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HARIDRA (*CURCUMA LONGA*): A REVIEW OF ITS ANTI-INFLAMMATORY AND THERAPEUTIC POTENTIAL

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ABSTRACT

Background Haridra (*Curcuma longa* Linn.), commonly known as turmeric, is an important medicinal plant extensively described in Ayurveda and widely used in traditional healthcare. Its Tikta-Katu Rasa, Laghu-Ruksha Guna, Ushna Virya and Katu Vipaka contribute to its Kapha-Vata Shamaka, Shothahara, Kushthaghna, Krimighna and Vishaghna actions. Modern research has identified curcuminoids, particularly curcumin, as major bioactive constituents responsible for several pharmacological activities. Experimental and clinical evidence suggests that turmeric and curcumin can modulate inflammatory mediators, oxidative stress and intracellular signaling pathways, supporting their potential application in chronic inflammatory disorders. Materials and Methods Relevant information concerning Haridra, curcumin, inflammation, pharmacological mechanisms and therapeutic applications was reviewed. Clinical and experimental evidence relevant to its anti-inflammatory activity was synthesized conceptually. Results & Discussion Ayurvedic descriptions of Haridra as a Shothahara and Kapha-Vata Shamaka Dravya show conceptual agreement with its experimentally demonstrated multi-target anti-inflammatory activity. However, bioavailability and heterogeneity of formulations remain important limitations. Conclusion Haridra represents an important bridge between Ayurvedic pharmacology and modern anti-inflammatory research. Further standardized, adequately powered clinical studies are required to establish disease-specific preparations, doses and long-term therapeutic effectiveness.

Keywords: Haridra; *Curcuma longa*; Curcumin; Shotha; Anti-inflammatory

INTRODUCTION

Inflammation is a protective biological response to infection, tissue injury and other harmful stimuli; however, persistent or dysregulated inflammation contributes to the pathogenesis of several chronic disorders, including arthritis, inflammatory bowel disease, metabolic disorders and cardiovascular disease. Modern anti-inflammatory pharmacotherapy is effective but may be associated with adverse effects during prolonged administration, creating continuing interest in plant-derived compounds with multi-target pharmacological activity. Among medicinal plants, *Curcuma longa* Linn. has received considerable attention because its principal polyphenolic constituent, curcumin, demonstrates anti-inflammatory and antioxidant effects through multiple cellular and molecular mechanisms [1].

In Ayurveda, *Curcuma longa* is known predominantly as Haridra and occupies an important position both as a medicinal drug and dietary substance. Classical descriptions attribute Tikta and Katu Rasa, Laghu and Ruksha Guna, Ushna Virya and Katu Vipaka to Haridra. These pharmacodynamic attributes explain its actions on Kapha and Vata and its traditional applications in Shotha, Kushtha, Prameha, Krimi, Pandu and several disorders involving impaired metabolism, obstruction of body channels and altered tissue responses. Its broad spectrum of actions makes Haridra particularly relevant for understanding inflammation from an Ayurvedic perspective [2].

Modern phytochemical investigations have identified curcumin, demethoxycurcumin and bisdemethoxycurcumin as major curcuminoids of turmeric, together with volatile oils and numerous other constituents. Curcumin has been extensively investigated for its ability to influence transcription factors, enzymes, cytokines and oxidative pathways involved in inflammation. The convergence between the classical Shothahara application of Haridra and contemporary evidence for the anti-inflammatory activity of curcumin provides a rational basis for an integrative review of its therapeutic potential [3].

MATERIALS AND METHODS

The present work is a narrative structured review based on Ayurvedic and contemporary scientific literature. Information regarding Haridra was reviewed from classical Ayurvedic literature, particularly Charaka Samhita, Bhavaprakasha Nighantu and relevant Dravyaguna literature. Contemporary information was collected from peer-reviewed reviews, clinical trials and systematic reviews available through biomedical literature sources, with emphasis on *Curcuma longa*, curcumin, inflammation, osteoarthritis, rheumatoid arthritis and inflammatory bowel disease. The collected information was organized under Ayurvedic pharmacology, probable Samprapti Vighatana, phytochemistry, mechanisms of action and therapeutic evidence to establish an integrative interpretation of the drug [4].

