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Review Article

A review on pharmacological and therapeutic profile of zaranbad (Curcuma Zedoaria Rosc.)

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ABSTRACT

Botanicals are the main components of prescriptions of Unani physicians in the treatment of diseases. Zaranbad (Curcuma Zedoaria) has been used for various therapeutic purposes since ancient time. It's uses as a drug mostly for the treatment of respiratory diseases such as common cold and cough (Nazla wa Zukam), anti-allergic, cough expectorant (mukharrij-e-balgham), Arthritis (waja-ul-mafasil), liver tonic & also give strength to abdominal muscles, (muqavvi e meda wa jigar), palpitation (khafkan) as mufarreh,wa, muqavvi e reham (uterine tonic) in leucorrhoea and normalize periods (menstruation regulator), daf-e-humma (antipyretic), wound cleanser/detergent (jali), brain tonic (muqavvi-e-dimagh), heart tonic (muqavvi-e-qalb), anti-diarrheal (qabiz), paralysis (falij), tiryaq (antidote) and antiemetic. Through this review paper an attempt has been made to explain morphology, pharmacological actions and ethno-medicinal, traditional and therapeutic uses of curcuma zedoaria and eventually provide an ample scope for further researches to explore its therapeutic potential to develop a more robust medicine for respiratory hepatic, uterine, brain and cardiac diseases as mentioned in unani literature.

Keywords: Anti-emetic, antidote, Curcuma, Nazla, Palpitation, Uterine tonic.

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INTRODUCTION

Zaranbad (Curcuma zedoaria) is a rhizome that grows in an area of tropical and subtropical humid forest. The fragrant plant bears red and green bract yellow flowers; segment of the underground stem is wide and tuberous with multiple branches. Zaranbad belongs to Family Zingiberaceae. It is a wild growing plant cultivated in the eastern Himalayas in India, Ceylon and China.

In appearance the plant closely resembles curcuma longa and grows to a height about 0.4 m and bears green leaves with brownish purple veins. Mostly roots (rhizomes) and leaves are used for various therapeutic purposes. Zaranbad is an herbaceous and rhizomatous perennial plant composed of an upright pseudo-stem corm and underground cylindrical branches or rhizomes and fleshy roots. Some roots broaden terminal garage systems *i.e* rounded to elongated tuber called the roots of plant. From March to April the axillary buds of the corm and apical buds of the 3rd order rhizomes emerge above the floor as inflorescences. This basal flower spike, which grows approximately 30 cm tall, seems just earlier than the foliage at the node closest to the flower spike. A vegetative shoot continually develops. New branches begin to increase on corms of these days shaped aerial shoots via autumn. The above floor foliage dies lower back from November to December storage roots are formed. They are having a high (>70%) carbohydrate content. The plant has 4-6 leaves with a lamina which is 20-60 cm long. The leaf lamina is oblong lanceolate on both sides, finely acuminate and glabrous. The stalk of the flowers is 20-25 cm long and appears before the leaves. The flowers are yellow while the flowering bract is tinged with red and green. Calyx is 8 mm long. Corolla is twice as long as the calyx. Capsule is trigonous, ovoid, flat, smooth and irregularly bursting. Tubers are branched on the palm and camphorous. The root has camphorous odour and sweet in taste.[1]There are many more functions of curcuma zedoaria which are mentioned in unani literature such as respiratory, hepatic, uterine and cardiac diseases.

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

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. [3,4,5,6,7,8,9,10,11,12]

Mizaj (Temperament)
There are controversies among the unani physician regarding the Mizaj of Zaranbad. It is hot[3] and dry[3] according to Ibn e Sina and Najmul Ghani. [3, 10]. It is hot[2] and dry[2] according to Ibn Baitar, Hakim Mohammad and Hakeem Kabiruddin. [10,12, 13]

