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Yellow zeodary: A natural beauty enhancer

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Abstract
The perennial herb known as wild turmeric *(curcuma aromatica*), which is indigenous to India and Southeast Asia, has long been utilized in traditional, medicinal, cosmetic procedures. Its cosmetic potential has been confirmed by recent research, which also shows that, it has several advantages for skin and haircare. This review article explores the chemical makeup, pharmacological characteristics, and cosmetic uses of wild turmeric, emphasizing the herb's antibacterial, anti-inflammatory, and antioxidant qualities. We talk about how effective it is for skin whitening, reducing hyperpigmentation, skin regeneration, anti-aging, reducing wrinkles, promoting hair development, and controlling dandruff, Handling oily skin and acne. In addition, we examine the safety profile, formulation issues, and perspective future study areas for utilizing wild turmeric's aesthetic benefits. Our thorough analysis highlights the adaptability and effectiveness of wild turmeric as a natural ingredient in cosmetic formulations, offering a promising alternative to synthetic compounds.

Keywords: *Curcuma aromatica*, traditional medicine, anti-inflammatory, wild turmeric, anti-ageing

Introduction

Curcuma aromatica is a perennial herb with distinctively aromatic rhizomes that is utilized in various Southeast Asian, Indian, and Chinese traditional medicinal system [1]. Linnaeus created genus curcumin in1753 with his species plantarum. Van Rheede described curcuma as early as 1678-1693 in Hortus Indicus Malabaricus [2]. It is described arshoghna properties in Bhavaprakas Nighantu, where he highlights its significance for medicinal application. Ayurvedic, Unani, and Sanskrit medical writings all attest to the long history of turmeric's therapeutic use in south Asia. An ointment containing turmeric is prescribed by the Susruta's Ayurvedic compendium 250 BC to cure the effects of contaminated food. The Latin word terramerita which describes the color of ground turmeric that mimics a mineral pigment is where the world turmeric originates. Turmeric is referred to as "haldi" in North India and "manjal" in the south, a word that appears often in ancient Tamil literature. It is simply called yellow root or terrmerita in a few languages. Its name is derived from the Latin word curcuma in several civilizations. Turmeric gorgeous golden color also gives it the nickname Indian saffron [3]. *Curcuma aromatica* is used in the siddha system to make Arkushtaila and Nirkovai maaththirai tablets [4]. Rhizome of curcuma aromatica Salisb has highest cosmetic value. Ayurveda claims that a variety of illnesses can be treated with its medicinal properties, which consist of rooksha-laghu, guna, ushna-verrya, katu vipaka, and thikta katu rasa. [5]. *Curcuma aromatica* is also known as wild turmeric.

The world is aware of Erode's original turmeric efficacy. Pure Kasturi manjal, also known as wild turmeric, is a skin type-neutralizing herb that can be applied to the face or anywhere else on the body to prevent undesired hair development. Enhances skin tone and complexion overall. After using this curcuma aromatica products, the skin appears smooth and naturally luminous, effectively reduces acne scars, slows the rate of facial hair growth, cures skin problems, prevents and remove stretch marks [9]. Rhizomes has anti-inflammatory, antioxidant, anti-bacterial, characteristics making them useful in cosmetics and medicine [10]. Essential oil used in perfumery and aromatherapy. Leaves used as home therapy to treat acne and eczema [11]. Roots used to treat dysentery and digestive diseases [12]. Stems used to cure skin ailments [13]. When intentional adulteration occurs, it is usually caused by improper plant material harvesting, processing, or collection /substitution of closely related species. In contrast, inadvertent adulteration is usually motivated by economics and desire to maximize business margins. If harmful compounds such as metal salts [such as lead chromate] or Sudan dyes are combined with plants or species, the general public's health may suffer. Many plant-derived components, such as sawdust and cheap starch, have been combined with turmeric powder and replaced with the rhizomes of wild-harvested curcuma species, particularly those containing the pigment curcumin, such as *curcuma zedoaria, curcuma Malabaricus, and curcuma zanthorrhiza*. When cheaper vegetable ingredients such as sawdust and corn flour are combined with turmeric, microscopy can detect the result. However, when the adulterants are from the same genus, distinguishing them becomes more difficult because boiling the rhizomes eliminates key features such as starch grains and oleoresin cells. Powdered turmeric rhizomes have three key microscopic characteristics: Oil cells rich parenchymatous ground tissue and unique patches of gelatinized starch formed after boiling in water. The existence of calcium oxalate crystals in turmeric rhizomes has not been observed; hence the discovery of these crystals in turmeric products implies adulteration with non-curcuma species [14]. Allied species of curcuma includes: *curcuma amarissima, curcuma alismatifolia, curcuma attenuate, curcuma bicolor, curcuma chuanezhu, curcuma elata, curcuma comosa, curcuma exigua, curcuma roscoeana, curcuma thorelii, curcuma wenyujin, curcuma longa, curcuma phaeocaulis, curcuma caesia, Curcuma aeruginosa, Curcuma caulina, Curcuma angustifolia, Curcuma montana, Curcuma pseudomontana, Curcuma zedoaria, Curcuma malabarica, Curcuma decipiens, Curcuma rubescens, Curcuma amada, Curcuma haritha, and Curcuma bhatii* are reported. [15, 16, 17].

