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MEDICINAL IMPORTANCE OF TRADITIONAL HERBAL PLANT *HARITAKI* (*TERMINALIA CHEBULA*): AN OVERVIEW

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ABSTRACT

Haritaki (*Terminalia chebula* Retz.) of Combretaceae family is called the 'King of Medicines' in Tibet. This medicinal plant is widely distributed throughout India, Srilanka and Burma, Herbal drugs represent a major allocation of all the recognized systems of health within the world. Also, the medicinal plants are foundas cheap and valuable sources of varied phytoconstituents which are used significantlyin the improvement of drugs against various diseases. *Terminalia chebula* which iscommonly known as black myrobalan or chebulic myrobalan, which is a deciduous tree of Combretaceae family, which has been considered as one among the foremost important medicinal plant in medicines of *Ayurveda*. Numbers of chemical constituents are found to be related to the drug like ellagic acid, tannins, chebulinic acid, gallic acid, flavonoids and punicalagin. *Terminalia chebula* Retz. Possess antioxidant, antibacterial, anti-diabetic, antiviral, antifungal, anti-ulcer, anti-cancerous, anti-mutagenic and wound healing activities. Moreover, *Haritaki* has been used significantly within the preparation of several *Ayurvedic* formulations. This review elucidates on its Phytochemistry, Pharmacognostic characters and various pharmacological effects exhibited by *Terminalia chebula*.

KEYWORDS: *Haritaki*, Phytochemistry, Pharmacognosy, *Terminalia chebula*.

INTRODUCTION

According to WHO 80 % of world population depends on traditional system of medicine involving the use of plant extracts or their active chemical constituents. In the last few decades, the field of herbal medicine is getting more useful in both developed and developing countries.[1]

As the herbal medicines are cheap, and have natural origin with higher safety and less or no side effects. *Terminalia chebula* is a evergreen tree with flowering and belong to family Combretaceae. It has various common names like black myrobalan, chebulic myrobalan, ink tree, or (English), *Harad (Hindi), Haritaki* (*Sanskrit* and *Bengali*), *Harada (Marathi* and *Gujrati)*. It well known as '*Haritaki'* as it carries away all diseases or it is sacred to God *Shiva* (*Hara*). *Haritaki* has several synonyms like '*Pathya'*, since it eliminates obstructions from the pathways and channels in the body; '*Abhaya'*, since it gives fearlessness; '*Amrta'*, means an ambrosia; '*Divya'*, means a divine herb; '*Medhya'*, means a nerve tonic; '*Pranada'*, means lifesaving; '*Jivaniya'*, means a vitalizing herb; '*Vayahstha'*, means which promotes longevity and maintains youth, etc. According to Indian mythology, this plant is believed to be arise from the drops of Ambrosa (*Amrita*), which fell on the earth while Lord *Indra* was drinking it. Furthermore, the plant has been well reported to possess antioxidant, anti-diabetic, antibacterial, antiviral, antifungal, anticancer, antiulcer, anti-mutagenic, wound healing activities.[2,3,4]

Fig 1: *Terminalia chebula* Retz.

Fig 2: Fruits of *Terminalia chebula* plant.

Latin name: *Terminalia chebula* Retz

Family: Combretaceae

Kula: *Haritaki Kula*

Gana: Charaka[5] *- Prajasthapana, Jwaraghna, Kushtaghna, Kasaghna, Arshoghna*

Sushruta[6] *-Triphala, Amalakyadi, Parushakadi*

Vernacular Name.[7]

Languages	Vernacular names
Sanskrit	*Abhaya, Kayastha, Shiva, Pathya, Vijaya*
English	Myrobalan,Chebulic myrobalan
Hindi	*Harre, Harad, Harar*
Assamese	*Shilikha*
Bengali	*Haritaki*
Gujrati	*Hirdo, Himaja, Pulo-harda*
Kannada	*Alalekai*
Kashmiri	*Halela*
Malayalam	*Katukka*
Marathi	*Hirda, Haritaki, Harda, Hireda*
Oriya	*Harida*
Punjabi	*Halela, Harar*
Tamil	*Kadukkai*
Telugu	*Karaka, Karakkaya*
Urdu	*Halela*
China	Zhang-Qin-Ge, Hezi
France	Myrobalan in dien
Germany	Myrobalane

Etymology of synonyms

1. **हरीतकी-हरतिरोगान्इतिहरीतकी।**[8]**(आ.नि.)**

It Destroys All Diseases.

