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Morphological and Secondary Metabolites Tests of Black Turmeric (*Curcuma caesia Roxb.)*

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ABSTRACT:

Curcuma caesia Roxb rhizomes were collected and grown for morphological Study. The secondary metabolites like Tannins, Saponins, Alkaloids, Flavonoids and Phenol were studied for their confirmatory test. The morphological data were collected as leaf size, rhizome size and stem height were studied. It was noted that plants grown at Mumbai locality and grown at Indore shown some variation. The Important secondary metabolites also shown variations in leaf and rhizome. This data will give idea for the further research in the field of secondary metabolites of *Curcuma caesia roxb.*

INTRODUCTION:

India is the only country where there is a strong research and development base for turmeric. However, research on *Curcuma caesia Roxb*., especially in the area of pharmacology, is being pursued by many workers in many countries). The first ever research on *Curcuma caesia Roxb.* in India was initiated at Udayagiri in Orissa in1944 under the Indian Council for Agriculture Research.

The genus *Curcuma caesia* Roxb. Belongs to family Zingiberaceae (GRIN Database, 2005, ISI Database, 2005). *Curcuma caesia* Roxb. is native to Bengal and originated from India (Velayudhan et al., 1999). It is a perennial, rhizomatous and herbaceous plant. It can be differentiated from other *Curcuma species* because of its bluish-black rhizome. The rhizome has a bitter and pungent smell (Paliwal et al., 2011). *Curcuma caesia* Roxb. is used as condiments, medicine and perfumes (Kumar, 1991); stimulants, anti-diarrheal, diuretic, antiemetic, wound cleaner and skin disorder (National Medicinal Plants Board, 2008); fuel source, treat blood diseases, animals and insect bites, congestions scabies (Velayudhan et al. 1999). *Curcuma caesia Roxb.* was reported to contain more phenolic compound than C. amada (Katalinic et al., 2006). The rhizomes of *Curcuma caesia* Roxb. are consisted of curcuminoids, flavonoids, volatile oil, protein, amino acids and alkaloids (Sarangthem & Haokip,2010).

In India it is found in West Bengal, Madhya Pradesh, Orissa, Chhattisgarh, and Uttar Pradesh states. It nourishes well in moist deciduous forest areas (Nadkarni,1976). Rhizomes of the plant are used for sprains and bruises and also employed in the preparation of cosmetics (Anonymous, 2001).

Taxonomical Hierarchy of the plant :

Kingdom	Plantae
Phylum	Angiosperms
Class	Monocots
Order	Zingiberales
Family	Zingiberaceae
Genus	*Curcuma*
Species	*caesia*
Binomial Name	*Curcuma caesia Roxb.*

Secondary Metabolites

Secondary metabolites are organic compounds that are not directly involved in the normal growth, development or reproduction of a plant or in an organism. A common role of secondary metabolites in plants is defense mechanism i.e. used to fight from herbivores, pests and pathogens (Bennett RN, Wallsgrove RM,1994). The term secondary metabolite was first coined by Albrecht Kossel and he got in medicine and physiology in 1910 (Jones,1953). In humans or plants, secondary metabolites are of great importance as they are used in many fields such as medicine, flavoring agent, cosmetics, food additives, antimicrobial, dyes, etc. (Vaishnav, 2011).

Medicinal uses of *Curcuma casiea*

In India it is found in West Bengal, Madhya Pradesh, Orissa, Chhattisgarh, and Uttar Pradesh states. It nourishes well in moist deciduous forest areas (Nadkarni,1976). Rhizomes of the plant are used for sprains and bruises and also employed in the preparation of cosmetics (Anonymous, 2001). *Curcuma amada Roxb.* is useful in bronchitis, asthma, sprains, skin diseases, and in amotion caused due to injuries (Kirtikar and Basu, 1987). The genus *Curcuma* is a well-known spice of India. It is also called Haldi and more than 200 species and subspecies of it is found all across the world. One of which is *Curcuma Caesia* Family: Zingiberaceae. It is also known as “Kali Haldi.” It is an erect rhizomatous herb with large leaves. Fresh rhizomes are

aromatic with intense camphoraceous odor and are applied externally to sprain and bruises (Wealth of India, 2001). Black Turmeric (*Curcuma caesia*) is native to North-East and Central India. It is also sparsely found in Papi hills of East Godavari, the root hills of the Himalayas and North Hill Forest of Sikkim. The rhizomes of Black Turmeric have a high economic importance owing to its putative medicinal properties.