Fig. 1 *Curcuma aromatic*

Taxonomical Classification [6-7]

Table 1: Illustration of Taxonomic classification

1	**Kingdom**	**Plantae**
2	Clade	Angiosperms
3	Clade	Monocots
4	Order	Zingiberales
5	Family	Zingiberaceae
6	Genus	Curcuma
7	Species	*C. aromatica*

Synonyms

Curcuma wenyujin

Curcuma zeodria roxb.

Vernacular Name

Table 2: Vernacular names

1	**Hindi**	**Jangli haldi**
2	Sanskrit	Aranya haridra, Vanaharidra
3	Bengali	Vana Haridra, Van Halodi
4	Marathi	Amba-halad, Ran-haldi
5	Malayalam	Kasthurimanjal, Kattumanjal,
6	Telugu	Bontha-pasupu, Kasturi pasupu
7	Tamil	Kasturi manjal
8	Nepali	Ban haledo
9	Oria	Palua, Bono haldi
10	Kannada	Kasturi-arishina

Botanical Description

A cross-sectional view of the root displays the epidermis, cork, cortex, and central region having a small pith. The outermost layer, the epidermis, is composed of a single layer of parenchymatous tissue. Beneath the epidermis, there are four to five layers of thick-walled, brown parenchymatous cork. The cells within this layer have ovoid to oblong simple starch granules and minimal yellow cell content. The cells of the cortex are radially elongated and undergo disintegration, leading to the formation of large air channels. Occasionally, the parenchyma obstructs these air passages. Following the cortex is the endodermis, characterized by thickened walls on its inner tangential and radial surfaces. The pericycle, consisting of a single layer of parenchymatous tissue with thin walls, is situated after the endodermis. The central stele, found posterior to the pericycle, shows a radially alternating arrangement of phloem and xylem strands, characteristic of a typical monocotyledonous structure. Surrounding the xylem are Sclerenchymatous fibres having yellow cell material. At the core, a small pith is present, formed of spherical, thin-walled parenchymatous cells, some of which also have yellow cell content. The maceration of the root reveals scalariform vessels with angular pits, which display obliquely perforated rims and vary in size and shape. The lignified Tracheid's have thick walls and tapering ends. The fibres are both crisp and elongated, showing sharpness and a diversity of shapes and sizes. The transverse section of the lateral rhizome is circular, featuring sporadic vascular patterns within the ground tissue, cortex, and clusters of epidermis. The outermost layer consists of a rectangular-shaped epidermis composed of parenchymatous cells. Following this is the cork or epidermis, which forms 10 to 12 layers of unevenly arranged, thin-walled suberized cells with a parenchymatous structure. The cortex beneath consists of 20 to 35 layers of polygonal, thin-walled parenchymatous cells that are yellowish in colour, with cell contents primarily consisting of simple starch and minimal oil globules. Most cells show an ovoid morphology, like the elongated starch grains present. Numerous cortical vascular bundles within the cortex are scattered, closed, and collateral, lacking a fibrous zone. Following the cortex is a single layer of pericycle, which consists of thin-walled parenchymatous cells, succeeded by a single-layered, thick-walled endodermis. This pericycle has small vascular bundles. The vascular bundles next to the pericycle are larger, forming 2 to 3 xylem elements, while those oriented towards the centre have 5 to 6 xylem elements along with phloem. Both collateral and closed vascular bundles are seen. The ground tissue of the stele consists of polygonal, thin-walled parenchymatous cells characterized by yellow cell content and flattened, ovoid, oblong starch granules. The core and lateral rhizomes show identical microscopic characteristics. Examination of the rhizome's macerate reveals polygonal parenchymatous tissues with yellow cell content, thin-walled brown rectangular parenchymatous cork tissue, and helical to spiral vascular elements [8].

