

A REVIEW ON TURMERIC: THE INDIAN GOLDEN SPICY ROOT

¹ Miss. vaishnavi S. Pakhare, ²Prof. Vijay G. Rokade, ³Mr. Lahu D. Hingane

¹student At Aditya Pharmacy College,

²professor At Aditya Pharmacy College,

³principal At Aditya Pharmacy College .

¹Aditya Pharmacy College Beed, India.

Abstract :

Curcuma longa (Turmeric), belonging to Zingiberaceae family is one of the most useful herbal medicinal plants. Extensive researches have proven that most of the turmeric activities of the turmeric are due to curcumin. It has various useful properties with antioxidant activities and is useful in conditions such as inflammation, ulcer and cancer. It also has antifungal, antimicrobial, renal and hepatoprotective activities. Therefore, it has the potential against various cancer, diabetes, allergies, arthritis, Alzheimer's disease and other chronic and hard curable diseases. The purpose of this review was to provide a brief summary of the new and current knowledge of the effects of curcumin. Recent studies have authenticated the use of turmeric for various diseases especially oxidative stress induced ones such as cancer, diabetes mellitus and inflammatory disorders. It also is used as hepatoprotective, nephroprotective, anticoagulant and anti-HIV to combat AIDS. As the global scenario is now changing towards the use of non-toxic plant products having traditional medicinal use, development of modern drugs from turmeric should be emphasized for the control of various diseases. Further evaluation needs to be carried out on turmeric in order to explore the concealed areas and their practical clinical applications, which can be used for the welfare of mankind. It is washed, dried and then ground into a powder which is then used for a variety of purposes. It is native to Asian countries, and forms a staple part of foods cooked in India and Pakistan. But its uses extend beyond cooking and food; they are also used as a part of Indian traditional medicine.¹

keywords-

Turmeric, curcumin (diferuloyl methane), Soxhlet apparatus, acetone, TLC plate {silica gel G and water}, mobile phase {glacial acetic acid, chloroform and ethanol}, antiseptic, antioxidant, anti-inflammatory, anti-neoplastic, antidiabetic.

INTRODUCTION:

Curcumin (diferuloyl methane), the natural yellow pigment in turmeric, is isolated from the rhizomes of the plant *Curcuma longa*. It constitutes about 3-4% of the composition of turmeric. In the south and southeast tropical Asian countries, turmeric has been used for centuries as a spice to give the specific flavor and yellow color to curry. Turmeric became a very important spice to mankind when it was observed that the addition of turmeric powder in food preparation preserved its freshness and nutritive value. Turmeric, as an additive, improved the palatability, aesthetic appeal and shelf life of perishable food items. The use of turmeric became more popular when it was found to act as a therapeutic agent for various illnesses. In the Ayurvedic system of medicine, turmeric is used as a tonic and as a blood purifier. Its role in the treatment of skin diseases and its ability to soften rough skin resulted in the prolific use of turmeric in topical creams and bath soaps in India. Turmeric is also used in home remedies in the treatment of cuts, wounds, bruises, and sprains. Its use as an anti-inflammatory and antimicrobial agent has been recognized for more than a century. The importance of turmeric in medicine took a new twist when it was discovered that the dried rhizome of *Curcuma longa* is very rich in phenolics, whose structures have been identified as curcuminoids. Phenolics are known to possess antioxidant properties. Free radical mediated damage to biological systems is recognized as the initiating agent for many diseases, such as cardiovascular diseases, cancer, and arthritis. Turmeric and its constituents show beneficial effects on these diseases and on other illnesses.² 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. Medicines derived from plants have played a pivotal role in the health care of many cultures, both ancient and modern. The Indian system of holistic medicine known as "Ayurveda" uses mainly plant-based drugs or formulations to treat various ailments, including cancer. Of the at least 877 small-molecule drugs introduced worldwide between 1981 and 2002, the origins of most (61%) can be traced to natural products. Although many synthetic drugs are produced through combinatorial chemistry, plant-based drugs are more suitable, at least in biochemical terms, for human use. Nonetheless, modern medicine has neither held in very high esteem nor encouraged the medicinal use of natural products. Turmeric is a plant that has a very long history of medicinal use, dating back nearly 4000 years. In Southeast Asia, turmeric is used not only as a principal spice but also as a component in religious ceremonies. Because of its brilliant yellow color, turmeric is also known as "Indian saffron." Modern medicine has begun to recognize its importance, as indicated by the over 3000 publications dealing with turmeric that came out within the last 25 years.³

pharmacognosy of turmeric:

Turmeric is a flowering plant, *Curcuma longa* of the ginger family, Zingiberaceae, the roots of which are used in cooking.