DRUG REVIEW

HARIDRA

Haridra is one of the commonly used medicinal substances in Ayurvedic practice and is obtained principally from the rhizome of *Curcuma longa* Linn., family Zingiberaceae. The yellow-colored rhizome is used both medicinally and as a dietary spice. Classical Ayurveda employs Haridra internally as well as externally, indicating its broad therapeutic applicability. It is particularly

associated with disorders involving Kapha, Kleda, Ama, Krimi, Shotha and abnormalities of the skin and metabolic system. The traditional therapeutic spectrum therefore extends considerably beyond its contemporary popular recognition as an anti-inflammatory spice [5].

Taxonomical Classification

Taxonomical Rank	Classification
Kingdom	Plantae
Phylum	Tracheophyta
Class	Liliopsida / Monocotyledons
Order	Zingiberales
Family	Zingiberaceae
Genus	<i>Curcuma</i>
Species	<i>Curcuma longa</i> L.
Common name	Turmeric
Ayurvedic name	<i>Haridra</i>

Vernacular Names

Language	Vernacular Name
Sanskrit	<i>Haridra</i>
English	Turmeric
Hindi	Haldi
Bengali	Halud
Assamese	Halodhi
Gujarati	Haldar
Marathi	Halad
Kannada	Arisina / Arishina
Malayalam	Manjal
Tamil	Manjal
Telugu	Haridra / Pasupu
Odia	Haladi
Urdu	Haldi
Nepali	Haldi

Synonyms of Haridra

S. No.	Synonym
1	<i>Haridra</i>
2	<i>Nisha</i>
3	<i>Nisi</i>

S. No.	Synonym
4	<i>Rajani</i>
5	<i>Ratri</i>
6	<i>Pita</i>
7	<i>Kanchani</i>
8	<i>Dosa</i>

Geographical Distribution

Curcuma longa is essentially a cultivated tropical plant and is not generally encountered as a truly wild species. Kew considers it a cultigen associated particularly with southwestern India, although its exact centre of origin is uncertain and has also been linked with South or Southeast Asia. It is extensively cultivated throughout India and other tropical Asian countries, including Bangladesh, China, Thailand, Cambodia, Malaysia, Indonesia and the Philippines. In India it is widely grown as an agricultural and medicinal crop in tropical and subtropical regions. Propagation is mainly vegetative through pieces of rhizome because cultivated turmeric is largely sterile.

Morphological Characters

Habit

Haridra is an erect, rhizomatous, perennial herb that generally grows up to approximately 1 metre in height. The aerial portion develops from an underground rhizome, which is the economically and medicinally important part of the plant. The leafy shoot forms a pseudostem because the leaf sheaths overlap around one another.

Rhizome

The rhizome is thick, fleshy, aromatic and highly branched. The primary rhizome is usually ovate or pear-shaped, while secondary rhizomes are elongated or finger-like. Freshly cut rhizomes show a deep yellow to orange-yellow internal surface due mainly to curcuminoid pigments. The rhizomes bear scars of roots, lateral branches and old leaf bases.

Roots

Numerous adventitious roots arise from the underground rhizome. Some roots may become swollen toward their ends. The root system supports vegetative growth and absorption, while propagation of cultivated turmeric is primarily through rhizome portions.

Leaves

Leaves are large, simple and oblong to lanceolate. They arise in tufts from the rhizome and possess long petioles with sheathing bases. The upper surface is generally dark green, whereas the lower surface is comparatively lighter. A leafy shoot may possess several large leaves arranged around the pseudostem.

Inflorescence and Flowers

The inflorescence is spike-like and arises on a separate stalk. Bracts are arranged compactly and enclose the flowers. The flowers are usually pale yellow to yellowish-white. Cultivated *Curcuma longa* is largely sterile and normally propagated vegetatively rather than by viable seed.

Ayurvedic Pharmacodynamic Properties

The principal Rasa of Haridra is described as Tikta and Katu, while its predominant Guna are Laghu and Ruksha. It possesses Ushna Virya and undergoes Katu Vipaka. On the basis of these characteristics, Haridra primarily pacifies aggravated Kapha and Vata. Tikta Rasa contributes to Kleda Shoshana, purification and reduction of excessive moist or metabolic components, whereas Katu Rasa supports Deepana, Pachana and Srotoshodhana. Its Ushna Virya assists in correcting metabolic sluggishness and reducing Kapha-dominant obstruction [6].

