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ETHNOPHARMACOLOGICAL PROPERTIES OF *CURCUMA LONGA*: A REVIEW

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ABSTRACT

Curcuma longa (Turmeric) is a member of the ginger family (Zingiberaceae) and is thought to be indigenous to the Indian subcontinent. It is grown and harvested commercially in India, China, and many regions of tropical Southeast Asia. Turmeric is an approved food additive and is commercially available at low cost. Indigenous systems of medicine, including the Ayurvedic systems, have widely used turmeric for centuries in the treatment of many inflammatory conditions and diseases such as biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism and sinusitis. Turmeric's active constituents are yellowish orange volatile oils called curcuminoids known as curcumin, which has demonstrated antioxidant, antineoplastic, antiviral, anti-inflammatory, antibacterial, antifungal, antidiabetic, anticoagulant, antifertility, cardiovascular protective, hepatoprotective, and immunostimulant activity in animals. Curcuminoids inhibit leukotriene biosynthesis via the lipoxygenase pathway and decrease prostaglandin formation. Some workers observed that Curcumin has caused apoptosis in various cancer cell lines and animal tumor cells and may inhibit angiogenesis. Today, turmeric has found application all over the world in various purposes such as medicinal purpose, cosmetic purpose, dyeing, skin care and coloring purpose. Present review indicating that *Curcuma longa* (Turmeric or Haldi) is a versatile indigenous plant to the Indian subcontinent having economic importance and can be promoted for diversified applications like medicinal and other potential uses.

INTRODUCTION: *Curcuma longa* (Turmeric) is a member of the ginger family {Zingiberaceae (**Figure 1**)} and is thought to be indigenous to the Indian subcontinent. It is grown and harvested commercially in India, China, and many regions of tropical south Asia and needs temperatures between 20 °C and 30 °C and a considerable amount of annual rainfall to thrive. Turmeric is best known for its culinary use as a major component of curry powder. In the United States, turmeric is an approved food additive and is commercially available at low cost reported [1]. Turmeric is commonly called haridra or haldi in India. Turmeric is known as "Manjal" and turmeric powder is known as "Manjal Thool" in Tamil language and in Tamil Nadu, India. In medieval Europe, turmeric became known as Indian saffron, since it was widely used as an alternative to the far more expensive saffron spice. Its active ingredient is curcumin and it has a distinctly earthy, slightly bitter, slightly hot peppery flavor and a mustardy smell. It shows up as a coloring agent in items as diverse as pharmaceuticals, yellow mustards, and cosmetics as well as in dyes for hair and fur [2].

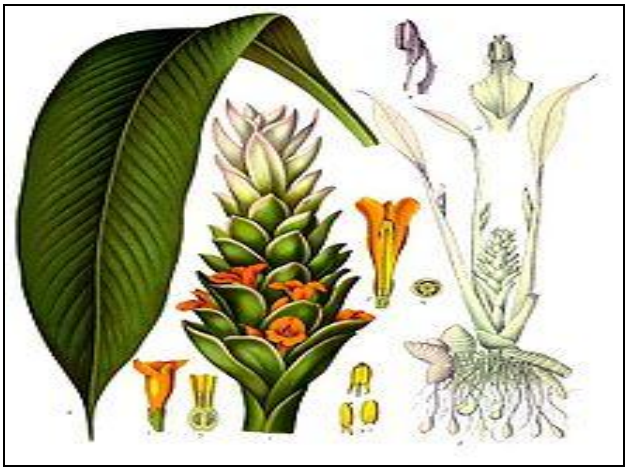

FIGURE 1: CLASSIFICATION OF *CURCUMA LONGA* (HALDI OR TURMERIC)

Classification:

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Liopsida
Subclass	:	Zingiberidae
Order	:	Zingiberales
Family	:	Zingiberaceae
Genus	:	Curcuma
Species	:	Longa
Scientific name:		*Curcuma longa*

History: *Curcuma longa* has been cultivated for thousands of years in India and Southeast Asia. The plant was introduced to China and Africa in the 7th and 8th centuries. In recounting his travels, *Curcuma longa* was eventually introduced to Jamaica in the 18th century. Currently, commercial production is primarily focused in India and Southeast Asia. The plant is cultivated in home gardens in tropical areas throughout the world. Indigenous systems of medicine, including the Chinese and Ayurvedic systems, have widely used turmeric for centuries in the treatment of many inflammatory conditions and diseases [3]. In India, turmeric has been traditionally used primarily for arthritic and muscular disorders, while in China it has been used as a topical analgesic and for conditions ranging from flatulence, colic, and ringworm to hepatitis and chest pain [4].