Biological source: Turmeric consists of the dried rhizomes of *curcuma longa* L. (*C. domestica* Valetton)

Synonyms:

Hindi- Haldi; Bang- Halud; Guj- Halada; Kan- Arisina; San- Haldi, Haridra; Tam- Manjal; Tel- Pasupu,

Scientific name : *Curcuma longa*

Family : Zingiberaceae

Kingdom : Plantae

Order : Zingiberales

Rank : Species

Higher classification : Hidden-lilies

Turmeric chemical constituents : Curcumin, Curcuminoid, Bisdemethoxycurcumin, Desmethoxycurcumin.⁴

Botany: It is a perennial plant, which grows 60 to 90 cm. in height and has tufted leaves. It is cultivated in India, China, Indonesia and other tropical countries

Chemical constituents:

1. Curcuminoids- Non-volatile colouring matter.
2. Curcumin, a diferuloylmethane; desmethoxy dicinnarmoylmethane; bidesmethoxy curcumin.
3. **Volatile oil:** l-cycloisoprenmyrcene, zinziberene turmerone, a-atlantone,
4. y-atlantone, phallandranene, sabinene, cineole, borneol Curcumone.
5. **Sugars-** arabinose, fructose and glucose.
6. *Bitter substances, Fixed oil and acid*

- **Chemical tests:**

1. Conc. H₂SO₄ or a mixture of H₂SO₄ with alcohol (90%) imparts a deep crimson colour to turmeric.
2. Boric acid colours to reddish brown which on addition of alkalies becomes greenish blue.

Cultivation:

Turmeric plants are widely grown in tropical areas of India, where over 70,000 acres are cultivated every year. plant is a perennial herb; 2-3 ft high with a short stem and tufted leaves; the rhizomes, which are short and thick, constitute the turmeric of commerce. The crop requires a hot and moist climate, a liberal water supply and a well drained soil. It thrives of any soil-loamy or alluvial, but the soil should be loose and friable. The field should be well prepared by ploughing and turning to a depth of about one ft. and liberally manure with farmyard and green manures. Sets or fingers of the previous crop worth one or two buds are planted 3' deep at distance of 11'-16' from April to August. The crop is ready for harvesting in about 9-10 months when the lower leaves turns yellow. The rhizomes are carefully dug up with hard picks, washed and dried.⁵



Fig.no. 1 cultivation

Extraction of curcumin from turmeric powder:

1. We plan to extract this curcuminoids from turmeric powder.
2. The process involves soxhlet extraction apparatus. It involves the solvent extraction .
3. In the first stage we followed the process as read in the literature surve .
4. This was done to ensure the process familiarity and also the presence of curcuminoids .
5. The turmeric was taken dried in sunlight and powdered, 20 g of this weighed and placed in the soxhlet apparatus.
6. 200ml of acetone was heated and refluxed in the apparatus, the process was monitored until theyellown colour of the extraction faded away[colourless].
7. The final extract was concentrated.



fig. no. 2- extraction process by using soxhlet

➤ BIOLOGICAL ACTIVITY OF TURMERIC AND ITS COMPOUNDS:

TABLE NO. 1

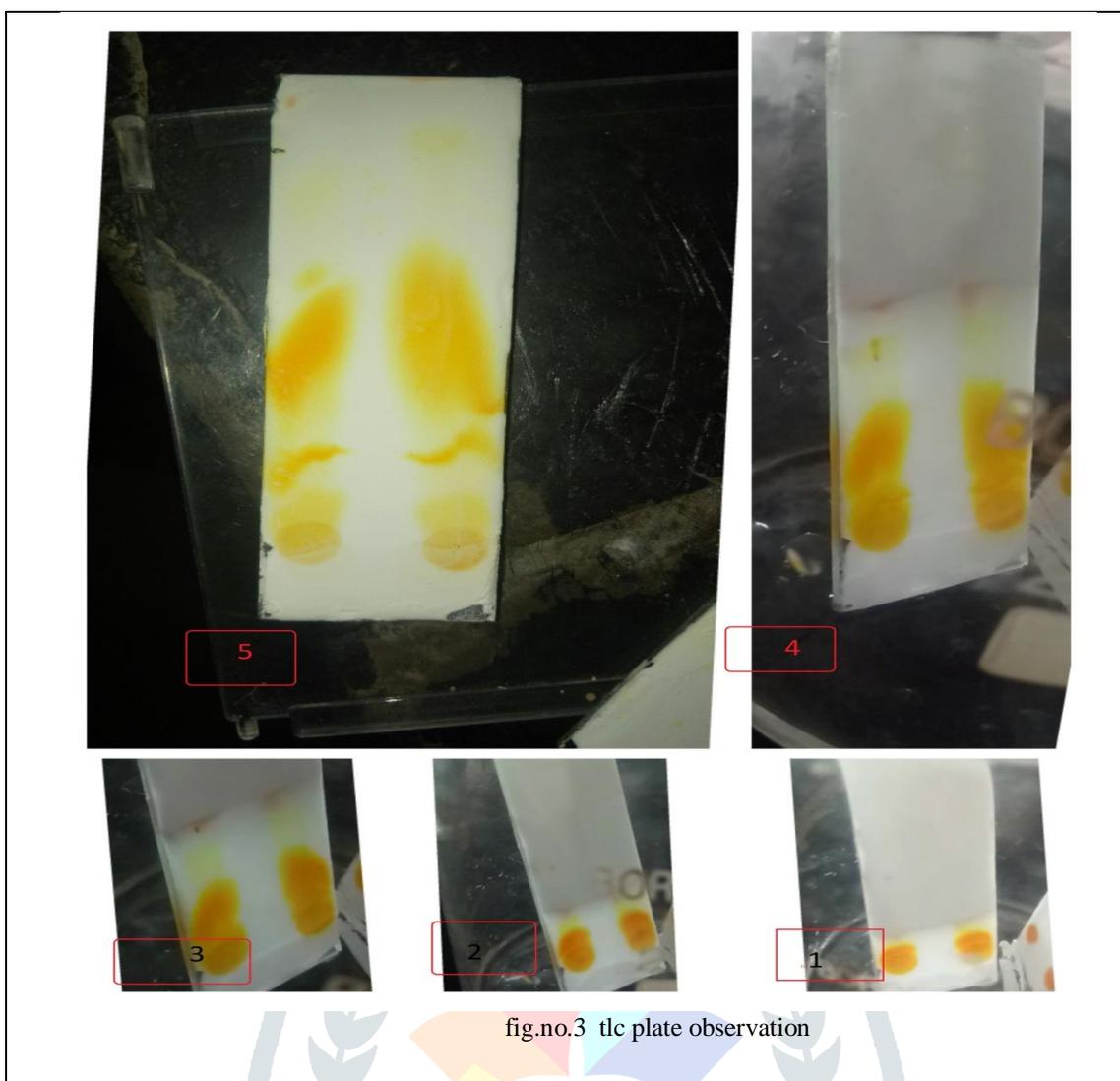
Compound/extract	Biological activity
Turmeric powder	Wound-healing
Ethanol extract	Antiinflammatory
	Hypolipemic
	Antitumour
	Antiprotozoan
Petroleum ether extract	Antiinflammatory
	Antifertility
Alcoholic extract	Antibacterial
Crude ether extract	Antifungal

Chloroform extract	Antifungal
Aqueous extract Volatile oil	Antifertility Antiinflammatory
	Antibacterial
Curcumin	Antifungal Antibacterial Antiprotozoan Antiviral Hypolipidemic Hypoglycemic Anticoagulant Antioxidant Antitumor Anticarcinogenic
Ar-turmerone	Antivenom
Methylcurcumin	Antiprotozoan
Demethoxycurcumin	Antioxidant
Bisdemethoxycurcumin	Antioxidant
Sodium curcuminatate	Anti-inflammatory Antibacterial