2. **अभया-न भयं अस्याःइति ।**[8]**(आ.नि.)**

Not Fearful Of Any Diseases**.**

3. **अमृता-अमृतवत्फलादायिनी, रसायनत्वेन जराव्याधिप्रतषेधात् ।**[9]**(भा.प्र.)**

Ambrosia, a Divine Herb.

4. **अमोघा-अव्यर्था।**[8]**(आ.नि.)**

Always Beneficial.

5. अव्यथा-नव्यथाअस्याःइति ।नव्यथयतिइतिवा[8](आ.नि.)

It Helps To Cure The Disease Only.

6. चेतकी-चेतयतिअनयास्त्रोतःशुद्धेः।[8](आ.नि.)

It Clears the obstruction of channel and maintains the Sensation intact.

7. जीवन्ती-जीवन्तं पुरुषं यापयति, स्वास्थ्यकरत्वात् आयुष्करत्वाच्च ।[9](भा.प्र.)

Life promoting.

8. पचंभद्रिका-पचं भद्रा रसा अस्या:।[10](अ. म.)

Combination of Five Rasa.

9. कायस्था-काय: तिष्ठतिअनयाइति।कायेतिष्ठतिइतिवानिष्फलानभवतिइत्यर्थः।[8](आ.नि.)

Sustains the Body and Enter in thebody. It Has Beneficial Action to Body.

10. पथ्या-पथोऽनपेताइति।पथिसाधुःइतिपथ्याहिताइत्यर्थः।[8](आ.नि.)

Good to Take**.**

11. पूतना-पूतं करोतिइति।विरेचकत्वात्।[8](आ.नि.)

It is *Virechaka* (Laxative), so it releases all the excreta from the Body.

12. हैमवति-हिमवतिजाताइति।[8](आ.नि.)

It originated on mountains of Himalayas.

13. शिवा-शिवंकरोतिइति।

It provides full benefit whosoever uses it.

SYNONYMS OF *HARITAKI*

SYNONYMS	D.N.[11]	R.N.[12]	K.N.[13]	Bhv N.[9]	M.N.[14]
Haritaki	+	+	+	+	+
Abhaya	+	+	+	+	+
Pathya	+	+	+	+	+
Kayastha	-	+	+	+	+
Aamruta	+	+	-	+	+
Putana	+	+	-	+	+
Haimavati	+	+	-	+	-
Aavyatha	+	+	-	+	+
Chetaki	+	-	-	+	+
Shreyasi	-	+	+	+	+
Shiva	+	+	-	+	+
Vayatha	+	-	-	+	+
Vijaya	+	-	+	+	-
Rohini	+	+	-	+	+
Jeevanti	-	+	-	+	+
Jaya	+	+	-	-	+
Jivakriya	-	+	-	-	-
Divya	-	+	-	-	-
Prapathya	-	+	+	-	-
Pranada	+	-	+	-	-
Devi	-	+	-	-	-
Nandini	+	-	-	-	-

Review of *Haritaki* as per *Veda, Samhita* and *Nighantus*

***Vedas*:** In *Vedic* compendia any description of *Haritaki* was not found. In *Shaunaka Samhita* of *Atharvaveda*, term "*Jivanti*" was comes for *Leptadenia Reticulata* W. and A. not for *Terminalia chebula* Retz.

***Charak Samhita* (1000 B.C. - 4 A.D.):** In *Charaka Samhita*, *Haritaki* was mentioned with synonyms i.e. *Abhaya, Amrita, Pathya, Vijaya, Shiva* and *Haritaki*. It is described among *Arshoghna, Kushthaghna, Kasahar, Hikkanigrahana, Jvarahar, Prajasthapana, Vayah-Sthapana Mahakashaya, Virechanopaga,.Haritaki* is indicated in *Kushtha, Jvara, Prameha, Unmada, Apasmara, Krimi Roga, Pandu, Grahani, Visha, Madatyaya* and *Bhutabadha* etc.[5]

***Sushruta Samhita* (1000 B.C.-500 A.D.)**: In *Sushruta*, it is described under *Samhita Haritkyadi, Vachadi, Mustadi, Mushkakai, Parushakadi, Triphaladi* and *Amlakyadi Gana.Haritaki* was mentioned with synonyms i.e. *Abhaya, Amrita, Pathya, Vijaya* and *Haritaki*. It is indicated in *Kushtha, Kandu, Apasmara, Unmada, Pandu, Bhagandara, Garavisha, Pliha Roga, Urustambha, Gandamala, Nadi Vrana, Netra Roga, Raktapitta* and *Prameha*.[6]

