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Therapeutic Potential of Curcuma zedoaria (Zaranbad) in Unani Medicine: A Review

MOHAMMED WARIS, AAIYSHA KHATOON, Prof.Nizamul Haque, Dr Abdul Khalique

PG SCHOLAR, DEPARTMENT OF ILMUL ADVIA

STATE TAKMIL UT TIB COLLAGE AND HOSPITAL, MAHA YOGI GURU GORAKHNATH AYUSH UNIVERSITY

Abstract

Curcuma zedoaria, commonly known as Zaranbad, is an important medicinal plant of the family Zingiberaceae widely used in Unani, Ayurvedic, and traditional Chinese systems of medicine. Botanicals constitute the major components of Unani prescriptions, and Zaranbad has been employed since ancient times for the management of a wide range of diseases. Traditionally, the rhizome is used in respiratory disorders such as *Nazla wa Zukam* (common cold and cough), allergic conditions, arthritis (*Waja-ul-Mafasil*), digestive disturbances, liver diseases, palpitation (*Khafqan*), leucorrhoea, menstrual irregularities, fever, paralysis, and inflammatory disorders. It is also regarded as a *Muqavvi-e-Meda wa Jigar* (stomachic and liver tonic), *Muqavvi-e-Qalb* (cardiotonic), *Muqavvi-e-Dimagh* (brain tonic), *Muqavvi-e-Reham* (uterine tonic), *Mukharrij-e-Balgham* (expectorant), *Qabiz* (anti-diarrheal), *Jali* (detergent), *Tiryaq* (antidote), and antiemetic agent in classical Unani literature. The rhizome contains several important phytoconstituents including curcuminoids, sesquiterpenes, flavonoids, terpenoids, and essential oils, which are responsible for its diverse pharmacological activities. Scientific studies have demonstrated hepatoprotective, antioxidant, anti-inflammatory, antimicrobial, anti-allergic, anticancer, antiulcer, antinociceptive, hypolipidemic, antivenom, larvicidal, anti-amoebic, and cytotoxic properties of the plant. Bioactive compounds such as curcumin, curcumenol, germacrone, curdione, and zerumbone have shown promising therapeutic effects in experimental studies. The present review highlights the morphology, Mizaj (temperament), pharmacological actions, traditional applications, therapeutic importance, phytochemical constituents, and scientific evidence related to Curcuma zedoaria. The collected data indicate that Zaranbad has potential ethnopharmacological and pharmaceutical interest, and could serve as a scientific basis for further studies on the development of effective herbal preparations for respiratory, hepatic, uterine, neurological, digestive and cardiovascular diseases.

Inroduction

Curcuma zedoaria popularly referred as Zaranbad or zedoary is a medicinal plant of the family Zingiberaceae. It is common in tropical and subtropical Asia including India, China and Sri Lanka. It has been used for centuries in traditional medicine systems like Unani, Ayurveda, and Chinese medicine due to its various therapeutic uses. The plant's highly fragrant rhizome is particularly esteemed for its medicinal benefits and abundant phytochemical content. C. zedoaria is a perennial herb with thick roots and wide, lanceolate leaves, which are purple with purple marks. The plant has beautiful yellow blossoms with reddish-green bracts. The rhizomes have a camphor scent, and are rich in essential oils, curcuminoids, flavonoids, terpenoids and starches. It has a high pharmacological value due to these compounds. In the last few years, scientific research has pointed to the biological value of Curcuma zedoaria in the treatment of various diseases. Experimental and clinical studies revealed the antiinflammatory, antimicrobial, antioxidant, hepatoprotective, anticancer, analgesic and gastroprotective properties of the plant. In Unani medicine, Zaranbad has been used for the treatment of respiratory tract diseases, liver diseases, uterine diseases, digestive tract diseases and cardiac

