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Pharmacognostic Studies on *Curcuma Longa*

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Research Article

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Abstract

The turmeric (*Curcuma longa*) plant, a perennial herb belonging to the ginger family, is cultivated extensively in south and southeast tropical Asia. The rhizome of this plant is also referred to as the "root" and is the most useful part of the plant for culinary and medicinal purposes. The most active component of turmeric is curcumin, which makes up 2 to 5% of the spice. The characteristic yellow color of turmeric is due to the curcuminoids. Curcumin is an orange–yellow crystalline powder practically insoluble in water. Turmeric is used as a dietary spice, coloring agent in foods and textiles, and a treatment for a wide variety of ailments. It is widely used in traditional Indian medicine to cure biliary disorders, anorexia, cough, diabetic wounds, hepatic disorders, rheumatism, and sinusitis. Turmeric paste in slaked lime is a popular home remedy for the treatment of inflammation and wounds. For centuries, curcumin has been consumed as a dietary spice at doses up to 100 mg/d. Extensive investigation over the last five decades has indicated that curcumin reduces blood cholesterol, prevents LDL oxidation, inhibits platelet aggregation, suppresses thrombosis and myocardial infarction (MI), suppresses symptoms associated with type II diabetes, rheumatoid arthritis, multiple sclerosis (MS), and Alzheimer's disease, inhibits human immunodeficiency virus (HIV) replication, enhances wound healing, protects from liver injury, increases bile secretion, protects from cataract formation, and protects from pulmonary toxicity and fibrosis, is an anti-leishmaniasis and an antiatherosclerotic. Additionally, there is extensive literature that suggests that curcumin has potential in the prevention and treatment of a variety of other diseases.

Keywords: Pharmacognosy; TLC; Medicinal Plants; Powder Microscopy

Introduction

Over the last several years, there has been increasing interest in turmeric and its medicinal properties. This is partially evidenced by the large numbers of scientific studies published on this topic. Turmeric (*Curcuma longa*), a flowering plant in the family Zingiberaceae, is widely used as a food coloring and is one of the principal ingredients in curry powder. Turmeric has long been used in both Ayurvedic and Chinese medicine as an anti-inflammatory, to treat digestive disorders and liver problems, and for the treatment of skin diseases and wound healing. The active ingredient in turmeric is curcumin, which has been the subject of numerous animal studies—but as of yet, very few studies on people—demonstrating various medicinal properties. Curcumin has

been shown, for example, to stimulate the production of bile and to facilitate the emptying of the gallbladder. It has also demonstrated in animals a protective effect on the liver, anti-tumor action, and ability to reduce inflammation and fight certain infections.

Numerous studies suggest that curcumin lowers serum cholesterol levels. Dixit, et al. [1] itself compared Nardostachys with *Curcuma* and reported that 50% ethanolic extract of Curcuma tuber exhibited better cholesterol and triglyceride lowering activity [Ch = -85%; Tg = -88%] and also elevates HDL-cholesterol/total cholesterol ratio. Soudamini, et al. [2] investigated the effect of oral administration of curcumin on serum cholesterol levels and on lipid peroxidation in the liver, lung, kidney, and brain of mice treated with carbon tetrachloride, paraquat, and cyclophosphamide. It significantly lowered the increased peroxidation of lipids in these tissues produced by these chemicals. It also significantly lowered the serum and tissue cholesterol levels in these animals, indicating that the use of curcumin helps in conditions associated with peroxide-induced injury such as liver damage and arterial diseases.

Soni and Kuttan [3] examined the effect of curcumin administration in reducing the serum levels of cholesterol and lipid peroxides in 10 healthy human volunteers receiving 500 mg of curcumin per day for 7 days. A significant decrease in the level of serum lipid peroxides (33%), an increase in high-density lipoproteins (HDL) cholesterol (29%), and a decrease in total serum cholesterol (12%) were noted. Because curcumin reduced serum lipid peroxides and serum cholesterol, the study of curcumin as a chemo preventive substance against arterial diseases was suggested.

