

Review Article

MEDICINAL PROPERTIES OF BLACK TURMERIC: A REVIEW

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ABSTRACT

Commonly known as 'Black Turmeric' is a perennial herb with bluish-black rhizome of the family Zingiberaceae. This species has been gradually increasing in popularity in the interested community for its unmatched medicinal properties. In ethno medicinal practices, the traditional healers use the genus *Curcuma* for the treatment of various types of diseases but *Curcuma caesia* Roxb. Is a very less known and almost untouched drug. 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.

Keywords: *Curcuma caesia*, black turmeric, perennial herb, traditional healers, medicinal uses.

INTRODUCTION

Black turmeric (*Curcuma caesia* Roxb.) is an important medicinal plant belonging to zingiberaceae family. *Curcuma caesia*, black turmeric is a perennial herb with bluish-black rhizome. The rhizomes of *Curcuma caesia* have a high economical importance owing to its reputed medicinal properties. Rhizome of this plant is claimed to be useful in treating several disease like piles, leprosy, bronchitis, asthma, cancer, epilepsy, fever, wounds, impotency, fertility, tooth ache and vomiting etc [1]. The rhizome of black turmeric has a high economic importance owing to its medicinal properties. Black turmeric has been regarded as endangered by the central forest department of India due to bio piracy [2].

In the hilly areas of the country this endangered medicinal plant grows, thus needs to be conserved for future generations. *C.caesia* is a wonder herb and contains the highest content of curcumin and it is a chemical substance with many curative properties [3]. It is used for treatment of menstrual disorders, piles, impotency and epilepsy. Externally, this plant has been used in the treatment of wounds, white patches on the skin and leprosy sores [4]. It is also capable of enhancing fertility levels. It is also used for the treatment of enlargement of the spleen and certain types of tuberculosis. The rhizome as well as the leaves of the plant is used in medical formulations [5].

TAXONOMICAL HIERARCHY [6]

Kingdom: Plantae
Subkingdom: Viridaplantae
Phylum: Tracheophyta Sinnott
Subphylum: Euphyllophytina
Class: Magnoliopsida "monocotyledons" "commelinids"
Order: Zingiberales
Family: Zingiberaceae
Subfamily: Zingiberoideae
Tribe: Hedychieae
Genus: *Curcuma*
Species: *C. caesia* Roxb
Vernacular Names in different parts of India *C. caesia* is known by different names [6]
Hindi: Kali Haldi, Nar Kachura Krishna Kedar
Manipuri: Yaingang Amuba or Yaimu
Marathi: Kala-haldi
Kannada: Kariarishina, Naru Kachora
Bengali: Kala Haldi

Mizo: Aihang, Ailaihng
Telugu: Nalla Pasupu
Assamese: Kala Haladhi
Nepalese: Kaalo Haledo

MORPHOLOGY OF THE PLANT [7]

Rhizome: The rhizome is tuberous and has camphoraceous sweet odor and 2-6 cm in diameter, the shape and size is often variable. It is sessile, and covered with adventitious roots, root scars and warts and is laterally flattened. The nodal and inter nodal zones present due to its circular wrinkles on the surface. The surface of rhizome is dark brown, bluish black, or buff in color; a false impression of growth rings is the circular arrangements of remnants of scaly leaves. The branching is more or less sympodial

Root: At the propagation stage the rhizome is not developed. Yellow brown long fibrous and tapering adventitious roots are found all over the surface of rhizome

Leaves: The leaves are found of 10-20 grouped. Leaf are broad oblong lanceolate and glabrous. In the middle region the lamina shows deep ferruginous purple colored clouds. The petiole is ivory color and unsheathing the petioles encircles each other forming a pseudo axis. The variation is parallel, typical characteristic of monocots

Inflorescence: The inflorescence 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, when it is old it become crimson.

Flowers: The flower is smaller than bracts with pale yellow and reddish border. Calyx: 10-15 mm long, obtuse, 3 toothed, and Corolla: long tubular with pale yellow lip - 3 lobed semi-elliptic

CONSTITUENTS

It contains: alkaloids, terpenes, amino acids, carbohydrates, tannins, flavones, flavonoids, steroids, reducing sugars, proteins, anthraquinones, glycosides, cardiac glycosides [3].