diseases. Herbal medicine and natural therapeutics have gained popularity over the years, leading to an even greater scientific interest in this plant. Although this plant has been used traditionally in many ways, its phytochemistry, pharmacological activities and therapeutic uses are still poorly documented. Hence, the present review was designed to summarise the existing information regarding the botanical description, traditional uses, phytochemistry, pharmacological properties and therapeutic potential of Curcuma zedoaria. It generally grows up to **40–100 cm** in height and possesses an erect pseudostem arising from an underground corm. The plant develops branched, cylindrical, aromatic rhizomes with fleshy roots, some of which enlarge into tuberous storage organs rich in carbohydrates.The leaves are **4–6 in number**, oblong-lanceolate, glabrous, and measure approximately **20–60 cm** in length, often exhibiting purplish-brown markings along the midrib. Flowering occurs from **March to April**, with the inflorescence emerging before the leaves. The flowers are yellow and enclosed by attractive green bracts tinged with red. The fruit is a smooth, ovoid, three-angled capsule that dehisces irregularly at maturity. The rhizomes possess a characteristic **camphoraceous aroma** [1]and a slightly sweet, aromatic taste. Among all plant parts, the **rhizomes are the principal medicinal component**, although the leaves are also used in traditional medicine for various therapeutic purposes. The present review may serve as scientific foundation for future research and developing of new formulations of herbs from this valuable medicinal plant.

Botanical Name: Curcuma Zedoaria. [2, 3,4,5,6,7,8,9,10]

Family Name: Zingiberacea [2, 3,4,5,6,7,8,9,10]

Vernacular Names of Curcuma zedoaria [3,4,5,6,7,8,9,10,11,12]

Language	Vernacular Names
English	Zedoary, Zerumbet
Arabic	Arqalkafoor, Zaranbad
Persian	Kasoor, Zaranbad, Urukelkafoor
Urdu	Kocher, Zaranbaad
Hindi	Kachur, Narkachur, Kapoorkachri
Bengali	Shetty, Aakangni, Piyakachura
Sanskrit	Karchura, Dravida, Duralabha, Gandhamulaka, Kapaka, Gandhasara
Marathi	Kachari, Kachora
Tamil	Kichilikilhangul, Pulankilhangu
Telugu	Kachchiligaddalu, Kachoram

Mizaj (Temperament)

Ibn Sina and Najmul Ghani described Zaranbad as having a hot and dry temperament of the third degree (Hot^3 Dry^3)[3, 10]. In contrast, Ibn Baitar, Hakim Mohammad, and Hakeem Kabiruddin considered its temperament to be moderately hot and dry, i.e., of the second degree (Hot^2 Dry^2) [10,12, 13].

Afaal (Pharmacological Actions) [3,6,7,11,12,13]

It acts as a *Mufatteh-e-Sudad* (deobstruent), helping to clear obstructions from body channels, and as a *Mufarreh wa Muqavvi-e-Qalb* (exhilarant and cardiotonic), which strengthens cardiac function and promotes mental well-being. The drug is also valued as a *Kasir-e-Riyah* (carminative) for relieving flatulence and digestive discomfort, and as a *Muqavvi-e-Meda* (stomachic) that improves appetite and digestion. Its cleansing and protective effects classify it as a *Jaali* (detergent) and *Daf-e-Taffun* (antiseptic). Zaranbad further exhibits *Mudirr-e-Baul* (diuretic) and *Mudirr-e-Haiz* (emmenagogue) activities by promoting urination and menstrual

flow, while its *Munaffis wa Mukhrij-e-Balgham* (expectorant) action aids in the expulsion of phlegm from the respiratory tract. Traditional texts also describe it as a *Muteeb Dahan* (salagogue), *Muqavvi-e-Baah* (aphrodisiac), *Muhallil-e-Auram* (anti-inflammatory), *Qabiz* (astringent), *Muqavvi-e-Jigar* (liver tonic), and *Tiryaq* (antidotal agent), highlighting its extensive therapeutic importance in Unani pharmacology.

Uses of Curcuma zedoaria

Rhizome

The rhizome of Curcuma zedoaria is known for its stimulant, hepatoprotective and digestive properties and has been used in traditional medicine for long. It is used as an appetizer, liver tonic, and is very useful in the post-partum period to give strength and promote general health. In Unani medicine, Zaranbad is used in combination with Nigella sativa, Myristica fragrans and honey in semi-liquid form to treat conditions like Nazla (catarrhal). In unani medicine, rhizome is used as a beneficial medicine in dyspepsia, abdominal colic, vomiting, cough and febrile conditions. It is also used traditionally for menstrual irregularities, abdominal cramps, rheumatic pain and digestive disturbances. The fresh rhizome has a diuretic and blood-purifying property, and is used in the treatment of leucorrhoea and discharge in gonorrhoea. The rhizome is said to cure cough and throat irritation by chewing. The traditional sources also refer to its use as an antidotal agent for snake venom including that of the Indian cobra. [10,1]

