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Pharmacological and phytochemical study of *Haridra* in Maharashtra state with special reference to *Desh Vichar*

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ABSTRACT

Haridra (*Curcuma Longa* Linn.) has been well documented in Ayurvedic Pharmacopoeias which includes *Samhita* (treatise), *Nighantus* (lexicons), *Chikitsagrantha* (compendia of Ayurveda). It provides a collective information regarding *Haridra*, its morphological characters, properties and actions, from *Nighantu*, *Samhita,* analysis of *Haridra* rhizome as per *Desh Vichar* (different geographical conditions). It reveals *Haridra* actions on *Sthaulya* (obesity). The article reveals its synonyms, botanical description, pharmacognosy and its different pharmacotherapeutic actions. Indication in various diseases as per *Samhitas* and *Nighantu*. Importance of different geographical conditions remains untouched, so an attempt was made for analysis of rhizome from three different regions of Maharashtra and to notice the changes in its percentage of composition.

Key words: *Haridra, Curcuma longa Linn., Desh Vichar, Phyto-Constituents, Pharmacognosy, Maharashtra.*

INTRODUCTION

Haridra has been recorded in the texts like *Vedas* (6000BC), *Samhita* (1500BC - 600AD) and *Sangrah Grantha* (800AD – 1900AD). Recently drug or formulations of herbal origin has gained great importance. Among these *Dravya, Harida* has been used as a spice and also for curative purpose since ages. It is India's most ancient and traditional export commodities. It is known as king of spice and since it belongs to India its known as Indian saffron.

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After lots of observation it was found that geographical variations and climate of the place of origin of the drug is the major factor in influencing the potency of drug, the reference of *Desh* (region) are present since the *Vedic Kaal* in the form of *Aarya-Aanarya Desh*.

Later in *Samhita* as per *Charak Samhita Viman Sthan* as *Trividha Desh : Jangam Desh, Anup Desh* and *Sadharan Desh*. Among the drugs of herbal origin plants like *Haridra* are used as spices and also for curative purpose. *Haridra* in particular, has gained global attention for its properties like anti-mutagenic, hypocholesterlemic, anti-diabetic, choleretic, expectorant and many more.[1] One of its property like anti-obesity has been focused here. In pathophysiology of *Sthaulya* (obesity) *Kapha* and *Vaat Dosh* is involved and *Medodushti* is seen dominantly.

So, the treatment must be *Kaphahar Vaathara* and *Lekhan Karma* is expected. On that account, *Haridra* is mentioned having *Lekhan* properties and *Kaphahar* and *Vaathar Guna Dharma.*

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Haridra is botanically identified as *Curcuma longa* Linn.,

Taxonomical classification[2]

- Kingdom - Plantae
- Division - Angiospermae
- Order - Zingiberale
- Family - Scitaminae
- Subfamily - Zingiberoidae
- Tribe - Zingibereae
- Scientific name - *Curcuma longa*
- Genus - Curcuma
- Species - Longa

Botanical description[3]

Latin name	*Curcuma longa* Linn.
Family	Zingiberaceae
Vernacular names	*Sanskrit - Rajni, Gauri, Haridra, Hattavilasini, Nisha* Hindi - Haldi Marathi - Halad English - Indian saffron, turmeric Bengali - Halud Tamil - Manjal Telugu - Pampi, Pasupu
Habitat[4]	Extensively cultivated all over India. In Bombay presidency there are two varieties 1. Oval rhizomes with hard rich colour, chiefly used in dyeing - *Lokhandi Haldi* 2. Softer, larger, lighter coloured long rhizomes which are usually used for eating Plant is a native of South Asia and is cultivated extensively throughout warmer parts of the world, including India. *Haridra* is a tropical returning plant, native to India and is cultivated throughout the tropics around the world.
Botanical description	It is a rhizomatous herbaceous perennial plant belonging to the family zingiberaceae. Individual plant grows to a height of 1m and have long oblong leaves. Rhizome having aromatic, deep orange yellow color rhizome, root fibers with tubers. Leaves are elliptic - oblong, caudate - acuminate. Inflorescence is central to the leaf-tuft and appearing with the leaves, flower few to a bract, yellow, not exserted. Plants are gathered annually for their rhizomes and are reseeded from some of those rhizomes in the following seasons. The rhizome from which the turmeric is derived is tuberous with a rough and segmented skin. The rhizome matures beneath the foliage in the ground
Parts used	Tubers and rhizomes

