Review Article

MEDICINAL VALUE OF CURCUMA CASSIA ROXB: AN OVERVIEW

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ABSTRACT

Curcuma caesia is commonly known as kali haldi and it belongs to the family Zingiberaceae. Black turmeric is an uncommon endemic as well as the ethnomedicinally importantce of South East Asia. This herb is available throughout north-east, central India, Papi Hills of East Godavari, West Godavari, and Andhra Pradesh. In the traditional system of medicine, fresh and dried rhizomes of Curcuma caesia are used in treating leucoderma, asthma, tumours, piles, bronchitis, bruises etc. Curcuma caecia has scientifically studied for various therapeutical activities like antioxidant, antibacterial, antipyretic, larvicidal, insecticidal, antimicrobial, wound healing and antihyperglycemic. The present review is an effort to give a detailed survey of the literature on its, phytochemistry, traditional uses and therapeutic studies.

Keywords: Curcuma caesia, kali haldi, Zingiberaceae, Black turmeric, rhizomes, phytochemistry

INTRODUCTION

In ethno medicinal practices, the traditional healers use the genus Curcuma for the treatment of various ailments but Curcuma caesia Roxb. is very less known and untouched drug. The genus Curcuma is a member of the ginger (family Zingiberaceae), which comprises over 70 species of rhizomatous herbs.^{1, 2} The plants have lots of potential in terms of medicinal properties. Literature reveals its anti-inflammatory, hepatoprotective, blood purifier, antioxidant, antiasthamatic, anti-tumour, stomachic and carminative properties.^{3.4}

The leaf has a deep violet patch which runs throughout the lamina . Rhizome is aromatic, carminative and stimulant and a paste made from the rhizome is used to cure dysentery and as poultice in rheumatic pain, sprains and bruises.⁵ There has been great extent of work was conducted, especially in India, on the chemical constituents of *Curcuma Caecia* and reported that the oils of the plant posses antibacterial and antifungal properties 4. When rhizomes are cooked with mustard oil or sesame oil and the prepared paste is applied externally on rheumatism and paining part of the body.^{6,7}

The plant originates from india and south-east asia. It grows in rich humid and clayey soils among them *curcuma longa* is commonly known as haldi in hindi, is a perennial plant having a short stem with large oblong leaves. It bears ovate pyriform or oblong, ovate or cylindrical rhizomes, which are often branched and brownish yellow in color. However the rhizome of species curcuma caesia roxb.^{8,9} Popularly known as kali haldi is very less known and almost untouched drug. In india it is found in west Bengal, Madhya Pradesh, Orissa, Chhattisgarh And Uttar Pradesh States . It flourishes well in moist deciduous forest areas. Rhizomes of the plant are used for sprains and bruises and also employed in the preparation of cosmetics it is

commonly cultivated in ceylon, belgium, indonesia, france and in south india and bengal and used in indian traditional system of medicine and also in several food stuff preparation for its medicinal properties.^{10,11}

Traditional uses

- The rhizome and leaves of kali haldi is used in different parts of the world. It is used as a tonic for the brain and the heart.
- Dried rhizomes and leaves of curcuma caesiaRoxb.are used in piles, leprosy asthma, cancer, wounds, impotency, fertility, tooth ache, vomiting, and allergies.¹²
- Rhizomes are often used for treatment of leucoderma, piles, bronchitis, asthma, Tumors, tuberculous glands of the neck, enlargement of the spleen, epileptic.
- In North-East and Central India Curcuma caecia Roxb dried rhizome and leaves are used for treatment of Piles, leprosy, asthma, cancer, wounds, fever, impotency, fertility, tooth ache, vomiting, allergies.¹³
- Rhizome of Curcuma caesia is grounded in the form of a paste in rheumatic arthritis.^{14,15}
- Fresh rhizome decoction is used as antdiarrhoeiaric and to get relief from stomach ache. The fresh rhizome paste of curcuma caesiais applied during the snake bite and scorpion bite.¹⁶The dried powder used to mixed with seed powder of Andrographis paniculata Wall ex .Nees and applied during insect and snake bite.^{17,18}
- Arunachal Pradesh the paste of fresh rhizome is applied during snake and scorpion bite7. In Assam fresh rhizome juice mixed with mustard oil and is given to cattles in dysentery.¹⁹
- In Asian Rhizome of *Curcuma caecia* used for wound, pox & tumour . Powdered tuber is orally administered with water in stomachache and bloating.²



