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SCIENTIFIC OVERVIEW OF CURCUMA AROMATICA

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ABSTRACT

Curcuma aromatica, commonly known as wild turmeric, belongs to the *Zingiberaceae* family and has been widely recognized in traditional medicine and modern herbal formulations for its potent therapeutic and cosmetic properties. This plant is rich in bioactive constituents such as curcuminoids, essential oils, and phenolic compounds, which contribute to its antioxidant, anti-inflammatory, antimicrobial, and wound-healing effects. Traditionally, *Curcuma aromatica* has been used to treat various skin disorders, promote complexion, and protect against microbial infections. In the present study, the emphasis is placed on the extraction and formulation potential of *Curcuma aromatica* for herbal facial cleansing gels. The hydroalcoholic extraction method enables the efficient isolation of active components, which can enhance the stability and efficacy of the final product. When incorporated into cosmetic formulations, the extract helps to cleanse the skin, reduce inflammation, prevent acne, and rejuvenate damaged skin cells. Its natural aroma and soothing properties further contribute to a refreshing cleansing experience without the side effects often associated with synthetic ingredients. The study also highlights the environmental and health benefits of using natural plant-based ingredients over chemical alternatives. The use of *Curcuma aromatica* in skincare formulations aligns with the growing demand for safe, sustainable, and effective herbal cosmetics. Overall, this research supports the potential of *Curcuma aromatica* as a valuable ingredient in the development of herbal facial cleansing gels and other cosmetic products aimed at promoting healthy and radiant skin through natural means.

INTRODUCTION

Curcuma aromatica, commonly known as wild turmeric, is a rhizomatous herb belonging to the family *Zingiberaceae*. It is widely distributed in tropical and subtropical regions, particularly in India and Southeast Asia, where it has long been valued for its medicinal, cosmetic, and aromatic properties. Traditionally, it has been used in Ayurvedic and Unani systems of medicine for the treatment of various ailments such as skin infections, inflammation, and wounds. The plant is rich in curcuminoids, volatile oils, and phenolic compounds, which are responsible for its diverse biological activities including antioxidant, antimicrobial, anti-inflammatory, and wound-healing properties. In recent years, there has been a growing interest in the use of natural herbal ingredients in cosmetic formulations due to their safety, efficacy, and environmental compatibility. Among them, *Curcuma aromatica* stands out as a promising bioactive agent for skincare products. Its natural yellow pigment, soothing fragrance, and healing effects make it an ideal ingredient for facial cleansers, creams, and other dermatological preparations. The incorporation of *Curcuma aromatica* extract into herbal formulations can enhance skin cleansing, prevent acne, reduce pigmentation, and promote overall skin health. The extraction of its active compounds using hydroalcoholic or other solvent systems ensures maximum retention of therapeutic properties. The present study focuses on understanding the characteristics, extraction process, and potential cosmetic applications of *Curcuma aromatica*, emphasizing its role in developing natural and effective herbal skincare products.

CURCUMA AROMATICA

PHARMACOGNOSTIC REVIEW OF *CURCUMA AROMATICA*

Macroscopic Evaluation

Sourabh D Jain et al (2016) The rhizome of *Curcuma aromatica (Zingiberaceae)* were collected from local market of Khargone, Madhya Pradesh. Pharmacognostic study was carried on the basis of Morphological characters such as color, odor, taste, size, fracture, texture etc. were considered.[1]

Table no. 12: The results of the Pharmacognostic study.

Characters	Observation
Organoleptic characters	
Colour	Deep orange
Odor	Aromatic
Taste	Pungent
Quantitative Macro morphology	
Size	3-5 cm in diameter
Length	1-1.5 cm long
Macroscopically feature	
Shape	Finger shaped
Surface	Smooth or slightly rough
Texture	Hard and Heavy
Fracture	Short

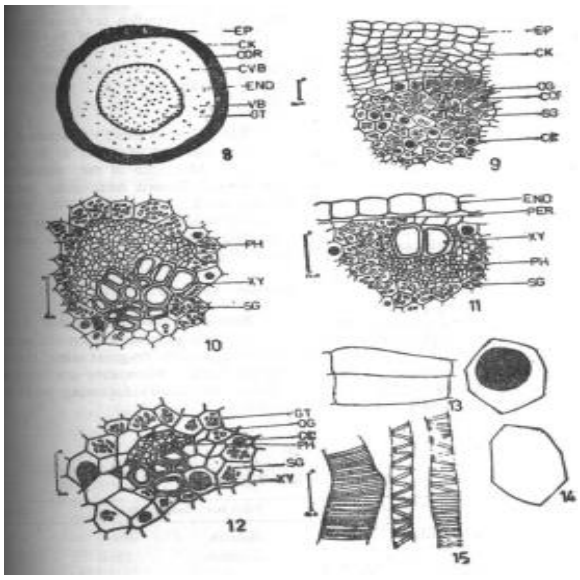
Rhizome of *Curcuma aromatica*

Debbarma Promod et al (2018) *Curcuma aromatica (zingiberaceae)* were collected from Palakkad district, kerala. After identifying the plant, for the study purpose rhizome of *Curcuma aromatica* is washed with running water and kept for drying under shade. Pharmacognostic study was carried on the basis of Morphological characters such as colour, odour, taste, size, fracture etc. Rhizome are 6.5 – 7 cm in length and 1.5- 2 cm in diameter, less leteral branches, palmately attached and root tubers present, light yellow inside, sweet camphooraceous in odour and Pungent in taste. They have slightly rough external surface with big round scar, hard & heavy.[2]