Roots

The roots are considered useful in gastrointestinal ailments, e.g., flatulence and indigestion and are used as correctives in purgatives. These abnormal genital discharges are traditionally treated with fresh roots of the plant such as leucorrhoea, gonorrhoea. Children are also given root powder or juice as an edible tonic for nourishment and to promote rest. The roots are said to be beneficial in classical medicine for strengthening the heart and brain, and enhancing overall vitality. [1]

Leaves

The leaves of Curcuma zedoaria are mainly used in the form of juice for the treatment of dropsy and certain urinary complaints. Due to their aromatic nature, the leaves are also incorporated into cosmetic preparations and traditional remedies for chronic skin diseases and dermatological conditions. [1]

Whole Plant

The whole plant possesses significant medicinal importance and is widely used as a carminative, particularly in pediatric digestive disorders. Traditional physicians have recommended Zaranbad in diseases affecting the liver, spleen, and nervous system, including epileptic conditions. Owing to its anti-inflammatory activity, paste prepared from the plant is externally applied over wounds, swellings, painful joints, and skin disorders.The herb is also regarded as a general body stimulant and blood purifier. It is considered useful in respiratory ailments due to its expectorant and warming properties. In traditional systems of medicine, Zaranbad is believed to strengthen the uterus, improve reproductive health, and act as an aphrodisiac. Powdered preparations are commonly administered to enhance digestion, support liver function, regulate body temperature, and normalize menstruation. Juice of the plant is also employed in urinary tract disorders and infections. Furthermore, the herb acts as a gastrointestinal stimulant, relieves flatulent colic, and may help protect the gastric mucosa from ulceration and irritation. [5,6, 7, 11]

Miqdār-e-Khūrāk (Dosage)

The recommended therapeutic dose of Curcuma zedoaria in Unani medicine generally ranges from 1–3 g per day [9, 13], commonly administered in powdered form. According to Ḥakīm Kabiruddin and other classical Unani scholars, the dosage may be extended up to 3–5 g [12] depending on the nature and severity of the disease, method of administration, and patient condition. In certain therapeutic applications, doses up to 7 g daily have also been reported in traditional literature.

Muzarrat (Adverse Effects)

Excessive use of Zaranbad may produce certain undesirable effects, particularly headache, as described in traditional Unani literature. Therefore, it is usually administered in appropriate dosage and often combined with corrective agents to minimize adverse reactions. [10,11,12,13]

Musleh (Corrective)

To counterbalance its unwanted effects, especially headache and excessive heat, Unani physicians recommend the use of corrective substances such as Viola odorata (Gul Banafsha) and Santalum album (Sandal Safaid), Sumbul-ut-Tib (Valeriana officinalis). [10,11,12,13,14]

Badal (Substitute)

In traditional practice, Shitraj Hindi (Plumbago zeylanica) , Darunaj Aqrabi (Doronicum hookeri) , Jangali Kasni (Taraxacum officinale), Tukhm Turanj (Citrus medica seeds), and Buzidān (Polygala senega). [10,11,12,13,]

Important Unani Formulations [15]

Formulation Name
Majoon Murawwahul Arwah
Majoon Zaranbad
Majoon Chobchini
Safoof Chutki
Roghan-e-Surkh
Mufarreh Moatadil
Mufarreh Shaikhurraees
Arq-e-Hazim
Marham-e-Muqil
Roghan-e-Baladur
Roghan-e-Mujarrab
Safoof-e-Khadar Jadid
Dawa al-Misk Har Jawahar Wala
Faluniya Farsi
Halwa-e-Chobchini
Jawarish Mastaghiba Nuskha Kalan

Chemical Constituents and Their Pharmacological Actions

Compounds like curcumenol and dihydrocurdione show significant analgesic and antinociceptive[16] effects, suggesting their potential for pain relief and sensory discomfort reduction. The derivatives of curcuminoids – such as curcumin, dihydrocurcumin, tetrahydrocurcumin, and tetrahydrobisdemethoxycurcumin have antiallergic properties and can be used to inhibit allergic[17] reactions and inflammatory responses. Some of the constituents especially α-curcumene, β-turmerone, zerumbone, zerumbone epoxide, diferuloylmethane and di-p-coumaroylmethane have been found to possess cytotoxic activity [18,19] on abnormal or malignant cells. Moreover, curcumin, demethoxycurcumin and bisdemethoxycurcumin are widely recognized for their anticancer[20] properties, which is attributed to their antioxidant, antiproliferative and apoptosis inducing