***Ashtang Samgraha* (600 A.D.) and *Ashtang Hridya* (700 A.D.):** In *Ashtanga Samgraha Vagbhatta* has been mentioned in *Parushakadi Gana, Mustadi Gana, Vachadi Gana,* etc.[15] While in *Ashtanga Hridaya, Haritaki* was mentioned with synonyms i.e. *Abhaya, Pathya, pranada, vijaya, shiva* and *Haritaki* and it is indicated in *Ajirna, Garadosha, Raktagulma, Twakadosha, Shukra, Timira, Visha, Kshata, Vrana, Kushtha, Shopha* and *Udararoga* etc.[16]

***Saushruta Nighantu* (6th Cent.)**

It was written by *Acharya Saushruta*. According to this *Nighantu, Haritaki* has been mentioned in *Mushkakadi Gana. Amrita, Abhaya, Pathya, Pranada, Nandini, Vijaya* are the synonyms.[17]

***Ashtanga Nighantu* (8th Cent.)**

Ashtanga Nighantu has been written by *Vahatacharya.* In this *Nighantu, Haritaki* is mentioned in *Parushakadi Gana*. It's synonym are described here are *Abhaya, Pranada, Pathya, Putana, Amrita, Amogha, Jaya, Haimavati, Pinditaka, Kayastha* and *Rohini*.[18]

***Dhanvantari Nighantu* (10th Cent.)**

This has been written by *Mahendra Bhaugik.Haritaki* is mentioned in *Guduchyadi Varga* and *Abhaya, Pathya, Amrita, Prapathya, Putana Jaya, Avyatha, Vayastha, Chetaki, Haimavati, Shiva, Nandini, Pranada, Rohini* and *Vijaya* have been given as its synonym. *Haritaki* is indicated in *Medhya Karma, Lekhana Karma, Chakshuroga, Meha, Kushtha, Vrana, Shopha, Vamana, Vatarakata, Mutrakrichchhra* and *Indriyaprasadana.*[11]

***Madanpala Nighantu* (14th Cent.)**

This was written by *Madanpal*. In this *Nighantu, Haritaki* is found in *Abhayadi Varga*. Following are the synonym of *Haritaki* are *Shiva, Pathya, Chetaki, Vijaya, Prapathya, Prathama, Jaya, Putana, Kayastha, Pranada,Amogha, Amrita, Jivaniya, Abhaya, Vayahastha, Hemavati, Vritana, Nandini, Shreyasi* and *Rohini*. It is indicated in *Dipana, Medhya, Vrishya, Chakshushya, Brimhana, Shvasa, Kasa, Jvara, Prameha, Gulma, Arsha, Kushtha, Shopha, Udararoga, Krimi, Grahani, Vibandha, Vishamajvara, Adhmana, Gulma, Vrana, Hikka* and *Kandu.*[14]

***RajaNighantu* (14th Cent.)**

This book is written by *Narhari Pandit*. *Haritaki* is found in *Amradi Varga* in this *Nighantu. Haimavati, Jaya, Abhaya, Shiva, Avyatha, Chetanika, Rohini, Pathya, Prapashtya, Putana,*

Amrita, Jivapriya, Jivanika, Jivanti, Pranada, Jivya, Kayastha, Shreyasi, Devi, Divya and *Vijaya* are given as its synonyms.[12]

***Bhavaprakash Nighantu*(16th Cent.)**

This was written by *Acharya Bhavmishra*. *Haritaki* has been mentioned in *Haritakyadi Varga* and following are the synonyms found in this *Nighantu- Abhaya, Pathya, Kayastha, Putana, Shiva, Vayastha, Amrita, Chetaki, Shreyasi, Haimavati, Avyatha, Vijaya, Jivanti,* and *Rohini*. It is indicated in *Dipana, Medhya, Rasayana, Chakshushya, Shvasa, Kasa, Chhardi, Hikka, Jvara, Prameha, Shotha, Udararoga, Arsha, Kushtha, Grahani, Vishama Gulma, Krimi, Vibandha, Anulomana, Adhayamana, Kamla, Shula, Anaha, Pliha Roga, Ashmari, Mutrakrichchha* and *Mutraghata*.[9]