Fresh rhizomes of *Curcuma aromatica*

Microscopic Evaluation

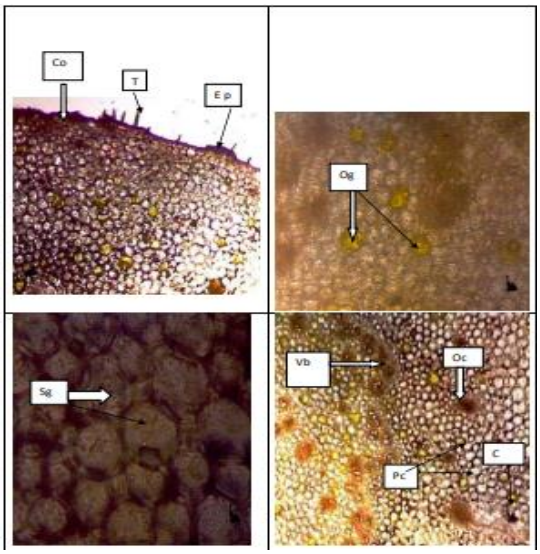
T. R. Shantha et al (1991) The microscopy of the lateral rhizome of *Curcuma aromatica (Zingiberaceae)*, is circular and features several distinct layers, including the epidermis, cork, cortex, and ground tissue with scattered vascular bundles. The cork consists of 10-12 layers of thin-walled, suberized cells, while the cortex has 20-35 layers of polygonal parenchymatous cells containing starch grains and oil globules. The vascular bundles are collateral and closed, with varying sizes and numbers of xylem elements. The ground tissue is composed of thin-walled parenchymatous cells containing starch grains and yellow cell content. Maceration reveals thin-walled cork tissue, polygonal parenchymatous tissue, and helical to spiral vessel elements. The central rhizome exhibits similar microscopical structures.[3]



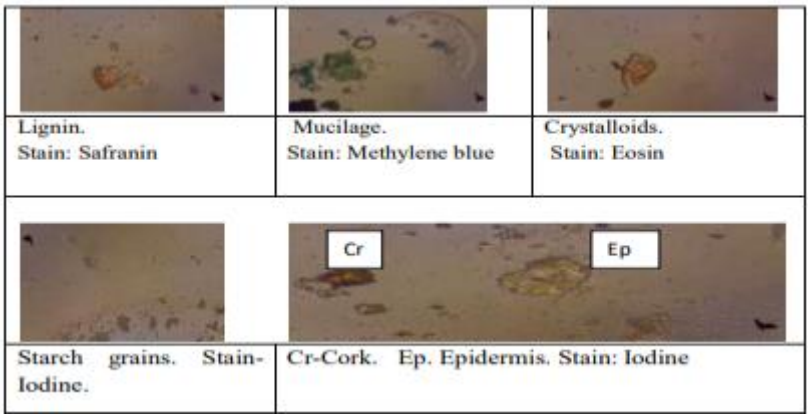
Microscopy of *Curcuma aromatica.*

EP - Epidermis, CK - Cork, COR -Cortex, CVB - Conjoint vascular bundle, ENO - Endodermis, VB - Vascular bundles, GT - Ground tissue, OG - Oil gland, PH - Phloem, XY - Xylem, SG - Sclerenchyma girdle, PER - Pericycle, END – Endodermis.

Debbarma Promod et al (2018) Microscopic characters of fresh rhizome of *Curcuma aromatica (Zingiberaceae)*, have epidermal hairs: 1-2 celled, branched, thick walled, lignified. Periderm - 3-5 layered. Outercortex-Lesser number of scattered collateral vascular bundles, starch grains present. Innercortex- Amphicribal vascular bundles arranged in patches. Vascular elements-Trachieds with spiral and scalary and vessels with reticulate thickening, bundle sheath absent, fibre present very few. Oil cells are present. In Powder microscopylignin, Cork, crystalloids, Starchgrains, Mucilage, lignified fibres, epidermal cells, were also seen in powder microscopy.[4]

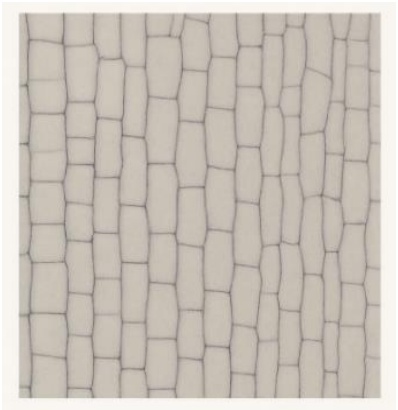


Tranverse section of *Curcuma aromatica* Vb- vascular bundle, Oc- Oleo resin cells, C-Cortex, Pc-Parenchyma cells, T- Trichomes, Co- Cork, Ep-Epidermis, Og- Oil globules. Sg-Starch grains.

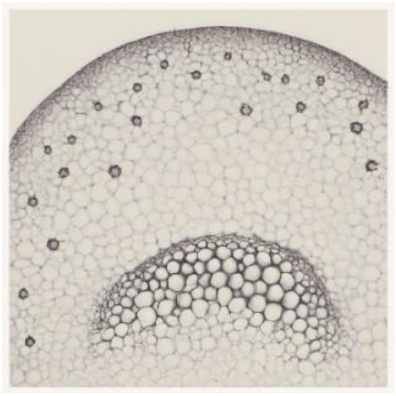


Powder microscopy characteristics of rhizome of *curcuma aromatica.*

Moe Moe Myint Aung et al (2021) The microscopic structure of rhizome of *Curcuma aromatica (Zingiberaceae)*, reveals polygonal-shaped epidermal cells with straight anticlinal walls, along with oil cells, secretory cells, and starch grains. The periderm consists of 5-7 layers of thin-walled parenchymatous cells, while the cortex has 35-45 layers of polygonal-shaped cells. The vascular bundles are collateral, scattered throughout the ground tissue, and feature a fibrous or sclerenchymatous sheath. The xylem and phloem tissues exhibit characteristic cellular components, including vessels, tracheids, fibers, and parenchyma.[5]



