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A REVIEW ON *CURCUMA CAESIA* AS A HERBAL MEDICINE

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ABSTRACT: *Curcuma caesia* Roxb. is a relatively uncommon and nearly unexplored medicine; traditional healers employ the genus Curcuma to cure various diseases. In the current effort, the requisite ethnomedicinal utilities are attempted to be established. An erect, perennial herb with big leaves, *Curcuma caesia* Roxb. Rhizomes are grown for their rhizomes, which are utilized in traditional medicine. Fresh rhizomes have a strong camphoraceous odour. According to reports, the main components of the plant are camphor, ar-turmerone, (Z)- ocimene, ar-curcumene, 1,8-cineole, elemene, borneol, bornyl acetate, and curcumene. According to reports, the plant has antifungal, anti-asthmatic, antibacterial, smooth muscle relaxant, antioxidant, analgesic, locomotor depressant, anticonvulsant, and muscle relaxant actions as well as anti-inflammatory qualities. It is today regarded as an important source of distinctive natural compounds for creating medications to treat various ailments. This review focuses primarily on the plant's pharmacological effects, phytochemistry, and medical applications. Contemporary pharmacological investigations have supported some of the conventional claims and uses. Due to its rarity and the species' genuineness, many elements of this perennial herb have not been explored. Due to its overuse as a traditional medicine since antiquity, the species is only sometimes available because it is an endangered crop. Due to *C. caesia's* status as a critically endangered medicinal plant, conservation strategies utilizing cutting-edge breeding techniques strongly warrant additional research on its toxicity, adverse effects, and clinical efficacy in various assay systems.

INTRODUCTION: According to Ayurveda, India has a long tradition of employing plants as medicines. It is well-acknowledged that medicinal plants are important for illness prevention, mitigation, and treatment. History has shown that plants have always been a valuable source of all-natural items for preserving human health. These days, their importance is just increasing. Most people increasingly favor alternative remedies to avoid the harmful side effects of several modern medications. Indian medicinal plants are regarded as a rich source of several pharmacologically active principles and chemicals, which are frequently employed in homemade treatments for a variety of illnesses. Black Turmeric, botanically classified as *Cucurma caesia*, is a rare turmeric species belonging to the Zingiberaceae family. The perennial herb is native to Asia, where it has been growing wild for thousands of years and is valued as an ornamental and medicinal plant. Black Turmeric was once prevalent in the wild, but it is now an endangered species due to overharvesting.

The rhizomes are prized for medicinal and religious uses in Asia, and the demand is higher than the plants can grow naturally, leading to unsustainable harvests. Black Turmeric rhizomes are slow growing, taking around nine months to mature. Despite its endangered status, home gardeners are planting Black Turmeric for future sustainable harvests, and organizations are working throughout Asia to promote against over-foraging to increase

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the species' population. Many regional names, including Narkachur, Black Zedoary, Siyah Haldi, and Kali Haldi know black Turmeric. The rhizomes are challenging to find fresh in local markets but are widely sold in powdered forms and nutritional supplements through online health retailers [1]. The Zingiberaceae family's Curcuma genus contains 80 species, some of which have a long history of usage in Ayurveda, Siddha, and Unani traditional medical practises. Among these, *Curcuma longa*, which is well-known to have exceptional therapeutic potential, has received the most research [2].

The less well-known species, *Curcuma caesia*, also called Kali Haldii, is endemic to the North East Herb and has a bluish-black rhizome [3]. It can be found in the Indian states of Uttar Pradesh, West Bengal, Madhya Pradesh, Orissa, and Chhattisgarh. It thrives in wet deciduous woodland regions [4]. The plant's rhizomes are used to treat bruises and sprains and make cosmetics. It has tall, rhizomatous leaves [5] and is a herb. Fresh rhizomes have a powerful camphoraceous fragrance and are utilised topically to bruises and sprains [6].