Distribution of *Curcuma longa*: In the Indian Ayurveda system of herbal medicine, turmeric is known as strengthening and warming to the whole body. Traditional uses in India include to improve digestion, to improve intestinal flora, to eliminate worms, to relieve gas, to cleanse and strengthen the liver and gallbladder, to normalize menstruation, for relief of arthritis and swelling, as a blood purifier, to warm and promote proper metabolism correcting both excesses and deficiencies, for local application on sprains, burns, cuts, bruises, insect bites and itches, for soothing action in cough and asthma, as antibacterial and anti-fungus, and in any condition of weakness or debility.

Erode, a city in the South Indian state of Tamil Nadu, is the world's largest producer and most important trading center of turmeric in Asia. For these reasons, Erode in history is also known as "Yellow City" or "Turmeric City". Sangli, a town in the southern part of the Indian western state of Maharashtra, is the second largest and most important trading center for turmeric in Asia. India produces 600,000 tons of turmeric annually which is 75% of world production of 800,000 tons.

According to Michael Moriarty, “The ancient Hawaiians used this herb for many things, including the prevention and treatment of sinus infections, ear infections (swimmers ear) and gastrointestinal ulcers.”

The old herbals of Europe make little if any mention of turmeric. Marco Polo refers to turmeric as Indian saffron used for dying cloth.

Morphology of *Curcuma longa*: *Curcuma longa* is a perennial herb, with a short stem, tufted leaf and the rhizomes, which are short and thick and from root to leaves about 2 feet long, deeply veined leaves that project upward from stems that grow from the base of the plant. The leaf color is deep green and the surface is glossy and smooths (**Figure 2**). The flowers range from white to light yellow and form a tall spike (**Figure 3**).

The rhizomes, specialized underground stems that are root-like in structure have a brown surface and bright orange or yellow interior flesh and after cutting, it is in curved cylindrical or oblong tubers 2 or 3 inches in length, and an inch in diameter, pointed or tapering at one end, yellowish externally, with transverse, parallel rings internally deep orange or reddish brown, marked with shining points, dense, solid, short, granular fracture, forming a lemon yellow powder (Figure 3).

FIGURE 2: PLANTS OF *CURCUMA LONGA*

FIGURE 3: WHITE FLOWER, RHIZOMES AND RHIZOME POWDER OF *CURCUMA LONGA*

Active Constituents: The active constituents of turmeric are the flavonoid curcumin (diferuloylmethane) and various volatile oils, including tumerone, atlantone, and zingiberone. Turmeric contains up to 5% essential oils and up to 5% curcumin, a polyphenol. Other constituents include sugars, proteins, and resins.

Turmeric's active constituents are yellowish orange volatile oils called curcuminoids. There is currently great interest in the curcuminoid known as curcumin, Curcumin is the active substance of turmeric and is known as Natural Yellow. The systematic chemical name is (1*E*, 6*E*)-1, 7-bis (4-hydroxy-3-methoxyphenyl)-1, 6 heptadiene-3, 5-dione. It can exist at least in two tautomeric forms, keto and enol (**Figure 4**). The keto form is preferred in solid phase and the enol form in solution. Curcumin is a pH indicator. In acidic solutions (pH <7.4) it turns yellow, whereas in basic (pH > 8.6) solutions it turns bright red.

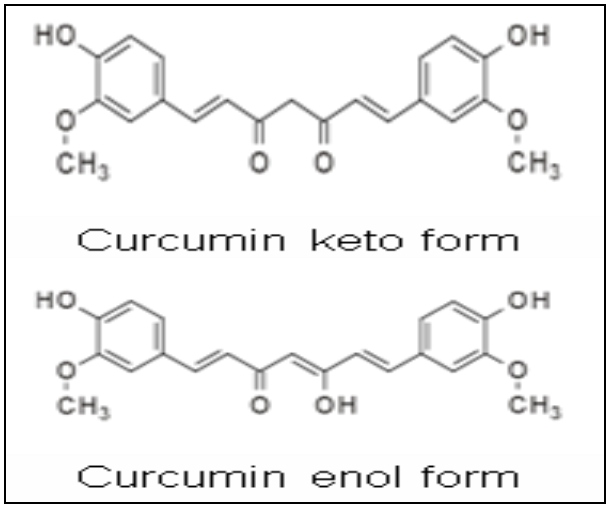

FIGURE 4: CHEMICAL STRUCTURE OF CURCUMIN

Ethnopharmacology of *Curcuma longa* root: There is currently great interest in the curcuminoid known as curcumin, which has demonstrated antioxidant, antineoplastic, antiviral, and immunosuppressive activity in vitro and in animals.