Figure 2: Dried rhizomes of Curcuma caesia

Taxonomical Hierarch y Kingdom: Plantae Subkingdom : Viridaeplantae Phylum: Tracheophyta Sinnott Subphylum: Euphyllophytina Class: Magnoliopsida"monocotyledons""commelinids" Order: Zingiberales Family: Zingiberaceae Subfamily: *Zingiberoideae* Tribe: *Hedychieae* Genus: Curcuma Species: C. caesia Roxb

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Vernacular names

Hind: Kali Haldi Manipuri: YaingangAmuba or Yaimu Marathi: Kala-haldi Telugu: NallaPasupu Bengali: Kala haldi Mizo: Aihang, Ailaihan Assamese: kalahaladhi Malayalam: Kari manjal Sanskrit: RajaniNishaa, Nishi, Ratri.

Botanical description^{21, 22, 23}

Morphology

The plant is normally erect with height ranging from 0.5 to 1.0 m.It is divided into underground large ovoid tuberous rhizome often called rootstock and an erect aerial shoot along with leaves (Fig-1) and reproductive part.

Root

As the plant propagates with rhizome, the primary roots are not seen; however, yellow brown long fibrous and tapering adventitious roots are present all over the surface of rhizome.

Rhizome

The rhizome is tuberous with camphoraceous sweet odour, about 2–6 cm in diameter, the shape and size is often variable. It is sessile, laterally flattened and covered with adventitious roots, root scars and warts. It shows longitudinal circular wrinkles on the surface giving the look of nodal and intermodal zones to the rhizomes. The surface (cork) of rhizome is dark brown, bluish black, or buff in colour. The branching is more or less sympodral. (Fig.-2).

Leaves

The leaves are usually present in the groups of 10-20; each leaf is broad oblong lanceolate and glabrous. A deep farraginous purple colour is present in the middle region of the lamina the petiole is ivory in colour andensheathing the petiole encircle each other forming pseudoxis. The variation is parallel in nature.

Inflorescence

It is 15-20 cm long dense spike, which arises much before the opening of leaf, the bracts are green, and the bracts of coma are deep red, which become crimson after maturation.

Flower

Flowers are pale yellow colour with reddish border (Fig.-3). Calyx: 10-15 mm long, obtuse and 3 toothed. Collora: long tubular, pale yellow lip-3 lobe semi- elliptic.

Distribution

This plant is widely distributed in north-east and central India. *Curcuma caesia* is sparsely found in Papi Hills of East Godavari, West Godavari, and Khammam Districts of Andhra Pradesh.

Phytochemical constituents

Curcuma caesia Roxb. is a perennial, erect rhizomatous herb with large leaves. Fresh rhizomes are aromatic with intense camphoraceous odour, cultivated for its rhizomes, which

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are used in traditional medicine. The plant is reported to contain camphor, ar-turmerone, (Z)-ocimene, ar-curcumene, 1, 8-cineole, elemene, borneol, bornyl acetate and curcumene as the major constituents *Curcuma caecia* has medicinal value due the presence of natural constituents. The majority of their activity is due to bioactive compound viz alkaloids, steroids, phenolics, and tannins.Preliminary phytochemical studied in of *n*-hexane, petroleum ether (60:80), benzene, chloroform, ethyl acetate, methanol, and water extract of rhizome curcuma caecia and showed the presence of these major constituent.^{22,23}

Biological activities

1) Neuropharmacological assessment of Curcuma CaesiaRhizome in experimental animal models

