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Review Article

Integrating Traditional and Modern Knowledge: A Review on *Khulanjan* (*Alpinia galanga*) in Unani Medicine

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Abstract

Aims and objective: Khulanjan (*Alpinia galanga*) is a rhizomatous Zingiberaceae herb long used in Unani medicine. Classical texts ascribe to Khulanjan a warm, dry temperament (Unani *mizāj*) and describe it as a carminative digestive stimulant and tonic (e.g. *Mufarreh*, *Muqawwi-e-Meda*, *Muqawwi-e-Qalb*), with expectorant and cardiac tonic actions. The objectives of this review are to examine and correlate these traditional Unani uses of khulanjan with modern pharmacological findings; to bridge classical knowledge and contemporary science; and to identify potential therapeutic applications of its bioactive constituents. These traditional uses for indigestion, flatulence, respiratory complaints and weakness reflect its characterization as an aromatic, stimulant herb. Modern phytochemical analyses identify key bioactive constituents in Khulanjan rhizome, including the flavonoid galangin and volatile oils rich in 1,8-cineole, β-pinene, methyl cinnamate, borneol and related terpenes. Such compounds confer demonstrable bioactivities: experimental studies report strong antioxidant, anti-inflammatory and broad-spectrum antimicrobial effects of *A. galanga* extracts. For example, high phenolic/flavonoid content in the rhizome correlates with potent radical-scavenging and antibacterial activity in vitro. Thus, contemporary research largely validates classical claims: Khulanjan's traditional designation as a digestive/carminative tonic and healer of 'phlegm' and inflammation finds support in its phytochemistry and observed pharmacology. This synthesis of Unani doctrine and modern evidence underscores that the age-old uses of Khulanjan have a rational basis, illustrating how classical herbal wisdom aligns with scientific pharmacological validation.

Keywords: *Alpinia galanga*; Khulanjan; Unani medicine; Mizaj; phytochemicals; antioxidant; anti-inflammatory; antimicrobial.

Introduction

Khulanjan, scientifically identified as *Alpinia galanga* L. is a significant species within the Zingiberaceae family it plays a crucial role in Unani Medicine, utilized both as single drug (Mufrad Dawa) and in compound formulations (Murakkab Dawa). Although it shares a close botanical kinship with ginger (Zingiber officinale), Khulanjan is frequently regarded as superior in various therapeutic contexts. The plant is known by a multitude of vernacular names across different ethnic groups. In Tamil, it is known as Pera-rattai; in Hindi, it is called Khulanjan; in Kannada, it is termed Dhumarasmi; in Bengali, it is identified as Kulingjan; in Gujarati, it is called Kulinjan; in Malayalam, it is referred to as Per arattha, Kol-inji, or Pararatta; in Telugu, it is known as Pedda-dhumpa; in Marathi, it is called Kulinja or Koshtkulayan; in Sanskrit, it is referred to as Mahabaracach, Sugandha vacha, Rasna, or Barakulanjar; and in English, it is commonly known as Greater galangal. [1]

Botanical & Ethnopharmacological Background:

The rhizome of *Alpinia galanga* (Willd.) Roxb. (Family Zingiberaceae) is widely used in traditional Unani medicine in South and Southeast Asia. In Unani medicine, the plant is known as Khulanjan and is described as a warm (hot) and dry temperament (mizāj). (Fig 1) shows the plant and Rhizome of Alpinia galangal (Khulanjan). It is used as a carminative, stomachic (muqawwi-i-meda), phlegm resolving- (munaffis-e-balgham), and general tonic of the heart and brain (muqawwi qalb/rooh). [2] Ethnobotanical surveys confirm that *A. galanga* has historically been used for digestive disorders, respiratory complaints, rheumatic pains and as a general tonic. [3,4] Recent pharmacological research has reinforced the traditional Unani uses. Modern studies have validated these traditional claims, showing that *A. galanga* possesses notable antimicrobial, anti-inflammatory, antioxidant, analgesic, and neuroprotective properties. Despite its well-established traditional use, systematic correlation between Unani concepts, such as temperament (*Mizaj*), modes of action

(*Afa'al*), and therapeutic indications, and modern biomedical data remain limited. Integrating classical knowledge with the current scientific understanding can help in developing new therapeutic leads and validating Unani formulations through pharmacological and biochemical approaches. Therefore, the present review aims to synthesize traditional Unani knowledge and contemporary research on *Alpinia galanga* (Khulanjan), focusing on its phytochemical composition, pharmacological activities, and therapeutic significance, with the objective of establishing a holistic understanding that bridges traditional wisdom and modern science. [1]