The volatile rhizomes oil of *Curcuma caesia* contains of 30 components, representing 97.48% of the oil, with camphor (28.3%), ar-turmerone (12.3%), (Z) ocimene (8.2%), 1,8cineole (5.3%), elemene (4.8%), borneol (4.4%), bornylacetate (3.3%) and curcumen e (2.82%), ar- curcumene (6.8%) as the major constituents [9].

MEDICINAL USES

The rhizomes of the herb are often used for pneumonia, cough, and also for cold in children.

The rhizomes of herb are used as a rubeficient to rub the body after taking a Turkish bath.

The rhizome of *C.caesia* is used for fever and asthma in adults.

In northeast India, the powder of rhizomes is used as a face-pack.

Fresh rhizomes are crushed and applied as a paste on forehead for relief from migraine or applied on the body for sprains and bruises.

The rhizomes act against leukoderma, epilepsy, cancer and HIV / AIDS.

Intake of small amount of rhizome paste is claimed to expel gases from the stomach and cure menstrual disorders.

The rhizome of the plant is aromatic, contains essential oil and used for a variety of purposes.

The characteristic pungent smell of the rhizome is mainly due to the presence of essential oil rich in camphor and starch.

The rhizome of the herb is traditionally used for the treatment of hemorrhoids, leprosy, asthma, fever, wounds, vomiting, anthelmintic, aphrodisiac, gonorrhoeal discharges and inflammation.

Also *Curcuma caesia* rhizome extract had been used as smooth muscle relaxant, anti-tumour and anti-oxidant [3].

Fresh rhizome of black turmeric is used in wounds and nagging sores for relief and quick healing.

Curcuma caesia provides relief from stomach problems including indigestion. Chewing a small piece of rhizome will provide relief from indigestion or stomach pain. It also helps in easy digestion and the proper functioning of the liver and kidneys [2].

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.

Rhizomes are often used for treatment of leucoderma, piles, bronchitis, asthma, Tumors, tuberculous glands of the neck, enlargement of the spleen, epileptic [9].

Rhizome of *Curcuma caesia* is grounded in the form of a paste in rheumatic arthritis.

Fresh rhizome decoction is used as antidiarrhoeic and to get relief from stomach ache. The fresh rhizome paste of *Curcuma caesia* is applied during the snake bite and scorpion bite. The dried powder used to mixed with seed powder of *Andrographis paniculata* Wall ex. Nees and applied during insect and snake bite.

In Assam fresh rhizome juice mixed with mustard oil and is given to cattles in dysentery.

In Asian Rhizome of *Curcuma caesia* used for wound, pox & tumour. Powdered tuber is orally administered with water in stomachache and bloating [10].

Anti-Inflammatory activity

Proteins isolated from aqueous Soxhlet extraction of rhizome *Curcuma caesia* showed significant antioxidant activity which was found to be heat stable. When tested on the carrageenan rat paw model system it showed high anti-inflammatory activity at a dose level of 100mg/kg [11].

Antiemetic activity

The ethanol extract of *Curcuma caesia* rhizome showed significant antiemetic activity on chick emetic model and compared with domperidone [12].

Depressant and hypnotic activity

Curcuma caesia has potential therapeutic value for the management of depressive disorders. The methanol extract of *Curcuma caesia*

(MECC) rhizome was studied for CNS depressant activities and reported that the flavonoids, saponins and tannic acid are involved for the protecting brain function from CNS disturbance antidepressant. The analgesic activity of *Curcuma caesia* extract 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 [13].

Bronchodilating activity

Prithesh Paliwal et al. (2011) investigated the bronchodilating activity of extracts of *C. caesia*. Bronchodilator activity of the extract was studied on the histamine aerosol induced Bronchospasm and pre-convulsion dyspnoea in guinea pigs. Treatment with methanolic CC extract 500 mg/kg showed significant protection against histamine induced bronchospasm. In this study CC extract significantly prolonged the latent period of convulsions followed by exposure to histamine aerosol at the dose of 500 mg/kg and showed maximum protection of 34.84% at 4th h as compared to chlorpheniramine maleate (standard) 2 mg/kg, p.o. which indicating its H₁ receptor antagonistic activity and supports the anti-asthmatic properties of the plant [14].