Ramirez-Bosca, et al. [4] reported that daily oral administration of hydroalcoholic extract of *Curcuma longa* decreases significantly the LDL and apo B and increases the HDL and apo A of healthy subjects. In another review by Miquel, et al. [5] the daily intake of 200 mg of hydroalcoholic extract of curcuma results in a decrease in total blood lipid peroxides as well as in HDL and LDL-lipid peroxidation. This anti-atherogenic effect was accompanied by a curcuma antioxidant-induced normalization of the plasma levels of fibrinogen and of the apo B/apo A ratio.

In another study carried out by Jun-Ichi Nagata & Morio Satio [6] curcumin intake and its correlation with physiological effects on indices of liver function, serum and liver lipid profiles were observed. After 28 days HDL-cholesterol concentrations of rats fed curcumin diets were significantly higher ($P<0.05$) than those of the control group, and serum TG concentration of rats fed the x100 curcumin diets was significantly lower ($P<0.05$) than that of the x1 curcumin group.

Hossam MM Arafa [7] studied the effect of curcumin on high cholesterol diet fed rats after one week reported that curcumin helps lower elevated cholesterol levels induced by a high-fat diet in rats. In the curcumin-supplemented rats, triglyceride levels dropped by 25-31%, while low-density lipoprotein (LDL) levels fell by 58% compared to the un-supplemented group. The curcumin-fed animals also demonstrated a 51% increase in high-density lipoprotein (HDL) levels.

Description

Perennial herb up to 1.0 m in height; stout, fleshy, main rhizome nearly ovoid (about 3 cm in diameter and 4 cm long). Lateral rhizome, slightly bent (1cm _2–6cm), flesh orange in colour; large leaves lanceolate, uniformly green, up to 50cm long and 7–25cm wide; apex acute and caudate with tapering base, petiole and sheath sparsely to densely pubescent. Spike, apical, cylindrical, 10–15cm long and 5–7 cm in diameter. Bract white or white with light green upper half, 5–6 cm long, each subtending flowers, bracteoles up to 3.5 cm long. Pale yellow flowers about 5cm long; calyx tubular, unilaterally split, unequally toothed; corolla white, tube funnel shaped, limb 3-lobed. Stamens lateral, petaloid, widely elliptical, longer than the anther; filament united to anther about the middle of the pollen sac, spurred at base. Ovary trilocular; style glabrous. Capsule ellipsoid. Rhizomes orange within.

(A) (B)

Figure 1: (A) Whole plant, (B) Rhizome.

Materials and Methods

Voucher specimen: The plant material Rhizome of *Curcuma longa* was collected from the wild and Identity was confirmed with the voucher specimen using Gamble [8].

Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian Pharmacopoeia [9]. Physico-chemical values such as the percentage of total ash, acid-insoluble ash, water-soluble ash, and water and alcohol-soluble extractives were calculated as per the Indian Pharmacopoeia [9]. TLC fingerprinting profile carried as per Stahl E [10]. For the Anatomical studies, transverse sections (TS) were prepared and stained [11]. A standard, Limit for total microbial count provided by WHO Guidelines (1998) was followed and also Indian herbal pharmacopoeia.

Results and Discussions

Physico-Chemical Parameters

The Physicochemical parameters shows that the sample under study falls within the range of the limits prescribed by API Erddis

Physicochemical Constants			Organoleptic characters	
Parameters	Values	Limit	Parameters	Values
TA	7.56%	NMT 9%	Taste	Characteristic
AIA	0.37%	NMT 1%	Color	Orange-reddish-brown
ASE	10%	NLT 8%	Odour	Characteristic
WSE	40%	NLT12%	Texture	Rough

Table 1: Physicochemical parameters.

TLC Finger Printing Profile of Curcuma Longa

TLC Finger Printing Profile							
Under Visible Light							
Rf Values	0.4	0.34	-	-	- -	-	-
Sprayed with 10% H_2SO_4							
Rf Values	0.4	0.6	0.21	0.34	0.64 0.68	-	-
Sprayed with Anisaldehyde							
Rf Values	0.09	0.23	0.5	0.73	- -	-	-
Under Short UV (254nm)							
Rf Values	0.7	0.33	0.61	0.81	0.89 -	-	-
Under Long UV (366nm)							
Rf Values	0.6	0.14	0.21	0.27	0.33 -	-	-

Table 2: Rf values of TLC profile of Curcuma.

