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HARIDRA: EXTRACTION AND PROPERTIES

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ABSTRACT

Haridra, Curcuma longa, is a part of livelihood since ancient time. Its description as a highly potential medicine is available in *vedas* as well as oldest ayurvedic *samhitas*. Acharyas has described different properties of *haridra* like *kaphvatshamak, vishaghna, kusthaghna, vran ropak, vranya* etc. In present era many experiments are performed to evaluate its efficacy (anti-microbial, anti-fungal, anti-oxidant-etc) and different methods are employed for extraction of active components. This article overviews properties possessed by *haridra* as per Ayurveda, its different extraction techniques and in vivo studies performed to evaluate different properties of *haridra*.

KEYWORDS: *Haridra, extraction techniques, anti-microbial, vishghna.*

INTRODUCTION

Haridra is a perennial herb and member of *zingiberaceae* family. It is cultivated throughout the Asian countries. Also called as *Rajani, Nisa, Nisi, Ratri, Kasanada*[1] etc. The main objective of *ayurveda* is to sustain the health of a healthy individual and to cure ailment of a diseased individual. *Haridra* fulfil both these objectives. Aacharya *Charaka* has mentioned *haridra* under *lekhniya mahakashaya, vishghna mahakashaya, kusthangna mahakashaya.*[2] It is a known *kaphavatshamak*. It possesses given properties as per Ayurveda such as[3]:

kushthaghna	*Shothahar*
Pramehahar	*Apachihar*
Krimighna	*Kamala*
Raktadoshanashak	*Medhya*
lekhana	*Vranaropan*
Panduhar	*Pinasahar*
Aruchihar	*Twakdoshahar*
Varnya	*Balya*
Kandughna	*Vishaghna*

***Ras panchak*[3]**

Ras	*Tikta, Katu*
Gun	*Ruksha*
Virya	*Ushna*
Vipak	*Katu*
karma	*Kaphapittanut, Vishaghna, Varnya, Kusthaghna, Krimighna, Pramehanaska*

Properties as per various *Nighantus*[4]

Sr. No	*Nighantu*	Properties
1	*Dhanvantari Nighantu*	*Vishaghna, Kushthaghna, Kandughna, Pramehahar, Vrana, Varnya, Balya, Krimighna, Pinasahar, Aruchihar*
2	*Bhavaprakash Nighantu*	*Kaphanashan, Pittanashan, Varnya, Twakdoshahar, Pramehanashan, Raktadoshanashak, Shothahar, Panduhar, Vranaropan*
3	*Madanpala Nighantu*	*Kaphanashan, Pittanashan, Varnya, Twakdoshahar, Pramehanashan, Ra ktadoshanashak, Shothahar, Panduhar, Vranaropan*
4	*Raj Nighantu*	*Kaphanashan, Pittanashan, Varnya, Twakdoshahar, Pramehanashan, Raktadoshanashak, Shothahar, Panduhar, Vranaropan Vishaghna, Kushthaghna, Kandughna, Pramehahar, Vrana, Varnya, Balya, Krimighna, Pinasahar, Aruchihar*

According to present time studies, *haridra* constitutes anticancer activity, anti-inflammatory activity, antihepatotoxic activity, anti-oxidant activity, antidepressant activity, inhibition of aggregation of human blood platelets, antifungal activity and mosquitocidal activity, neuroprotective activity, hypoglycaemic activity, hypolipidemic activity, wound healing activity, anti-allergic and anti-histamine activity and complexion promoting activity.[5] *Ayurveda* insists use of *haridra kand* (rhizome) as whole indifferent forms such as *churna* (powder), *kwatha* (decocction), oil etc and each kind is beneficial in different diseases. Now a days, plant extracts are used and different bioactive components extracted are evaluated for their potencies. Many researches have been conducted till now to know which component is more potent and many more are still to be done. Different Extractions techniques are used to detect diversity of components present in the plants.

EXTRACTON TECHNIQUES[6]

Extraction involves the separation of medicinally active portions of plant or animal tissues from the inactive or inert components by using selective solvents in standard extraction procedures. The products so obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use. Here are different extraction techniques like:

Plant tissue homogenization: Dried or wet, fresh plant parts are grinded in a blender to fine particles, put in a certain quantity of solvent and shaken vigorously for 5 - 10 min or left for 24 h after which the extract is filtered.

Serial exhaustive extraction: It involves successive extraction with solvents of increasing polarity from a nonpolar (hexane) to a more polar solvent (methanol) to ensure that a wide polarity range of compound could be extracted.

Soxhlet extraction: Soxhlet extraction is only required when the chosen compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent. The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled.

Maceration: In maceration (for fluid extract), whole or coarsely powdered plant drug is kept in contact with the solvent in a corked container for a defined period with frequent agitation until soluble matter is dissolved. This method is best fit for use in case of the thermolabile drugs.

Decoction: This method is used for the extraction of the water soluble and heat stable constituents from crude drug by boiling it in water for 15 minutes, cooling, straining and passing sufficient cold water through the drug to produce the required volume.

Infusion: It is a dilute solution of the readily soluble components of the crude drugs. Fresh infusions are prepared by macerating the solids for a short period of time with either cold or boiling water.

Digestion: This is a kind of maceration in which gentle heat is applied during the maceration extraction process. It is used when moderately elevated temperature is not objectionable and the solvent efficiency of the men strum is increased thereby.

Percolation: This is the procedure used most frequently to extract active ingredients in the preparation of tinctures and fluid extracts.