properties. Some phytoconstituents from Curcuma zedoaria like furanodiene, germacrone, curdione, neocurdione, curcumenol, isocurcumenol, aerugidiol, zedoarondiol, curcumenone and curcumin have been reported to exhibit hepatoprotective[21] activity. The compounds are thought to be beneficial in preventing liver tissue damage caused by toxins and oxidative stress. In addition, curzerenone and dehydrocurdione are known to possess good antiinflammatory activity, which is seen in the reduction of inflammatory mediators and tissue swelling. [22]

Scientific reports:

1. Hepatoprotective Activity

Extracts of *Curcuma zedoaria*—particularly those obtained using aqueous acetone—have demonstrated potent **hepatoprotective effects**. These extracts contain **sesquiterpenes** such as **furanodiene, germacrone, curdione, curcumenol, neocurdione, and curcumin**, which protect against **acute liver injury** induced by D-galactosamine and lipopolysaccharide in rats. The mechanism involves inhibition of **galactosamine-induced cytotoxicity** in hepatocytes, suppression of **lipopolysaccharide-induced nitric oxide** synthesis in macrophages, and attenuation of **TNF-α–mediated liver damage**. The hepatoprotective, antidiabetic, and anti-inflammatory potential of the plant is attributed to its **terpenoids, flavonoids, phenylpropanoids, and essential oils**.[32]

2. Anticancer Activity

The **methanolic extract** of *C. zedoaria* has shown significant **anticancer and anti-inflammatory** properties (Hong, 1988; Lee, 1988). Curcuminoids isolated from the rhizome exhibited **cytotoxic activity** against **human ovarian cancer cells** and were found to **inhibit COX-2 enzyme activity**, suggesting chemo-preventive potential. Other studies have reported that the essential oils of *C. zedoaria* suppress **tumor cell proliferation** by inducing apoptosis, largely due to **zerumbone** and related sesquiterpenes .[38]

3. Anti-Inflammatory Activity

Two major compounds—**curzenone** and **dehydrocurdione**—isolated from methanolic extracts demonstrated **strong anti-inflammatory effects**. At a dose of 1 µmol, these constituents inhibited **12-O-tetradecanoylphorbol-13-acetate (TPA)-induced inflammation** by up to **75% and 53%**, respectively .[24]

4. Lipid-Lowering (Hypolipidemic) Activity

In an experimental study involving adult male rats, administration of **hydroethanolic extracts of *C. zedoaria*** (200–400 mg/kg body weight) for 12 days significantly reduced **serum cholesterol and triglyceride levels**. The extract produced a lipid-lowering effect comparable to **atorvastatin (75 mg/kg)**, without significantly altering HDL or LDL cholesterol levels.[42]

5. Antidiarrhoeal Activity

The **ethanolic extract of *C. zedoaria* leaves** was found to significantly **delay the onset and reduce the frequency of castor oil–induced diarrhoea** in mice. This effect was attributed to inhibition of intestinal motility and fluid secretion.[43]

6. Analgesic and Antinociceptive Activities

The animal model studies conducted on Swiss albino mice and Long Evans rats showed the dose dependent enhancement in the tolerance of pain with C. zedoaria extracts (250–500 mg/kg). The rhizome extract not only delayed the response time to thermal pain stimuli but also demonstrated its analgesic potential. Furthermore, dichloromethane extracts of the rhizomes showed strong antinociceptive effects in a mouse model of acetic acid–induced writhing. The central and peripheral analgesic activity of the compounds curcumenol and dihydrocurdione were confirmed by their ability to inhibit the pain response by 64% and 46% respectively. [24]

7. Antimicrobial and Antifungal Activity

The extracts obtained with petroleum ether, chloroform, acetone, and ethanol showed a broad-spectrum antibacterial and antifungal activity against the tested pathogens including E. coli, Staphylococcus aureus, and Aspergillus species. The minimum inhibitory concentration (MIC) was found in the range of 0.01 mg/ml to 0.15 mg/ml, which indicates high antimicrobial activity of the rhizome.The essential oil fraction of C. zedoaria also exhibited strong antibacterial activity, which can be used in skin, respiratory and gastrointestinal infections. [28]