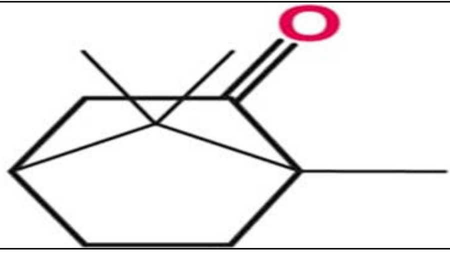
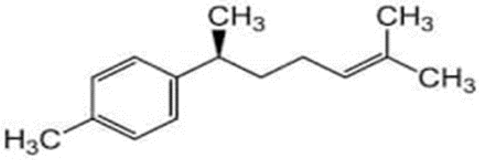
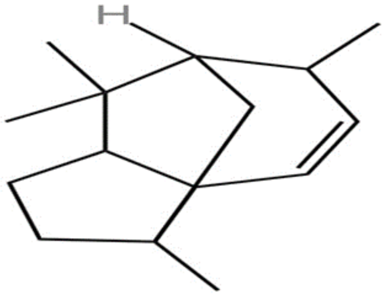
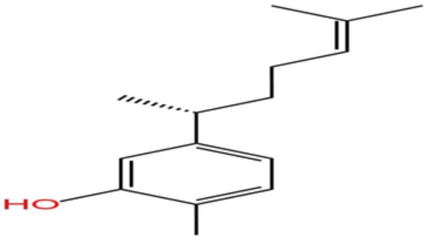
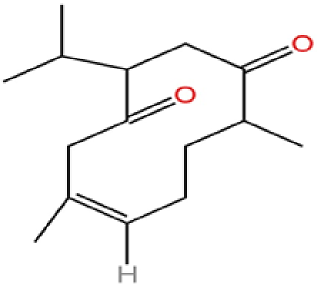
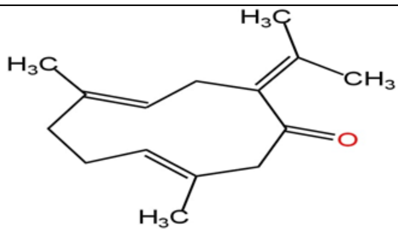
Geograhical distrubition, cultivation & collection