Afaal (Actions):
Mufatteh-sudad *(Deobstruent)*, Mufarreh-wa Muqavvi-e-qalb *(Exhilarent & Cardiotonic)*, Kasir-e-riyah *(Carminative)*, Jaali *(Detergent)*, Mudire-e-boul (Diuretic), Mudir-e-haiz *(Emmenagogue)*, Munaffis-wa-mukharrij-e-balgham *(Expectorant)*, Muqavvi-e-meda *(Stomachic)*, Muteeb dahan *(Salagogue)*, Muqavvi-e-bah *(Aphorodisiac)*, Muhallil-awram *(Anti-inflammatory)*, Qabiz *(Constipative)*, Daf-e-taffun *(Antiseptic)*, Muqavvi-e-Jigar *(Liver tonic)*, Tiryaq *(Antidot)*. [3,6,7,11,12,13]

Therapeutic uses:
Rhizome: It is used as an appetizer and liver tonic and is usually recommended during parturition. In the case of Nazla, Shoniz (Nigella Sativa) Zaranbad (Curcuma Zedoaria) Bisbasa (Myristica fragrance) and honey (Apis Mellifera) mixed and given in semi-liquid form. In Ayurvedic Braticityadikwatha is an ingredient used in high fever. Fresh rhizomes have diuretic properties; act as blood purifier and arrest of leucorrhoea and gonorrheal discharges. Rhizomes are chewed simply to soothe cough. Rhizome is an essential component of a health tonic given after childbirth to women.[10,1]

Roots: Useful for flatulence, dyspepsia and as a purgative corrector. Fresh root regulates discharge of leucorrhoea and gonorrhea. Root powder is a healthy alternative for children used in the form of juice. It has been reported that it is very effective as a tonic for the heart and brain.[1]

Leaf: Mostly used in form of juice for the treatment of dropsy. It is a fragrant component in cosmetics used to treat chronic skin diseases.[1]

Whole plant: Zaranbad useful as carminative in children. It is also beneficial in liver, spleen and epileptic seizure disorders. Since Zaranbad is an anti-inflammatory agent so its paste is used to treat inflammation, wounds, skin ailments and pains. The herb acts as a stimulant to the body and purifies blood. It is very helpful in the treatment of respiratory disorders. It tones the uterus and functions as an aphrodisiac. Zaranbad improves digestion, liver function, and normalizes the body temperature when administered in powdered form and helps in regularizing menstruation. It is used in juice form to treat urinary disorders such as urinary tract infections. Zaranbad is used in flatulent colic as a gastrointestinal stimulant and prevents ulceration from discomfort as well as helps to treat

dyspepsia, colic, vomiting and cough. In the case of stomach cramps, amenorrhea, abdominal pain and rheumatic pain, the herb is very useful. Zaranbad is used as an Antivenom for the Indian cobra. [5,6, 7, 11]

Dosage: 1-3 gram. [9, 13]
3-4 gram. [12]

Muzarrat (adverse effect): it causes headache. [10,11,12,13]

Musleh (corrective): Gul banafsha (*Violoaodorata* Linn.) and sandal safaid (*Santalum album* Linn). [10,11,12,13,14]

Badal (substitute): Daroonaj Aqrabi (*Doronicumhookeri*). [10,11,12,13,]

Important Formulation: Majoon Murawwahul Arwah, Majoon chobchini, Roghan e Surkh, Mufarreh Shaikhurraees, Mufarreh Moatadil, Safoof Chutki, Arq e Hazim.[15]

Chemical Constituents and their action: Curcumenol, dihyrocurdione act as Analgesic and antinociceptive.[16] Curcumin, dihydrocurcumin, tetrahyrodemothxycurcumin, tetrahydrobismethoxycurcumin act as Antiallergic.[17] A-Curcumene, b-tumerone, zerumbone, zerumbone epoxide, diferuloylmethane, di-p-coumaroylmethane has Cytotoxic effect. [18, 19] Curcumin, demothxycurcumin and bisdemothxycurcumin has Anticancer effect. [20] Furanodiene, germacrone, curdione, neocurdione, curcumenol, isocurcumenol, aerugidiol, zedoarondiol, curcumenoneand curcumin act as hepatoprotective. [21]Curzenone and dehydrocurdione has Anti-inflammatory effect.[22]

Scientific reports:

Anti-Allergic Activity: The 80% aqueous acetone extract of the rhizomes of C. zedoaria cultivated in Thailand. It was found to inhibit the releases of beta hexoaminidase as a marker of antigen-IgE-mediated degranulation in RBL-2H3 cells and Passive Cutaneous anaphylaxis reaction in mice. From the active fraction, four curcuminoids (curcumin, dihydrocucumin, tetrahydrodemethoxycurcumin, and tetrahydrobisdemethoxycurcumin) were isolated from C. zedoaria. Curcumin showed the highest activity against beta hexosaminidase release having 50% inhibitory concentration (IC50) of 5.3 µm followed by bisdemethoxycurcumin (IC50 11µm.) with regarded to the structural requirements of curcuminoids for the activity, the conjugated ole fines at the 1-7 positions and the 4′-or 4″- hydroxyl groups of curcuminoids were suggested to be essential for strong activity. Whereas the 3′- or 3″ methoxy group can enhance the activity. Furthermore the effects of curcumin and bisdemethoxycurcumin on calcium ionophore (A23187 and ionomycin) induced degranulation and antigen induced release of tumour necrosis factors (TNF)-α and IL-4 were examined.[17]

Anti-Inflammatory activity: Curcuma zedoaria showed promising anti-inflammatory activity in experimental models. Compounds curzenone and dehydrocurdione obtained from Methanolic extract of the rhizomes suppressed 12-O-tetradecanoyiphorbol-13-acetate (TPA) by 75% and 53% respectively. At a dose of 1µmol application.[23] Chihiro et al. have also studied the anti-inflammatory property of the Methanolic extract of C.zedoaria using the adjuvant arthritis in mouse model. [24]

Analgesic activity: Navarro et al. investigated the analgesic activity of C. zedoaria rhizomes grown in Brazil. Alcoholic extract, different fractions (dichloromethane, ethyl acetate sand methanol) of rhizomes were showed analgesic activity along with curcumenol. The activity was investigated using several models of pain in mice including writhing, formalin and capsaicin. Curcumenol presented promising analgesic effects, being several times more potent than the reference drugs evaluated in the same experimental models. The calculated 50% inhibitory doses (ID50) Values were 22 and 12 µmol/kg in relation to the second phase of the formalin model. The lack of effect in the hot plate test suggests that curcumenol acts by a mechanism that does not involve the participation of the opioid system. All the fractions were pharmacologically analyzed. The results indicate that the dichloromethane extract caused a dose dependent analgesic effect when given by the intra-peritoneal route, inhibiting acetic acid- induced. [24]

Platelet activating activity: The freeze-dried form of aqueous extract of C. zedoaria was studied for its inhibitory effect on platelet activating factor using a radio-ligand. It was found that C. zedoaria inhibited 50.60% platelet activating factor binding to rabbit platelets concentration of 200 mg/ml. [25]

Antivenom activity: Aqueous extract of C. zedoaria was investigated for inhibitory activity by binding of anti-cobra venom antibody to antigen of cobra venom by using the 96-well plate enzyme linked immunosorbent assay (ELISA) method. In this study the extract was allowed to react with immobilized venom before the addition of anti-venom antibody. The extract of C. zedoaria showed clear inhibitory activity. It was found that the extract targeted neurotoxin and protein-degrading enzyme present in venom, thus suggesting use of aqueous extract as antivenom.[26]

Antioxidant activity: The ethanolic, ethyl extract and water extracts of C. zedoaria had shown potent

antioxidant activity. [27] At 20 mg/ml, the essential oil of C. zedoaria was moderate to good in antioxidant activity, good in reducing power and excellent in scavenging effect on 1, 1-diphenyl-2-picrylhy-drazyl radical but low in chelating effect on ferrous ion. [27]

Antimicrobial and antifungal activity: The antimicrobial activity of extracts of C. zedoaria tubers was tested against six bacterial and two fungal strains using the agar well diffusion and broth dilution methods. Petroleum ether, hexane, chloroform, acetone and ethanol extracts exhibited antibacterial as well as antifungal activity. Acetone and hexane extracts of the tubers showed comparable antimicrobial activity as indicated by minimum inhibitory concentration (MIC) values. The MIC values for different strains and extracts ranged from 0.01 to 0.15 mg/ml. The findings also support the use of C. zedoaria tubers in traditional medicine for the treatment of bacterial and fungal infections. [28]