The ethanol extracts of Curcuma caesiaexhibited an important neuropharmacological activity. The study was conducted by Karmakaret al.in adult male Swiss albino mice to evaluate the methanol extract of C. caesia rhizome for some neuropharmacological activities. Methanol extract Curcuma caesia at 50 and 100 mg/kg body weight was evaluated for analgesic activity against acetic acid-induced writhing and tail flick tests. Locomotors activity was estimated by means of an actophotometer. Anticonvulsant effect was assessed against pentylenetetrazolinduced convulsion in mice and muscle relaxant effect was evaluated by using rota-rod apparatus. The methanol extract of Curcuma caesia showed significant inhibition of writhes in a dose dependent manner and also exhibited significant increase in tail flicking reaction time of mice, but the effects were not dose dependent, Peak analgesic effect was increase up to a maximum. The methanol extract of Curcuma caesia significantly depressed the locomotors activity in mice in a dose dependent fashion and the methanol extract of Curcuma caesia pre-treatment exhibited significant and dose dependent protection from PTZ-induced convulsions in mice by delaying the onset of convulsions. The methanol extracts of Curcuma caesia significantly and dose dependently decreased the fall off time in mice demonstrating its muscle relaxant property.²⁴

2) Comparative antioxidanactivity of nonenzymatic and enzymatic extracts of Curcuma zedoaria, Curcuma angustifolia and Curcuma caesia

A study was conducted by Dhal et al. To compare the efficacy for antioxidant activity of both the crude (non-enzymatic) and enzymatic extracts of three important medicinal plants Curcuma zedoary, Curcuma caesia and Curcuma angustifolia respectively. Both the enzymatic and crude extracts of the rhizome and leaves of these plants were analyzed for their free radical-scavenging activity in different in vitro systems, e.g. DPPH radical scavenging activity, hydroxyl radical scavenging activity and different antioxidant enzymatic assay. DPPH scavenging activity of C. Caesia was found to be 55.32 ± 0.2 at 200μ g/ml of crude extract. The hydroxyl radical scavenging activity of C. caesia was found to be 40.26 ± 0.01 of the crude extracts as compared to ascorbic acid (standard), which was found to be 52.33 ± 0.40 at the concentration of 50μ g/ml. In case of enzymatic extracts DPPH scavenging activity of C.caesiawas found to be 31.2 ± 0.8 at 200μ g/ml and maximum antioxidant activity was found in catalase, superoxide dismutase and glutathione peroxidase enzyme.²⁵

3)A comparative study of phenol content and antioxidant activity between nonconventional Curcuma caesia Roxb. and Curcuma amada Roxb

Krishnarajet al .studied to investigate the phenol content and antioxidant activity of a nonconventionalCurcuma sp. namely,Curcuma caesiain comparison with another species,

Curcuma amada. The reducing power and superoxide, ABTS and DPPH radical scavenging activities were determined to compare the antioxidant activity. The total phenol content of methanol extracts of rhizomes was found to be 37.64 and 44.33 mg TAE/g dry materials, respectively. These phenolic compounds are generally responsible for antioxidant activity. The reducing power of C. caesiawas more than the C. amada, similarly superoxide, ABTS and DPPH scavenging ability of C. caesia rhizomewas more than the C.amada.²⁶

4) Study of the anti-ulcerogenic activity of the ethanolic extracts of rhizome of Curcuma Caesiaagainst gastric ulcers in experimental animals

Curcuma caesiahas significant ant-ulcer activity. The ethanol extract of Curcuma caesiaexhibited significant anti-ulcer activity in the experimental animal model studied by Swarnamoni et al. The albino rats of either sex were used to evaluate the anti-ulcer activity. The treatment of rats with ethanol extract of Curcuma caesia (EECC-500mg/kg) produced significant reduction of ulcer index, gastric acid volume, pepsin, free and total acidity alongwith increased production of gastric mucus in Aspirin induced ulceranimal model. Aspirin treatment caused a significant increase in the ulcer index, pepsin activity, free and total acidity, volume of gastric juice and decreased mucus production. Curcuma caesiaextract decreased the gastric volume and gastric acid secretion significantly by pretreatment with aspirin.²⁷