Rasa-Panchaka (as per *Bhavprakash* and *Raj Nighantu*)[5]

Dravya - *Haridra*

Guna - *Laghu, ruksha*

Rasa - *Katu, Tikta*

Virya - *Ushna*

Vipaka - *Katu*

Doshagnata - *Kapha Pithagna (Bhavprakash Nighantu), Kapha Vatahara* (Raja Nighantu).

Varieties of *Haridra*

Around 133 species of curcuma have been identified worldwide.

There are more than fifty types of *Haridra*.

Haridra mentioned in *Nighantu* and *Samhitas*

- *Haridra - Curcuma longa* linn.
- *Daru Haridra - Berberis aristata*
- *Amragandhi Haridra - Curcuma amada*
- *Vana Haridra - Curcuma aromaticum* Salisb
- *Krushna Haridra - Curcuma caesia* Roxb.
- *Shweta Haridra - Curcuma zedoaria* Rosc.

Paryaya - *Haridra, Harita, Haladi, Haladika, Kanda, Peetha, Peethika, Pinga, Ranjani, Ranghini, Swaran Varus, Varna Vathi, Vara Vasmini, Varna,*

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Hatavilasini, Yoshitpriya, Krumighani, Vishaghani, Nisha, Pinda, Nirvisha, Nishakhya, Jayanti, Gauri, Sumangalya, Yuvathi, Vara, Bhadra Latha, Pinda Bhadra, Sundari , Rajani, Vaisya, Syama, Ratri, Pingal, Varnada, Mangalya, Mangal, Laxmi, Shobhana.

A glance at some of the major varieties of turmeric grown in India[6]

Varieties of Indian Turmeric	State
Allepey	Kerala
Erode, Salem, Roma, Suguna	Tamilnadu
Rajapore, Sangli	Maharashtra
Nizamabad Bulb	Telangana
Duggirala, Suguna (Prabha)[16]	Andhrapradesh
Lakadong	Meghalaya

Concept of *Desh Vichar*

In *Vachaspati*, the word *Desh* is defined as that which indicates or directs the particular substance mainly an area or geographical place.

- As per *Sushurut Samhita Sutrasthan* 3 types of *Desh* are mentioned - *Anup, Jangam and Sadharan*[7]
- As per *Sushrut Samhita Sutrasthan, Bhumipravibhagiya Adhyay* the quality of *Dravya* depends on the quality of soil.
  - As per *Charak Kalpasthan* 3 types of *Desha* are mentioned - *Jangama, Sadhanarana, Anup.*[8]
  - *Bhavprakash Purvakhand* :3 types of *Desh* have been mentioned *Jangam, Anup* and *Sadharan*
  - *Raj Nighantu* has also mentioned *Desh* as *Sadharan, Jangam, Anup Desh (Pradhan Anup Desh, Madhyam Anup Desh, Kaniya Anup Desh)* in *Anupadi Varga*.

Materials and Methods

Botanically identified *Haridra* (*Curcuma longa* Linn.) belonging to Scitaminae family was procured from three regions of Maharashtra.

- Western Maharashtra: Sangali
- Vidarbha: Wardha
- Marathwada: Beed

Identified by Department of *Dravya Guna,* Smt. KGMP Ayurvedic Mahavidyalya, Charni Road, Mumbai, India.

Authenticated and Standardised by Alarsin Pharmaceuticals, Andheri, Mumbai, India.