Figure 1: Plant and Rhizome of *Alpinia galangal* (Khulanjan), source: https://www.dabur.com/ayurveda/ayurvedic-medicinal-plants/kulanjan-plant

Phytochemical composition:

Phytochemical investigations revealed that Khulanjan *A. galanga* rhizomes contain a diverse array of secondary metabolites such as 1′-acetoxychavicol acetate, 1′-acetoxyeugenol acetate, 1, 8-cineole, and phenylpropanoid derivatives. [5] Another review reiterates the presence of terpenoids (cineole), flavonoids (galangin), diarylheptanoids, and phenolic acids. [6] GC-MS- profiles confirm that volatile oils may be dominated by methyl cinnamate, 1, 8-cineole, and other monoterpenes, depending on the chemotype. [7] In the Unani framework, "hot and dry" mizāj correspond to stimulating volatile oils and phenolic compounds with digestive and metabolic activity. (Table 1) shows the Chemical constituent of Khulanjan and their pharmacological actions.

Table 1: Chemical constituent of Khulanjan and their pharmacological actions.

Chemical Composition of Khulanjan	Pharmacological Actions
1′-Acetoxychavicol acetate (ACA)	Potent anti-tumor, chemopreventive, antiviral. [8]
Galangin	Antioxidant, antibacterial, anti-inflammatory, enhances liver defence. [9, 10]
Kaempferide / Alpinetin	Anti-ulcer, anti-diabetic, cardio protective. [11, 12]
1,8-Cineole	Bronchodilator, expectorant, relieves respiratory ailments.[13, 14]
Eugenol	Analgesic, antiseptic, anti-fungal. [15, 16]

Pharmacological Activities

Antioxidant Activity: Ethanolic extracts of *A. galanga* exhibit strong free radical- scavenging and lipid peroxidation inhibitory activity. [17] The antioxidant activity supports the Unani notion of khulanjan as a tonic herb that stabilizes body systems and defends against "cold" or "phlegmatic" states.

Anti-inflammatory and analgesic effects: *A. galanga* extracts reduce nociception and inflammatory mediator levels in animal models. [18, 19] These findings resonate with the use of khulanjan for rheumatic pain, chest constriction, phlegm, and inflammatory disorders. [2]

Antimicrobial Activity: Ethanolic and methanolic extracts show activity against Staphylococcus aureus, Escherichia coli, Candida albicans, and Aspergillus flavus.[20] In Unani medicine, Khulanjan's use in bronchitis and digestive infections is supported by these antimicrobial properties.

Gastroprotective/digestive effects: Classical Unani formulations utilize khulanjan as a muqawwi-i-meda (stomachic) and a carminative.[2] Modern studies have shown the inhibitory activity of α-amylase and α-glucosidase. [21]

Antidiabetes/Metabolic Effects: In vitro studies have shown that *A. galanga* inhibits α-amylase- and α-glucosidase- in a dose-dependent- manner [21], aligning with its metabolic tonic role in Unani medicine.

Anticancer and Cytotoxic Effects: *A. galanga* extract induces senescence in HER2-overexpressing breast cancer cells. [22] and exhibits apoptotic activity. [5]

CNS / Neuroprotective effects: Major constituents (e.g., ACA and AEA) have favorable membrane permeability [23], supporting its Unani classification as a muqawwi-i-rooh (nerve/brain tonic).

Integration of Unani Perspective

The warm/dry temperament corresponds to the stimulation of volatile oils, which enhances digestion and metabolism. Respiratory and tonic indications are correlated with antimicrobial and antioxidant effects.

Therapeutic Uses in Unani Literature

According to classical Unani texts, Khulanjan has been extensively used for its medicinal benefits. (Table 2) shows the Therapeutic Indications and Mode of Action / Benefit of Khulanjan. (Table 3) shows the Compound formulation of Khulanjan and their Action, Therapeutic Uses and doses.

Table 2: Therapeutic Indications and Mode of Action / Benefit of Khulanjan.