Analgesic Activity

Different extracts obtained from *C. caesia* and *C. amada* rhizomes possess analgesic and antipyretic activity. 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 activity. Where by *C.amada* showed better response in comparison to *C. caesia* [15].

Locomotor Depressant, Anti-convulsant and Muscle Relaxant Effects

Indrajit Karmakar et al. (2011) evaluated the MECC for some neuro pharmacological activities like analgesic, Locomotor, Anticonvulsant property and muscle relaxant effect in experimental animal models. The results of acetic acid induced writhing showed significant inhibition of writhes, at both test doses as compared with control group in a dose dependent manner. In tail flick test MECC at the both doses exhibited significant increase in reaction time of mice. In locomotor activity study, it was found that MECC significantly depressed the locomotor activity in mice in a dose dependent fashion. In anticonvulsant evaluation methanolic extract of *Curcuma caesia* pre-treatment exhibit significant and dose dependent protection from PTZ-induced convulsions in mice. In muscle relaxant study, the MECC significantly and dose dependently decreased the fall off time in mice demonstrating its muscle relaxant property [16].

Anxiolytic and CNS Depressant Activity

Indrajit Karmakar et al. (2011) evaluated the Methanolic extract of *C. caesia* rhizome for Central Nervous System (CNS) depressant activities. Methanolic extract of *C. caesia* was studied for Hypnotic activity, Forced swim test and Tail suspension test. Methanolic extract of *C. caesia* (50 and 100 mg/kg; i.p.) produced significant and dose dependent reduction in the onset and prolongation of sleep duration induced by pentobarbitone. Methanolic extract of *C.caesia* on immobility period in both FST and TST at the doses of 50 and 100 mg/kg, i.p for 7 successive days to mice reduce the immobility periods significantly in a dose dependent manner, denotes significant antidepressant activity [17].

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, 4 extracts viz. Petroleum ether, Dichloromethane, ethanol and aqueous extract of rhizomes of *Curcuma amada* and *Curcuma 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 dependent 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 [18].

Anti-bacterial Activity

Angel Gabriel Rajamma et al. (2012) investigated antioxidant and antibacterial activities of oleoresins isolated from nine *Curcuma* species. Oleoresins were extracted from rhizomes of nine starchy *Curcuma* species such as *C. aeruginosa*, *C. amada*, *C. aromatica*, *C. brog*, *C. caesia*, *C. malabarica*, *C. raktakanta*, *C. sylvatica* and *C. zedoaria* [19].

Thrombolytic Activity of Ethanolic Extract of *Curcuma caesia* rhizomes

Due to activation of plasminogen the extract showed significant clot dissolution activity, so the *C. caesia* is used for the treatment of ischemic myocardium or thromboembolic disorders. However, the exact mechanism and action of the extract remain unclear [20].

Neuropharmacological assessment of *Curcuma caesia* Rhizome in experimental animal models

The ethanol extracts of *Curcuma caesia* exhibited an important neuro pharmacological activity. The study was conducted in adult male Swiss albino mice in methanol extract of *C. caesia* rhizome for evaluating neuro pharmacological activities. Methanol extract *C. caesia* at 50 and 100 mg/kg body weight was evaluated for analgesic activity against acetic acid-induced writhing and tail flick tests. Using actophotometer locomotors activity was estimated. Anticonvulsant effect was assessed against pentylene tetrazol induced convulsion in mice and muscle relaxant effect was evaluated by using Rota-rod apparatus. The methanol extract of *C. caesia* showed significant inhibition of writhes in a dose dependent manner and also exhibited significant increase in tail flicking reaction time of mice, were not dose dependent, Peak analgesic effect was increase up to a maximum. In a dose dependent manner the methanol extract of *C. caesia* significantly depressed the locomotors activity in mice. The methanol extract of *Curcuma caesia* pre-treatment exhibited significant and dose dependent protection from PTZ-induced convulsions in mice by slowing the onset of convulsions. The methanol extracts of *C. caesia* significantly and dose dependently decreased the fall off time in mice demonstrating its muscle relaxant property [21].