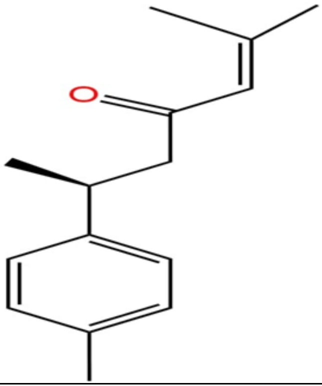
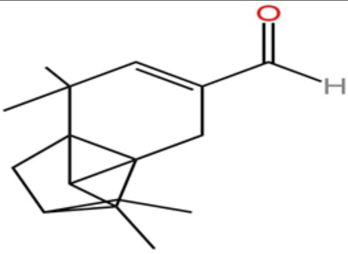
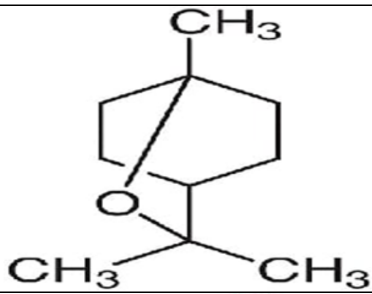
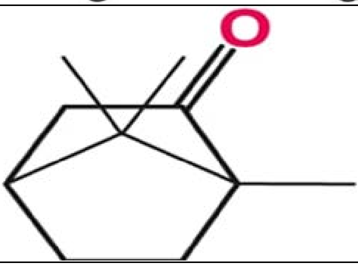
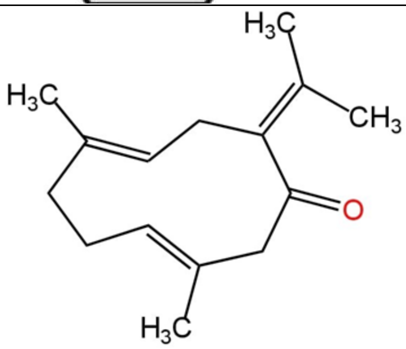
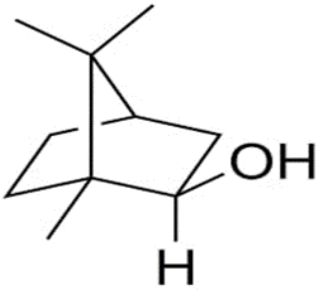
Curcuma aromatica is indigenous to Indochina, south central China, and the Indian subcontinent. It is a rhizomatous geophyte that is primarily found in tropical biomes that are sometimes arid. It is frequently found in tropical and subtropical areas, namely in China, Japan, and India, where it is grown mostly for its rhizomes [18, 19]. Turmeric may be grown in a variety of topical setting, from sea level, with temperature ranging from 20to35 degrees Celsius and an annual rainfall of 1500 mm or more, either rained or irrigated. Though it may be cultivated in a variety of soils it flourishes on well drained sandy or clay loam soils with a pH of 4.5to 7.5 and a high organic content. The land is prepared by receiving early monsoon showers. The soil is fine tilled after four heavy ploughings. Laterite soils must be carefully ploughed and treated with 500kg of hydrate lime per hectare. Beds of 1.0 m width, 15cm height, and convenient length are prepared as soon as per-monsoon showers arrive, with a50 cm gap between them. Ridges and furrows can also be used for planting. In Kerala and other west coast places where rainfall begins early the crop can be shown between Aprils and may while receiving pre-monsoon showers. When Planting, either whole or split mother or finger rhizomes are utilized disease-free, fully grown rhizomes should be chosen. A hand hoe is used to make little pits on the beds that are spaced 25 cm a part by30cm. Cattle dung or compost that has been well-decomposed is poured into pits, followed by the placement of seed rhizomes and soil. In ridges and furrows, the ideal distance is 45-60cm between rows and 25 cm between plants. To plants a hectare of turmeric, 2500 kg of rhizomes must be used as seed. Farmyard manure or compost at a rate of 30-40hec is applied by broadcasting and ploughing during field preparation or as a basal dressing by spreading over beds or into pits during planting. Fertilizers of 60kg N, 50kg p2o5, 120kgk20 per acre will be applied in split doses. During planting, zinc can also be applied at a rate of 5 kg/ha, and 2 t of organic manures, such as oil cakes, can be applied per hectare. In this scenario, the dose of farmyard manure can be lowered. It is also recommended to use coir compost [at a rate of 2.5t/ha] in conjunction with farmyard manure, biofertilizer [azospirillum], and half of the necessary nitrogen, phosphorus, and potassium. The crop will be mulched soon after planting with green leaves at a rate of 12-15 tons per hectare. Mulching may be repeated at 7.5t/ha at 45and 90 days after planting following weeding, fertilizer application and earthling up. Weeding must be done three times at 60, 90, and 120days following planting depending on weed strength. In the case of irrigated crops, depending on the weather and soil conditions, approximately 15to23 irrigations are required in clayey soils and 40 irrigations in sandy loams. Turmeric can be planted as an intercrop in coconut and areca nut plantations. It can also be grown as a mixed crop along asides chilies, colocasia, onion, brinjal, and cereals such as maize and ragi. Maturity of the crop and harvesting; generally, a crop reaches maturity in six to eight months. Rhizomes harvesting takes place between November and December. After thoroughly washing the rhizomes in water to get rid of any surface moisture, and then dried once more in the shade. October through November is the ideal months to harvest leaves. Post-harvest handling: for commercial use, sliced and dried rhizomes are kept cold. Rhizomes are tilled into sand piles or dirt until March to obtain planting material. Chemical components: when harvested in February, March, and November, the rhizomes yield an average of 0.18% essential oil. Essential are most composed of delta-pinene, beta-pinene, camphor, and other compounds. Production and cultivation costs; the production of fresh rhizomes ranges from 285 to 315 quintals/hectare, whereas the yield of leaves, measured on a fresh weight basis, falls between 70 and 80 quintals/hectare. While the essential oil output from rhizomes is 80-90kg/ha [at0.28% of fresh weight], the essential oil yield from leaves is 7-8kg/hectare [20, 21].