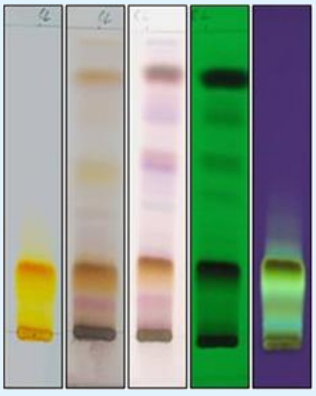


Figure 2: TLC Finger Printing Profile of Curcuma Longa.

Mobile Phase- Toluene: Ethyl acetate (8:2)
A. Visible B. Sprayed With 10% H_2SO_4
C. Sprayed with Anisaldehyde
D. Under short UV and E. Long UV

Anatomical Studies

Outer most 4 to 6 layers of brick shaped parenchymatous cork, Followed by cork cambium. The cortex consists of thin walled cellulosic with inter cellular spaces, parenchymatous cells containing scattered vascular bundles with starch grains. Oleo-resins cells with brownish contents are also observed throughout the ground tissue .Oil cells with submersed walls containing either orange yellow globules of volatile oil and resin matter. Endodermis is well marked and starch grains abundant. Xylem vessels annular spiral unlignified. Fiber

thin walled central lumen lignified with pectosic transverse septa. Vessels mainly spirally thickened a few reticulate and annular.

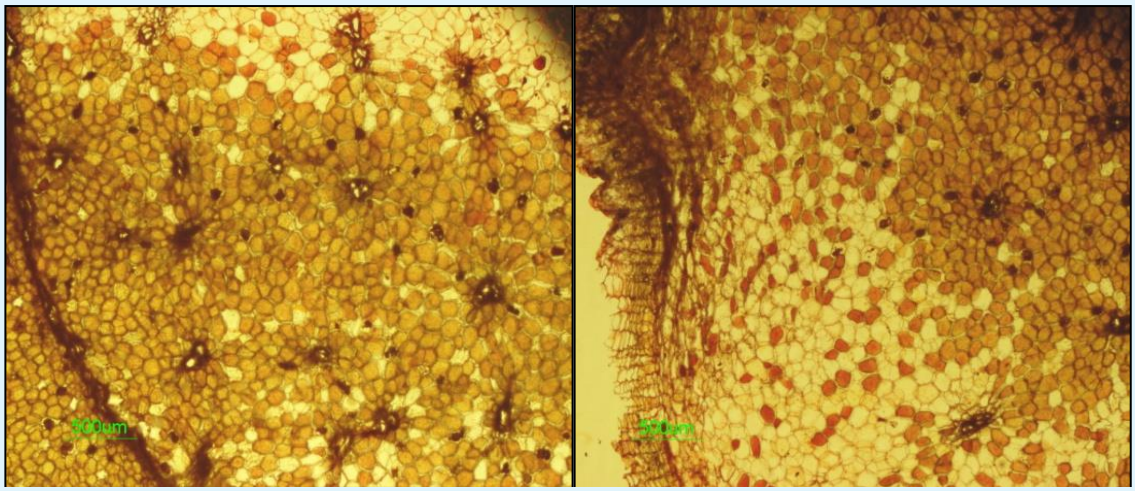
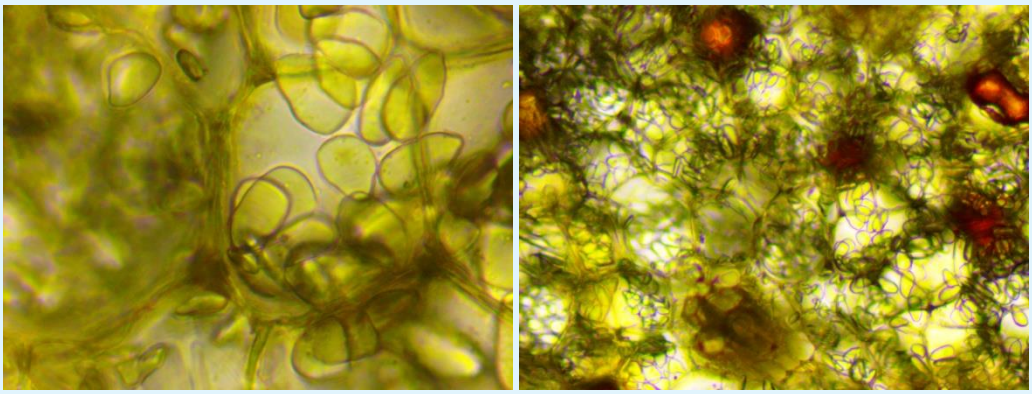
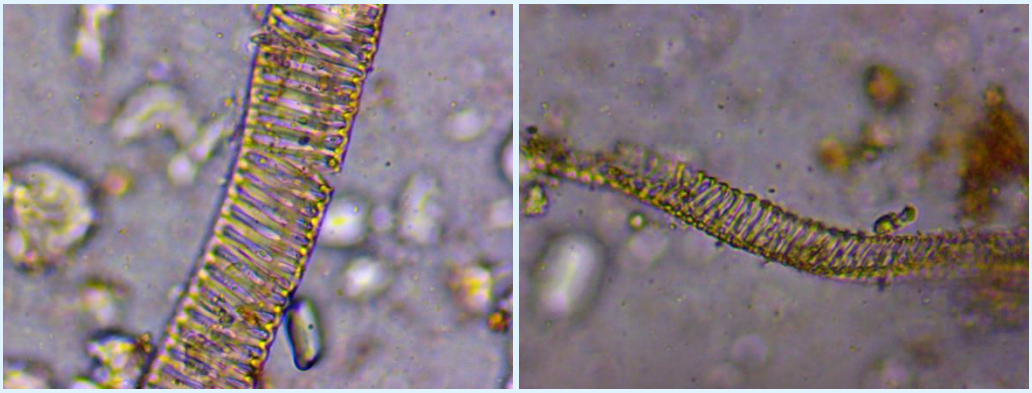