Due to *Curcuma caesia's* supposed medical capabilities, its rhizomes are of significant commercial value. This plant's rhizome is said to be effective in treating a variety of illnesses, including piles, leprosy, bronchitis, asthma, cancer, epilepsy, fever, wounds, impotence, fertility, tooth pain, and vomiting, among others [7]. The medicinal qualities of black turmeric's rhizome give it a high economic value. The national forest department of India has declared black turmeric endangered due to biopiracy [8].

Botanical Description [9]
Taxonomical Classification:

Kingdom: Plantae

Subkingdom: Viridaeplantae

Phylum: Tracheophyta Sinnott

Subphylum: Euphyllophytina

Class: Magnoliopsida

Order: Zingiberales

Family: Zingiberaceae

Subfamily: Zingiberoideae

Tribe: Hedychieae

Genus: Curcuma

Species: *Curcuma caesia* Roxb

Morphology: The plant often stands upright and is between 0.5 and 1.0 meters tall. It is separated into an erect aerial shoot with leaves **Fig. 1** and a reproductive portion, as well as an underground big ovoid tuberous rhizome frequently referred to as the rootstock.

Root: The core roots of the plant are not visible during rhizome propagation, but adventitious roots that are yellow-brown, long, fibrous, and tapering can be seen all over the rhizome's surface.

Rhizome: The rhizome is tuberous and has a camphoraceous, pleasant odour. Its size and shape can vary from 2 to 6 cm. It has adventitious roots, scars from previous roots, and warts all over it. It is sessile and lateral flattened. It has surface wrinkling that is longitudinal and circular, giving the appearance of nodal and intermodal zones to the rhizomes. Rhizome surfaces (cork) might be buff, blue-black, or dark brown in colour. The branching is sympodral in nature **Fig. 2.**

Leaves: The leaves are typically found in groups of 10–20, and each one is glabrous, broad, oblong, and lanceolate. The lamina's centre portion exhibits a strong farraginous purple hue. The petiole is ivory in colour and forms a pseudoxis when it wraps around another petiole. The variation is parallel in nature.

Inflorescence: It is a thick spike that is between 15 and 20 cm long that appears well before the first leaf opens. The bracts of the coma are deep red and turn scarlet as they mature.

Flower: Flowers have a red border and are pale yellow in colour **Fig. 3.**

Calyx: Obtuse, 10-15 mm length, with 3 teeth.

Collora: Long tubular, pale yellow lip-3 lobe semi-elliptic.

FIG. 1: AERIAL SHOOTS WITH LEAVES OF *CURCUMA CAESIA* ROXB

FIG. 2: TUBEROUS RHIZOME

FIG. 3: FLOWERS OF *CURCUMA CAESIA*

Synonym of *Curcuma caesia*:

Language	Synonyms
Hindi	Kali Haldi, Nar Kachura Krishna Kedar
Manipuri	Yaingang Amuba or Yaimu
Marathi	Kala-haldi
Bengali	Kala Haldi
Mizo	Aihang, Ailaihang
Telugu	Nalla Pasupu
Kannada	Kariarishina, Naru Kachora
Assamese	Kala Haladhi
Nepalese	Kaalo Haledo

Geographical Distribution [10]: The species occurs in moist deciduous forests, mostly in Bengal, North East, and Central India, within the altitudinal range of 200-1000 m. It develops as the ground cover of forest regions in subtropical to temperate regions. It is a rare species and is mostly under cultivation. Mostly found in Bengal and the north-eastern part of the country, including Arunachal Pradesh, Meghalaya, and Mizoram. It is also found in certain parts of central India like Raipur, Mandla, Amarkantak, Panchamarhi.

Climate [10]: In soils with sandy topsoil and an acidic pH range of 4.5–6.5, *Curcuma caesia* thrives. It is a plant that prefers partial shade, but it may also thrive in full sun when grown under controlled conditions.

Soil [11]: Wet, well-drained soil that is rich in organic matter. It is grown on a variety of soils, including red clay loam, ashy loam, and light black soil. However, a sandy or clay loam with good drainage is where it thrives best. Feeding the soil with a liquid fertilizer during the growing season, which runs from spring to fall is best.

