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 ethnomedicinally important 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 caesia* has scientifically studied for various therapeutic activities like antioxidant, antibacterial, antipyretic, larvicidal, insecticidal, antimicrobial, wound healing and anti-hyperglycaemic. The present review is an effort to give a detailed survey of the literature on its phytochemistry, traditional uses and therapeutic studies.

**Keywords:** *Curcuma cassia*, Phytochemistry, Pharmacological activity

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1 Introduction

Medicinal plants have been used for centuries as remedies for human diseases. Treatments with the use of various plants have historically formed the basis of sophisticated traditional medicine, preceding the established scientific literature by thousands of years. The medicinal value of these plants lies in some chemical substances that produce a definite physiological action on human body.

In ethnomedicinal 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. The plants have lot of potential in terms of medicinal properties. Literature reveals its anti-inflammatory, hepatoprotective, blood purifier, antioxidant, antiasthmatic, anti-tumour, stomachic and carminative properties.

*Curcuma caesia* Roxb. (Common name, Black Tumeric) is a perinial herb of distinguishable bluish-black rhizome with a bitter and pungent smell and it is famous for its medicinal properties. In west Bengal, the rhizome of the plant is used in Kali Puja, and hence the plant is called Kali haldi. By etymology, Kali is the feminine form of Kala, which means black color and hence the plant is termed as black turmeric in English. This species has been regarded as endangered by the central forest department of India due to biopiracy. Paste made from the rhizome is used to cure dysentery and as poultice in rheumatic pain, strains, bruises bronchitis, asthma, skin diseases, and inflammation caused due to injuries. 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. 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.

Plants have 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. The plant originates from India and South-East Asia. It grows in rich humid and clayey soils among them *curcuma longa*. It is widely cultivated as a medicinal plant in Southeast Asian countries. In India it is found in west Bengal, Madhya Pradesh, Orissa, Chhattisgarh and Uttar Pradesh. It flourishes well in moist deciduous forest areas. Rhizomes of the plant are used for 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.\textsuperscript{8-11}

\textbf{Fig. 1: Curcuma caesia plant}

\textbf{Fig. 2: Dried rhizomes of Curcuma caesia}

\section*{2 Scientific classification}

\begin{itemize}
  \item \textbf{Kingdom} : Plantae
  \item \textbf{Class} : Magnoliopsida
  \item \textbf{Order} : Zingiberales
  \item \textbf{Family} : Zingiberaceae
  \item \textbf{Subfamily} : Zingiberoideae
  \item \textbf{Genus} : \textit{Curcuma}
  \item \textbf{Species} : \textit{C. caesia}
\end{itemize}

\section*{3 Vernacular names}

\begin{itemize}
  \item \textbf{Hind} : Kali Haldi
  \item \textbf{Manipuri} : Yaingang Amuba or Yaimu
  \item \textbf{Marathi} : Kala-haldi
  \item \textbf{Telugu} : Nalla Pasupu
  \item \textbf{Bengali} : Kala haldi
  \item \textbf{Mizo} : Aihang, Ailaihan
  \item \textbf{Assamese} : Kalahaladhi
  \item \textbf{Malayalam} : Kari manjal
  \item \textbf{Sanskrit} : Rajani Nishaa, Nishi, Ratri.
\end{itemize}

\section*{4 Geographical distributions}

The plant originates from India and South-East Asia. It is widely cultivated as a medicinal plant in Southeast Asian countries. This plant is widely distributed in north-east and central India.

In India it grows in West Bengal, Madhya Pradesh, Orissa, Bihar, North-East and Uttar Pradesh. \textit{Curcuma caesia} is sparsely found in Papi Hills of East Godavari, West Godavari, and Khammam Districts of Andhra Pradesh.

\section*{5 Botanical description\textsuperscript{12-14}}

\textit{Curcuma caesia} is perennial rhizomatous herbs, having simple and distichous leaves and their inflorescence are terminal on the leafy shoot or on the lateral shoot. Besides, they have delicate, ephemeral and highly modified flowers. While, their fruits are capsule.

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 and reproductive part.

\subsection*{5.1 Leaves}

The leaves are in the groups of 10–20, each leaf is broad oblong lanceolate and glabrous. The upper side of the leaf is rough, velvety, but this character may vary. In the middle region the lamina shows deep farraginous purple colored clouds. The petiole is ivory color and enshewing the petioles encircle each other forming a pseudoaxis. The variation is parallel, typical characteristic of monocots.

\subsection*{5.2 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.

\subsection*{5.3 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.

\subsection*{5.4 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.

\subsection*{5.5 Flower}

Flowers are pale yellow colour with reddish border. Calyx: 10-15 mm long, obtuse and 3 toothed. Collora: long tubular, pale yellow lip-3 lobe semi-elliptic.
6 Phytochemical constituents12-15

Phytochemical Screening of n-hexane, petroleum ether (60:80), benzene, chloroform, ethyl acetate, methanol, and water extract of rhizome Curcuma caesia revealed the presence of alkaloids, phenols, phytosterols, terpenoids, carbohydrates, tannins, glycosides, saponins, quinones, amino acids, oils and flavonoids.

About 30 volatile oil components were identified in the rhizomes of Curcuma caesia by GC-MS, representing 97.48% of the oil, with camphor (28.3%), ar-tumerone (12.3%), (Z)-Ocimine (8.2%), 1-ar-curcumene (6.8%), 1, 8-cineole (5.3%), element (4.8%), borneol (4.4%), bornyl acetate (3.3%) and curcumene (2.82%) as the major constituents. Rastogi et al reported linalool as the major component comprising 20.42% followed by ocimine (15.66%), 1- ar-curcumene (14.84%), zingiberol (12.60), 1, 8-cineole (9.06%), and borneol (7.4%) as major constituent16.