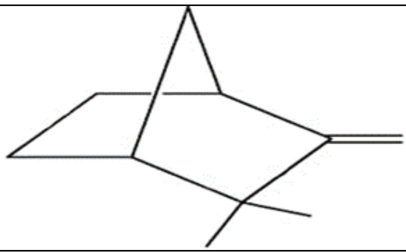
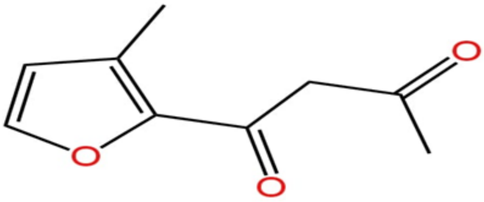
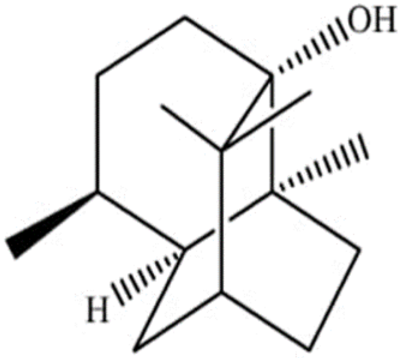
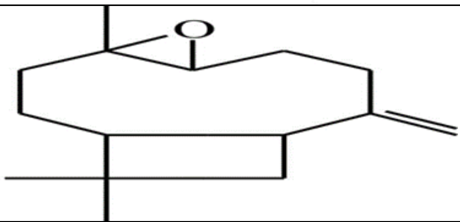
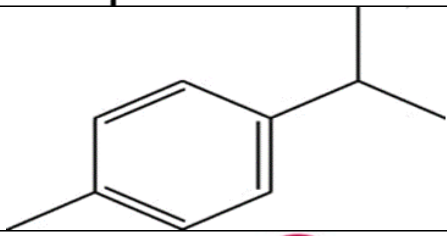
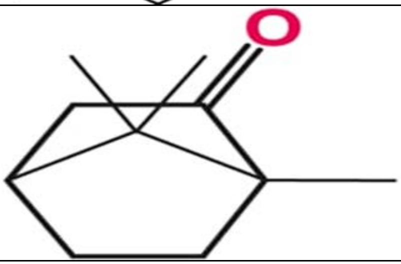
Phytochemical constituents of *c. aromatica*

Curcuma aromatica contains several bioactive substances that are extracted from the plant's rhizomes, leaves, and petioles and used to treat a variety of ailments. Example includes alkaloids, terpenoids, flavonoids, steroids, saponins, tannins, phenols, phytosterols, glycosides, protein amino acids, and volatile oils. Here are a few of the main phytoconstituents found in different plant sections of Curcuma aromatica [22].