Various studies have been conducted through extraction of curcumin, bioactive compounds of *haridra* with different extraction methods. In a study, result showed that the curcumin extraction yield using Soxhlet method (6.9%) was noticeably higher than those obtained from microwave-assisted (3.72%), ultrasound-assisted (3.92%) and enzyme-assisted (4.1%) extractions[7], which clearly indicates Soxhlet extraction as one of the finest technique.

SOLVENTS FOR EXTRACTION[6]

Different solvents are used for extraction of bio-components present in plant. The choice of solvent depends upon requirement of bio-components like phenolic contents, fatty acids, polyphenolic contents etc. Properties of a good solvent consist of low toxicity, easily evaporate at low heat, preservative action, inability to cause the extract to complex or dissociate. The end product contains traces of residual solvent; therefore, solvent should be nontoxic and should not interfere with the bioassay .Various solvents that are used in the extraction procedures are:

Water: Water is universal solvent. Water soluble phenolics are important as anti-microbial and antioxidant compound.

Acetone: Acetone dissolves many hydrophilic and lipophilic components from the two plants used, is miscible with water, is volatile and has a low toxicity to the bioassay used. It is a very useful extractant, especially for antimicrobial studies where more phenolic compounds are required to be extracted.

Alcohol: Alcohol has higher amounts of polyphenols as compared to aqueous extracts. They are more efficient in cell walls and seeds degradation, which have unipolar character and cause polyphenols to be released from cells.

Chloroform: Tannins and terpenoids can be extracted with use of hexane and chloroform.

Ether: Ether is commonly used selectively for the extraction of coumarons and fatty acids.

STUDIES CONDUCTED

Ayurveda suggests many formulations of *haridra* for wide range of diseases. Haridra as single drug is also indicated. Many studies on curcumin (main constituent in *haridra*) have been conducted, so far, like antioxidant study, anti-inflammatory study, antiviral study, and antifungal study to evaluate these properties of curcuminoids. Studies on the toxicity and anti-inflammatory properties of curcumin have included in vitro, animal, and human studies. These studies well explain use of *haridra* in many contexts, when we are facing multidrug resistant bacteria.

ANTIBACTERIAL STUDY

- Among various studies, an antibacterial study on aqueous extract of C. longa rhizome prove its properties as the MIC (minimum inhibitory concentration) value of 4 to 16g/L and MBC (minimum bactericidal concentration) value of 16 to 32g/L against S. epidermis ATCC 12228, Staph. aureus ATCC 25923, Klebsiella pneumoniae ATCC 10031, and E. coli ATCC 25922.[8]
- The methanolic extract of turmeric shows MIC values of 16μg/mL and 128μg/mL against Bacillus subtilis and Staph. aureus, respectively.[9]
- Turmeric oil, found to be effective against B. subtilis, B. coagulans, B. cereus, Staph. aureus, E. coli, and P. aeruginosa.[10]
- Curcumin also hold inhibitory activity on methicillin-resistant Staph. aureus strains (MRSA) with MICvalueof125–250μg/mL.[11]
- In a study, investigation of 3new compounds of curcumin, namely, *indiumcurcumin*, *indium diacetyl curcumin*, and *diacetyl curcumin*, against Staph. aureus, S.epidermis, E.coli, and P.aeruginosa revealed that Indium curcumin had a better antibacterial effect compared to curcumin itself and it may be a good compound for further studies.[12]

ANTIVIRAL STUDY

- In vitro study of curcumin and its derivatives, namely, gallium-curcumin and Cu-curcumin, showed notable antiviral activity against herpes simplex virus type 1 (HSV-1) in cell culture by means of IC50 values of 33.0microg/mL, 13.9microg/mL, and 23.1microg/mL, respectively. The 50% cytotoxic concentration (CC50) of the respective compounds on Vero cell line showed to be 484.2μg/mL, 255.8μg/mL, and 326.6μg/mL, respectively.[13]
- Curcumin exhibited the anti-influenza activity against influenzaviruses PR8, H1N1, and H6N1. The results showed more than 90% decrease in virus yield in cell culture using 30μM of curcumin.[14]
- Curcumin showed the inhibitory activity against the expression of E6 and E7 genes of HPV- 16 and HPV-18, two main highly oncogenic human papilloma viruses.[15]

ANTIFUNGAL STUDY

- The study of addition the turmeric powder in plant tissue culture showed that turmeric at the 0.8 and 1.0g/L had appreciable inhibitory activity against fungal contaminations.[16]
- Methanol extract of turmeric demonstrated antifungal activity against Cryptococcus neoformans and Candida albicans with MIC values of 128 and 256μg/mL,respectively.[9]
- Hexane extract of C. longa at 1000mg/L demonstrated antifungal activity against Rhizoctonia solani, Phytophthora infestans, and Erysiphe graminis.[17]
- It was also observed that 1000mg/L of ethyl acetate extract of C. longa exhibitedinhibitory effect against R. solani, P. infestans, Puccinia recondite, and Botrytiscinerea.
- Curcuminat a dosage of 500mg/Lalso disclosed antifungal activity against R. solani, Pu. recondita, and P. infestans.[17]
- Candida species isolated from buccal epithelial cells of AIDS patients is also markedly inhibited by curcumin and it was found to be more effective comparedtofluconazole.[18]

CONCLUSION

Haridra is a well-established medicinal drug used since ancient times. Ayurveda recognized it a long ago and is widely accepted. Recent studies suggest new versions for its use and selective components to be used. Either way we use, *haridra* entirely beneficial for mankind. A standardize extraction technique should be established for better results and which can be followed worldwide. More human trials will be helpful for justifying the studies conducted.

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