7 Traditional uses17-23

Traditionally, the rhizomes of Curcuma caesia are used in treating leprosy, cancer, wounds, impotency, fertility, tooth ache, vomiting, allergies, leucoderma, asthma, tumours, piles, bronchitis, enlargement of the spleen, epileptic, menstrual disorder, smooth muscle relaxant activity, anthelmintic, aphrodisiac, gonorreal discharges, etc. The paste is applied on bruises, contusions and rheumatic arthritis pains in Manipur. Decoction of fresh rhizome as anti-diarrhoeic and to get relief from stomach ache. The Khamti tribe of Lohit district applied the paste of fresh rhizome in case of snake and scorpion bite. In Assam fresh rhizome juice mixed with mustard oil and is given to cattle in dysentery. In Asian Rhizome of Curcuma caesia used for wound, pox & tumour.

8 Pharmacological activities

Bioactive components such as curcuminoids are responsible for anti-oxidative and anti-inflammatory properties, wound healing, hypoglycemia, anti-coagulant, anti-microbial activities. Curcuminoids exhibit free radical scavenging property and anti-oxidant activity. Main bioactive substances in the rhizomes are due to curcumin and two related demethoxy compounds, demethoxycurcumin and bisdemethoxy curcumin. Flavonoids and phenolic compounds which are widely distributed in plants have been reported to exert multiple biological effects including antioxidant, free radical scavenging abilities, anti-inflammatory, anti-carcinogenic etc.

8.1 Neuropharmacological activity, Locomotor Depressant, Anti-convulsant and Muscle Relaxant Effects

Karmaka et al evaluated neuropharmacological activity like analgesic, Locomotor, Anticonvulsant property and muscle relaxant effect of Curcuma caesia rhizome in male Swiss albino mice. 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. The methanol extract of Curcuma caesia significantly depressed the locomotor activity in mice 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 property24.

8.2 Anti-oxidant Activity

Chirangini et al., (2004), evaluated Crude methanol extracts of the rhizomes of 11 species, including C. caesia for their antioxidant properties using sulphur free radical reactivity with curcumin as a reference indicator, C. caesia gave good degree of radioprotection25.

Mohit Mangla et al. (2010) investigated the antioxidant activity of methanolic extract of rhizomes of C. caesia using DPPH (1,1-diphenyl-2-picrylhydradzyl) free radical scavenging assay. The IC 50 value of extract and Butylated Hydroxytoluene was found to be 862.35 μg and 46.25 μg for 2 ml of 500 μM concentration of DPPH. This suggested that methanolic C. caesia extract had moderate IC 50 value as compared to Butylated Hydroxytoluene26.

8.3 Smooth Muscle Relaxant and Anti-asthmatic Activity

Arulmozhi et al. (2006) evaluated anti-asthmatic property of C. caesia in guinea pig trachea and also in the presence of various receptor antagonists and enzyme inhibitors. The C. caesia extract concentration dependently relaxed the carbachol (1 μM)-induced pre-contractions and the presence of an antagonist, such as propranolol, glbenclamide, 2’, 5’-dideoxyadenosine, a- chymotrypsin, L-NNA and methylene blue, did not affect the log concentration relaxing response curves of cumulative C. caesia extract to carbachol (1 μM)-induced pre-contraction27.

8.4 Analgesic Activity

Satija Saurabha et al., (2011) compared the analgesic and antipyretic activity of different extracts obtained from C. caesia and C. amada rhizomes. Analgesic and antipyretic activities of the plant extracts was evaluated using chemical model of acute pain and brewer’s yeast induced hyperthermia in rats. The writhing and pyrexia were observed at the doses of 250 and 500 mg/kg body weight of rats. Both the plants exerted analgesic and antipyretic activity28.

8.5 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 activity29.

8.6 Antimicrobial activity
The rhizome of *Curcuma caecia* possessed high antioxidant activity, antibacterial activity and also inhibit gram +ve (*S. aureus and B. subtilis*) and gram -ve (*E. coli*) bacteria. Ethanol extract of *Curcuma caecia* (EECC) showed a significant antibacterial activity against *Staphylococcus aureus*. The antibacterial properties have also showed the presence of phenolic compound. The ulcer index, pepsin and tannic acid are involve for the protecting brain function from CNS disturbance antidepressant. Result revealed remarkable depressant, anticonvulsant and hypnotic activity. The ethanol extract of *Curcuma caecia* rhizome was evaluated for CNS depressant activities and reported that the flavonoids, saponin were proved for their anxiolytic and CNS depressant 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*. The ethanol extract of *Curcuma caecia* and *C. caesia* were very effective in causing death of earthworms. Both *Curcuma species* were very effective in causing death of earthworms.

9 Conclusion

*C. caesia* is widely distributed throughout India. The plant appears to have a broad spectrum of activity on 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, anti-ulcer activity and many other miscellaneous activities. The rhizomes of the plant have a broad spectrum of activity on 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, 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*. The ethanol extract of *Curcuma caecia* and *C. caesia* were very effective in causing death of earthworms. Both *Curcuma species* were very effective in causing death of earthworms.

10 Competing interest

Author claims no competing interests.

11 Author’s contributions

BS and RK carried out literature review and draft the manuscript. SC participated in collection of data. All authors read and approved the final manuscript.

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