Jordan *et al.,* [5] observed that curcuminoids inhibit leukotriene biosynthesis via the lipoxygenase pathway and decrease prostaglandin formation. Curcumin has caused apoptosis in various cancer cell lines and animal tumor cells and may inhibit angiogenesis [6, 7]. Curcumin has antiseptic and antiparasitic activity. It preferentially inhibits platelet aggregation induced by platelet-activating factor and arachidonic acid [8].

Hata *et al.,* [9] studied on rats and mice; dietary curcumin has demonstrated preventive activity against carcinogenesis in the skin, colon, forestomach, and duodenum. Curcumin blocks certain cyclosporine-resistant pathways of T-cell proliferation and thus may be a potential adjuvant immunosuppressive agent for the treatment of cancer [1]. Case reports of decreases in p24 antigen with the ingestion of 2.5 g of curcumin daily for seven days led to a study of curcumin in 60 patients with HIV infection [2].

Pharmacokinetics: Pharmacokinetic studies in animals have demonstrated that 40-85 percent of an oral dose of curcumin passes through the gastrointestinal tract unchanged, with most of the absorbed flavonoid being metabolized in the intestinal mucosa and liver [10, 11]. Due to its low rate of absorption, curcumin is often formulated with bromelain for increased absorption and enhanced anti-inflammatory effect.

Curcumin has an estimated bioavailability of 65% after oral administration. It inhibits cytochrome P-450 isoenzyme 1A1 and is metabolized by glucuronidation [9]. The T_{max} and $t_{1/2}$ is 3.29 and 6.77 h.

Pharmacological action of *Curcuma longa*:

1. **Antioxidant Effects:** Free radicals can originate from environmental chemicals, tissue injury, infections and auto-immune processes. Antioxidants protect the body from damage from free radicals. Water- and fat-soluble extracts of turmeric and its curcumin component exhibit strong antioxidant activity, comparable to vitamins C and E. One study showed curcumin to be eight times more powerful than vitamin E in preventing lipid peroxidation [12]. A study of ischemia in the feline heart demonstrated that curcumin pretreatment decreased ischemia-induced changes in the heart [13]. An *in vitro* study measuring the effect of curcumin on endothelial heme oxygenase-1, an inducible stress protein, was conducted utilizing bovine aortic endothelial cells. Incubation (18 hours) with curcumin resulted in enhanced cellular resistance to oxidative damage [14].

2. **Hepatoprotective Effects:** Turmeric has been found to have a hepatoprotective characteristic similar to silymarin. Animal studies have demonstrated turmeric's hepatoprotective effects from a variety of hepatotoxic insults, including carbon tetrachloride (CCl_4), galactosamine, acetaminophen (paracetamol) and Aspergillus aflatoxin [15]. Turmeric's hepatoprotective effect is mainly a result of its antioxidant properties, as well as its ability to decrease the formation of proinflammatory cytokines.

   In rats with CCl_4-induced acute and subacute liver injury, curcumin administration significantly decreased liver injury in test animals compared to controls.Turmeric extract inhibited fungal aflatoxin production by 90 percent when given to ducklings infected with *Aspergillus parasiticus*. Turmeric and curcumin also reversed biliary hyperplasia, fatty changes, and necrosis induced by aflatoxin production. Sodium curcuminate, a salt of curcumin, also exerts choleretic effects by increasing biliary excretion of bile salts, cholesterol, and bilirubin, as well as increasing bile solubility, therefore possibly preventing and treating cholelithiasis [15].

3. **Anti-inflammatory Activity:** The volatile oils and curcumin of *Curcuma longa* exhibit potent anti-inflammatory effects. Oral administration of curcumin in instances of acute inflammation was found to be as effective as cortisone or phenylbutazone, and one-half as effective in cases of chronic inflammation [16]. In rats with Freund's adjuvant-induced arthritis, oral administration of *Curcuma longa* significantly reduced inflammatory swelling compared to controls. In monkeys, curcumin inhibited neutrophil aggregation associated with inflammation.

   Curcuma longa's anti-inflammatory properties may be attributed to its ability to inhibit both biosynthesis of inflammatory prostaglandins from arachidonic acid, and neutrophil function during inflammatory states. Curcumin may also be applied topically to counteract inflammation and irritation associated with inflammatory skin conditions and allergies. After intraperitoneal administration, curcumin and sodium curcuminate exhibited strong anti-inflammatory activity in the carrageenin-induced oedema test in rats and mice [16].

4. **Anticarcinogenic Effects:** Animal studies involving rats and mice, as well as *in vitro* studies utilizing human cell lines, have demonstrated curcumin's ability to inhibit carcinogenesis at three stages: tumor promotion, angiogenesis, and tumor growth [17]. In two studies of colon and prostate cancer, curcumin inhibited cell proliferation and tumor growth. Turmeric and curcumin are also capable of suppressing the activity of several common mutagens and carcinogens in a variety of cell types in both *in vitro* and *in vivo* studies [18]. The anticarcinogenic effects of turmeric and curcumin are due to direct antioxidant and free-radical scavenging effects, as well as their ability to indirectly increase glutathione levels, thereby aiding in hepatic detoxification of mutagens and carcinogens, and inhibiting nitrosamine formation [17, 18].

