoholic extract of turmeric offered protection against BaP-induced increase in micronuclei in circulating lymphocytes of healthy individuals (Hastak et al. 1997). In a subsequent study, the authors treated patients suffering from oral submucous fibrosis (OSF) with turmeric extract (3 g/day) for 3 months. The number of micronuclei from oral exfoliated cells of OSF patients before and after treatment with turmeric extract was recorded. They found that the number of micronuclei in oral exfoliated cells decreased substantially and was comparable with that of normal, healthy individuals.

Table: 1

Disease	Dose	Response	Reference
Asthma	NC	Relief from bronchial asthma and cough	Jain, Bhatnagar, and Parsai 1979
Ulcer	150mg	Reduction of peptic ulcer	Prucksunand et al. 2001
Cancer	Topical application	Reduction in itching, pain, and	Kuttan, Sudheeran, and

		size in external cancerous lesions	Joseph 1987
Infection	Topical application	Umbilical cord care after cutting	Alam et al. 2008

Turmeric was also found useful in healing peptic ulcers. In a phase II clinical trial, 45 patients with peptic ulcer received capsule-filled turmeric orally in the dose of 2 capsules (300 mg each) five times daily. After 4 weeks of treatment, ulcers were found to be absent in 48% of cases. After 12 weeks of treatment, ulcer-free cases increased to 76% (Prucksunand et al. 2001). A double-blind trial found turmeric to be helpful for people with indigestion and for people with stomach or intestinal ulcers, but it was shown to be less effective than antacids (Kositchaiwat, Kositchaiwat, and Havanondha 1993). An ethanol extract of turmeric was found to produce remarkable symptomatic relief in patients with external cancerous lesions. In a study of 62 patients, reduction in smell was noted in 90% of the cases and reduction of itching in almost all cases. Some patients (10%) had a reduction in lesion size and pain (Kuttan, Sudheeran, and Joseph 1987). A study on eight healthy subjects showed that the presence of turmeric in curry increases bowel motility and activates hydrogen-producing bacterial flora in the colon, thereby increasing the concentration of breath hydrogen (Shimouchi et al. 2008). Turmeric paste is used to heal wounds or to protect against infection. In certain parts of Bangladesh, turmeric is the most common application on the cut umbilical cord after delivery (Alam et al. 2008).

CONCLUSION

The beneficial effects of turmeric are traditionally achieved through dietary consumption, even at low levels, over long periods of time. A precise understanding of effective dose, safety, and mechanism of action is required for the rational use of turmeric in the treatment of human diseases. Further clinical studies are warranted if turmeric is to be employed in meeting human needs and improving human welfare. The activities of turmeric include antibacterial, antiviral, anti-inflammatory, antitumor, antioxidant, antiseptic, cardio protective, hepatoprotective, nephroprotective, radio protective, and digestive activities.

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