Ayurvedic Parameter	Property of Haridra
Rasa	<i>Tikta, Katu</i>
Guna	<i>Laghu, Ruksha</i>
Virya	<i>Ushna</i>
Vipaka	<i>Katu</i>
Dosha Karma	<i>Kapha-Vata Shamaka</i>
Important actions	<i>Shothahara, Kushthaghna, Krimighna, Vishaghna, Kandughna</i>
Major therapeutic relevance	<i>Shotha, Kushtha, Prameha, Kandu, Vrana, Krimi</i>

Chemical Composition

Chemical Group	Important Constituents
Curcuminoids	Curcumin, demethoxycurcumin, bisdemethoxycurcumin
Volatile oil	ar-Turmerone, alpha-turmerone, beta-turmerone
Sesquiterpenes	Zingiberene, ar-curcumene, beta-sesquiphellandrene
Other volatile constituents	Curione and related terpenoids
Carbohydrates	Starch and other carbohydrates
Resinous matter	Oleoresin and resinous constituents
Lipid components	Fatty matter and related lipids
Other constituents	Proteins, sugars and mineral constituents

Shothahara Action of Haridra

Shotha broadly represents swelling or inflammatory manifestation and may arise through disturbances involving Vata, Pitta, Kapha, Rakta, Ama and obstruction of Srotas. The Shothahara action of Haridra can be interpreted through the combined influence of its Tikta-Katu Rasa, Laghu-Ruksha Guna and Ushna Virya. These properties oppose excessive Kapha, reduce Kleda, facilitate movement through obstructed Srotas and support the digestion of metabolically undesirable material. Thus, rather than acting only on visible swelling, Haridra may influence several components involved in the Ayurvedic pathogenesis of inflammatory conditions [7].

Role in Agni, Ama and Srotas

The Ayurvedic interpretation of chronic inflammatory disease frequently involves impaired Agni, formation of Ama and subsequent Srotorodha. When Ama combines with aggravated Dosha and circulates through susceptible channels, it can localize in specific tissues and produce pain, swelling, heaviness and functional impairment. The Katu and Tikta characteristics of Haridra, supported by Ushna Virya, provide a conceptual basis for Ama Pachana, reduction of Kapha-Kleda and restoration of channel patency. This may be particularly relevant in inflammatory disorders exhibiting Ama, stiffness, heaviness and swelling [8].

Action on Rakta and Skin

Haridra has a prominent place in Ayurvedic management of Kushtha, Kandu, Vrana and other skin-related disorders. Its classical applications suggest an influence on Rakta, Kleda and pathological changes involving the skin. The combination of Tikta Rasa and Ruksha Guna assists in reducing excessive Kleda, while its traditional Kushthaghna, Kandughna and Vishaghna applications provide a rationale for its extensive use in inflammatory and pruritic skin conditions. Both internal administration and external application have consequently remained important components of its traditional usage [9].

MODERN PHARMACOLOGICAL REVIEW

Phytochemical Constituents

The pharmacological activity of *Curcuma longa* is attributed to a complex phytochemical profile. Curcuminoids constitute the major nonvolatile bioactive fraction and include curcumin, demethoxycurcumin and bisdemethoxycurcumin. Curcumin is the most extensively investigated component and is responsible for much of turmeric's characteristic yellow pigmentation. Turmeric also contains volatile constituents such as turmerones in addition to carbohydrates, proteins and other minor compounds. The pharmacological effects of the whole rhizome therefore cannot necessarily be considered identical to those of isolated curcumin [10].

Molecular Basis of Anti-inflammatory Activity

Curcumin exerts anti-inflammatory activity through modulation of several signaling pathways rather than through a single molecular target. Important mechanisms include suppression of nuclear factor-kappa B (NF- κ B) signaling, modulation of cyclooxygenase-2 and lipoxygenase pathways and reduction of pro-inflammatory mediators. Curcumin has also been reported to influence cytokines such as tumor necrosis factor- α and interleukins involved in sustaining inflammatory responses. This multi-target behavior provides a plausible contemporary pharmacological explanation for the traditionally broad therapeutic application of Haridra [11].