Cultivation of Plant [11]: In North-East India, the middle of April is the ideal time to raise the crop; however, in other locations, it is the pre-monsoon season. Rhizomes are used to spread the crop vegetatively. During April, rows of the full or partial rhizome, weighing roughly 20 g, should be planted there. The best planting spacing is 30 cm apart, requiring 4500 propagules (rhizome

segments) per acre. Rhizomes germinate within 15 to 20 days.

Irrigation Practices: The crop is typically grown in areas of Assam and Kerala with high rainfall under rain-fed conditions. It is necessary to irrigate other areas to maintain constant humidity regularly. The best irrigation technique is sprinkler irrigation.

Disease and Pest Control: On the crop, *Tephrina species*, *Coletotrichum species*, and *Corticium species* can occasionally be found as leaf spots and leaf blotches. Spraying liquid organic booster on them every week will manage them.

Crop Maturity and Harvesting: The crop matures in around nine months. Mid-January marks the end of harvesting. Irrigation is used to hydrate the soil before to digging the rhizomes to prevent damage. Harvest deterioration could result from damage to the rhizomes.

Post-harvest Management: Rhizomes that have been peeled, chopped in half, or sliced should be dried in an oven set to 55 °C or under a well-ventilated shade. These dehydrated rhizomes need to be kept in appropriate damp-proof containers.

Yield: Fresh rhizome yield is predicted to be between 19 and 21 tonnes per acre, and dried rhizome yield is between 3.5 and 5 tonnes per acre.

Phytochemistry: *Curcuma caesia* contains maximum curcuminoids, oil content, flavonoids, phenolics, and different important amino acids; the presence of these bioactive secondary metabolites correlates with the medicinal uses of *Curcuma caesia* fragrances, flavouring and many important useful Pharmaceutical Products [12]. The research on the volatile oil of *Curcuma caesia* rhizomes resulted in the identification of 30 components, representing 97.48% of the oil, with camphor (28.3%), ar-turmerone (12.3%), (Z)- ocimene, (8.2%), ar-curcumin (6.8%), 1, 8-cineole (5.3%), elemene (4.8%), borneol (4.4%), bornyl acetate (3.3%) and curcumene (2.82%) as the major constituents [13].