8. Toxicological Studies

In toxicity studies, high protein flour of C. zedoaria rhizomes was toxic to young rats when fed at 320 g/kg, resulting in death within 6 days. Toxicity, however, varied between species in chicks, where the same diet (100-200 g/kg) did not kill the birds, but did affect growth and feed efficiency. [37]

9. Anti-Allergic Activity

The anti-allergic effect of Curcuma zedoaria rhizome extract has been proven to be significant in studies. Rhizomes grown in Thailand produced an 80% acetone extract, which had inhibitory effect on antigen–IgE mediated allergic reaction. Experimental investigations of these cells showed that the release of β-hexosaminidase, which is thought to be an essential mast cell degranulation marker, was suppressed. The extract also inhibited passive cutaneous anaphylaxis reaction in animal models suggesting its potential role in allergic diseases. The active fraction was subjected to phytochemical analysis resulting the isolation of four major curcuminoids, curcumin, dihydrocurcumin, tetrahydrodemethoxycurcumin and tetrahydrobisdemethoxycurcumin. Of these compounds, curcumin showed the highest inhibitory effect on β-hexosaminidase release with bisdemethoxycurcumin coming in second. From the structural activity relationship studies, it was suggested that the double bond in the side chain at positions 1–7 and the hydroxyl group at the 4′ or 4″ position is important for the potent anti-allergic activity, while the methoxy group on the side chain at the 3′ or 3″ position further enhances the effect. [17]

10. Platelet Activating Factor Inhibitory Activity

The aqueous extract of Curcuma zedoaria has been studied for the antiplatelet activating factor (anti-PAF) activity, which is a key factor in inflammation, thrombosis and allergic reactions. An extract of the plant in aqueous form has been prepared by the freeze drying process and tested in experimental studies by radioligand assay to investigate its inhibitory effect on the binding of PAF to rabbit platelets. The results showed that the extract had a significant anti-activation effect on platelet activating factor (PAF). The extract inhibited the binding of PAF to rabbit platelets by about 50.60% at a concentration of 200 mg/ml. The findings show that Curcuma zedoaria has a significant anti-platelet activating and anti-inflammatory activity, and may account for its traditional use in inflammatory and circulatory diseases. Further studies showed that curcumin and bisdemethoxycurcumin could inhibit mast cell degranulation induced by calcium ionophore and decreased the antigen-induced release of inflammatory cytokines like the tumor necrosis factor-α (TNF-α) and interleukin-4 (IL-4). The results confirm the traditional use of Zaranband for inflammatory and allergic diseases and indicate that its curcuminoids could have a significant influence on immune and hypersensitivity reactions.[25]

11. Antivenom Activity

Aqueous extract of Curcuma zedoaria was tested for its antivenom property against cobra venom. The interaction between cobra venom antigens and antivenom antibodies was studied by the following experimental assessment: 96-well enzyme-linked immunosorbent assay (ELISA) technique was used. In this approach, the plant extract was first incubated with the immobilized venom components, before adding the venom-specific antivenom antibodies. The study showed that the extract has a significant inhibitory effect on venom activity. The results indicated that aqueous extract inhibited significant toxic factors of cobra venom

such as neurotoxins and tissue damaging and toxic enzymes. In conclusion, these finding show that Curcuma zedoaria could have therapeutic potential in snakebite poisoning treatment, which are consistent with its traditional application.[26]

12. Antioxidant Activity

In experimental studies, different extracts of Curcuma zedoaria showed high antioxidant activity in different experimental studies. The extracts of this plant (ethanic, ethyl acetate and aqueous) were found to be potent free radical scavengers, which reflect their protective action against oxidative stress and damage mediated by free radicals. The essential oil obtained from Curcuma zedoaria also exhibited considerable antioxidant properties. The oil exhibited moderate to good antioxidant and strong antioxidant reducing power properties at 20 mg/ml concentration. It also showed high scavenging activity of 1,1 diphenyl-2-picryl hydrazyl (DPPH) free radicals, which implies good hydrogen donating properties. The oil however, showed moderate ferrous ion chelating activity.[27]

13.Anti-Amoebic Activity

The alcoholic extract of Curcuma zedoaria rhizome exhibited good antiamoebic activity in Amoebiasis. Experimental studies showed that the extract could inhibit the growth of Entamoeba histolytica in concentration of 1-10mg/ml. Based on these observations, the plant could be studied for possible therapeutic applications in the management of amoebic infections, and gastroinestinal disorders of protozoal pathogens. [29]

