

# Pharmacognostical and antimicrobial activity of leaf of *Curcuma angustifolia* Roxb.

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## Abstract

The present study was designated to investigate the antimicrobial activity of leaves of *Curcuma angustifolia* Roxb. The aqueous extract showed considerable activity against all the four tested strains viz., *Pseudomonas aeruginosa*, *Escherichia coli*, *Candida albican* and *Candida non-albican*. Also, attempt was made to evaluate the pharmacognostical standards of the leaves of the plants which include macroscopy, physico-chemical parameters and preliminary phytochemical screening.

**Keywords:** *Curcuma angustifolia*, Leaves, Antimicrobial activity.

## Introduction

The total documented medicinal plant species were distributed over 26 families and have occupied various life forms, of which 14 were herbaceous species (3 climbers, 1 grass and 10 forbs), 13 were tree species, 6 were woody climber species and 3 were shrub species. combretaceae and liliaceae had the highest number of species used in curing diseases. Different plant parts of these species, such as, root, tuber, leaf, fruit, bark, resin, seed and latex were used as medicine. In majority of cases, root (14 species) was used for preparing medicine, followed by fruit (7 species) and bark (5 species). Green plants synthesize and preserve a variety of biochemical products, many of which are extractable and used as chemical feed stocks or as raw material for various scientific investigations. Many secondary metabolites of plant are commercially important and find use in a number of pharmaceutical compounds. However, a sustained supply of the source material often becomes difficult due to the factors like environmental changes, cultural practices, diverse geographical distribution, labour cost, and selection of the superior plant stock and over exploitation by pharmaceutical industry<sup>1</sup>.

Plants, especially used in Ayurveda can provide biologically active molecules and lead structures for the development of modified derivatives with enhanced activity and /or reduced toxicity. The small fraction of flowering plants that have so far been investigated have yielded about 120 therapeutic agents of known structure from about 90 species of plants. Some of the useful plant drugs include vinblastine, vincristine, taxol, podophyllotoxin, camptothecin, digitoxigenin, gitoxigenin, digoxigenin, tubocurarine, morphine, codeine, aspirin, atropine, pilocarpine, capscicine, allacin, curcumin, artemesinin and ephedrine among others. In some cases, the crude extract of medicinal plants may be used as medicaments. On the other hand, the isolation and identification of the active principles and elucidation of the mechanism of action of a drug is of paramount importance. Hence, works in both mixture of traditional medicine and single active compounds are very important.

Where the active molecule cannot be synthesized economically, the product must be obtained from the cultivation of plant material<sup>2-3</sup>.

*Curcuma angustifolia* Roxb. (Tikur), Zingiberaceae is important medicinal plants used in India system of medicine in treatment of various disease and disorders. The major chemical constituent of the plant are methyl eugenol, camphor, cineol etc.<sup>4</sup>

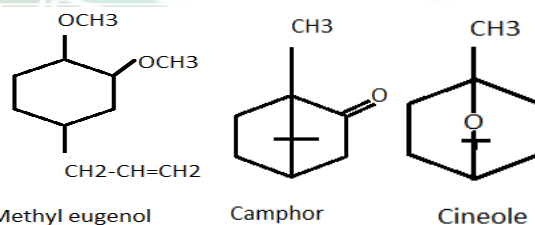


Fig. 1: Chemical constituents of *Curcuma angustifolia* Roxb.

The various uses of the plant are: it is nutritive; it is non-irritating diet in certain chronic diseases, during convalescence from fevers, in irritations of the alimentary canal, pulmonary organs, or of the urinary apparatus. It is well suited for infants to supply the place of breast-milk or for a short time after having weaned them. It may be given in the form of jelly, variously seasoned with sugar, lemon-juice, fruit jellies, essences, or aromatics. Its jelly has no peculiar taste, and is less liable to become acid in the stomach, and is generally preferred by young infants to all others, except tapioca. The rhizomes are used externally as well as internally. It may also promote healing of stomach ulcers. It is externally benefits in diarrhea, dysentery, colitis. The herb is commonly used as a general tonic in tuberculosis. It is used in cough, bronchitis and also as a nourishing food for infants. It is the main ingredient in biscuits, cakes, pudding, jellies and face powder<sup>5-6</sup>.