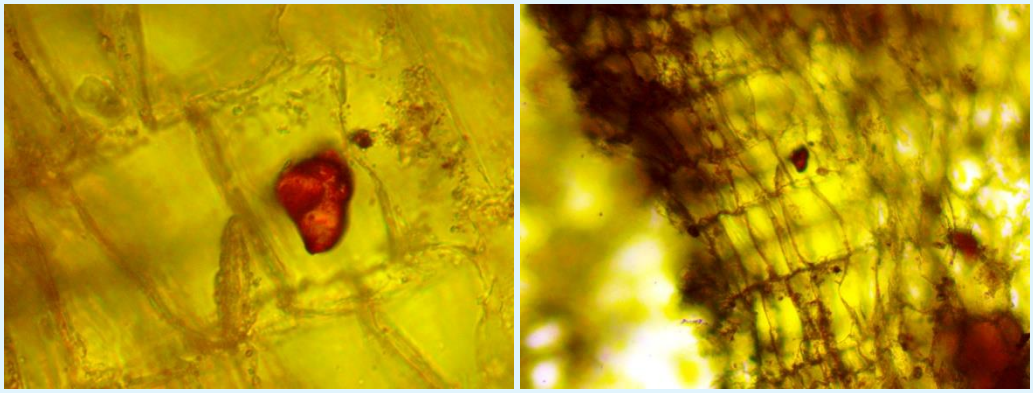
Figure 3: T.S of Rhizome of *Curcuma longa.*



Starch grains **Parenchyma cells with curcumin**



Reticulate vessels



Curcumin in parenchyma cells **Fiber tissue**

Figure 4: Powder microscopy of *Curcuma longa.*

Powder Microscopy

The powder is yellow in colour. Microscopic analysis of the powder revealed the presence of fibres. Simple starch grains mostly oval and a few rounds were abundantly found. Reticulate vessels were also observed. Cells with oleo resin having curcumin content were also found

Microbial Limit Tests

Microbial

Total Aerobic Bacterial Count (TABC): 2.1×10^3
Total Yeast and Mould Count (TYMC): 0.6×10^3
(Microbial Contamination limit for raw herbs- TABC: $<10^7$, TYMC: $<10^5$)

The microbial limit tests indicate that the results are in conformation with Standards mentioned by API.

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