Sample of Sangali

Sample of Beed

Sample of Wardha

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Analytical report of sample of *Haridra* of Sangali

Test	Specifications	Result
Appearance	Fresh rhizomes	Fresh rhizome
Colour	Yellow	Yellow
Odour	Characteristic	Characteristic
Taste	Characteristic	Characteristic
Moisture content NMT	80%	78.3%
Total Ash NMT	9%	8%
Acid insoluble ash NMT	1%	0.85%
Alcoholic soluble extractive NLT	8%	8.08%
Water soluble extractive NLT	12%	16.10%
Volatile oil NLT	4%	4%
NMT : Not more than, NLT : Not less than		

Analytical report of sample of *Haridra* of Wardha

Test	Specifications	Result
Appearance	Fresh rhizomes	Fresh rhizomes
Colour	Yellow	Yellow
Odour	Characteristic	Pleasant characteristics
Taste	Characteristic	Characteristics
Moisture content NMT	80%	79.7%
Total Ash NMT	9%	7.00%
Acid insoluble ash NMT	1%	0.76%
Alcoholic soluble extractive NLT	8%	8.12%
Water soluble extractive NLT	12%	18.21%
Volatile oil NLT	4%	4%
NMT : Not more than, NLT : Not less than		

Analytical report of sample of *Haridra* of Beed

Test	Specifications	Result
Appearance	Fresh rhizomes	Fresh rhizomes
Colour	Yellow	Yellow
Odour	Characteristic	Characteristic
Taste	Characteristic	Characteristic
Moisture content NMT	80%	76.2%
Total Ash NMT	9%	6.87%
Acid insoluble ash NMT	1%	0.89%
Alcoholic soluble extractive NLT	8%	8.02%
Water soluble extractive NLT	12%	17.26%
Volatile oil NLT	4%	4%
NMT : Not more than, NLT : Not less than		

Chemical composition[9]

- By far the most researched constituents in turmeric are the 3 alkaloidal curcumins which belong to the group – curcumin, demethoxy-curcumin and bisdemethoxycurcumin. These are the gold substances in turmeric.
- Root extract contains curcuminoids and bisabolene types sesquiterpines such as turmerone, curcumene, zingiberene.
- The root is 70% carbohydrate, 7% protein, 4% minerals and 4 to 14% essentials oils which is mostly turmerone, zingiberone.

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- Curcuminoids are polyphenols and are crystallized from turmeric oleo-resins. They appear as free flowing yellow orange powder. Of the 3 to 5% curcuminoids in turmeric typically 85% is curcumin, 10% demethoxycurcumin and 5% is bisdemethoxy-curcumin.

Not just the curcumins

- Turmerin, a water-soluble antioxidant peptide is found.
- Turmerin forms 0.1% of the dry weight of turmeric and is obtained in a crystalline form.
- Fresh rhizome has at least 9 sesquiterpenoids like beta curcumin, alpha turmerone etc.
- Other molecules like d-camphor, 1-a-curcumene, sabinene, zingerene etc.

Phytochemical variations as per following three regions of Maharashtra

1) Western Maharashtra - Sangali

Geographical climate[10]

The Sangli district comes under deccan plateau geographic region. The maximum temperature in the district reaches upto 42°C whereas minimum temperature is usually around 14°C. Humidity of Sangli district is 30-35.

Climate of Sangli district is hot and dry which helps to improve quality of turmeric.

Appearance in Sangli turmeric rhizomes is having less wrinkles as boiled in water before.

Curcumin content (%) - 3.45% (2.8 to 4.366%) due storage facility for turmeric its curcumin content increase from 3.426 to 5.784 upto 2.5 years.

Curcumin is an active ingredient which has distinctly earthy, slightly bitter, a little hot peppery flavour and a mustardy aroma.

Oil content - 4.5034 curcumin yield (kg ha-l) - 228.053s. Ranges from 4 % to 5%.

Sugar content - Sangli turmeric possesses higher sugar contents.