14. Larvicidal Activity

The essential oil of Curcuma zedoaria extract and the formulated product (oil impregnated sand granules) have been tested for larvicidal activity against Aedes aegypti larvae. The studies showed high larvicidal activity, which makes them good in controlling mosquitoes. The lethal dose values (LD50 and LD99) of the oil were found to be 33.45 ppm and 83.39 ppm, respectively, indicating high toxicity against mosquito larvae. The findings suggest the zedoary oil is also potential natural larvicides for using in the vector control program that is eco-friendly and environmentally harmless.[30]

15. Antiulcer Activity

The extract of Curcuma zedoaria is a key ingredient in several classical Unani formulation for the peptic ulcer and hyperacidity treatment. The root powder reduced the gastric damage in experimental rats with pylorus-ligation, which showed significant gastroprotective effect. Oral administration of root powder at a dose of 200mg/kg significantly lowered gastric juice secretion, free acid, total acidity and ulcer index and increased the gastric pH. The antiulcer effect that was observed was similar to that of the standard antiulcer drug Omeprazole. The results are consistent with the traditional use of Zaranbad in gastric disorders and indicate that the plant could be useful in preventing gastric mucous membrane ulcerations and acid overproduction.[31]

16. Anti-Mutagenic Activity

The anti-mutagenic activity of Curcuma zedoaria has been determined by using the microsomal/ Salmonella assay system. The crude drug used in this study was extracted with boiling water, which is a traditional extraction procedure used for preparing oral medicines in Chinese medicine. The extracts were tested for their ability to inhibit mutation by testing them with mutagenic agents like picrolonic acid and benzo[a]pyrene. The results indicated that the compound Curcuma zedoaria has moderate inhibitory activity against benzo[a]pyrene-induced mutagenicity, which could help to prevent cell genetic damage and carcinogenic changes.[34]

17. Hemagglutinating Activity

extracts from Curcuma zedoaria also exhibit marked hemagglutinating property. Crude proteins extracted by magnesium chloride and NP-40 extracts showed erythrocytes-aggregating property. The biological activities suggest presence of lectin-like proteins or bioactive compounds that can interact with red blood cell membranes and could play a role in the immunological and pharmacological activity of the plant.[35]

18. Cytotoxic Activity

Cytotoxic activity of Curcuma zedoaria against various human cancer cell lines has been studied. Studies on traditional Thai herbal formulations for cancer therapy were conducted with the ethanolic and aqueous extract of the plant. The sulforhodamine-B assay revealed strong cytotoxic activity against human large-cell lung carcinoma (CORL-23) and prostate cancer (PC3) cell lines with comparatively low toxicity towards normal human fibroblast cells (10FS). The reported IC50 values of ethanolic extract against CORL-23, PC3 and normal fibroblast cells were 6.05, 17.84 and 55.50 µg/ml respectively, showing the extract to be selectively toxic towards the malignant cells. The aqueous extract did not exhibit significant or any cytotoxic activity on the cell lines tested, in contrast. The results indicate the presence of certain bioactive compounds in ethanolic extracts of Curcuma zedoaria that could show anti-cancer effects, especially on lung cancer cells. [36]

19. Anti-Nociceptive Activity

The anti-nociceptive and anti-Analgesic effect of Curcuma zedoaria is validated in mice in Acetic acid induced abdominal constriction model. Different parts of the plant, such as roots, mother rhizomes and rugose rhizomes were collected in different seasons and evaluated for pain-relieving activity after preparing dichloromethane extracts. The extracts derived from the mother rhizomes recovered in autumn and winter had the highest activity among the tested samples. Both extracts when injected intraperitoneally at 10 mg/kg, were able to inhibit the abdominal constrictions by 91.1% and 93.4% respectively. Some isolated compounds like curcumenol and dihydrocurdione also showed excellent inhibition of pain responses, supporting its role in the analgesic and anti-nociceptive activity of the plant. All these observations are in keeping with the traditional use of Zaranbad in painful inflammatory and rheumatic conditions.[16]