Surface view of epiblema showing cells of rhizome (400x)



Transverse section of rhizome vascular bundle (200x)

PHYTOCHEMICAL REVIEW OF *CURCUMA AROMATICA*

Das Trishna et al (2010) The air-dried powdered rhizome of *Curcuma aromatica (Zingiberaceae),* was extracted by continuous hot percolation method in Soxhlet apparatus with different solvents, starting from petroleum ether (60-80 c) followed by benzene, chloroform, acetone, methanol, ethanol and water. Each time before extracting with the next solvent, the powdered material was air dried below 50 ^{o}C, each extract was concentrated by distilling off the solvent and evaporating to dryness on water bath. The extracts were subjected for phytochemical screening. The ethanolic extract (yield 2.35%) was investigated for its antifertility activity.[6]

Table no. 13: Phytochemical screening of the extracts of *Curcuma aromatic.*

Test	P	B	C	A	EA	M	E	W
Alkaloids	–	–	–	–	–	+	+	+
Carbohydrates	–	–	+	–	–	+	+	+
Glycosides	–	+	+	–	–	–	–	–
Phytosterols	+	+	–	–	–	+	+	+
Fixed oil and fats	–	–	–	–	–	–	–	–
Phenolic compound and Tannins	–	–	–	–	–	–	–	–
Saponins	+	+	–	–	–	–	–	–
Proteins and Aminoacids	–	–	–	–	–	–	–	–
Gums and Mucilage	+	+	–	–	–	–	–	–
Flavonoid	–	–	–	–	–	–	–	–
Coumarin	–	–	–	–	–	–	–	–

P = Petroleum Ether, B = Benzene, C = Chloroform, A = Acetone, EA = Ethyl acetate, M = Methanol, E = Ethanol, W = Water. (+) = Present (-) = Absent.

Sourabh D Jain et al (2016) Phytochemical parameters of rhizome of *Curcuma aromatica* (*Zingiberaceae)* performed for the chemicals constituents like alkaloids, flavonoids, glycosides, tannins, amino acids and gum and mucilage. The Preliminary Phytochemical Investigations of Chloroform, Ethanolic and Aqueous extract of rhizome *Curcuma aromatica Salisb* were preformed which reveals the presence of Alkaloid, Flavonoids, Glycoside, Tannins, Amino acid and Gum & Mucilage type of major secondary metabolites which revealed their potent therapeutic activity.

Table no. 14: Phytochemical analysis of *Curcuma aromatica.*

Compounds	Chloroform	Ethanol	Aqueous
Alkaloids	-	+	+
Flavonoids	-	-	+
Glycosides	+	-	-
Tannins	-	+	-
Amino acid	-	-	-
Gum & Mucilage	-	-	-

(Indication: + Presence, - Absence)

Preliminary Phytochemical Screening:

Test for Alkaloids

Dragendorff's Test: In 3 ml. of filtrate, few drops of Dragendorff's reagent (potassium bismuth iodide solution) were added and formation of Orange Brown colored precipitate shows presence of alkaloids.

Mayer's Test: Few drops of Mayer's reagent (potassium mercuric iodide solution) were added in 3 ml of filtrate and formation of cream colored precipitate indicates presence of alkaloids.

Test for Flavonoids

Shinoda Test: 5 ml of (95%v/v) ethanol was added in the extract and then few drops of concentrated Hydrochloric acid and 0.5g magnesium turnings were added. Pink color shows the presence of flavonoids.

Lead acetate test: To small quantity of extract, lead acetate solution was added. Yellow colored precipitate formation shows the presence of flavonoids.

Test for Glycosides
Borntrager's test: To about 3 ml extract, dilute sulphuric acid was added. It was boiled and filtered. To cold extract equal volume of benzene or chloroform was added. After shaking, organic solvents were well separated. Add ammonium, ammonical layer turned pink.

Test for Tannins
Gelatin test: To 2 ml test solution, 1% Gelatin solution containing 10% sodium chloride was added to obtain a white precipitate.

Ferric chloride test: To 1ml of the extract, ferric chloride solution was added and formation of a dark blue or greenish black color shows the presence of tannins.

Test for Amino Acid
Ninhydrin test: 3 ml of test solution was heated and 3 drops of 5% Ninhydrin Solution was added in boiling water and was boiled for 10 minutes. Purple or bluish color appeared.

Test for Gum and Mucilage
About 10 ml of the extract was slowly added to 25ml of absolute alcohol under constant stirring. Precipitation indicates the presence of gum and mucilage.[7]

Debbarma Promod et al (2018) The objective of this study was aimed to identify active compounds in rhizome of *Curcuma aromatica* (*Zingiberaceae)*. A plant cell produces two types of metabolites primary metabolites involved directly in growth and metabolism (carbohydrates, lipids and proteins etc), and secondary metabolites not involved in metabolic activity (alkaloids, phenolics, sterols etc) but act as defense chemicals. The Preliminary Phytochemical Investigations of Aqueous, Ethanolic and Petroleum Ether extract of rhizome *Curcuma aromatica Salisb* were preformed which reveals the presence of Carbohydrates, Alkaloids, Amino acids, Saponin, Glycosides, Flavonoids, Steroids and Tannins. The results of the screening were expressed.[8]

Table no. 15: Phytochemical analysis of *Curcuma aromatic.*

Carbohydrate test

Name of test	Aquous extract	Ethanol Extract	Petroleum Ether extract
Malish test	+ve	+ve	+ve
Benedict test	+ve	+ve	-ve
Feling test	+ve	+ve	+ve
Barfoad test	+ve	+ve	+ve