Pharmacological various activities<sup>7-12</sup> had been screened viz., Banerjee and Nigam investigated antifungal efficacy of essential oils of *Curcuma angustifolia*, Banerjee and Nigam S.S. investigated antibacterial activities of essential oil from *Curcuma angustifolia*, Banerjee and Nigam studied chemical examination of the essential oils of *Curcuma angustifolia* Roxb., Mishra and Dixit perform the pharmaceutical studies on starches of some zingiberaceous rhizomes, Nguyen *et al.*, studied the chemical composition of oils of *Curcuma angustifolia* Roxb from Vietnam, Banerjee and Nigam investigated the antifungal activity of *Curcuma angustifolia*. Literature review revealed that no any work has been carried in leaves to evaluate the antimicrobial activity; therefore, the present work was conceived by us.

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## Material and Methods

### Selection of plant

*Curcuma angustifolia* Roxb. belongs to family *Zingiberaceae* is medicinally important plant, commonly grown in some parts of our country and used in the treatment of various disease and disorders of human ailments by tribal and rural people of our country. So, far no any systematic work was carried out to investigate the anti-microbial activity of leaf of the selected plant therefore, the plant was selected for present investigation.

### Collection of plant material

The leaves of the selected plant were collected in the months of August 2010 from the botanical gardens of Ujjain District of Madhya Pradesh and authenticated by Dr. S. N. Dwivedi, Prof. and Head, Department of Botany, Janata PG College, APS, University, Rewa, M.P-India and a voucher specimen MP/06/33 were deposited in our department. The leaves were later air-dried, powdered and stored in an air-tight container for further use.

### Pharmacognostic evaluation

#### Macroscopic characters

Various morphological studies of the leaf were studied and result was reported in table 1.<sup>13</sup>

#### Physico-chemical evaluation

The dried leaves of *Curcuma angustifolia* Roxb. were subjected to standard procedure for the determination of various physicochemical parameters.<sup>14</sup>

### Extraction of Plant Material

The extraction of plant material was carried out by maceration, 150 gm dried leaf powder was taken and dissolved in 500 ml of distilled Chloroform-water and was left for 48 hours, then was filtered and concentrated.<sup>14</sup>

### Preliminary Phytochemical screening

The aqueous extract obtained after maceration was subjected to various phytochemical screening as per the standard procedure to reveals the presence of various active phytoconstituents.<sup>14</sup>

### Antimicrobial activity<sup>15-16</sup>

All the microorganisms were obtained from from Chotiram Hospital and Research Centre, Indore, M.P. Two bacteria strain *Pseudomonas aeruginosa* and *Escherichia coli* & two fungi strain *Candida albican* and *Candida non-albican* were used for present investigation. Nutrient agar media was used for bacteria whereas salburauads agar media was used for fungi.

### Preparation and application of disks for experiment<sup>15-16</sup>

Different concentration of the extracts (20-100 µg/ml) was prepared by reconstituting with Water. The test microorganisms were streak to agar medium by streaking plate method. After streaking the autoclaved filter paper discs (5 mm in diameter) impregnated with the extracts were placed on plates using flame-sterilized forceps. The antimicrobial assay plates were incubated at 37°C for 24hr. For positive control Ampicilline and Fluconazole (60µg/ml) and for negative control solvent was used.



Fig. 2: *Curcuma angustifolia* Roxb. : Mature



Fig. 3: *Curcuma angustifolia* Roxb.: Leaves



Fig. 4: *Curcuma angustifolia* Roxb.:Early Flowers



Fig. 5: *Curcuma angustifolia* Roxb.: Complete plant parts



**Observation of results**

Results were recorded as presence or absence of zone of inhibition. The inhibitory zone around test paper disks indicated absence of microbial growth and it was reported as positive (growth inhibition observed) and absence of zone as negative. The test was repeated thrice in interday interval to insure reliability of the results. The diameters of the inhibition zones were measured in mm (after subtraction the diameter of disc i.e. 5mm), shown in table 4.