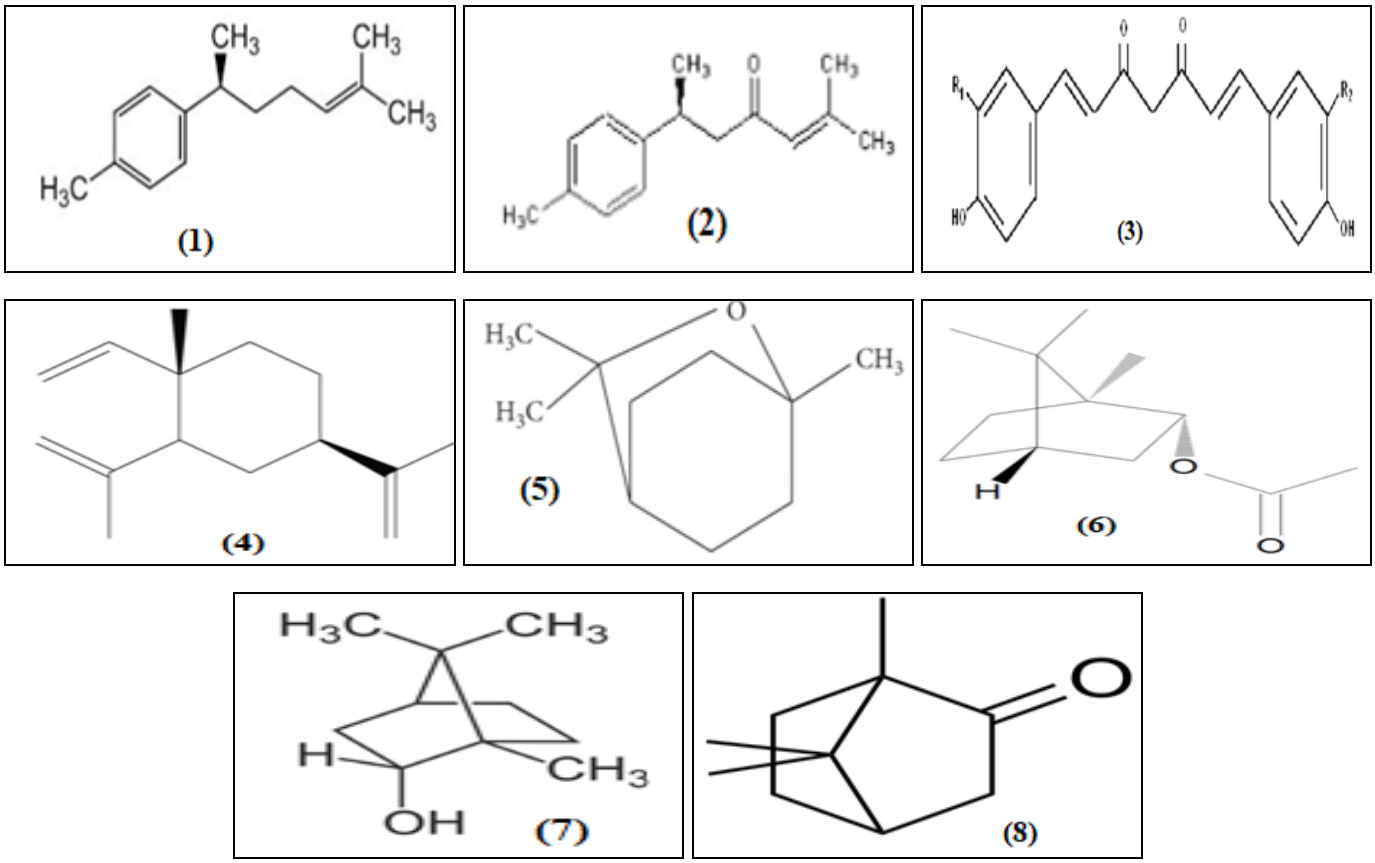

FIG. 4: STRUCTURE OF VARIOUS PHYTOCONSTITUENTS PRESENT IN CURCUMA CAESIA : (1) AR-CURCUMENE (2) AR- TURMERONE (3) CURCUMINOIDS (4) B – ELEMENE (5) 1,8- CINEOLE (6) BORNYL ACETATE (7) BORNEOL (8) CAMPHOR

Content of Volatile Oil, Total Curcuminoids and Other Bioactive Components in *Curcuma caesia:* Parameters Content in the Rhizomes:

- Total curcuminoid (mg/g dry wt.) 77.4±0.06
- Volatile oil content (% v/w) 6.65±1.12
- Total phenols (mg/g dry wt.) 60±0.03
- Flavonoids (mg/g dry wt.) 30±0.06
- Alkaloids (mg/g dry wt.) 103.25±1.66
- Soluble protein (mg/g fresh wt.) 46.5±1.9

Traditional Uses:

1. Different places of the world employ the rhizome and leaves of kali haldi. It is utilised as a heart and brain tonic.

2. *Curcuma caesia* Roxb dried rhizomes and leaves are used for allergies, piles, leprosy, asthma, cancer, wounds, impotence, and fertility [14].

3. Leucoderma, piles, bronchitis, asthma, tumours, tuberculous glands of the neck, enlargement of the spleen, and epilepsy are among the conditions that rhizomes are frequently used to treat.

4. *Curcuma caecia* Roxb's dried rhizome and leaves are used in North-East and Central India to cure allergies, allergies, piles, leprosy, asthma, cancer, wounds, fever, impotence, and fertility [15].

5. Rhizome of *Curcuma caesia* is grounded in the form of a paste & used in rheumatic arthritis [16, 17].

6. Fresh rhizome decoction is used as antdiarrhoeiaric and to get relief from stomach ache.

7. The fresh rhizome paste of curcuma caesiais is applied during the snake bite and scorpion bite [18]. The dried powder of *C. caesia* is mixed with seed powder of Andrographis paniculata Wall ex. Nees and applied during insect and snake bite [19, 20].