Table 2: Principal Phyto-constituents found in the various sections of the *curcuma aromatica* plant

Plant parts	Structure	Phytoconstituents
Rhizomes		Camphor (18:8-32.3%)
		Ar-curcumene (19.5%)
		di-epi-alpha-cedrene (16.5%)
		Xanthorrhizol (26.3%)
		Curdione (50.6%)
		Germacrone (4.3%-16.5%)

		Turmerone (17.4%-2.6%)
		8,9-dehydro-9-formyl-cycloisolongifolene
Petiole		1,8-ciniole (8.8%)
		Camphor (16.8%)
		Germacrone (2.2%)
		Isoborniole (6.8%)

		Camphene (1.2%)
		Ketone from Elshotzia (6.0%)
		Alcohol from patchouli (8.4%)
		Oxygen caryophyllene (8.7%)
Leaves		p-cymene (25.2%)
		Camphor (24-28.5%)

Traditional Uses [23, 24, 25, 26]

Curcumin and turmeric offer numerous benefits for skincare, including antioxidant and anti-aging properties, such as protecting the skin from damage, reducing signs of aging, and minimizing skin damage caused by the sun. They also promote skin health and conditions, including helping with acne-prone skin, skin diseases like psoriasis, scleroderma, and skin cancer, and reducing itching and scaling associated with psoriasis. Additionally, curcumin and turmeric improve skin appearance and texture by giving a radiant quality, reducing skin irregularities, moisturizing dry skin, lightening stretch marks, and reducing dark circles. Furthermore, they provide additional benefits, including soothing and calming the skin, exfoliating dead skin cells, and enhancing blood circulation to promote healthy skin.

Pharmacological properties [27, 28, 29, 30]

Antioxidant activity

Extracts from the rhizomes of *C. aromatica* demonstrate significant antioxidant properties. Sesquiterpenoids, which are present in the volatile oil of *C. aromatica*, have anti-inflammatory, antiviral, and antioxidant characteristics. The essential oil derived from the methanol extract of the leaves shows remarkable scavenging activity against superoxide radicals. Both C. aromatica oil and its extracts are valuable sources of antioxidants for the food industry. The rhizome of C. aromatica exhibits notable DPPH scavenging activity in both ethanol and hot water extracts. Furthermore, the toluene extract of C. aromatica displays substantial antioxidant activity *in vitro* and *in vivo*. Ethanol extracts of C. aromatica from India, known for their high total polyphenol content and significant radical scavenging activity, have demonstrated AChE inhibitory efficacy comparable to that of C. longa from Myanmar. Additionally, extracts containing ethyl acetate and dichloromethane have shown potent antioxidant effects

Anticancerous activity

Numerous studies have examined curcumin, a potential antioxidant from *C.aromatica*, which exhibits anticarcinogenic action in various cell lines. According to reports, *C. aromatica* has several medicinal benefits, such as enhancing blood flow, eliminating blood stasis, and curing cancer. It has been demonstrated that injecting oil into the hepatic artery can successfully treat transplanted hepatoma in rats and primary liver cancer in humans. At a non-cytotoxic dose of 10μM, curcumin and its analogues from the rhizomes (CA-2, 3 and 4) decreased the invasive potential of colon 26-L5 cells. The most active of these curcuminoids was CA-4, which inhibited tumor cell migration and invasion in a concentration-dependent manner. The ethanolic extract has potent antiangiogenic and pro-apoptotic properties in *in vivo* settings, which may make it a viable anticancer drug. Intestinal metaplasia and esophagoduodenal anastomosis (EDA) were less common in the EDA animals given C. aromatic oil. Polyxylose, a crude polysaccharide extract from the rhizomes that dissolves in hot water, can significantly slow the proliferation of gingival fibroblast cells by 92%. Curdione, one of the primary ingredients, plays a significant role in C. aromatica' s A promising new anticancer treatment for liver cancer involves combining resveratrol from Polygonum cuspidatum with curcumin from *C. aromatica*. In Hepa1-6 cells, it increased intracellular reactive oxygen species (ROS) levels and produced a synergistic antiproliferative impact *C. aromatica* oil is a potent anti-fibrosis medication, particularly while renal fibrosis is still in its early stages. Additionally, it may increase pyruvate and glycine levels while decreasing lipid, acetoacetate, glucose, phosphorylcholine/choline, and trimethylamine oxide levels in the rats' serum. Therefore, by blocking some metabolic pathways, such as lipid metabolism, glycolysis, and methylamine metabolism, oil supplementation can reduce the symptoms of renal fibrosis.