5. **Antimicrobial Effects:** Extract and the essential oil of *Curcuma longa* inhibit the growth of a variety of bacteria, parasites, and pathogenic fungi. A study of chicks infected with the caecal parasite *Eimera maxima* demonstrated that diets supplemented with 1-percent turmeric resulted in a reduction in small intestinal lesion scores and improved weight gain. Another animal study, in which guinea pigs were infected with either dermatophytes, pathogenic molds, or yeast, found that topically applied turmeric oil inhibit dermatophytes and pathogenic fungi, but neither curcumin nor turmeric oil affected the yeast isolates.

   Improvements in lesions were observed in the dermatophyte- and fungi-infected guinea pigs, and at seven days post-turmeric application the lesions disappeared [19]. Curcumin has also been found to have moderate activity against *Plasmodium falciparum* and *Leishmania major* organisms [20].

6. **Cardiovascular Effects:** Turmeric's protective effects on the cardiovascular system include lowering cholesterol and triglyceride levels, decreasing susceptibility of low density lipoprotein (LDL) to lipid peroxidation and inhibiting platelet aggregation [21]. These effects have been noted even with low doses of turmeric. A study of 18 atherosclerotic rabbits given low-dose (1.6-3.2 mg/kg body weight, daily) turmeric extract demonstrated decreased susceptibility of LDL to lipid peroxidation, in addition to lower plasma cholesterol and triglyceride levels.

   The higher dose did not decrease lipid peroxidation of LDL, but cholesterol and triglyceride level decreases were noted, although to a lesser degree than with the lower dose. Turmeric extract's effect on cholesterol levels may be due to decreased cholesterol uptake in the intestines and increased conversion of cholesterol to bile acids in the liver.

   Inhibition of platelet aggregation by *Curcuma longa* constituents is thought to be via potentiation of prostacyclin synthesis and inhibition of thromboxane synthesis [22].

7. **Gastrointestinal Effects:** Extract of *Curcuma longa* exert several protective effects on the gastrointestinal tract. Sodium curcuminate inhibited intestinal spasm and p-tolymethylcarbinol, a turmeric component, increased gastrin, secretin, bicarbonate, and pancreatic enzyme secretion [23]. Turmeric has also been shown to inhibit ulcer formation caused by stress, alcohol, indomethacin, pyloric ligation, and reserpine, significantly increasing gastric wall mu;cus in rats [23].

Dosage: A dose of turmeric powder is 500 - 8,000 mg per day used in human studies. Standardized extracts are typically used in lower amounts, in the 250-2,000 mg range. For arthritis, dosages of 8-60 g of fresh turmeric root three times daily or 400-600 mg of curcumin three times daily have been recommended by oral route [24]. For dyspepsia, 1.5-3 g of turmeric root is recommended. Preparations of the root should be standardized to contain not less than 3% curcumin and not less than 3% volatile oils.

Adverse Effects: No significant toxicity has been reported following either acute or chronic administration of turmeric extracts at standard doses. At very high doses (100 mg/kg body weight), curcumin may be ulcerogenic in animals, as evidenced by one rat study. There are no reported adverse effects of curcumin or turmeric, except rare cases of allergic contact dermatitis. One case occurred as an occupational illness in a miller working in a spice shop.

Many Indian women apply turmeric to their skin in an effort to minimize unwanted hair growth, but few experience dermatitis of 62 patients completing an 18-month study of the topical use of curcumin to treat skin and mucous membrane cancers, only 1 reported an adverse effect, scalp itching.

Some investigators have reported the potential for gastric ulceration with high-dose curcumin on the basis of animal studies, but the data are inconsistent with some studies suggesting antiulcerogenic effects. There has been concern about the possibility of additive antiplatelet activity, although there have been no reports of this in humans [25].

Drug Interactions: Curcumin has no interactions with drugs. Because of the possibility of additive anti-platelet activity, caution should be taken with respect to concurrent use of curcumin with anticoagulants and with medications and dietary supplements known to have antiplatelet activity. Some references have suggested that curcumin decreases the effect of immune suppressants without providing supporting data [24].

Contraindications: The American Herbal Products Association classifies turmeric as a menstrual stimulant and some sources recommend avoiding curcumin in pregnancy. Its use is not recommended during breast-feeding, as effects on breast-feeding infants are unknown. Turmeric should be avoided in patients with bleeding disorders and bile duct obstruction and should be used only under the supervision of a physician in patients with gallstones [26].