Alkaloids

Dragan drof	+ve	+ve	+ve
Wagner's test	+ve	-ve	-ve
Mayer's test	+ve	+ve	+ve
Hager's test	+ve	+ve	-ve

Amino acids

Ninhydrine	-ve	-ve	-ve
Xanthoprotic	+ve	+ve	-ve

Protein

Millon' test	-ve	-ve	-ve
Biuret test	-ve	-ve	-ve

Saponin

Foam test	-ve	-ve	+ve

Glycosides

Killar kilini test	+ve	+ve	+ve
Borntrager's test	+ve	+ve	+ve

Phenolic compound

Phenolic test	-ve	-ve	-ve

Flavonoids

Shinod's test	+ve	+ve	+ve

Steroids

Salkowaski test	+ve	+ve	+ve

Tannins

$FeCl_3$ test	+ve	+ve	-ve
Lead acetade test	+ve	+ve	-ve
Pot.dichromate test	+ve	+ve	-ve

(Indication: + Presence, - Absence)

Bhoomi Joshi et al (2018) Phytochemical screening of ethanolic extract of *Curcuma aromatica (zingiberaceae)* rhizome showed Alkaloids, Flavonoids and Terpenoids are present and absence of Tannins, Glycoside, Phenols and Saponin. The Methanolic extract of *Curcuma aromatica Salib* rhizome showed Alkaloids, Flavonids, Terpenoids are present and absence of Tannins, Glycoside, Phenols, Saponin.[9]

Table no. 16: Phytochemical screening of *Curcuma aromatic*.

Phytochemical	Test	Curcuma aromatica	
		Ethanol	Methanol
Alkaloid	Dragondroff test	+	+
	Mayer's test	+	+
	Wagner's test	+	+
Flavanoids	Lead acetate test	+	-
	Sulphuric acid test	+	+
	Alkaline reagent test	+	+
	Zinc hydrochloride test	-	-
	Pew test	-	-
Phenol	Ferric chloride test	-	-
Saponins	Frothing test	-	-
Tannins	Lead acetate test	-	-
	Ferric chloride test	-	-
Terpenoids	Salkowski test	-	-
	Copper Acetate test	+	+

(Indication: + Presence, - Absence)

Vihang Vithalrao Patil et al (2019) Phytochemical analysis was carried out to detect the presence of any pharmaceutically active compound in rhizome of *Curcuma aromatica (Zingiberaceae)*, including of alkaloids, flavonoids, terpenoids, steroids, saponins, phenols, glucosides. Major phytochemicals like alkaloids, flavonoids, phenols, saponins, steroids, etc. were found in *Curcuma aromatica* extracts. Glucosides was absent in *Curcuma aromatica* extracts. On the other hand, terpenoid was found in *Curcuma aromatica.* Presence of alkaloids, flavonoids and phenolics strongly suggest plants involvement in antibacterial activity.[10]

Table no. 17: Qualitative analysis of the Phytochemicals of *Curcuma aromatic*.

Phytochemicals	Test	*C. aromatica*	
		Water	Methanol
Alkaloid	Mayer's Test	+	+
Flavonoids	Shinoda Test	+	-
Phenols	$FeCl_3$ Test	+	+
Terpenoids	Liebermann Burchards Test	+	+
Steroids	Salkowski Test	+	+
Carbohydrates	Fehling's Test	+	+
Proteins	Biuret Test	+	+
Saponins	Foam Test	+	-
Glucosides	Legal's Test	-	-

(+ Indicates the presence of constituent, - Indicates the absence of constituents).

Lata Choudhary et al (2024) Phytochemicals of rhizome of *Curcuma aromatica (Zingiberaceae),* were all identified by phytochemical screening of the extract.[11]

Table no. 18: Phytochemical analysis.

Group	Test	Examination	Results
Alkaloid	Hager's test	Yellow precipitate	Alkaloid present
Flavonoid	Shinoda's test	Pinkish-red color	Flavonoid present
Tannin	Gelatin test	Green color appeared	Tannin present
Glycoside	Borntrager's test	No Faint pink color observed	Anthraquinone glycoside absent
Glycoside	Legal's test	No red color observed	Cardiac glycoside absent
Saponin	Froth formation test	Froth formation	Saponin present
Carbohydrate	Fehling's test	No Red precipitate	Carbohydrate absent
Phenol	$FeCl_3$ test	Bluish-black color observed	Phenol present
Protein	Xanthoprotic test	No yellow color observed	Protein absent
Sterol	Libermann-Burchard's test	Brown-ring formation	Sterol present
Diterpene	Copper acetate test	Eemerald green color observed	Diterpene present
Triterpene	Salkowski's test	Yellow color observed	Triterpene present

Salma Khadka et al (2025) The *Curcuma aromatica (Zingiberaceae)* rhizome extract showed the presence of alkaloids, steroids, phenols,flavonoids, tannins, triterpenoids, saponins, and amino acids. However, it lacks carbohydrates and glycosides in acetone,ethanol, toluene, and water.[12]

Table no.19 Preliminary phytochemical study of various extracts of *Curcuma aromatica*:

Phytochemical constituents	Specific tests	Result			
		Toluene extract	Ethanol extract	Acetone extract	Aqueous extract
Alkaloid	Mayer's test	+	+	+	+
	Hager's test	+	+	+	+
	Dragendorff's test	+	+	+	+
	Wagner's test	+	+	+	+
Carbohydrates and glycosides	Molisch's test	–	–	–	–
	Fehling's test	–	–	–	–
Sterols	Salkowski's test	+	+	–	–
Phenol	Ferric chloride test	+	+	+	+
Protein and amino acids	Biuret test	–	+	+	+
	Ninhydrin test	+	+	+	+
	Xanthoprotein test	+	+	+	+
	Million's test	+	+	+	+
Fixed oils and fats	Saponification test	+	+	+	+
Flavonoids	Aqueous NaOH	+	+	+	+
	Shinoda test	–	+	+	+
	Conc. H_2SO_4	+	+	+	+
	Lead acetate test	+	+	+	+
	Ammonia test	+	+	+	+
	Zinc hydrochloride test	+	+	+	+
Tannin	Gelatin test	–	+	+	+
	Ferric chloride test	+	+	+	+
Triterpenoids and saponins	Aqueous NaOH	+	+	+	+
	Foam test	–	+	+	+

(+) = Present (-) = Absent.