Antimicrobial activity

Antibacterial properties against several plant and human diseases. Aqueous extracts of rhizome exhibited enhanced antibacterial efficacy against pathogens, including *Bacillus subtilis, Staphylococcus aureus, Staphylococcus epidermidis, Escherichia coli, Shigella Flexner, and Pseudomonas aeruginosa. C. aromatica* can be employed as a natural food preservative to safeguard against the recognized sources of food-borne diseases and spoilage. The oil has shown efficacy as an anti-dermatophytic agent in *in vitro* assays. It is effective against the three prevalent dermatophytic fungi responsible for human ringworm infections: *Epidermophyton floccosum, Microsporum gypseum, and Trichophyton rubrum. Vancomycin-resistant Enterococcus faecalis (VRE) and E. coli* are multiresistant bacteria causing urinary tract infections that can be efficiently treated with the rhizome extract of *C. aromatica. C. aromatica* oils show a potent inhibitory action against the pathogens *S. aureus, B. subtilis, and E. coli*. Furthermore, it exhibited potential antibacterial properties against several human pathogenic bacteria, including *Shigella sonnei, Bacillus subtilis, Staphylococcus aureus, Pseudomonas aeruginosa, and Shigella dysenteriae*. The hexane extract of the rhizome showed bactericidal activity against *Enterococcus faecalis, Streptococcus sp., and Staphylococcus aureus.*

Anti-angiogenic activity

cDNA microarray investigation revealed that demethoxycurcumin (DC), a structural analogue of curcumin derived from C. aromatica, demonstrated anti-angiogenic properties and influenced genetic reprogramming in cultured human umbilical vein endothelial cells (HUVECs). DC induced a fivefold downregulation of nine angiogenesis-related genes, suggesting that the compound's antiangiogenic effects primarily relied on genetic reprogramming. Gelatin zymography was employed to assess matrix metalloproteinase-9 (MMP-9), a product of an angiogenesis-related gene that DC down-regulates by over fivefold, to corroborate the findings of cDNA microarray research. The findings indicated that a primary mediator of DC's inhibition of angiogenesis was modifying MMP-9 gene expression. Furthermore, Synder and his colleagues revealed that certain curcumin analogues possess anti-angiogenic effects.

Anthelmintic activity

Extracts of *C. aromatica* demonstrated considerable nematode-hatching and nematocidal efficacy against Meloidogyne incognita, a root-knot nematode. M. incognita egg hatching was severely impacted by the butanoic extract of C. aromatica after 120 hours of exposure at 1000 ppm concentration. The alcoholic extract of *C. aromatica* rhizomes exhibited modest anthelmintic activity against Ascaris lumbricoides *in vitro*. Zederone, a sesquiterpenoid extracted from the rhizomes of *C. aromatica*, exhibited notable antifeedant efficacy against the larval stage of Spilarctia oblique. Fresh C. aromatica rhizomes were employed to acquire neocurdione, isoprocurcumenol, and 9-oxoneoprocurcumenol, an innovative sesquiterpene that inhibited adherence to the blue mussel Mytilus edulis galloprovincialis

Wound Healing Activity

Lab rabbit wounds were treated with a white, soft paraffin lotion containing 1% powdered *C. aromatica* rhizomes.Wounds treated with paraffin took 1 and 13 days to heal, but wounds treated with C. aromatica took 9 and 11 days.