Uses: *Curcuma longa* rhizome powder is usage dates back from 3000 B.C. in India. From a significant part in daily cuisine to treating diseases like cancer, turmeric is beneficial to mankind. It is impossible to think of Indian food without turmeric. Today, turmeric has found application all over the world in various purposes such as medicinal purpose, cosmetic purpose, dyeing and coloring purpose. Woman in India apply turmeric before taking bath as its antibacterial property protects the skin from infects and protects it from harsh sunlight.

- Medicinal Use
- Food Use
- Cosmetic Use

Medicinal Use: Powdered rhizome is used to treat wounds, bruises, inflamed joints and sprains in Nepal. In current traditional Indian medicine, it is used for the treatment of biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism and sinusitis [27]. A short clinical trial in 18 patients with definite rheumatoid arthritis showed significant improvement in morning stiffness and joint swelling after two weeks of therapy with oral doses of 120 mg/ day. Application of the powder in combination with other plant products is also reported for purification of blood and for menstrual and abdominal problems.

In patients undergoing surgery, oral application of curcumin reduces post-operative inflammation. Recently, curcumin has been formulated as slow-release biodegradable microspheres for the treatment of inflammation in arthritic rats. It is evident from the study that curcumin biodegradable microspheres could be successfully employed for therapeutic management of inflammation [28].

Turmeric is a member of the Ginger family and is one of the most valuable holistic ingredients you can feed to your poultry to help prevent disease in your flocks. Turmeric is responsible for the golden colour of our feeds.

Clinical Indications:

1. **Hepatoprotection, Cholelithiasis and Cholestasis:** Turmeric's hepatoprotective effects, evidenced in a number of animal studies, suggest it may be used in cases of toxic insult due to exogenous toxins from lifestyle and environmental exposures. Curcumin has choleretic activity that increases bile output and solubility, which may be helpful in treating gallstones [15].

2. **Inflammation:** Curcumin is a potent anti-inflammatory with specific lipoxygenase- and COX-2- inhibiting properties. Animal, *in vitro* and *in vivo* studies demonstrate turmeric's effectiveness at decreasing both acute and chronic inflammation. A double-blind, crossover, placebo-controlled human study of 42 patients with osteoarthritis used a combination product containing turmeric, *Boswellia serrata*, *Withania somnifera* and zinc. After three months on the combination or placebo, patients noted a significant reduction in pain ($p<0.001$) and disability ($p<0.05$) [16].

3. **Cancer:** Numerous animal, *in vitro* and *in vivo* studies have demonstrated the anticarcinogenic effects of turmeric and its flavonoid component curcumin against colon, breast and prostate cancers, as well as melanoma [29]. Curcumin, one of the most studied chemopreventive agents that allow suppression, retardation or inversion of carcinogenesis.

Curcumin is also described as an anti-tumoral, anti-oxidant and anti-inflammatory agent capable of inducing apoptosis in numerous cellular systems [30].

a. **Lung cancer**: Zhang *et al.,* [31] investigated that the mechanism of anti-tumor effects of curcumin on human lung cancer cell (A549). Curcumin can interfere with cell growth cycle of A549 cell and suppress cell growth.

b. **Colon cancer:** Sun *et al.* [32] investigated that curcumin inhibits the growth of HT-29 and WiDr cells in colon cancer.

c. **Bladder cancer:** Curcumin can suppress the growth; induce apoptosis of bladder cancer EJ cell in vitro. Its mechanism is related with down-regulations of the expressions of NF-kappa B and Cyclin D1. Curcumin has great potential for the treatment of bladder cancer [32].

d. **Breast cancer:** Curcumin inhibits the proliferation in both estrogen receptor (ER) positive MCF-7 cells and ER negative MDA-MB-231 cells. Means Curcumin exerts multiple suppressive effects on breast carcinoma cells [33].

e. **Melanoma:** Curcumin induced melanoma cell apoptosis and cell cycle arrest, curcumin arrested cell growth at the G(2)/M phase and induced apoptosis in human melanoma cells by inhibiting nuclear factor (NF) kappa B activation and thus depletion of endogenous nitric oxide. Therefore, Curcumin should be considered further as a potential therapy for patients with melanoma [34].

4. **Hyperlipidemia:** Animal and *in vitro* studies have shown the potential for turmeric to decrease blood lipids. Further clinical studies need to be performed in this area to discover optimal dosages for cardiovascular protection and lipid lowering [22].

5. **Gastric Ulcer:** An open, phase II trial was performed on 25 patients with endoscopically-diagnosed gastric ulcer. Participants were given 600 mg powdered turmeric five times daily. After four weeks, ulcers had completely healed in 48 percent of patients. The success rate increased over time, with 76 percent being ulcer free after 12 weeks of treatment. No significant adverse reactions or blood abnormalities were noted [23].