Comparative anti-oxidant activity of nonenzymatic and enzymatic extracts of *Curcuma zedoaria*, *Curcuma angustifolia* and *Curcuma caesia*

The non-enzymatic and enzymatic extracts of three important medicinal plants namely *C. zedoaria*, *C. caesia* and *C. angustifolia* were used to compare the antioxidant activity. By using in-vitro systems both the enzymatic and non-enzymatic extracts of the rhizome and leaves of these plants were analyzed for their free radical-scavenging activity. DPPH scavenging activity of *C. caesia* was found to be 55.32 ± 0.2 at a concentration of 200 µg/ml of crude extract. The hydroxyl radical scavenging activity of *Curcuma caesia* was found to be 40.26 ± 0.01 of the crude extracts and it was compared to ascorbic acid (standard), which was found to be 52.33 ± 0.40 at the concentration of 50 µg/ml. In case of enzymatic extracts 2, 2-diphenyl-1-picrylhydrazyl (DPPH) scavenging activity of *C. caesia* was found to be 31.2 ± 0.8 at a concentration of 200 µg/ml. The maximum antioxidant activity was found in catalase, superoxide dismutase and glutathione peroxidase enzyme [22].

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

Krishnaraj et al. studied to investigate the phenol content and antioxidant activity of a nonconventional *Curcuma* sp. namely, *Curcuma caesia* in 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. caesia* was more than the *C. amada*, similarly superoxide, ABTS and DPPH scavenging ability of *C. caesia* rhizome was more than the *C. amada* [23].

Study of the anti-ulcerogenic activity of the ethanolic extracts of rhizome of *Curcuma caesia* against gastric ulcers in experimental animals

Curcuma caesia has significant anti-ulcer activity. The ethanol extract of *Curcuma caesia* exhibited 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 along with increased production of gastric mucus in Aspirin induced ulcer animal 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 caesia* extract decreased the gastric volume and gastric acid secretion significantly by pretreatment with aspirin [24].

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 volatilized 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 [25].

Smooth Muscle Relaxant and Anti-asthmatic Activity Arulmozhi et al. (2006) evaluated anti-asthmatic property of *C. caesia*.

The hydro alcoholic 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 hydro alcoholic extract in calcium channel modulation was investigated in depolarized rabbit aorta. The CC extract concentration dependently relaxed the carbachol (1 µM)-induced pre-contractions and the presence of an antagonist, such as propranolol, glibenclamide, 2', 5'-dideoxyadenosine, α-chymotrypsin, L-NNA and methylene blue, did not affect the log concentration relaxing response curves of cumulative CC extract to carbachol (1 µM)-induced pre-contraction [26].

Antimicrobial activity

The isolated oil from the rhizome of *Curcuma caesia* possessed high antioxidant activity, antibacterial activity and also inhibit g +ve such as *S. aureus* and *B. subtilis* and g-ve such as *E. coli* bacteria. Essential oils comprising of mixtures of monoterpenes, sesquiterpenes, and various aliphatic hydrocarbons are potential sources of antimicrobial compounds. Ethanolic extract of *Curcuma caesia* (EECC) showed a significant antibacterial activity against *Staphylococcus aureus*. The antibacterial properties have also shown the presence of phenolic compound. 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 [27].

CONCLUSION

The present study emphasizes the knowledge on the plant *Curcuma caesia* Roxb. This study demonstrated that herbal product can be effective as modern medicine and also thought out to be safe in

comparison to the synthetic product. The rhizomes of the plant have enough bioactive properties. It is prescribed for treatment of piles, impotency, menstrual disorders and epilepsy. *Curcuma caesia* have biological activities like smooth muscle relaxant, anti ulcerogenic, anthelmintic, anxiolytic and CNS depressant activity and many other miscellaneous activities. The phytoconstituents are also proved to be identified. The pharmacological studies reported in this review confirm the therapeutic value of *C. caesia*. This review supports the possible of *Curcuma caesia* as a medicinal plant.

CONFLICT OF INTREST

No conflict of interest.

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