Antitussive activity

A study indicates that the antitussive efficacy of *C. aromatic's* ethanol extract is dose-dependently comparable to that of codeine phosphate. A study revealed that the antitussive efficacy of C. aromatic's ethanol extract is comparably effective to that of codeine phosphate in a dose-dependent manner. Following 1.5 hours of oral administration, the extract diminished coughing by 79% at a dosage of 400 mg/kg body weight, comparable to codeine phosphate's 87% efficacy at a dosage of 40 mg in mice. An acute oral toxicity assessment of the ethanol extract revealed no adverse effects at a maximal dosage of 4 g/kg. After 1.5 hours of oral administration, the extract reduced coughing by 79% at a dosage of 400 mg/kg body weight, which is similar to codeine phosphate's 87% effectiveness at 40 mg in mice. An acute oral toxicity assessment of the ethanol extract shown no adverse effects at a maximum dosage of 4 g/kg.

Anti-inflammatory activity

In murine models, both aqueous and alcoholic extracts exhibited anti-inflammatory effectiveness—ethanol extracts and formulations showed significant anti-inflammatory effects in arachidonic acid-induced ear irritation. The anti-inflammatory efficacy was ascribed to impact on several mediators and arachidonic acid metabolism through the mice, both aqueous and alcoholic extracts showed anti-inflammatory efficacy. Ethanol extracts and formulations demonstrated a significant anti-inflammatory effect in arachidonic acid-induced ear irritation. This efficacy was linked to their impact on various mediators and the metabolism of arachidonic acid through the cyclooxygenase system. Additionally, a study investigated the anti-inflammatory properties of volatile oil from C. aromatic. The antitussive efficacy of the ethanol extract of C. *aromatic*a was found to be dose-dependent and comparable to that of codeine phosphate. After 1.5 hours of oral treatment, the extract significantly reduced the cough cyclo-oxygenase pathway. A study was performed on the anti-inflammatory activities of volatile oil derived from *C.aromatica*.

Anti-platelet activity

Compounds from CA and other pharmaceuticals were evaluated for their efficacy in inhibiting AA, collagen, and ADP-induced platelet aggregation in human whole blood. The antiplatelet activity of the compounds was assessed *in vitro* using the Chrono Log whole blood aggregometer employing an electrical impedance method. Curcumin from CA and other compounds markedly reduced platelet aggregation induced by AA, with IC (50) values less than 84 micromolar. Curcumin from CA was the most effective antiplatelet drug, reducing AA-, collagen-, and ADP-induced platelet aggregation with IC (50) values of 37.5, 60.9, and 45.7 micromolar, respectively.

Conclusion

Curcuma aromatica, or wild turmeric, has gained popularity as a useful and effective natural component for a range of cosmetic uses. It is a great option for skin lightening, reducing hyperpigmentation, anti-aging, wrinkle reduction, wound healing, skin generation, promoting hair development, controlling dandruff, managing acne, and managing oily skin because of its antioxidant, anti-inflammatory, and anti-bacterial qualities. The safety and effectiveness of wild turmeric in cosmetic formulation are supported by a body of research encompassing traditional usage, *in vitro*, *in vivo*, and clinical investigation. The growing trend of consumers looking for sustainable and natural products makes wild turmeric a viable substitute for artificial ingredients. Prospective investigation ought to extraction and formulation techniques, conducting extensive clinical trials, looking into potential synergistic benefits with other natural substances, and investigating novel cosmetic applications. Through the utilization of wild turmeric's cosmetic properties, the beauty and personal care sector can create novel, efficient, and long-lasting products to satisfy consumers' increasing need for natural and environmentally friendly remedies. "This conclusion offers a thorough summary of the usage of wild turmeric for cosmetics by summarizing the key findings, highlighting the advantages and possible uses, and suggesting future research topics.

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