**Results and discussion**

The present study was taken up to screen the pharmacognostical, phytochemical and anti-microbial activity of leaves of the plant *Curcuma angustifolia*. The macroscopical studies of leaves of *Curcuma angustifolia* was carried out and the results are presented in Table 1. The physicochemical analysis of leaves was carried out. In this study ash values (total ash, acid insoluble ash and water soluble ash) were determined, Swelling index, LOD, Foaming index, Foreign organic matter (F.O.M.) was determined (Table 2). Extraction of the plant material was done with water by maceration and the extract was screened for the presence of medicinally active phyto constituents (Table 3). The antimicrobial activity of extract was performed and reported. In this study the results of the investigations show that leaves shows remarkable anti-bacterial activity than anti-fungal activity when compared to standard. The zone of inhibition was shown in Table 4. Thus, these studies provided a scientific support to the selected medicinal plants which claims its use in folk lore medicine.

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**Table 1: Morphological features of leaves of *Curcuma angustifolia* Linn.**

S/No.	Character	Appearance
1.	Color	Upper surface is dark in color Lower surface is light in color
2.	Odor	Characteristic or Turmeric like
3.	Taste	Turmeric like
4.	Shape	Lanceolate
5.	Size	36 to 37 cm length; 8 to 10 cm in width
6.	Leaf Base	Decurrent base
7.	Apex	Acute
8.	Margin of Lamina	Entire Margin
9.	Venation	Parallel Venation
10.	Nature	Simple Leaf
11.	Mid Rib	Present
12.	Petiole	Absent
13.	Shape of Lamina	Lanceolate
14.	Surface	Smooth
15.	Duration	Deciduous
16.	Phyllotoxy	Verticillate or Whorled

**Table 2: Physicochemical Parameters of leaves of *Curcuma angustifolia* Roxb.**

S/No.	Physicochemical Parameters	Result (w/v)
1.	Ash Values	
	Total Ash Value	5.7%
	Acid Insoluble Ash Value	2.50%
	Water Soluble ash Value	0.5%
2.	Moisture Content (Loss On Drying)	0.8%
3.	FOM	2.4%
4.	Swelling index	0.2%

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**Table 3: Preliminary Phytochemical Screening of Aqueous extract of leaves of *Curcuma angustifolia* Roxb.**

S/No.	Tests	Aqueous extract
1.	Fixed oil and fats Spot test Soap formation test	+ -
2.	Tannins Ferric chloride test Alkaline reagent	- -
3.	Proteins Millions Reagent Ninhydrin Reagent Biuret Test	- + -
4.	Flavonoides Alkaline reagent test Shinoda test	+ +
5.	Steroids and triterpenoids Lieberman burchard test Salkowski test	- +
6.	Mucilage and gum Reaction with 90% alcohol	-
7.	Waxes Reaction with alcoholic KOH	-
8.	Alkaloids Dragendorff's reagent Mayer's reagent Wagner's reagent Hager's reagent	+ - - -
9.	Carbohydrates Molish test	+
10.	Glycosides Borntrager's test	+
11.	Inulin	-
12.	Starch (Amylum)	-

**Table 4: Antimicrobial activity of aqueous extract of leaves of *Curcuma angustifolia* Roxb.**

Conc. (ug/ml)	EC					PA					CA					CAN				
	20	40	60	80	100	20	40	60	80	100	20	40	60	80	100	20	40	60	80	100
AEL	-	10	12	15	19	4	13	21	22	26	-	-	-	7	13	-	-	-	-	2
SD (60 ug/ml)	20.5 (A)					28.0 (A)					16.7 (F)					19.2 (F)				
CT	-					-					-					-				

Abbr.: EC = *Escherichia coli*, PA= *Pseudomonas aeruginosa*, CA= *Candida albican*, CAN= *Candida non-albican*, SD= standard drug, A- Ampiciline, F= Fluconazole, CT= Control, AEL: Aqueous extract of leaves.