Phytochemical constituents of *Curcuma caesia*: The phytochemical study by Sarangthaem et al has 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 (Sarangthaem et al, 2003). 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-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 curcumin (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 constituents. The *Curcuma Caesia* rhizome oil was also analyzed 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 α-borneol (7) d camphore (18.88) as major constituents. Curcumin was isolated from *Curcuma Caesia* by Pandey and Gupta in 2019.

Materials and methods:

Material was collected from Indore and Kolkata. Rhizome were rinse with water ten times. It was kept in dilute Dettol for 24 hours to eliminate contamination of microorganisms. Rhizomes and leaves were dried in oven at room temperature. The dried leaves and rhizomes were made in to fine powders. The fine powders were used for the different confirmatory tests.

Methods were used for confirmatory test of phenol tannins alkaloids and Flavonoids as follows

1 Test for tannins:

Lead acted test: in the test tube 1ml of the filtrated extract with 2ml 10 % lead acetate solution were added. Precipitate formation indicates the presence of tannins.

2. **Test for saponins:**
   Foam test: In the test tube containing 1ml of the filtrated extract add 2ml distilled water and shake vigorously allowing to stand for 10 minutes. Development of form on the surface of the solution lasting for 10 minutes indicates the presence of saponins.

3. **Test for alkaloids**:
   Dragendroff's test: Add 2ml of Dragendroff's reagent in a test tube containing 1 ml of the filtrate extract. The presence of an alkaloid was indicated by the presence of orange color.
4. **Test for flavonoids:**
   Alkaline reagent test: In the test tube containing 1ml of the filtrated extract with 2ml of dil. NaOH were added.

5.Test for phenolic compounds:

Lead acetate test: In a test tube containing 1ml of the filtrated extract add 2ml 0f 10% lead acetate solution. Formation of brown precipitate indicates the presence of phenolic compounds.

Results and discussion:

The following significant results were obtained from the present investigation. The morphological study of *Curcuma caesia* plants collected from Indore and Kolkata showed variations in their growth and leaf pattern. Both the plants showed nice growth but shown little variations in their leaf size. The main important characteristics of Black turmeric is presence of purple color on the midrib and inside the rhizomes. The same purple color was found on leaves of both the plants collected from Kolkata and Indore. The variation in purple color was noted in two different rhizomes. The purple color found darker in the rhizomes collected from the Kolkata as compared with rhizomes collected from Indore. The purple color was found faint in rhizomes of Indore.

The presence of secondary metabolites was tested by different standard confirmatory tests. It was observed, the different secondary metabolites are present in leaves and rhizomes of both the samples collected from different places of India. It was found that the compounds like tannins, saponins, alkaloids, flavonoids and phenols were present in good amount.

From the above morphological and biochemical investigations, it is concluded that, the *Curcuma caesia* shows little variations in their morphological characters of leaves and rhizomes collected from two different states of India. The secondary metabolites were found in both the samples. This primary information will helpful for future research on *Curcuma caesia*.

	
Plant from Kolkata	Plant from Indore
	
Rhizome Color collected from Indore	Rhizome Color collected from Kolkata
	
Sizes of Rhizomes collected from Indore	Sizes of Rhizomes collected from Kolkata

Observation table:

Table 1: For leaves

Secondary metabolites	*Curcuma caesia*
Tannins	Present
Saponins	Present
Alkaloids	Present
Flavonoids	Present
Phenol	Present

Table 2: For rhizome

Secondary metabolites	*Curcuma caesia*
Tannins	Present
Saponins	Present
Alkaloids	Present
Flavonoids	Present
Phenol	Present

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