8. Following a Turkish bath, the herb's rhizomes is used as a rubeficient [21].

9. The powder of rhizomes is applied on the face as a face pack in northeast India.

10. Fresh rhizomes are crushed and applied as a paste to the forehead for migraine relief. They are also administered to the body to treat sprains and bruises.

11. It is said that consuming a modest amount of rhizome paste can treat menstruation issues and help the stomach release gases [22].

12. Fresh rhizome juice is combined with mustard oil and given to animals suffering from diarrhea in Assam [23].

13. Asians utilize the rhizome of *Curcuma caecia* to treat tumors, pox, and wounds. In cases of bloating and stomachaches, the powdered tuber is taken orally with water [24].

Pharmacological Activities of *Curcuma caesia*: The rhizome's bioactive components give rise to its medicinal benefits. Curcuminoids are bioactive substances that include antioxidant and anti-inflammatory effects, as well as wound healing, hypoglycemic, and anti-coagulant activities. Curcuminoids also have free radical scavenging and antioxidant activity [25, 26]. Curcumin and two related demethoxy chemicals, demethoxycurcumin and bisdemethoxycurcumin, are responsible for the majority of the bioactive components in the rhizomes. Widely present in plants, flavonoids and phenolic compounds have been shown to have a variety of biological effects, including antioxidant, free radical scavenging, anti-inflammatory, anti-carcinogenic, and more [27]. The following pharmacological effects of *C. caesia* have been noted in previous research due to the presence of some biological chemicals in the plant, such as phenolics and flavonoids (Borah *et al.*, 2019) [28].

Antioxidant Activity: The methanolic extract of *Curcuma caecia's* rhizomes has been shown to have antioxidant activity, which was assessed by DPPH free radical scavenging. This effect is brought on by the presence of phenolic constituents [29]. The rhizome and leaves of *Curcuma caecia* plants were subjected to enzymatic and crude extract analyses for antioxidant activity regarding DPPH radical scavenging activity and hydroxyl radical-scavenging activity. It was found that the

nonenzymatic extracts outperformed the enzymatic extracts in terms of free radical scavenging ability [30].

Antifungal 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 [31].

Antibacterial Activity: The antioxidant and antibacterial properties of oleoresins extracted from nine Curcuma species were studied by Angel Gabriel Rajamma *et al.* in 2012. Dichloromethane was used to extract the oleoresins from the rhizomes of *Curcuma zedoaria* and *Curcuma caesia*, and the antioxidant and antibacterial activity of the oleoresins was tested. All of the species' oléoresins displayed high DPPH radical scavenging activity and ferric-reducing power, and these properties were well correlated with phenolic content. Gram positive and negative bacteria were both inhibited by oleoresins [32].

Antiemetic Activity: The ethanol extract of *Curcuma caecia* rhizome showed significant antiemetic activity on chick emetic model and compared with domperidone [33].

Anthelmintic Activity: In a study by Gill Randeep *et al.* (2011), the antihelmintic activity of the two most well-known species of Curcuma, *Curcuma caesia* and *Curcuma zedoaria*, was demonstrated. Extracts were examined, and the timing of the earthworms' paralysis and demise was determined. All of the two plants' extracts showed dose-dependent efficacy. The outcomes showed that the most efficient method for rendering earthworms paralysed was *Curcuma caesia* ethanol extract [34].

Analgesic Activity: The analgesic and antipyretic effects of several extracts derived from *Curcuma caesia* and *Curcuma amada* rhizomes were compared by Satija Saurabha *et al.* in 2011. Rats with brewer's yeast-induced hyperthermia and a chemical model of acute pain were used to test the plant extracts' analgesic and antipyretic effects. When rats were given dosages of 250 and 500 mg/kg body weight, writhing and pyrexia were seen. Both plants had antipyretic and analgesic effects [35].

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 signinificant reduction of ulcer index, gastric acid volume, pepsin, free and total acidity along with increased production of gastric mucus [36].