METHODOLOGY:**Identification method:****Thin layer chromatography{TLC}:**

1. TLC plate – take required amount of silica gel G and water in empty beaker to make slurry and apply it on tlc plate.
2. place it in oven for 105°C temperature in hot air oven for 30 min for activation preparation of mobile phase: take 9.5 ml of chloroform, 0.5 ml of ethanol and 0.1 ml of glacial acetic acid in beaker then keep it for saturation for 15 mins.
3. Then remove TLC plate from hot air oven after 30 min and mark it 1cm from top and 1cm from bottom.
4. Apply the test solution on tlc plate and keep it in saturation chamber for 15 mins.
5. then remove tlc plate from saturation chamber and keep it for drying
6. $rf = ds/df$. simply divide the distance the solution traveled by the distance the solvent traveled. the **retention factor** will always be between **zero** and **one**.

$$\begin{aligned}
 RF &= Ds/Df \\
 &= 5.9 \div 6.5 \\
 &= 0.90
 \end{aligned}$$



Recent studies:

➤ Curcumin: A Potent Protectant against Esophageal and Gastric Disorders:

The poor water solubility, dissolution, and retention time of curcumin in the stomach limits its practical usefulness in the treatment of peptic ulcer disease and neoplastic alterations including oral, esophageal, and gastric cancers in humans.^{17,18,19}. However, the therapeutic effect of curcumin might be exerted by its metabolites. For instance, Jamil et al.²⁰ have studied the spasmolytic, inotropic, and chronotropic activity of major curcumin metabolite tetrahydrocurcumin and the nonenzymatic curcumin hydrolysis products ferulic acid, feruloyl methane, and vanillin. They concluded that demethoxycurcumin and bisdemethoxycurcumin showed more pronounced spasmolytic effects in guinea pig ileum as well as vasodilation and negative inotropic activity in guinea pig arteries and atria, respectively, than those exhibited by a parent curcumin. This evidence seems to indicate that both curcuminoids derivatives can contribute to the observed pharmacological effects of the *C. longa* extract²⁰. Thus, future studies are required to prove if the enrichment of extracts of *C. longa* with curcumin metabolites demethoxycurcumin and bisdemethoxycurcumin could potentially enhance the therapeutic efficacy of curcumin. Recently, shown that plasma curcumin was below the detection limit of 0.1 ng/ml after oral curcumin administration in healthy volunteers; instead, only the curcumin metabolite, curcumin glucuronide, has been detected as early as 30 min after curcumin administration and achieved a maximal concentration within 2.7 hours. This suggests a rapid metabolism of curcumin which form the glucuronide conjugate. more importantly revealed that the gene expression of antioxidative genes NRF2, HO-1, and NQO1 was increased and the epigenetic genes for histone deacetylases HDAC1, HADAC2, HADAC3, and HADFAC4 have been suppressed by curcumin glucuronide. They concluded that despite the absence of the parent curcumin in the blood/plasma, the antioxidant and epigenetic modulatory effects of curcumin glucuronide can explain the potential overall health beneficial effect of this herbal medicinal product.¹⁶ Thus, it is reasonable to believe that most of the curcumin effects in vivo may be due to local and direct effects rather than systemic effects of this turmeric compound after absorption. This notion which is supported by the pharmacokinetics and pharmacodynamics of curcumin regulating antioxidant and epigenetic gene expression in humans could be of interest for basic researchers and clinicians.⁷

- Preparation, characterization, and in vitro release study of curcumin-loaded cataractous eye protein isolate films:

Curcumin, a naturally occurring polyphenol despite having therapeutic properties, has limited application due to its poor solubility in aqueous medium. The aim of this study is to explore a new protein source developed as a protein film, for the delivery of curcumin. The cataractous eye protein isolate (CEPI) is a mixture of proteins obtained after phacoemulsification surgery of the eye lens. The films have been prepared from the discarded CEPI and investigated for potential applications as a delivery system for curcumin. The films were prepared using glycerol as the plasticizer and glutaraldehyde as the cross-linker. The mechanical properties of the films were monitored by using nanoindentation techniques (NINT). The curcumin-loaded films were characterized by Fourier transform spectroscopy (FTIR), field emission scanning electron microscopy (FESEM), and thermogravimetric analysis (TGA) which established the incorporation of curcumin in the protein matrix. The loading efficiency of the films was found to be dependent on the degree of cross-linking of the films. In vitro release studies showed an initial burst release followed by a sustained release. The release rate is higher at pH 4.5 compared with pH 7.4. The released aliquots of curcumin-loaded films also exhibit antibacterial effects against *Staphylococcus aureus*. Our findings will be generally beneficial for the further reshaping of protein films as potential delivery carriers.⁸