6. **Chronic Anterior uveitis:** Thirty-two patients with chronic anterior uveitis (inflammation of uvia layer) took 375 mg curcumin three times daily for 12 weeks. Curcumin was effective in 86 percent of individuals, and was as effective as corticosteroid therapy, the only available standard treatment [7].

7. **Anti diabetic activity:** *Curcuma longa* rhizome extract showed blood glucose lowering activity in experimental, induced- diabetic rats. Curcumin treatment also significantly reduced macrophage infiltration of white adipose tissue, increased adipose tissue adiponectin production, and decreased hepatic nuclear factor-kappa B activity, hepatomegaly, and markers of hepatic inflammation. We therefore conclude that orally ingestedcurcumin reverses many of the inflammatory and metabolic derangements associated with obesity and improve glycemic control in case of diabetic rat [35].

8. **Anticoagulant activity:** Curcumin shows anticoagulant activity by inhibiting collagen and adrenaline-induced platelet aggregation *in vitro* as well as *in vivo* in rat thoracic aorta [22].

9. **Antifertility activity:** Petroleum ether and aqueous extracts of turmeric rhizomes show 100% antifertility effect in rats when fed orally. Implantation is completely inhibited by these extracts. Curcumin inhibits 5*α*-reductase, which converts testosterone to 5*α*-dihydrotestosterone, thereby inhibiting the growth of flank organs in hamster. Curcumin also inhibits human sperm motility and has the potential for the development of a novel intravaginal contraceptive [36].

10. **Alzheimer's disease:** Alzheimer's disease (AD) involves amyloid (Abeta) accumulation, oxidative damage and inflammation. The phenolic yellow curry pigment curcumin has potent anti inflammatory and antioxidant activities and can suppress oxidative damage, inflammation, cognitive deficits, and amyloid accumulation [37].

11. **Arthritis:** The cytokine macrophage migration inhibitory factor (MIF) has recently emerged as a crucial factor in the pathogenesis of rheumatoid arthritis (RA). Curcumin and caffeic acid were found to be the most potent inhibitors [38].

Food Use: *Curcuma longa* is widely cultivated for its rhizomes and rhizome powder also commonly known as turmeric and turmeric powder (**Figure 5**) which is used as a bright yellow-orange culinary spice. It has been known as poor man's saffron because it offers a less expensive alternative yellow colouring.

In *Curcuma longa*, curcumin is the primary pigment and is generally used in various food industries as a food color. It is mainly used in dairy products, beverages, cereal, confectionary, ice cream, bakery, and savory products.

Turmeric is mostly used in flavored milk drinks, cultured milk and desserts to obtain lemon and banana colors in dairy.

Turmeric is added at higher levels to sausages, pickles, relishes, sauces, dry mixes, and fish due to its original usage as a spice [39].

FIGURE 5: TURMERIC AND TURMERIC POWDER

Nutritional Value of Turmeric

Value per 100 grams

- **Moisture** : 13.100 gm
- **Protein** : 6.300 gm
- **Fat** : 5.100 gm
- **Minerals** : 3.500 gm
- **Fibre** : 2.600 gm
- **Carbohydrates:** 69.400 gm
- **Energy** : 349.000 K cal
- **Calcium** : 150.000 mg
- **Phosphorus** : 282.000 mg
- **Iron** : 67.800 mg

In addition, it also contains calcium, phosphorous, iron, carotene, thiamine and niacin.

Two teaspoons of turmeric powder contains

- Iron : 1.88 milligrams
- Vitamin B : 0.08 milligrams
- Dietary fiber : 0.96 grams
- Potassium : 114.48 milligrams
- Manganese : 0.36 grams

Cosmetic Use: Since time immemorial, turmeric is very popular in cosmetic use especially for woman. In the world, the biggest users of turmeric are in India. India is also major producer of turmeric. These natural plant's extracts used in cosmetic products marketed for skin care and hair care.

Skin Care and Colouring: Turmeric is used in many celebrations of Hindus. Especially in Hindu wedding brides would rub with turmeric on their bodies for glowing look. New born babies also rubbed with turmeric on their forehead for good luck.

Traditionally women rub turmeric on their cheeks to produce a natural golden glow, extract of turmeric has been added to creams for use as a colouring agent. A compound called curcumin is the yellow pigment in turmeric.

Washing in turmeric improves skin complexion and also reduces hair growth on body. Now days there are lots of herbal products in the market in which main herb used is turmeric as natural ingredient. These constitute home remedies for skin and hair problems.

Natural cleansers like milk with turmeric powder are effective natural cosmetics in themselves; it brings a healthy glow to the skin and makes them beautiful. Turmeric is also very effective tonic and a blood purifier. It is also skin-friendly and constitutes an important ingredient of many creams and lotions.