Antioxidant-Inflammatory Relationship

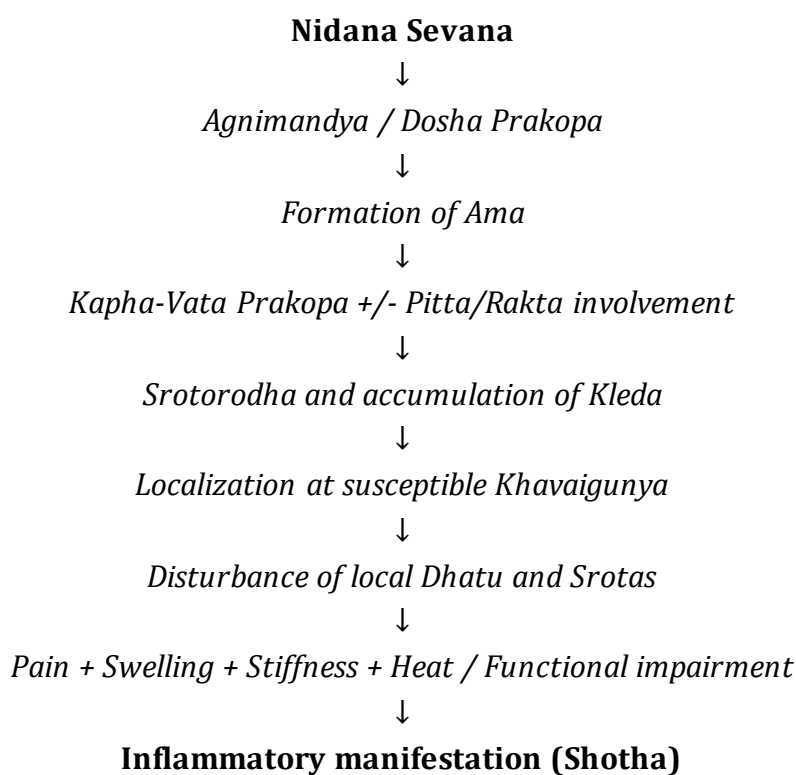
Oxidative stress and inflammation are closely interconnected processes because reactive oxygen species can activate inflammatory signaling pathways, while persistent inflammation itself promotes further oxidative damage. Curcumin demonstrates antioxidant activity through direct and indirect mechanisms, including modulation of endogenous antioxidant defenses. By reducing oxidative stress alongside inflammatory signaling, curcumin may interrupt the self-perpetuating interaction between cellular oxidative injury and chronic inflammation. This dual

antioxidant and anti-inflammatory activity is important when considering its potential role in long-standing inflammatory diseases [12].

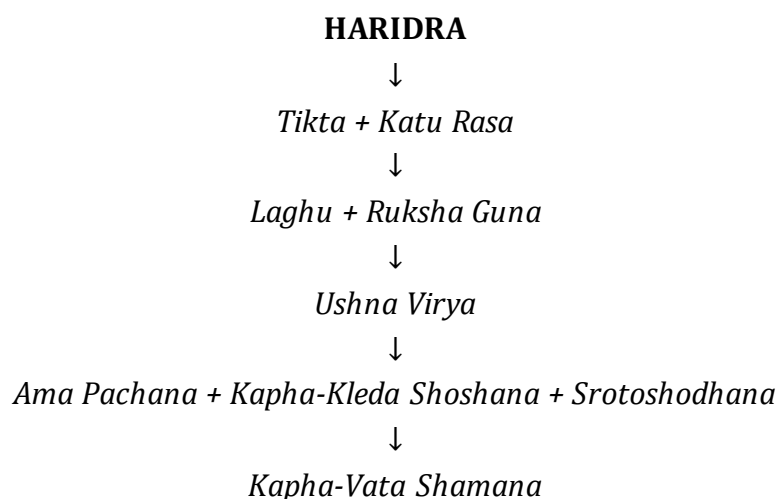
Therapeutic Potential in Musculoskeletal Inflammation

Among the clinical applications of turmeric, osteoarthritis has received substantial research attention. A systematic review and meta-analysis of randomized controlled trials involving 783 participants reported that *Curcuma longa* extracts produced significantly greater improvements in pain and physical function than placebo in patients with knee osteoarthritis. Although differences in formulations, curcuminoid concentrations, treatment duration and outcome assessment restrict direct comparison between trials, the overall findings support a potentially useful symptomatic role for standardized turmeric preparations in inflammatory and degenerative joint conditions [13].