PHARMACOLOGICAL REVIEW OF *CURCUMA AROMATICA*

Chemical composition and anti-mosquito potential of rhizome extract and volatile oil derived from *Curcuma aromatica* against *Aedes aegypti*

Benjawan Pitasawat et al (2005): Crude rhizome extracts and volatile oils of *Curcuma aromatica (Zingiberaceae)* were evaluated for chemical composition and anti-mosquito potential, including larvicidal, adulticidal, and repellent activities against the *Aedes aegypti* mosquito. The volatile oil showed stronger larvicidal activity (LC_{50}: 36.3 ppm), while the hexane extract was more effective against adult mosquitoes (LD_{50}: 1.6 µg/mg). In repellency tests on humans, the hexane extract offered 1 hour of protection, superior to the oil (0.5 hours).

The mechanism of action involves the activity of volatile compounds like xanthorrhizol**,** curcumene**,** and 1H-3a,7-methanoazulene, which likely exert neurotoxic effects on

mosquitoes. These compounds may interfere with neural transmission, leading to paralysis and death in larvae and adults. Repellent effects are likely due to volatile sesquiterpenes that disrupt mosquito host-seeking behavior.[13]

Antitussive activity of ethanolic extract of *Curcuma aromatica* rhizomes on sulfur dioxide induced cough in mice

Marina G.D et al (2008) Ethanolic extract of rhizome of *Curcuma aromatica (Zingiberaceae)* was investigated for its antitussive effect on sulfur dioxide induced cough model in swiss albino mice. The extract exhibited significant antitussive activity in a dose dependant manner. The activity was compared with the prototype antitussive agent codeine phosphate (Cp). The ethanolic extract at the dose of 100mg. 200mg and 400mg/kg body weight showed 68%, 74% and 79% of inhibition of cough with respect to control group. The present study has provided an experimental evidence for protection against cough by *Curcuma aromatica* rhizomes. he mechanism involved is the suppression of the cough reflex arc, possibly through modulation of sensory nerve response to airway irritation caused by sulfur dioxide gas.[14]

Table no. 20: Effect of ethanolic extract of *Curcuma aromatica* on sulfur dioxide induced cough in mice.

Treatment	Frequency of cough (mean ± SEM)			
	0 min	30 min. (% Inhibition)	60 min. (% Inhibition)	90 min. (% Inhibition)
Control	48.08±0.02	46.02±0.04	47.88±1.20	47.08±0.6
10mg Cp	47.26±0.02	20.04±0.02 (57%)	18.0±0.01* (62%)	15.08±0.04* (68%)
20mg Cp	47.02±0.02	16.0±0.20* (65%)	14±0.04* (70%)	12.08±1.20* (74%)
40mg Cp	48.02±0.02	12.08±0.04* (73%)	10.02±1.22* (78%)	6.22±0.01* (87%)
100mg *C.a*	48.08±0.02	30.08±0.02 (35%)	20.08±0.06 (57%)	15.08±1.02* (68%)
200mg *C.a*	48.06±0.02	22.07±1.08 (52%)	15.08±1.22* (68%)	12.08±0.46* (74%)
400mg *C.a*	47.18±0.02	16.08±0.08* (65%)	12.02±0.04* (74%)	10.08±0.22* (79%)

Anti-inflammatory and wound healing activity of *Curcuma aromatica salisb* extract and its formulation

Amit Kumar et al (2009) Anti-inflammatory and wound healing activity of topical application of *Curcuma aromatica (Zingiberaceae)* rhizome extract and is cream formulations in Arachidonic acid -induced ear inflammation and excision wound model was confirmed in albino mice. The extraction of these rhizomes was carried out by ethanol. The ethanol extract and formulations exhibited significant anti-inflammatory activity in arachidonic acid - induced ear inflammation. It also showed significant wound healing activity in excision wound model. Thus, resultant anti-inflammatory activity might be due to effects on several mediators and arachidonic acid metabolism involving cyclooxygenase pathway resulting in prostaglandin synthesis.[15]

Table no. 21: Anti-inflammatory activity of *Curcuma aromatica* extract and formulations on arachidonic acid induced topical inflammation.

Treatment	Difference in ear thickness (mm±S.E)	% Inhibition of inflammation
Control	0.176±0.005	--
Std drug (phenidone) 1mg/ear	0.047±0.005***	73.29
Extract (0.5mg/ear)	0.092±0.007***	47.72
Extract (1mg/ear)	0.068±0.005***	61.36
1% w/o cream formulation	0.095±0.008***	46.02
2% w/o cream formulation	0.055±0.007***	68.75
1% o/w cream formulation	0.108±0.003***	38.63
2% o/w cream formulation	0.075±0.003***	57.38

2% w/o cream formulation shows highest inhibition of inflammation with respect to all cream formulations and it was comparable to standard drug (phenidone).