Hair Care: For the treatment of dandruff, and as hair colorants and dyes, plant extracts are used as hair growth stimulators, the mechanism of action appears to be an acceleration of blood circulation or increased nutrition to the hair follicles.

CONCLUSION: Turmeric has been used in ayurvedic medicine since ancient times, with various biological applications. Although some work has been done on the possible medicinal applications, no studies for drug-development have been carried out as yet. Although the crude extract has numerous medicinal applications, clinical applications can be made only after extensive research on its bioactivity, mechanism of action, pharmacotherapeutics and toxicity studies.

However, as curcumin is now available in pure form, which shows a wide spectrum of biological activities, it would be easier to develop new drugs from this compound after extensive studies on its mechanism of action and pharmacological effects. Recent years have seen an increased enthusiasm in treating various diseases with natural products. Curcumin is a non-toxic, highly promising natural antioxidant compound having a wide spectrum of biological functions. It is expected that curcumin may find application as a novel drug in the near future to control various diseases, including inflammatory disorders, carcinogenesis and oxidative stress-induced pathogenesis.

Although the quality of the available clinical studies is questionable, turmeric appears generally safe. Well-designed clinical trials are probably warranted to clarify turmeric's role, if any, in the prevention and treatment of several cancers, as well as in the treatment of rheumatoid arthritis and several ocular conditions.

REFERENCES:

1. Hanif R, Qiao L and Shiff SJ: Curcumin, a natural plant phenolic food additive, inhibits cell proliferation and induces cell cycle changes in colon adenocarcinoma cell lines by a prostaglandin-independent pathway. J Laborat Clin Med 1997; 130:576-584.
2. Goh CL and Ng SK: Allergic contact dermatitis to *Curcuma longa* (turmeric). Cont Dermat 1987; 17:186.
3. Thaloor D, Singh AK and Sidhu GS: Inhibition of angiogenic differentiation of human umbilical vein endothelial cells by curcumin. Cell Growth Differ 1998; 9:305- 312.
4. Burnham TH: Review of natural products. St. Louis: Facts Compari 1993.
5. Jordan WC: Curcumin a natural herb with anti-HIV activity. J Nat Med Assoc 1996; 88:333.
6. Deodhar SD, Sethi R and Srimal RC: Preliminary study on antirheumatic activity of curcumin (diferuloyl methane). Ind J Med Res 1980; 71:632-634.
7. Lal B, Kapoor AK and Asthana OP: Efficacy of curcumin in the management of chronic anterior uveitis. Phytother Res 1999; 13:318-322.
8. Charles V and Charles SX: The use and efficacy of *Azadirachta indica* ADR ('neem') and *Curcuma longa* ('turmeric') in scabies: a pilot study. Trop Geogr Med 1992; 44:178-181.
9. Hata M, Sasaki E and Ota M: Allergic contact dermatitis from curcumin (turmeric). Cont Dermat 1997; 36:107-108.
10. Wahlstrom B and Blennow G: A study on the fate of curcumin in the rat. Acta Pharmacol Toxicol 1978; 43:86-92.
11. Ravindranath V and Chandrasekhara N: Absorption and tissue distribution of curcumin in rats. Toxicology 2010; 16:259-265.
12. Toda S, Miyase T and Arich H: Natural antioxidants. Antioxidative compounds isolated from rhizome of *Curcuma longa.* Laborat Chem Pharmacol Bullet 1985; 33:1725-1728.
13. Dikshit M, Rastogi L, Shukla R and Srimal RC: Prevention of ischaemia-induced biochemical changes by curcumin and quinidine in the cat heart. Ind J Med Res 1995; 101:31-35.
14. Mortellini R, Foresti R, Bassi R and Green CJ: Curcumin, an antioxidant and anti-inflammatory agent, induces heme oxygenase-1 and protects endothelial cells against oxidative stress. Free Rad Bio Med 2000; 28:1303-1312.
15. Park EJ, Jeon CH and Ko G: Protective effect of curcumin in rat liver injury induced by carbon tetrachloride. J Pharm Pharmacol 2000; 52:437-440.
16. Mukhopadhyay A, Basu N and Ghatak N: Anti-inflammatory and irritant activities of curcumin analogues in rats. Agents Act 1982; 12:508-515.
17. Limtrakul P, Lipigorngoson S and Namwong O: Inhibitory effect of dietary curcumin on skin carcinogenesis in mice. Canc Lett 1997; 116:197-203.
18. Dorai T, Cao YC and Dorai B: Therapeutic potential of curcumin in human prostate cancer. III. Curcumin inhibits proliferation, induces apoptosis, and inhibits angiogenesis of LNCaP prostate cancer cells *in vivo*. Prostate 2001; 47:293-303
19. Apisariyakul A, Vanittanakom N and Buddhasukh D: Antifungal activity of turmeric oil extracted from *Curcuma longa* (Zingiberaceae). J Ethnopharmacol 1995; 49:163-169.
20. Rasmussen HB, Christensen SB, Kvist LP and Karazami A: A simple and efficient separation of the curcumins, the antiprotozoal constituents of *Curcuma longa*. Planta Medica 2000; 66:396-398.
21. Ramirez-Tortosa MC, Mesa MD and Aguilera MC: Oral administration of a turmeric extract inhibits LDL oxidation and has hypocholesterolemic effects in rabbits with experimental atherosclerosis. Atherosclerosis 1999; 147:371-378.