2) Vidarbha - Nagpur

Geographical climate

The black soil of Vidarbha is suitable for turmeric cultivation. Additionally, 10 feet deep black soil available layer helps in water retention in soil. Black soil from Vidarbha is alkaline in nature having Ph more than 8.6 and it contains high organic carbon.[11]

Appearance and curcumin%

The specific characteristics of Vidarbha haldi are pungent odour, dark mustard yellow colour, concentric rings on wet stem, Curcumin oil is above 6 percent and when crushed manually it is about 8 percent. It has higher Curcumin oil content.

The standard curcumin content in turmeric is 2 to 4% by weight, anything over 6% is considered good. Spices board of India found that Vidarbha turmeric's curcumin content is 6.24% by weight.

3) Marathwada - Beed

Geographical climate

The medium black soil covers about 64.75 percent portion of the Marathwada region. The coarse and shallow soil covers about 22.26 percent portion of the Marathwada region. Ph value is 7.4 to 8.4%, organic carbon present in soil range from 0.34%.[12]

Curcumin and essential oil content

Curcumin percentage is 4.5 to 5% and essential oil content is 4 to 5% as per spice board of India and analytic report.

Pharmacotherapeutic actions of *Haridra* on Obesity

Anti-obesity

Lipid metabolisms demonstrate that the inhibition of adipogenesis can prevent obesity and that the activation of lipolysis can cure obesity.

Accordingly, there is increasing evidence that some natural plants can induce the inhibition of adipogenesis and lipogenesis or the activation of lipolysis. One such plant is the root of *Curcuma longa*,

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which is widely cultivated mainly in tropical regions of Asia and Africa.[13]

It possesses various biological activities such as anti-obesity, anti-atherosclerosis, anti-diabetes, anti-mutagenesis, anti-cancer, and anti-oxidation effects.

These effects might be related to its well-known biologically active compounds, curcuminoids, which include curcumin, demethoxycurcumin, and bisdemethoxycurcumin.

Even though *C. Longa* l. Has good medicinal efficacy, it has strong flavour and taste, which decrease consumer palatability and limit the industrial applications in food. Consequently, it is necessary to improve its characterization. *C. longa* l. Fermented by *aspergillus oryzae* has various properties including reduced bitterness and harsh taste that increase consumer acceptance. In the current study, we investigated the effects of *C. longa* l. 50% ethanolic extract supplementation in 60% high-fat diet-induced obese rats measured by the activation of adipogenesis and lipolysis.

Curcuma longa decreases cholesterol. It can stimulate the conversion of cholesterol to bile acids, an important way of eliminating cholesterol from the body.[14]

A case study of 1992 in India shows that by intake of 500mg of curcumin cholesterol count dropped by an average of 27%.[14]

Conclusion

The *Ayurvedic* pharmacodynamics of *Haridra* unveils that it poses *Ruksha, Ushna* property and pacifies *Kapha Pitta Doshas* and poses properties like *Lekhan, Varnya, Rujahar*. The drug is indicated in disease like *Prameh, Kustha, Pandu, Vrana*. With its properties like *Ruksha, Ushna, Kaphhar* it can be used in *Sthaulya* for *Lekhan Karma*. Phytochemical variations of *Haridra* as per different regions of Maharashtra. It has several synonyms which indicates its properties, its morphology its pharmacotherapeutic actions etc. It even possesses pharmacotherapeutic properties like anti-mutagenic, choleretic, hypocholesterolemic, anti-obesity. It possesses properties like activation of lipolysis. Analytic report of *Haridra* rhizome of Sangli, Wardha and Beed shows changes in percentage composition. It possesses not only curcuminoids as essential chemical groups but even water extract of turmeric like turmerin in an essential chemical compound for various pharmacotherapeutic actions. This work may steer further scientific researches to explore all the pharmacological properties of *Haridra* delineated in various *Samhitas* and may be referred as a revisit of classical description of *Haridra* and its concurrent utility.

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