System / Organ	Therapeutic Indications	Mode of Action / Benefit	References
Digestive System	Dyspepsia, loss of appetite, flatulence	Improves digestion and strengthens stomach	24, 25, 26,
Respiratory System	Cough, catarrh, asthma, sore throat	Acts as expectorant and anti-inflammatory	27, 25, 26
Nervous System	Nervous debility, paralysis, tremors	Works as stimulant and nervine tonic	24, 25, 26
Cardiovascular System	Cardiac weakness	Strengthens heart and improves circulation	24, 25, 26
Musculoskeletal System	Rheumatic and joint pains	Provides warmth, reduces pain and stiffness	27, 25, 26
General Use	Fever, diabetes, bad breath	Detoxifying, antipyretic, aromatic, and refreshing	24, 25, 26

Table 3: Compound formulation of Khulanjan and their Action, Therapeutic Uses and doses

Compound formulation of Khulanjan	Action	Therapeutic Uses	Doses
Habb-e-Nishat Jadeed-	Moharrik	*Zof-e-Bah* (sexual debility)	One pill with milk twice a day. [28]
Habb-e-Sara Khas	Muqawwi-e-Dimagh, Muqawwi-e-Asab	*Sara* (epilepsy), *Um-us-Sibyan* (infantile convulsion)	One pill twice a day. [28]
Laooq-e-Falij	Munaqqi-e-Dimagh (brain cleanser), Muqawwi-e-A'saab (nervine tonic).	Falij (paralysis), Laqwa (facial palsy), Amraz Dimaghi Barida (diseases of brain due to cold temperament).	5-10 g. [29]
Laboob Kabeer Khaas	Muqawwi-e-Bah, Muqawwi-e-Aza-e-Raeesa, Muqawwi-e-Qalb, Muqawwi-e-Dimagh, Muqawwie- Kulya, Muqawwi-e-Masana, Muqawwi-e-Asab, Muwallid-e-Mani, Mughalliz-e-Mani	Zof-e-Bah, Zof-e-Aam, Zof-e-Asab, Zof-e-Qalb, Zof-e-Dimagh, Zof-e-Kulya, Zof-e-Masana, Qillate- Mani, Riqqat-e-Mani	6 g with 60 ml Maullaham Khaas or milk once a day. [28]

Conclusion

Khulanjan (*Alpinia galanga*) exemplifies a botanical whose therapeutic profile is well-documented in both Unani tradition and modern science. In Unani literature, Khulanjan is described as having a warm (hot, dry) temperament and is employed as both a single drug (mufrad) and in compound formulations (murakkab) Classical texts credit it with properties such as Mufarreh (exhilarant), Mutayyib-e-Dehan (aromatic), Muhallil-e-Auram (anti-inflammatory), Musakkin (analgesic) and Kasir-e-Riyah (carminative). It has been used since antiquity for a wide range of ailments – from digestive disturbances (flatulence, poor appetite) and respiratory complaints to musculoskeletal aches and neurological weakness. Modern pharmacological research largely

validates these traditional claims. Numerous studies show Khulanjan rhizome extracts possess analgesic and anti-inflammatory activity, significantly reducing pain behaviors and edema in animal models Its essential oils and extracts exhibit broad-spectrum antimicrobial effects against bacteria (including *Staphylococcus*, *E. coli*, *Salmonella* spp.) and fungi. Likewise, Khulanjan is a rich source of antioxidants: its polyphenols and volatile constituents scavenge free radicals in vitro. Importantly, neuropharmacological studies reveal neuroprotective and cognitive-enhancing effects. For example, a chloroform fraction of A. *galanga* improved memory in an Alzheimer's mouse model, boosting brain antioxidant enzymes and cholinergic transmission while reducing acetylcholinesterase activity. These data concretely link the Unani notion of Khulanjan as a *nervine tonic and stimulant* with experimentally observed increases in neural function and free-radical defense. Strikingly, many Unani concepts of Khulanjan find support in the bench. Its "hot and dry" temperament correlates with metabolic stimulation and digestive benefits seen experimentally, while its carminative action (relieving flatulence) is consistent with smooth-muscle and enzyme-modulating activities reported in gastrointestinal studies. The aromatic (Mutayyib) quality emphasizes its active essential oil, which indeed contributes to antimicrobial and antioxidant effects. Likewise, the Unani descriptors *"anti-inflammatory"* and *"analgesic"* (Muhallil and Musakkin) are borne out by COX/NF-κB inhibition and pain-relief demonstrated in preclinical assays. The use of Khulanjan in complex Unani formulations mirrors modern findings that plant components often act synergistically; for instance, galangal extracts show enhanced antimicrobial effects when combined with other herbs. In this way, the *mufrad vs. murakkab* distinction in Unani is echoed by the synergy and polypharmacology emphasized in phytomedicine. In conclusion, Khulanjan offers a compelling example of how age-old Unani insights and contemporary pharmacology can reinforce one another. Its rich traditional profile and confirmed bioactivities advocate for continued integration of ethnomedical knowledge into modern drug research, fostering holistic models of care that are both evidence-based and culturally informed.

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