Anti-amoebic activity: Alcoholic extract of rhizome of C. zedoaria was able to inhibit the growth of Entamoebahistolytica at a concentration of 1–10 mg/ml. [29]

Larvicidal effect: Zedoary oil and its formulated preparation, zedoary oil-impregnated sand granules, were tested for larvicidal efficacy against Aedesaegypti mosquitoes. Zedoary oil exhibited pronounced potential against A. aegypti with a 50% and 99% lethal dose (LD50 and LD99, respectively) of 33.45 and 83.39 ppm, respectively. [30]

Antiulcer activity: C. zedoaria is the chief ingredient in several Unani preparations used to treat peptic ulcer. The effect of root powder (200 mg/kg, p.o.) on the volume of gastric juice, gastric pH, total acid, free acid and ulcer index in pyloric-ligated rats was studied. The root powder at a dose level of 200 mg/kg reduced the gastric pH, free acid, total acid and ulcer index significantly and the results were comparable with that of the standard drug omeprazole (30 mg/kg, i.p.). There by providing justification that the root is effective in affording protection against hyperacidity and gastric ulcers. [31]

Hepato-protective activity: A study was carried out to assess the effect of C. zedoaria on the growth of cultured human hepatic myofibroblast cells (hMF). During the course of liver fibrogenesis, hMF, mostly derived from hepatic stellate cells, proliferate and synthesize excessive amounts of extracellular matrix components. A water extract of Zedoariaerhizoma was evaluated for its anti-proliferative effect on the growth inhibition of hMF, since proliferation of hMF is known to be central for the development of fibrosis during liver injury and factors that may limit their growth are potential antifibrotic agents. hMF were obtained by outgrowth from human liver explants. Zedoariaerhizoma markedly reduced serum-driven cell proliferation, as assessed by nuclear autoradiography experiments and measurement of actual cell growth. Growth inhibition was totally reversed after removal of the Zedoariaerhizoma. Zedoariaerhizoma potently inhibited hMF growth (IC50 8.5 mg/ml), in a pertussis toxin-insensitive manner. The results that Zedoariaerhizoma exhibits potent anti-proliferative and anti-fibrogenic effects toward hMF indicated that Zedoariaerhizoma might have therapeutic implications in chronic liver disease. [32]

Anticancer activity: A study conducted by Hong et al.found that the Methanolic extract of C. zedoaria had both anti-cancer and anti-inflammatory activity. The inhibitors of prostaglandin biosynthesis and NO production have been considered as potential anti-inflammatory and cancer chemo-preventive agents. Methanolic extracts of C. zedoaria showed potent inhibition of COX-2 activity (> 80% inhibition at the test concentration of 10 mg/ml). Curcuminoids were synthesized and demonstrated cytotoxic against human ovarian cancer OVCAR-3 cells. [33] The observed curative dose at 50% (CD50) for curcumin, desmethoxycurcumin and bisdemethoxycurcumin was at dose of 4.4, 3.8 and 3.1 mg/ml, respectively. [21]

Anti-mutagenic activity: The anti-mutagenic activity demonstrated by using the Salmonella/microsomal system in the presence of picrolonic acid or benzo pyrene to test whether they contained direct or indirect anti-mutagens. Each crude drug was extracted with boiling water for 2 h (i.e. the method commonly used by Chinese people to prepare the drug for oral intake). C. zedoaria was found to possess moderate activity against benzo pyrene. [34]

Hem-agglutinating activity: Hem-agglutinating activity has been showed by extract of the C. zedoaria. Crude proteins obtained by Mg/NP-40 extraction from Curcuma species exhibited agglutination activity against rabbit erythrocytes.[35]

Cytotoxic activity: Water and ethanolic extracts of 12 Thai medicinal plants used as the ingredients of a southern. Thai traditional formula for cancer treatment were tested for cytotoxic activity against two types of human cancer cell lines (large cell lung carcinoma (CORL-23) and prostate cancer (PC3)) and one type of normal human cell line (fibroblast cells (10FS)). The sulforhodamine B

assay was used to test cytotoxic activity against all the cell types. One concentration (50 mg/ml) of two different extracts was tested first against cell lines and the active plant extracts were diluted further and tested for calculating IC50. The ethanolic extracts of C. zedoaria showed cytotoxic activity against CORL-23 and PC3 but less cytotoxic activity against 10FS (IC50: 6.05, 17.84 and55.50 mg/ml, respectively). The water extract of the plant exhibited no activity against any of the human cells studied. Ethanolic plant extract of C. zedoaria showed specific activity against lung cancer cell lines and less cytotoxic activity against normal cells. [36]