Antioxidant and antidiabetic activity of *Curcuma aromatic*

Srividya et al (2012) The study explored the antidiabetic and antioxidant properties of the toluene extract of *Curcuma aromatica (Zingiberaceae)* rhizome using both *in vitro* and *in vivo* models. The extract showed significant free radical scavenging activity in assays like DPPH (IC_{50} = 50.62 µg/ml), hydrogen peroxide, lipid peroxidation, and ABTS (IC_{50} = 0.038 µg/ml). In glucose uptake studies using isolated rat hemi diaphragm, the extract greatly enhanced glucose uptake (from 30.75 to 68.75 mg/g), especially when combined with insulin. In streptozotocin-induced diabetic rats, oral treatment with the extract (200 & 400 mg/kg) for 21 days significantly reduced serum glucose**,** triglycerides**,** and cholesterol, while improving total protein levels and body weight**.** The extract also boosted endogenous antioxidant enzyme levels (GSH, SOD, CAT) and lowered TBARS (Thiobarbituric Acid Reactive Substances) levels, indicating reduced oxidative stress. Additionally, it showed α-glucosidase inhibitory activity (59%), exceeding that of standard drug acarbose (51%).[16]

Table no. 22: Antioxidant activity of *Curcuma aromatica* extract.

Plant extract	DPPH method	Lipid peroxide method	Hydrogen peroxide radical scavenging method	ABTS radical scavenging method
		IC $_{50}$ Values µg/ml		
Petroleum ether	229.5±1.12	247±1.67	137±1.78	8.067±1.12
Toluene	50.62±0.998	75±0.87	43.75±1.24	0.038±1.54
Chloroform	235.56±0.634	265±1.43	250±0.65	9.485±0.76
Ethyl acetate	118.75±0.667	136±1.09	69±1.08	0.134±0.87
Acetone	150.55±1.345	172±0.98	123.43±0.95	6.896±1.65
Ethanol	132.5±1.876	153±0.67	72.50±1.90	0.244±1.86
Water	427.75±1.436	447±1.16	270±0.01	11.674±1.98
Standard	2.75±0.09[a]	-------	36.16±0.90[b]	11.25±1.43[a]
Standard				

lower IC_{50} indicates stronger antioxidant activity.

Antibacterial Activity of Rhizome of *Curcuma aromatica* and Partial Purification of Active Compounds

S. Revathi et al (2013) The hexane extract of *Curcuma aromatica* (*Zingiberaceae)* was tested on 10 bacterial strains (clinical isolates and standard strains). Agar diffusion method was adopted for determining the antibacterial activity of the extract. The hexane extract was found to be active against all Gram-positive strains tested, but inactive against Gram-negative strains. The minimum inhibitory concentration and minimum bactericidal concentration were determined and found to be 539µg/ml. The mechanism of antibacterial action is likely due to the presence of lipophilic phytochemicals such as germacrone and α-vatirenene identified in the hexane extract. These compounds may disrupt bacterial cell membranes, interfere with peptidoglycan synthesis, or inhibit bacterial enzyme systems, leading to cell lysis and death.

Table no. 23 Antibacterial activity of hexane extract of *Curcuma aromatica*:

Organism tested	Inhibition zone diameter (mm)*						
	Plant extract (µg/disc)					Control	
	7660	15320	30640	61280	76600	Antibiotic	Solvent
Staphylococcus aureus ATCC 25923	9	10	14	16	18	21 (cef)	-
S. aureus clinical isolate	9	11	12	15	16	18 (cef)	-
Staphylococcus epidermidis	-	9	12	14	16	23 (van)	-
Enterococcus fecalis. ATCC 29212	9	11	14	15	18	20 (van)	-
MRSA NCTC 10442	10	11	13	16	18	19 (cef)	-
MRSA clinical isolate	9	10	12	13	15	17 (cef)	-
Streptococcus sp.	10	12	15	16	17	34 (amp)	-
Pseudomonas sp. ATCC 27853	-	-	-	-	-	27 (cefo)	-
E. coli ATCC 25922	-	-	-	-	-	30 (cefo)	-
Klebsiella sp. Clinical isolate	-	-	-	-	-	29 (cefo)	-

The results for the antibacterial activities of the hexane extract of *Curcuma aromatica* on the tested organisms are given in Table. The crude hexane extract inhibited the growth of all the Gram-positive strains (*Staphylococcs aureus ATCC 25923, Staphylococcs aureus* clinical isolate, *Staphylococcs epidermidis* clinical isolate, *Enterococcus faecalis ATCC 29212, Streptococcus species* clinical isolate, *MRSA NCTC 10442* and *MRSA* clinical isolate) tested, but was not effective on gram negative organisms.

Table no. 24 MIC and MBC of hexane extract on gram-positive strains:

Organism	MIC (µg/ml)	MBC (µg/ml)
Staphylococcus aureus ATCC 25923	539	539
Staphylococcus clinical isolate	539	539
Streptococcus sp. clinical isolate	539	539
Enterococcus faecalis ATCC 29212	539	539
Staphylococcus epidermidis clinical isolate	269	539
MRSA NCTC 10442	539	539
MRSA Clinical isolate	539	539

The MIC and MBC results presented in Table indicate that the hexane extract is not only inhibitory but also bactericidal. The MIC and MBC values for all the tested organisms were 539 µg/ml, except for S. Epidermidis, which showed a MIC value at 269 µg/ml and MBC value at 539 µg/ml.[17]

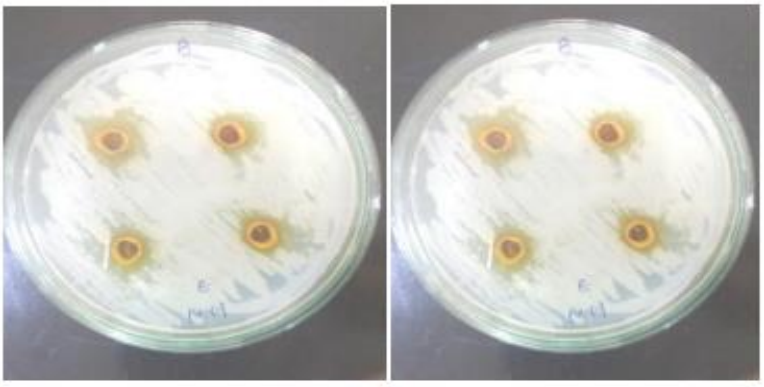
Isolation, identification, bioprocessing and characterization of secondary metabolites for its antimicrobial and genotoxicity from the soil screened microorganism