20. Hypotensive Activity

Curcuma zedoaria has demonstrated significant **hypotensive (blood pressure-lowering)** activity in experimental studies. Research conducted on hypertensive rat models suggests that extracts of *C. zedoaria* improve endothelial function and reduce elevated blood pressure. The antihypertensive effect observed was compared with **captopril**, a standard antihypertensive drug, indicating the plant's potential as a natural therapeutic agent for the management of hypertension. However, further clinical studies are required to confirm its efficacy and safety in humans.[39]

20. Anti-fertility Activity

Experimental studies have shown that the **ethanolic extract of *Curcuma zedoaria*** possesses **anti-fertility activity**. In animal studies, administration of the rhizome extract resulted in a significant reduction in the number of spermatogenic cell layers and the mitotic activity of seminiferous tubules in rat testes (**$p < 0.05$**). These findings suggest that curcumin and other bioactive constituents present in the rhizome may interfere with spermatogenesis, thereby reducing male fertility. However, additional studies, particularly in humans, are required to establish its safety, mechanism of action, and potential clinical applications.[40]

21. Antiviral Activity

Curcuma zedoaria has demonstrated promising **antiviral activity** in experimental studies. Bioactive compounds, particularly **germacrone** and **curcumin**, isolated from its rhizomes have shown inhibitory effects

against viruses such as **Influenza A (H1N1)** and **Herpes Simplex Virus type 1 (HSV-1)**. These findings suggest that the rhizome possesses significant antiviral potential and may serve as a source of novel antiviral agents. Nevertheless, further in vivo studies and clinical trials are needed to confirm its efficacy and safety in human viral infections.[41]

22. Antipyretic Activity

The **ethanolic extract of *Curcuma zedoaria*** has demonstrated **antipyretic (fever-reducing) activity** in experimental studies. Using the **Brewer's yeast-induced pyrexia** model in laboratory animals, the extract produced a significant reduction in elevated body temperature, indicating its effectiveness in controlling fever. These findings suggest that *C. zedoaria* possesses potential antipyretic properties, although further studies are necessary to elucidate its mechanism of action and evaluate its clinical efficacy in humans.[41]

Traditional Uses of Curcuma zedoaria

Plant Part	Preparation / Form	Traditional Uses	Route of Administration
Leaves	Leaf paste[19]	Used in lymphangitis, boils, and furunculosis	External / Local application
Rhizome	Rhizome oil[37]	Used as stomachic, emmenagogue, and for vomiting and menstrual retention	Oral
Roots	Fresh roots[38]	Used in leucorrhoea and abnormal vaginal discharge	External / Local application
Tubers	Tuber juice[36]	Administered for intestinal worms in children	Oral and local
Rhizome	Powdered[37] rhizome	Used for allergic disorders	Oral
Leaves	Leaf juice[36]	Used in dropsy and fluid accumulation	Oral
Leaves	Leaf juice[37]	Used in chronic skin diseases including leprosy	Oral

Conclusion

The phenolic acids, flavonoids and saponins present in the plant have proven to be helpful in allergic disorders, used in dropsy, and also useful in chronic skin diseases like leprosy. Curcuma zedoaria is an important medicinal plant with a wide spectrum of therapeutic potential and phytochemical composition, which is extensively used in Unani and other traditional systems of medicine. The rhizome is the most medicinal part of the plant and is rich in curcuminoids, sesquiterpenes, flavonoids and essential oils, which give it various biological activities. The traditional literature mentions about Zaranbad as a beneficial medicine for digestive system, liver, respiratory system, inflammatory and gynecological disorders, urinary system and nervous system. The traditional claims of the plant have been confirmed by the modern scientific studies with regard to hepatoprotection, antioxidant, anti-inflammatory, antimicrobial, anticancer, analgesic, antiulcer, anti-allergic, antivenom, hypolipidemic and cytotoxic activity. Experimental research also suggests its potential in oxidative stress, metabolic disorders, infectious diseases and inflammatory disorders. The presence of pharmacologically active compounds like curcumin, curcumenol, germacrone, curdione and zerumbone

explains the wide range of its therapeutic applications. Despite the ever increasing scientific evidence, there is still a need for more clinical and toxicological research to confirm its safety, efficacy, dosage standardization, and mechanism of action in human. Isolation of active constituents, formulation development and clinical evaluation based on evidence could be important areas for future studies to develop novel herbal therapeutics from Curcuma zedoaria. In general, Zaranband is a medicinal herb and has a high ethnopharmacological and pharmaceutical value.

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