➤ A CURRENT REVIEW ON *CURCUMA LONGA LINN.* PLANT

1. It is an essential substance to purify the gum resin of *Commiphoramukul* (Guggul) before it is made use of in ayurvedic formulations.
2. In veterinary medicine, turmeric is used to heal wounds or ulcers of animals.
3. Turmeric powder is used as an insect and ant repellent and sprinkled around the vessels to be protected.
4. turmeric and its constituents play an important role in our life.
5. Turmeric has been found to have a hepatoprotective characteristic similar to that of silymarin.
6. The volatile oils and curcumin and turmeric exhibit potent anti-inflammatory effects.
7. Constituents of turmeric exert several protective effects on the gastrointestinal tract.
8. Constituents of turmeric affect Alzheimer's disease.
9. Extract of turmeric suppresses symptoms associated with arthritis.
10. Turmeric and its extract inhibit angiogenesis.
11. Turmeric constituents can induce radioprotection.
12. Turmeric constituents inhibit proliferation of vascular smooth muscle cell.
13. Turmeric lower serum cholesterol levels.
14. Constituents of turmeric block the replication of HIV.⁹

Benefits:

Turmeric can help fight inflammation, potentially helping reduce your risk for various chronic diseases. Like many spices, turmeric (*Curcuma longa*) has a long history of use in traditional medicine. This flavor-filled spice is primarily cultivated from the rhizomes, or roots, of a flowering plant in India and other parts of Southeast Asia, and aside from giving curry its vibrant yellow color, turmeric is also known for having potent anti-inflammatory and antioxidant properties, according to a past review.

1. Curcumin Is an Anti-Inflammatory .
2. Curcumin May Protect Against Heart Disease.
3. Curcumin May Prevent (and Possibly Help Treat) Cancer.
4. Curcumin May Help Ease Symptoms of Osteoarthritis..
5. Effective Treatment for Inflammatory Bowel Disease
6. Helps to combat depression
7. Helps to strengthen the ligaments
8. Curcumin May Help Treat or Prevent Diabetes.
9. Reduce Risk of Childhood Leukemia¹⁰

side effects and precautions:

The general evidence suggests that turmeric is safe for consumption and as a medicinal product. Some people report mild stomach upset and occasional diarrhoea, but this is usually sensitivity to turmeric rather than side effects. It is unclear what it would do if consumed in large quantities. Turmeric has to be used with caution in pregnant women, as it is believed that turmeric has effects on the uterine wall. It can cause bleeding by preventing blood clotting, and should therefore be avoided if undergoing surgery. It is due to this side effect that turmeric should be avoided in patients who are taking blood thinning medication such as warfarin, aspirin and clopidogrel, as it can result in excessive bleeding in the event of an injury or ulcer in the stomach. Lastly, there is information that turmeric may interfere with some drugs used in chemotherapy, therefore who are undergoing chemotherapy should consult with their doctors on taking curcumin.¹¹

- Causes Stomach Upset.
- Triggers Heartburns.
- Leads To Vomiting.
- Affects To Bleeding.
- Affects Stool Elimination.
- Leads To Bleeding.
- Damages Liver.
- Causes Hypoglycemia.
- Hinders Anti-Cancer Treatment.
- Harms Blood Corpuscles.
- Affects Pregnancy.
- Negatively Interacts With Other Drugs.