A.R. Srvidya et al (2014) Antimicrobial activity was carried out by Minimum inhibitory concentration method and antioxidant studies were carried out by DPPH, Nitric oxide method, and reducing power method.The hydro ethanolic extract of *Curcuma aromatica (Zingiberaceae)* rhizome were found to have potent antimicrobial activity against *Bacillus cereus* at 1000 µg/ml and showed moderate activity against *Klebselia pneumonia* and *Candida albicans*. Both hot and cold maceration product of hydro ethanolic extract of *Curcuma aromatica* rhizome showed potent antioxidant activity. In the Nitric oxide method *Curcuma aromatica* rhizome extract showed moderate antioxidant activity for hot and cold hydro ethanolic extract. The antimicrobial activity is due to the action of flavonoids, phenolics, and terpenoids that disrupt microbial cell membranes, inhibit essential enzymes, or interfere with protein and DNA synthesis. The antioxidant mechanism involves neutralization of free radicals by donating hydrogen or electrons, metal ion chelation, and suppression of oxidative stress, which helps protect cells from damage.[18]

Comparative study of Phytochemical Screening and Antibacterial Activity of *Curcuma longa (L.) and Curcuma aromatica*

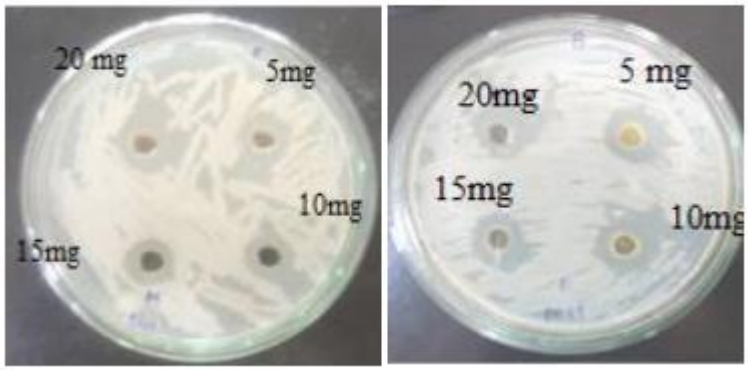
Bhoomi Joshi et al (2018) The study compared the phytochemical content and antibacterial activity of *Curcuma longa* and *Curcuma aromatica (Zingiberaceae)* using their rhizome**.** Ethanolic and methanolic extracts were prepared and tested against *Escherichia coli.* Methanolic extract of *Curcuma aromatica Salib.* shows inhibition zone of 7.5mm at highest concentration of 20mg.

***Curcuma longa* (L.)**



Ethanolic extract **Methanolic extract**

***Curcuma aromatica* (Salib.)**



Methanolic extract. **Ethanolic extract.**

Table no. 25: Zone of inhibition of *Curcuma aromatic.*

Extracts	Extract concentration (mg/2 ml)				
	Control	5mg/2ml	10mg/2ml	15mg/2ml	20mg/2ml
Ethanol	0.0mm	3.0mm	3.5 mm	4.0mm	4.5mm
Methanol	0.0mm	2.0mm	2.5mm	4.5mm	7.5mm

The mechanism of antibacterial action is likely due to the presence of bioactive secondary metabolites such as flavonoids, alkaloids, tannins, and terpenoids, which can disrupt bacterial cell walls, interfere with membrane integrity**,** and inhibit nucleic acid or protein synthesis**.** These compounds may alter microbial metabolism and cause leakage of cellular contents, leading to bacterial death.[19]

Therapeutic mechanism of *Curcuma aromatica Salisb.* rhizome against coronary heart disease

Chenghao Fei et al (2022) The study evaluated the ethanolic rhizome extract of *Curcuma aromatica (Zingiberaceae)* for its protective effect against coronary heart disease in Sprague-Dawley rats. *In vivo* experiments showed that *Curcuma aromatica* rhizome could significantly improve myocardial infarction, blood stasis, and blood lipid levels and regulate the PI3K/AKT/mTOR signaling pathway in coronary heart disease rats and included the regulation of lipid metabolism.[20]

Exploring the Antidiabetic and Lipid-Lowering Properties of Nepali Wild Turmeric (*Curcuma aromatica*): A Potential Natural Remedy

Salma Khadka et al (2025) The study evaluated the antidiabetic and hypolipidemic activities of ethanolic and aqueous extracts of *Curcuma aromatica (Zingiberaceae)* rhizome in alloxan-induced diabetic rats. Rats were orally treated with extract doses of 200 mg/kg and 400 mg/kg for 21 days. The ethanolic extract at 400 mg/kg showed the most potent effects, significantly reducing blood glucose**,** cholesterol, and triglyceride levels, while increasing HDL**.** The treatment also prevented diabetes-induced weight loss, likely by improving glucose utilization and protein preservation. The extracts were rich in flavonoids, alkaloids, saponins, terpenoids, and phenolics, which contributed to their insulin-sensitizing, α-glucosidase-inhibiting, and antioxidant actions**.**[21]

TOXICOLOGICAL REVIEW OF *CURCUMA AROMATICA*

Marina G. D et al (2008) Acute toxicity studies of the ethanolic extract of *Curcuma aromatica (Zingiberaceae)* rhizome was carried out in mice by Stair case method. No toxicity was observed upto the dose of 4.0g/kg body weight. The extract (suspended in a 0.25% gum acacia) was tested at three dose levels i.e. lower dose of 100mg, moderate dose of 200mg and the highest dose of 400mg/kg body weight.[22]