PROBABLE SAMPRAPTI OF INFLAMMATORY SHOTHA



PROBABLE SAMPRAPTI VIGHATANA BY HARIDRA





Reduction of Shotha



Relief in pain, swelling and functional impairment

RESULTS AND FINDINGS

- Haridra possesses Tikta-Katu Rasa, Laghu-Ruksha Guna, Ushna Virya and Katu Vipaka.
- Its pharmacological profile predominantly supports Kapha-Vata Shamana, reduction of Kleda and restoration of physiological movement through Srotas.
- Shothahara is an important traditional therapeutic action relevant to its contemporary investigation as an anti-inflammatory agent.
- The major bioactive constituents include curcuminoids, particularly curcumin, along with demethoxycurcumin and bisdemethoxycurcumin.
- Curcumin acts on multiple inflammatory signaling mechanisms rather than functioning as a single-target compound.
- Important reported mechanisms include modulation of NF- κ B, COX-2, lipoxygenase and pro-inflammatory cytokine signaling.
- Antioxidant effects may complement the direct anti-inflammatory activity by reducing oxidative stress associated with chronic inflammation.
- Clinical evidence is particularly encouraging in musculoskeletal inflammatory conditions such as knee osteoarthritis.
- A randomized placebo-controlled study of a *Curcuma longa* extract in painful knee osteoarthritis reported significant improvements in pain and functional measures compared with placebo [14].
- A randomized pilot study in active rheumatoid arthritis also reported encouraging clinical improvement with curcumin; however, the small sample size means that larger confirmatory studies are necessary.
- Clinical research in ulcerative colitis suggests that curcumin may have potential as an adjunct to conventional therapy, particularly in maintaining disease control.
- The major translational limitation is curcumin's relatively poor oral bioavailability, associated with factors including poor absorption and rapid metabolism.
- Differences in extraction methods, curcuminoid concentrations, formulations and bioavailability-enhancing technologies make direct comparison between clinical studies difficult.
- Overall, Ayurvedic and modern findings converge on the potential of Haridra as a multi-target medicinal substance relevant to inflammatory disorders, although therapeutic claims should remain specific to the preparation and clinical evidence available.

DISCUSSION

The Ayurvedic pharmacological profile of Haridra provides a coherent conceptual basis for its application in inflammatory disorders. Shotha is not viewed merely as localized swelling but as a manifestation arising from interactions among aggravated Dosha, disturbed Agni, Ama, Kleda, Srotorodha and susceptible Dhatu. The Tikta-Katu Rasa, Laghu-Ruksha Guna and Ushna Virya of Haridra may counter several of these components through Kapha-Vata Shamana, reduction of Kleda and restoration of physiological channel function. Contemporary clinical findings provide partial support for this traditional application; a randomized pilot trial in patients with active rheumatoid arthritis demonstrated encouraging improvement following curcumin administration, although the limited sample size prevents definitive conclusions [15].

Modern pharmacology further supports the concept of Haridra as a multi-target anti-inflammatory substance. Curcumin influences NF- κ B-mediated signaling, inflammatory enzymes, cytokines and oxidative pathways rather than acting exclusively at one site. Such pleiotropic pharmacological behavior is particularly relevant in chronic inflammatory diseases, where numerous interacting molecular mechanisms maintain pathological inflammation. Clinical evidence extends beyond musculoskeletal disorders: a randomized multicenter placebo-controlled trial found curcumin beneficial as an adjunctive maintenance intervention in ulcerative colitis, supporting the possibility that its anti-inflammatory actions may have therapeutic relevance across different organ systems [16].

Despite promising findings, important limitations must be recognized before translating experimental evidence into routine clinical recommendations. Curcumin has inherently limited systemic bioavailability, and clinical studies have employed widely differing extracts, doses, delivery systems and treatment durations. Consequently, findings obtained with a standardized or bioavailability-enhanced curcumin formulation should not automatically be generalized to ordinary turmeric powder or every Haridra preparation. Current evidence therefore supports Haridra as a promising anti-inflammatory medicinal plant, but future research should integrate Ayurvedic principles of patient and disease assessment with standardized botanical identification, chemically characterized formulations, pharmacokinetic evaluation, adequate sample sizes and clinically meaningful outcome measures.

CONCLUSION

Haridra (*Curcuma longa*) is an important Ayurvedic medicinal plant with substantial traditional and contemporary evidence supporting its anti-inflammatory potential. Its Tikta-Katu Rasa, Laghu-Ruksha Guna, Ushna Virya, Katu Vipaka and Kapha-Vata Shamaka properties provide an Ayurvedic basis for Shothahara, Kleda Shoshana and Srotoshodhana actions. Contemporary research demonstrates that curcumin and related constituents can modulate NF- κ B signaling, inflammatory enzymes, cytokines and oxidative pathways. Clinical evidence is particularly promising in osteoarthritis and suggests potential benefits in other inflammatory conditions. Nevertheless, variability in formulations and the limited oral bioavailability of curcumin remain major challenges. Well-designed clinical studies employing standardized Haridra preparations and clearly defined therapeutic outcomes are required to strengthen the integration of traditional Ayurvedic knowledge with evidence-based clinical practice.

CONFLICT OF INTEREST - Nil.

SOURCE OF SUPPORT - None.

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