Anti-nociceptive activity: The anti-nociceptive activity of the dichloromethane extracts from different parts (roots, mother rhizome and rugous rhizome) collected in different seasons was studied using the acetic acid-induced abdominal constriction model in mice. The extracts obtained from mother rhizome collected in autumn and winter at doses of 10 mg/kg intra-peritoneally caused considerable anti-nociceptive activity and inhibiting 91.1 and 93.4% of the abdominal constrictions respectively. Whereas compounds curcumenol and dihydrocurdione caused inhibitions of 64.0 and 46.0%, respectively. These results confirm that both compounds contribute towards anti-nociceptive and analgesic activity. [16]

Toxic effect of Curcuma zedoaria on chicks and rats: Flour was prepared from rhizomes of C. zedoaria in such way that most of the protein was retained. The crude protein (nitrogen ¥6.25) content in this product was 155 g/kg, compared with approximately 10 g/kg in commercial C. zedoaria flour. The high-protein flour proved highly toxic to 5-week-oldrats and caused 100% mortality within six days when given at 320 g/kg diet. Fresh rhizomes were minced and dried, that meal was given to weanling rats at 400 g/kg diet. All the rats lost weight rapidly, and few rats died within 4 days. This same C. zedoaria meal was given to one-day-old chicks at 100 and 200 g/kg diet. All the chicks survived the test period (20 days), but body weight, food intake and efficiency of food conversion decreased with increase in the level of C. zedoaria meal in the diet. [37]

Plants part	Traditional uses	Route of admiration	Reference
Leaf paste	Plasters in lymphangitis, furunculosis.	Local Application	19
Oil of rhizome	Stomachic, emmenagogic, vomiting, menstrual haematometra.	Orally	37
Fresh roots	Treatment of leucorrhoea discharge.	Local Application	38
Tuber juice	Treatment of worms in children.	Orally and Local	36
Powdered rhizome	Anti-allergant.	Orally	37
Leaf juice	Treatment of dropsy.	Orally	36
Leaf juice	Treatment of leprosy.	Orally	37

CONCLUSION

Unani Medicine presents avenues in the search of new and alternative drugs. There are thousands of plants in Unani Medicine used as therapeutics for various ailments. These medicinal plants have promising future because most of them have not been investigated for their pharmacological activities. The present review concludes that curcuma zedoaria had anti-inflammatory, analgesic activity, platelets activating activity, antimicrobial, antifungal activity, anti-cancer, antiulcer, anti-oxidant, larvicidal and anti-amoebic activities in several preclinical studies. In clinical studies Zedoaria showed efficacy to control allergy, inflammation, and arthritic pain. These pharmacological activities of Curcuma Zedoaria attribute to the natural phenols present in the root & rhizome such as curcumin, dihydrocucumin, tetrahydrodemethoxycurcumin, and tetrahydrobisdemethoxycurcumin. Moreover the root and rhizome of curcuma zedoaria contain curcumenol so, it can be used as an analgesic (daf-e-alam) to treat arthritis. This review also suggests that Zedoariaerhizoma has hepato-protective activity. Its therapeutic use in melasma, paralysis, bad odour of mouth, palpitation aphrodisiac, elephantiasis, sciatica pain, weight gain (obesity) and insect repellent have not been studied scientifically despite empirical evidences available in classical literature. In the light of this review, it can be said that root & rhizome of curcuma zedoaria and its derivatives may emerge as a potential drug as anti-allergic, analgesic, anti-oxidant anti-microbial, antifungal, antiulcer, anti-venom, hepato-protective, anticancer and larvicidal. Further rigorous studies are required to establish the efficacy of curcuma zedoaria as a potent drug for migraine, palpitation, paralysis, aphrodisiac, sciatica, chronic cough, obesity and in melasma.

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