

## CURCUMA CAESIA ROXB. AND IT'S MEDICINAL USES: A REVIEW

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### ABSTRACT

*Curcuma caesia* is commonly known as kali haldi and it belongs to the family *Zingiberaceae*. 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* Roxb are used in treating leucoderma, asthma, tumours, piles, bronchitis, bruises etc. In this review article various established facts related to the plant *Curcuma caesia* have been compiled so that proper scientific methods can be initiated to validate its traditional uses and open the door for a source of potential drugs in near future.

**Keywords:** *Curcumacaesia*, traditional uses, bioactivity.

### INTRODUCTION

India has long history of using plants for medicinal purposes as mention in Ayurveda. The significance of medicinal plants for prevention, mitigation and cure of diseases are always recognized. History revealed that plants have been a valuable source of natural products for maintaining human health at all the times. Their importance is continuously growing now days. Most of the people now prefer natural therapies to get rid of from serious side effects of some of the present day medication.

*Curcuma* Linn. is a large genus belonging to the family *Zingiberaceae*. It comprises about 70 species of rhizomatous herbs distributed mostly in Southeast Asia as wild and cultivated plants<sup>1</sup>. *Curcuma* species have a great importance for its medicinal value and *Curcuma caesia* has been using by various tribal communities from long before.

Kali haldi (*Curcuma caesia*) is a perennial herb with bluish-black rhizome native to North-East and Central India. Black Turmeric is also sparsely found in Papi Hills of East Godavari, West Godavari, and Khammam Districts of Andhra Pradesh. The rhizomes of kali haldi have a high economical importance because of its putative medicinal properties. The rhizomes are used in the treatment of smooth muscle relaxant activity<sup>2</sup>, haemorrhoids, leprosy, asthma, cancer, epilepsy, fever, wound, vomiting, menstrual disorder,

anthelmintic, aphrodisiac, inflammation, gonorrhoeal discharges, etc<sup>3</sup>.

In Madhya Pradesh, the plant is regarded as very auspicious and is stated that a person who possess it will never experience shortage of cereals and food. The rhizomes of the plant are aromatic in nature. The inner part of the rhizome is bluish-black in colour and emits a characteristic sweet smell, due to presence of essential oil<sup>4</sup>.

Traditionally, the rhizomes of *Curcuma caesia* Roxb. are used in treating leucoderma, asthma, tumours, piles, bronchitis etc. The paste is applied on bruises, contusions and rheumatic pains in Manipur<sup>5</sup>. In Arunachal Pradesh, Adi tribes use decoction of fresh rhizome as anti-diarrhoeic. The Khamti tribe of Lohit district applied the paste of fresh rhizome in case of snake and scorpion bite<sup>6,7</sup>.

### METHODS

#### Botanical description<sup>8</sup>

##### 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 root-stock 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 sympodial. (Fig.-2).

### Leaves

The leaves are usually present in the groups of 10–20; each leaf is broad oblong lanceolate and glabrous. A deep ferruginous purple colour is present in the middle region of the lamina. The petiole is ivory in colour and encircling 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.

Corolla: 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.

### Vernacular names

Hind: Kali Haldi

Manipuri: Yaingang Amuba or Yaimu

Marathi: Kala-haldi

Telugu: Nalla Pasupu

Bengali: Kala haldi

Mizo: Aihang, Ailaihan

Assamese: kalahaladhi

Malayalam: Kari manjal

Sanskrit: Rajani Nishaa, Nishi, Ratri.

### Phytochemical constituents of *Curcumacaesia*. Roxb

Preliminary phytochemical studies were carried out by Sarangtham et al and reported the presence of alkaloid, steroid, phenolic and tannin as major constituents in successive solvent extraction of rhizome with n-hexane, petroleum ether (60:80), benzene, chloroform, ethyl acetate and water [5]. The volatile oil component of the rhizomes of *Curcuma caesia* was analysed by GC-MS by Pandey et al. that resulted in the identification of 30 components, representing 97.48% of the oil, with camphor (28.3%), ar-turmerone (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. (Pandey et al 2003). 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 constituent<sup>9</sup>. The *curcuma caesia* rhizome oil was also analysed by Banarjee et al. and reported almost similar composition consisting of (+) linalool (20.42%), ocimine (15.66%), 1- ar-curcumene (14.84%), zingiberol (12.60), 1, 8-cineole (9.06%), and  $\alpha$ -borneol (7) d-camphore (18.88) as major constituent<sup>10</sup>.

### Traditional uses of *Curcuma caesia*

The fresh and dried rhizomes of *curcuma caesia* are used for treatment of various diseases.

The following uses have been reported-

1. Dried rhizomes and leaves of *curcuma caesia* Roxb. are used in piles, leprosy, asthma, cancer, wounds, impotency, fertility, tooth ache, vomiting, and allergies<sup>11-14</sup>.
2. Fresh rhizome decoction is used as anti-diarrhoeic and to get relief from stomach ache<sup>6</sup>. 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<sup>7</sup>.
3. The rhizome is used for the treatment of cough, fever, dysentery, worm infection<sup>15</sup>.
4. The fresh rhizomes are used in leprosy, cancer, epilepsy, anti-helminthic, aphrodisiac, gonorrhoeal discharge<sup>2</sup>.
5. Rhizome of *Curcuma caesia* is grounded in the form of paste in rheumatic arthritis<sup>9</sup>.