Turmeric patent:

Turmeric is a tropical herb grown in east India. Turmeric powder is widely used in India as a medicine, a food ingredient and a dye to name a few of its uses³. For instance, it is used as a blood purifier, in treating the common cold, and as an anti-parasitic for many skin infections. It is also used as an essential ingredient in cooking many Indian dishes. In 1995, the United States awarded patent on turmeric to University of Mississippi medical center for wound healing property. The claimed subject matter was the use of "turmeric powder and its administration", both oral as well as topical, for wound healing. An exclusive right has been granted to sell and distribute. The Indian Council for Scientific and Industrial Research (CSIR) had objected to the patent granted and provided documented evidences of the prior art to USPTO. Though it was a well known fact that the use of turmeric was known in every household since ages in India, it was a herculean task to find published information on the use of turmeric powder through oral as well as topical route for wound healing. Due to extensive researches were located in different languages namely Sanskrit, Urdu and Hindi. Therefore, the, 32 references USPTO revoked the patent, stating that the claims made in the patent were obvious and anticipated, and agreeing that the use of turmeric was an old art of healing wounds. Therefore, the TK that belonged to India was safeguarded in Turmeric case.¹²

Mashelkar valiantly fought and revoked the wrong US patent on turmeric. Led by Mashelkar, CSIR successfully fought the battle of revocation of the US patent on wound healing properties of *turmeric* (*USP 5,401,5041*) claiming that this was India's traditional knowledge and therefore not novel. Fortunately, it could provide documentary evidence of traditional knowledge including ancient Sanskrit text and a paper published in 1953 in the Journal of the Indian Medical Association. The patent was revoked in 1997, after ascertaining that there was no novelty.



RESULTS AND DISCUSSION:

“Turmeric : the golden spice : from kitchen to clinic.”

Turmeric is considered and referred to as the ‘**Golden Spice**’ by many. This is because Turmeric is one of the most powerful herbs out there and India has the rights of turmeric patent {R. A. MASHELKAR}. It has effective, amazing effects that not too many plants have.

Turmeric is a Powerful Herb with Tons of Benefits. It is almost impossible to talk about Indian cuisine without mentioning curries. In the same way, it is impossible to imagine an authentic curry without the use of a spice known as **turmeric**. Scientific research has discovered well over 300 active ingredients in that have powerful effects on the body. In fact, organic Turmeric is a very potent herb with a vast number of health benefits. Turmeric is considered to be the greatest of all herbs by some practitioners. In Ayurveda, the practice of traditional Indian medicine, turmeric is prescribed for just about everything — from cuts and grazes, to respiratory ailments, liver disease, gas, bloating, digestive illness, the heart, as an anti-septic and more. The active ingredients in Turmeric — *Curcuma longa* — are a group of plant substances called curcuminoids. Through its antioxidant mechanisms, curcumin supports colon health, exerts neuroprotective activity and helps maintain a healthy cardiovascular system.

Turmeric has very important commercially available derivative i.e CURCUMIN which were extracted by conventional extraction using soxhlet and then to check the curcumin in that dried extract we practically perform TLC identification method using chloroform[9.5ml], ethanol[0.5ml] and glacial acetic acid[0.1ml] as a mobile phase for better analysis and understanding. The RF value calculated is 0.90

A great deal of research has even reported that using curcumin is more advantageous than prescription drugs. When examining the research, turmeric benefits extend beyond that of these 10 drug/types of drugs:

- Anti inflammatory
- Anti-depressants (Prozac)
- Chemotherapy
- Anti-coagulants (Aspirin)
- Pain killers
- Diabetes drugs (Metformin)
- Arthritis medications
- Inflammatory bowel disease drugs
- Cholesterol drugs (Lipitor)
- Steroids

Turmeric has been attributed a number of medicinal properties in the traditional system of medicine and its internal as well local use has been advocated. The major claims have been for use as antiseptic, cure for poisoning, eliminating body waste products, for dyspepsia, respiratory disorders and cure for a number of skin diseases including promotion of wound healing. Recent studies have confirmed some of the older claims and brought out several new useful properties. Curcumin, curcuminoids and essential oils are the major active constituents. The main activities have been found to be anti-inflammatory, hepatoprotective, antimicrobial, wound healing, anticancer, antitumor and antiviral. Discovery of antiviral properties in curcumin, particularly against HIV, is interesting and needs proper evaluation. The review highlights some of the newer researches which may explain the multifaceted activity of this natural product. Different extracts of turmeric and also curcumin have been tried clinically in several diseased conditions with gratifying results.

In recent years turmeric has been recognized to be a safe herb, and one with no known drug interactions. It's been proven to have several beneficial effects.

“Turmeric is universally seen as one of the most important herbs for health and healing and is one of nature’s most powerful healers.

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