22. Srivastava R, Puri V, Srimal RC and Dhawan BN: Effect of curcumin on platelet aggregation and vascular prostacyclin synthesis. Arzneimittelforschung 1986; 36:715-717.
23. Ammon HPT and Wahl MA: Pharmacology of *Curcuma longa*. Planta Medica 1991; 57:1-7.
24. Kuttan R, Sudheeran PC and Joseph CD: Turmeric and curcumin as topical agents in cancer therapy. Tumori 1987; 73:29-31.
25. Commandeur JNM and Vermeulen NPE: Cytotoxicity and cytoprotective activities of natural compounds: the case of curcumin. Xenobiotica 1996; 26:667-680.
26. Jiang MC, Yang-Yen HF and Yen JJY: Curcumin induces apoptosis in immortalized NIH 3T3 and malignant cancer cell lines. Nutri Canc 1996; 26:111-120.
27. Jain SK and DeFillips RA: Medicinal Plants of India, Reference Publications, Algonac, Michigan, 1991: 120.
28. Kumar V, Lewis SA, Mutalik S, Shenoy DB, Venkatesh and Udupa N: Biodegradable microspheres of curcumin for treatment of inflammation. Ind J Physiol Pharmacol 2002; 46:209–217.
29. Shao ZM, Shen ZZ and Liu CH: Curcumin exerts multiple suppressive effects on human breast carcinoma cells. Internat J Canc 2002; 98:234-240.
30. Duvoix A, Blasius R, Delhalle S, Schnekenburger M, Morceau F, Henry E, Dicato M and Diederich M: Chemopreventive and therapeutic effects of curcumin. Canc Lett 2005; 223(2):181-190.
31. Zhang J, Qi H and Wu C: Research of anti-proliferation of curcumin on A549 human lung cancer cells and its mechanism. Zhong Yao Cai 2004; 27(12):923-927.
32. Sun M, Yang Y, Li H, Su B, Lu Y, Wei Q and Fan T: The effect of curcumin on bladder cancer cell line EJ *in vitro*. [Article in Chinese] Zhong Yao Cai 2004; 27(11):848-850.
33. Di GH, Li HC, Shen ZZ and Shao ZM: Analysis of anti-proliferation of curcumin on human breast cancer cells and its mechanism. Zhonghua Yi Xue Za Zhi 2003; 83(20):1764-1768.
34. Zheng M, Ekmekcioglu S, Walch ET, Tang CH and Grimm EA: Inhibition of nuclear factor-kappaB and nitric oxide by curcumin induces G2/M cell cycle arrest and apoptosis in human melanoma cells. Melanoma Res 2004; 14(3):165-171.
35. Weisberg SP, Leibel R and Tortoriello DV: Dietary curcumin significantly improves obesity-associated inflammation and diabetes in mouse models of diabesity. Endocrinology 2008; 149(7):3549-58.
36. Liao S, Lin J, Dang MT, Zhang H, Kao YH, Fukuchi J and Hiipakka RA: Growth suppression of hamster flank organs by topical application of catechins, alizarin, curcumin, and myristoleic acid. Arch. Dermatol Res 2001; 293:200–205.
37. Yang F, Lim GP, Begum AN, Ubeda OJ, Simmons MR, Ambegaokar SS, Chen PP, Kayed R, Glabe CG and Frautschy SA: Curcumin inhibits formation of Abeta oligomers and fibrils and binds plaques and reduces amyloid *in vivo*. J Bio Chem 2004; 57:522-526.
38. Molnar V and Garai J: Plant-derived anti-inflammatory compounds affect MIF tautomerase activity. Internat Immunopharmacol 2005; 5(5):849-856.
39. Shah BH, Nawaz Z and Pertani SA: Inhibitory effect of curcumin, a food spice from turmeric, on platelet-activating factor and arachidonic acid-mediated platelet aggregation through inhibition of thromboxane formation and Ca^{2+} signaling. Biochem Pharmacol 1999; 58:1167-1172.

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