6. The rhizome of *Curcuma caesia* is grounded and applied in the form of paste in rheumatic arthritis<sup>16</sup>.
7. Crushed rhizome paste is applied against cur or injury to control bleeding and quick healing<sup>16</sup>.
8. The rhizome *Curcuma caesia* is administered during inflammation of tonsils<sup>17</sup>.
9. The roots of the *Curcuma caesia* are grounded into powder and used with water to treat gastric disorder<sup>18</sup>.

### Biological activities

#### i) Neuropharmacological assessment of *Curcuma Caesia* Rhizome in experimental animal models

The ethanol extract of *Curcuma caesia* exhibited an important neuropharmacological activity. The study was conducted by Karmakare *et 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. Locomotor activity was estimated by means of an actophotometer. Anticonvulsant effect was assessed against pentylenetetrazol-induced 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 increased up to a maximum. The methanol extract of *Curcuma caesia* significantly depressed the locomotor 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<sup>19</sup>.

#### ii) Scavenging activity of *Curcuma caesia* rhizome against reactive oxygen and nitrogen species

Methanol extracts of rhizome of *Curcuma caesia* were investigated by Karmakare *et al.* for their in vitro antioxidant studies with reactive oxygen species (ROS) and reactive nitrogen species (RNS) because they are responsible for all the above

diseases. Effect of MECC on ROS and RNS were evaluated in different in-vitro methods like 1, 1-Diphenyl-2-picrylhydrazyl radical, hydroxyl radicals, superoxide anions, nitric oxide, hydrogen peroxide, peroxy nitrite and hypochlorous acid. Lipid peroxidation, total phenolic content was also measured by standard assay method. The extract showed significant antioxidant activities in a dose dependent manner. The result obtained in the study indicated that the methanol extract of *C. caesia* rhizome is a potential source of natural antioxidant<sup>20</sup>.

#### iii) Comparative antioxidant activity of non-enzymatic 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 zedoaria*, *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  $55.32 \pm 0.2$  at 200 µg/ml of crude extract. The hydroxyl radical scavenging activity of *C. caesia* was found to be  $40.26 \pm 0.01$  of the crude extracts as compared to ascorbic acid (standard), which was found to be  $52.33 \pm 0.40$  at the concentration of 50 µg/ml. In case of enzymatic extracts DPPH scavenging activity of *C. caesia* was found to be  $31.2 \pm 0.8$  at 200 µg/ml and maximum antioxidant activity was found in catalase, superoxide dismutase and glutathione peroxidase enzyme<sup>21</sup>.

#### iv) Anti-oxidant and antimicrobial activity of essential oils from nine starchy *Curcuma* species

The essential oils of nine rhizomes of *Curcuma* species were isolated by hydro distillation and analysed by G R *et al.* for total phenols, DPPH scavenging activity and reducing power. Antibacterial activity was determined against *Bacillus subtilis*, *Staphylococcus aureus* and *E. coli*. Nine tuberising *Curcuma* species which were considered for the study were namely *C. aeruginosa*, *C. amada*, *C. aromatica*, *C. brog*, *C. caesia*, *C. malabarica*, *C. rakthakanta*, *C. sylvatica* and *C. zedoaria*. The results showed that total phenolic content in the oils ranged from 4 – 83 µg gallic acid equivalents (GAE)

/µl oil. Most of the oils possessed high antioxidant activity, which was moderately correlated with phenolic content. Oils from *C. Caesia* exhibited maximum antibacterial activity against *B. Subtilis*<sup>22</sup>.

**v) A comparative study of phenol content and antioxidant activity between non-conventional *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*<sup>23</sup>.

**vi) 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, Arulmozhi et al, used Guinea pig and Rabbit as animal model. Methanolic extract of *Curcuma caesia* at a dose of (50-800 µg/ml) produce relaxation in trachea tissues pre-contracted with carbachol. It also showed a smooth muscle relaxation effect in presence of various receptor antagonists e.g. such as propranolol, glibenclamide, 2',5'-dideoxyadenosine, α-chymotrypsin, L-NNA and methylene blue. *Curcuma caesia* at a concentration of 30 µg/ml exhibited inhibitory effect on Ca<sup>2+</sup>-induced contraction in isolated rabbit aorta<sup>2</sup>.

**vii) Anxiolytic and CNS depressant activities of methanol extract of *Curcuma caesia* rhizome**

*Curcuma caesia* Roxb is proved to be a significant anxiolytic and depressant herb. The study was conducted by Karmakare et al., the methanol extract of *Curcuma caesia* produced significant and dose dependent reduction in the prolongation of sleep induced by the pentobarbitone. The methanol extract at dose of 50 and 100mg/kg, i.p. showed a significant prolongation of sleep duration whereas

methanol at higher dose 100mg/kg, i.p. is more effective than 50mg/kg body weight<sup>24</sup>.

**viii) 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 pre-treatment with aspirin<sup>25</sup>.

**ix) 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 secondary root formation was shown by rice seed treated with the presence of *C. caesia* leaves placed above and below the seed in comparison with 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 gets volatilized and escaped. While that of cut leaves gradually escaped and spread inside the petridishes 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<sup>26</sup>.

**CONCLUSIONS**

The present study emphasizes the knowledge on the plant *Curcuma caesia* Roxb. 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



(pharmacological & toxicological) would be considered for further scrutiny to develop the potential drug molecule.



**Fig. 1: Aerial shoots with leaves of *Curcuma caesia* Roxb**



**Fig.2: Tuberous Rhizome (cut surface) of *Curcuma caesia* Roxb**

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