Anxiolytic and CNS Depressant Activity: The MECC rhizome's potential for suppressing the central nervous system (CNS) was examined by Indrajit Karmakar *et al.* in 2011. Hypnotic activity, the forced swim test, and the tail suspension test were all examined for MECC. Pentobarbital-induced sleep induction was significantly and dose-dependently reduced by MECC (50 and 100 mg/kg; i.p.) in terms of both the onset and length of sleep. MECC dramatically reduced the immobility times in both the FST and the TST in a dose-dependent manner at dosages of 50 and 100 mg/kg, i.p. for 7 consecutive days in mice, demonstrating considerable antidepressant-like effect [37].

Thrombolytic Activity of Ethanolic Extract of *Curcuma caesia* Rhizomes: The *C. caesia* is utilised for the treatment of ischemic myocardium or thromboembolic illnesses since the extract showed considerable clot dissolving activity as a result of plasminogen activation. Uncertainty persists regarding the extract's precise mechanism and mode of action [38].

Bronchodilating Activity: Pritesh Paliwal *et al.* (2011) looked into the bronchodilator properties of *C. caesia* extracts. The extract's bronchodilator activity was investigated in guinea pigs with histamine aerosol-induced bronchospasm and preconvulsion dyspnea. Treatment with 500 mg/kg of the methanolic CC extract demonstrated substantial protection against bronchospasm brought on by histamine. In this study, the H1 receptor antagonistic activity of the CC extract significantly prolonged the latent period of convulsions following exposure to histamine aerosol at the dose of 500 mg/kg and showed maximum protection of 34.84% at 4 hours as compared to chlorpheniramine maleate (standard) at 2 mg/kg, p.o. This supports the plant's anti-asthmatic properties [39].

Anti-Inflammatory Activity: Significant antioxidant activity was identified in proteins isolated from *Curcuma caecia* rhizome water Soxhlet extraction, and these proteins were also proven to be heat stable. At a dose level of 100 mg/kg, it demonstrated strong anti-inflammatory action in tests on the carrageenan rat paw model system [40].

Toxicology: Numerous reports have been made on the toxic properties of essential oils, which have the potential to be very damaging to human health. As a result, the hazardous properties of any compound should be investigated before being used commercially. The growth of *Allium cepa* L. roots and the mitotic index of the cells are unaffected by the essential oil, according to a study on the genotoxicity of *C. caesia* leaf essential oil (0.05 mg) (Borah *et al.*, 2019) [28]. Additionally, the cells were examined for damaging chromosomal abnormalities, but none were found. As the outcomes of mutation at the cellular level, chromosome breakage, bridge, multipolarity, clump, and stickiness were the characters taken into consideration in the chromosome aberration test (Borah *et al.*, 2019). When the genotoxic effect of *C. caesia* rhizome essential oil was examined, it was discovered that the plant negatively affected the mitotic index of the cells and the roots of A. cepa (Paw *et al.*, 2019). There aren't any more reports of *C. caesia's* genotoxic effects, except for that one. Therefore, additional in vivo toxicological studies may result in the establishment of *C. caesia* in both the pharmaceutical and food businesses [41].

CONCLUSION: This study showed that herbal products can be as safe as synthetic products while yet being as effective as modern medication. The plant's rhizomes have been studied for their potential antifungal, anti-asthmatic, anti-smooth muscle relaxant, analgesic, locomotor depressant, anticonvulsant, and muscle relaxant actions, as well as its antibacterial, anti-ulcer, anxiolytic, and CNS depressing properties. The herb appears to have a wide range of therapeutic effects on many diseases. The pharmacological research mentioned in this review supports *Curcuma caesia's* medicinal benefits. However, the clinical, toxicological, and phytoanalytical qualities of this plant are less well known. Although several phytochemical investigations have been published, more need to be done. Additional research can be done, including clinical evaluation, phytoanalytical investigations, and toxicity evaluation, with the availability of original data. If these claims are scientifically and clinically verified, the plant has undergone some pre-clinical testing and may offer effective treatments for a variety of human illnesses.

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