A.R. Srividyaa et al (2013) The hydroalcoholic extract of rhizome of *Curcuma aromatica (zingiberaceae)* did not show genotoxic effects up to 312.5 µg/ml, with or without metabolic activation. No significant increase in aberrant cells was observed, suggesting that neither the extract's constituents nor their metabolites are genotoxic.[23]

Aknarin Pintatum et al (2020) The extract of rhizome of *Curcuma aromatica (zingiberaceae)* inhibited cell growth, with 28.6% ± 4.1% cell viability at 200 µg/mL concentration. However, it did not exhibit significant cytotoxicity, suggesting that it mainly affects mitochondrial reduction capacity and cell proliferation without negatively impacting membrane integrity.[24]

Salma Khadka et al (2025) Using the methodology outlined in OECD Guideline 423 (1996)**,** the acute oral toxicity of *Curcuma aromatica (Zingiberaceae)* rhizome extracts was assessed. Fixed doses of 2000, 3000, and 5000 mg/kg were administered to three animals, and they were monitored for toxic symptoms and mortality over a period of 4 to 72 hours**.** The lethal dose **(**LD_{50}**)** was determined based on any deaths following administration. Since no significant toxicity was observed up **to** 5000 mg/kg, this dose range was considered safe, and the experimental doses for evaluating the hypoglycemic activity were selected accordingly.[25]

ANALYTICAL REVIEW OF *CURCUMA AROMATICA*

Neerja Pant et al (2010) The rhizome of *Curcuma aromatica (zingiberaceae)* primarily contain curcumin as the main coloring compound, along with demethoxycurcumin, while bis-demethoxycurcumin is only detected in trace amounts when large sample quantities are analyzed using thin-layer chromatography. Compared to *Curcuma longa*, this species has a higher concentration of volatile oils (4–8%) and a lower content of curcuminoids (around 1.5%). Analytical techniques such as thin-layer chromatography (TLC) and gas chromatography (GC) can easily detect the unintentional or intentional addition of *Curcuma aromatica* to *Curcuma longa*, since the former contains unique volatile compounds such as camphene, camphor. The rhizomes yield about 6.1% essential oil which has demonstrated anti-tumor properties and has also been applied in the treatment of early-stage cervical cancer. Major compounds identified in the essential oil include α-pinene, β-pinene, camphene, 1,8-cineole, isofurano-germacrene, borneol, isoborneol, camphor, germacrone, and tetramethylpyrazine.[26]

Kasai H et al (2019) The study analyzed the volatile compounds of *Curcuma aromatic (Zingiberaceae)* rhizome using TD-GC-MS and identified several compounds, including β myrcene, limonene, 2-nonanone, linalool, terpinen-4-ol, β-caryophyllene, and α-humulene, which were newly detected in this species. Additionally, Direct Analysis In Real Time-Time of Flight Mass Spectroscopy (DART-TOFMS) was used to detect curcuminoids, but curcumin was not detected in *Curcuma aromatica*. The study also evaluated the antioxidant activity of *Curcuma aromatica* extracts using ESR spin-trapping method, which showed lower antioxidant activity compared to *Curcuma longa* and *Curcuma xanthorrhiza*, possibly due to the absence of curcumin and lower levels of phenolic compounds.[27]

Aknarin Pintatum et al (2020) The ethyl acetate extract of rhizome of *Curcuma aromatica (Zingiberaceae)* was fractionated by column chromatography, yielding 15 known compounds, including sesquiterpenes and curcumin, which were identified through spectroscopic data comparison with literature. Eight of these compounds were further analyzed using Ultra Performance Liquid Chromatography -High Resolution Mass Spectroscopy (UPLC-HRMS), along with the 80% ethyl alcohol extracts of four Curcuma species. The results showed that six compounds, including germacrone, curdione, and curcumin, were detected in the crude extract of *Curcuma aromatica*.[28]

Chenghao Fei et al (2022) This study investigates the multi-component and multi-target potential of *Curcuma aromatica (Zingiberaceae)* rhizome (CASR) in relation to coronary heart disease (CHD). Using chemical profiling, 35 compounds—mainly sesquiterpenes and curcuminoids—were identified, with eight core compounds showing strong interactions in a network analysis. CASR was linked to 51 CHD-related targets and 13 key pathways, including PI3K/AKT and calcium signaling. Lipidomics revealed 44 significantly altered lipids, associated with sphingolipid, glycerophospholipid, and glycerolipid metabolism. Correlation analysis connected key compounds like curzerene and curcumenol to lipid regulation.[29]

CONCLUSION

Curcuma aromatica has proven to be a highly beneficial medicinal and cosmetic herb due to its wide range of biological activities and natural safety profile. Its rich composition of curcuminoids, essential oils, and phenolic compounds contributes to its antioxidant, anti-inflammatory, antimicrobial, and skin-healing properties. These qualities make it an ideal ingredient for use in herbal formulations, particularly in facial cleansing gels and skincare products.The extraction of *Curcuma aromatica* using hydroalcoholic or other efficient solvent systems enables the isolation of bioactive constituents in a stable and potent form. Incorporating this extract into cosmetic formulations not only enhances cleansing and rejuvenation but also supports the prevention of acne and skin infections while improving overall skin texture and glow. Furthermore, the utilization of *Curcuma aromatica* in herbal cosmetics aligns with the growing global demand for safe, eco-friendly, and sustainable beauty products. It represents a natural alternative to synthetic ingredients that often cause irritation or side effects. Overall, the study emphasizes that *Curcuma aromatica* holds significant promise as a natural, effective, and safe herbal agent for promoting healthy and radiant skin.

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