5) Effect of Curcuma Caesia leaves on rice seed germination and seedling establishment

Curcuma caesia Roxb leaves exhibited a significant effect on rice seed germination and secondary root formation. The maximum radical growth as well as the secondary root formation was shown by rice seed treated with the presence of C. caesia leaves placed above and below the seed in comparison to the distilled water treated, and leaves extract in water 5%(w/v). The experimental plant did not exhibit such stimulation effect in rice seed treated with extract because during grinding and filtration, the essential oil get volatised and escaped. While that of cut leaves gradually escaped and spread inside the patridishes giving stimulation to the germination of the seeds. The result obtained in this study indicated that C. Caesia leaves have potential rice seed germination activity due to the presence of volatile oil.²⁸

6) Preliminary mechanistic studies on the smooth muscle relaxant effect of hydroalcoholic extract of Curcuma Caesia

Methanol extract of Curcuma caesia exhibited a significant smooth muscle relaxation activity. To evaluate the smooth muscle relaxing activity, Arulmozhiet al, used Guinea pig and Rabbit as animal model. Methanolic extract of Curcuma caesia at a dose of (50-800 μ g/ml) produce relaxation in trachea tissues precontracted with carbachol It also showed a smooth muscle relaxation effect in presence of various receptor antagonists e.g.such as propranalol, glibenclamide, 2',5'- dideoxyadenosine, -chymotrypsin, L-NNA and methylene blue. Curcuma caesiaata concentration of 30µg/ml exhibited inhibitory effect on Ca2+induced contraction in isolated rabbit aorta.^{29, 30}

7) Smooth Muscle Relaxant and Anti-asthmatic Activity

Arulmozhi *et al.* (2006) evaluated anti-asthmatic property of *C. caesia*. The hydroalcoholic extract of *Curcuma caesia* (CC extract) was tested for its relaxant effect in guinea pig trachea and also in the presence of various receptor antagonists and enzyme inhibitors. Furthermore, the possible role of hydroalcoholic extract in calcium channel modulation was investigated in depolarized rabbit aorta. The CC extract concentration dependently relaxed the carbachol (1 μ M)-induced pre-contractions and the presence of an antagonist, such as propranalol,

glibenclamide, 2, 5 -dideoxyadenosine, a-chymotrypsin, L-NNA and methylene blue, did not affect the log concentration relaxing response curves of cumulative CC extract to carbachol $(1 \ \mu M)$ -induced pre-contraction.³¹

8) Anthelmintic Activity

Gill Randeep *et al.* (2011) studies two most popular species of genus Curcuma, *C. amada* and *C. caesia* were proved for their anthelmintic activity. In this study, four extracts viz. Petroleum ether, Dichloromethane, ethanol and aqueous extract of rhizomes of *C. amada* and *C. caesia* were investigated for anthelmintic activity at three different concentrations. Three concentrations (50 mg/ml, 100 mg/ml and 150 mg/ml) of each extract were studied which included the determination of paralysis time and time of death of earthworms. All the extracts of both the plants exhibited dose dependant activity. The results indicated that ethanol extract (150 mg/ml) of *C. caesia* was most effective in causing paralysis of earthworms, while the ethanol extract (150 mg/ml) and Dichloromethane extract (150 mg/ml) of both Curcuma species were very effective in causing death of earthworms.³²

9) Antioxidant activity

The antioxidant activity of methanolic extract of rhizomes of *Curcuma caecia* has been reported and the antioxidant activity was measured by using DPPH free radical scavenging these effect is due to the presence of phenolic constituent 12. Both the enzymatic and crude extracts of the rhizome and leave off, *Curcuma caecia* plants have been analyzed for antioxidant activity in terms of DPPH radical scavenging activity, hydroxyl radical-scavenging activity and reported that the no enzymatic extracts prove to be a better scavenger of free radical in comparison to enzymatic extracts in Curcuma species.³³

10) Anti-fungal Activity

Banerjee and Nigam, 1976 reported antifungal activity in *C. caesia* rhizomes. Essential oil of rhizomes of *C. caesia* Roxb has been known for its antifungal activity.³⁴

11) Antimicrobial activity

Recently 14 have reported the isolated oil from the rhizome of *Curcuma caecia* possessed high antioxidant activity, antibacterial activity and also inhibit g +ve (S. aureus and B. subtilis) and g-ve (E. coli) bacteria. Essential oils comprising of mixtures of monoterpenes, sesquiterpenes, and various aliphatic hydrocarbons are potential sources of antimicrobial compounds 15.Ethanolic extract of *Curcuma caecia* (EECC) showed a significant anibaterial activity against Staphyloccocus aureus. The antibacterial properties have also shown the presence of phenolic compound16. terms of DPPH radical scavenging activity, hydroxyl radical-scavenging activity and reported that the nonenzymatic extracts prove to be a better scavenger of free radical in comparison to enzymatic extracts in Curcuma species.^{35,36}

12) Depressant and hypnotic activity

Curcuma caecia has potential therapeutic value for the management of depressive disorders. The methanol extract of *Curcuma caecia* (MECC) rhizome was evaluated for CNS depressant activities and reported that the flavonoids, saponin and tannic acid are involved for the protecting brain function from CNS disturbance antidepressant19 .The analgesic activity of *Curcuma caecia* extract (MECC) was evaluated by both acetic acid induced writhing method and tail flick method in mice to assess peripheral (non-narcotic) and central (narcotic) type of activities and revealed remarkable analgesic, locomotor depressant, anticonvulsant and hypnotic activity.³⁷

13) Anti Inflammatory activity

Proteins isolated from aqueous soxhlet extraction of rhizome *Curcuma caecia* showed significant antioxidant activity which was found to be heat stable. And also showed high anti-

inflammatory activity at a dose level of 100 mg/kg when tested on the carrageenan rat paw model system.³⁸

14) Antiemetic activity

The ethanol extract of *Curcuma caecia* rhizome showed significant antiemetic activity on chick emetic model. and compared with domperidone.³⁹

15)Anti-ulcerogenic activity

The anti-ulcer activity of the ethanolic extract of the rhizome of *Curcuma caecia* was experimented on four groups of albino rats and revealed that there is significant reduction of ulcer index, gastric acid volume, pepsin, free and total acidity along with increased production of gastric mucus.²¹

Pranab KR Bordoloi *et al.* (2012) studied the anti-ulcer activity of the ethanolic extract of the rhizome of *C. Caesia* on experimental animal models. Four groups of albino rats weighing 150-200 g were taken for the study (n = 5). Group A: Control (3%gum acacia 5 ml/kg/day orally for 7 days). Group B: Experimental control (Aspirin 400 mg/kg orally as single dose on 7th day). Group C: Test (*C. caesia* extract 500 mg/kg/day orally for 7 days plus Aspirin 400 mg/kg orally on 7th day) and Group D: Standard (Ranitidine150 mg/kg orally for 7 days and Aspirin 400 mg/kg orally on 7th day). The stomachs of the sacrificed rats were removed. The ulcer index, pepsin activity, free and total acidity and volume of gastric juice in group III and IV showed significant decrease in comparison to group II whereas there was an increase in gastric mucus secretion.^{40, 41}

CONCLUSION

C. caesia is widely distributed throughout India. The plant appears to have a broad spectrum of activity of several ailments. Rhizomes of the plant have been explored for antifungal activity, smooth muscle relaxant and anti-asthmatic activity, antioxidant activity, analgesic activity, locomotor depressant, anticonvulsant and muscle relaxant effects, anxiolytic and CNS depressant activity, anti-bacterial activity, anti-ulcer activity and many other miscellaneous activities. The rhizomes of the plant have enough bioactive properties as shown in the different animal model. The phytoconstituents are also proved to be identified. This data may signify the investigations of different bio-active compounds from the plant *Curcuma caesia* Roxb and the requisite level of activity. The pharmacological studies reported in this review confirm the therapeutic value of *C. caesia*.

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