***Shaligrama Nighantu* (19th Cent.)**

In this *Nighantu, Haritaki* is placed in *Haritakyadi Varga* and *Abhaya, Pathya, Amrita, Kayastha, Putana, Haimavati, Chetaki, Shreyasi, Avyatha, Vayastha, Shiva, Vijaya, Jivanti* and *Rohini* are given as its synonyms. It is indicated in *Dipana, Medhya, Rasayana, Chakshushya, Anulomana, Shvasa, Kasa, Prameha, Arsha, Kushtha, Shotha, Udararoga, Krimi, Grahani, Vibandha, Vishamajvara, Gulma, Adhayamana, Chhardi, Hikka, Kamla, Shula, Anaha, Pliha, Ashmari, Mutrakrichchhra* and *Mutraghata*.[19]

***Priya Nighantu* (20th Cent.)**

This was written by *Acharya Priyavrata Sharma*. In this *Nighantu, Haritaki* was described in *Haritkyadi Varga* and *Abhaya, Kayastha* has been included as its synonym. It is *Tridosha - Hara* and indicated in *Dipana, Pachana, Dosha Anulomana, Arsha, Gulma, Shotha, Svarabheda, Udavarta, Anaha, Udararoga, Pandu,* and *Kasa*.[20]

Types[9]

T. chebula (*Haritaki*) is classified into 7 types. From which, *Vijaya* is considered to be the best.

Sr. No.	Type	Found in	Shape	Useful
1.	***Vijaya***	*Vindhya*	oval in shape	All diseases
2.	***Rohini***	All places	round in shape	*Vrana (wound)*
3.	***Pootana***	*Sindh*	small and less bulky, seed is bigger, mesocarp is less	Externally
4.	***Amruta***	*Champaranya*	bulky	*Shodhanakarma*
5.	***Abhaya***	*Champadesha*	fruit has five lines	Eye diseases

6.	***Jeevanti***	*Saurashtra*	yellow in colour	All diseases
7.	***Chetaki***	*Himalaya*	three lines	Purgative

In practice, however, there are three types of *Haritaki*[21]:

1) ***Bala Haritaki*** - When the *Haritaki* fruit falls from the tree, the seed gets rigid called '*Bala Haritaki'*. Sometimes, the fruits are collected and dried although the seeds have not hardened which are also called '*Bala Haritaki'*. It is small, dark brown or black in colour.
2) ***Chambhari (Rangari) Haritaki*** - *Chambhari Haritaki* is an immature *Haritaki* fruit. It is small, less wrinkly and less wrinkled than the above variety; its length is about an inch; epidermis is yellow.
3) **Survari *Haritaki***- fully mature *Haritaki* fruit is called '*Survari Haritaki'*. It is Large, dense and heavy which is 2 inches long, yellowish-brown in colour.

***Grahya Lakshanas* of *Haritaki*[9]**

A fruit of *Haritaki* which is fresh, bulky, smooth, round in shape and weighs at least 24 g and does not float in water, is considered to be ideal for medicinal use.

Chattopadhyay and *Bhattacharyya*,[22] classified the *T. chebula* of three types - actually these are the different stages of maturity of fruits.

(a) Small Myrobalan- the immature fruit;

(b) Yellow Myrobalan –it is the mature stage of the fruit after development of seed;

(c) Large Myrobalan- the fully matured fruit.

The fruit of *Haritaki* comprises five *Rasas* namely[9]:

i. ***Madhur*** (sweet) - the fruit pulp,
ii. ***Amla*** (sour) - the bulky portion of the fruit,
iii. ***Tikta*** (bitter) – seed,
iv. ***Katu*** (pungent)- the covering of the fruit and
v. ***Kashaya*** (astringent) - the hard portion of the seed.

Thus, *Haritaki* is *Pancha Rasatamak*.

Properties and Action[7]

Rasa *: Madhura, Amla, Katu, Tikta, Kashaya*

Guna *: Laghu, Ruksha*

Virya *: Ushna*

Vipaka *: Madhura*

Karma[7]:-It acts as *Tridosha Shamaka* (mitigates *Vata*, *Pitta* and*Kapha*). *Shothahara* (anti-inflammatory), *Chakshushya* (beneficial for eyes), *Mukharogahara* (cures oral diseases), *Balya* (strengthening), *Deepana* (appetizer), *Paachana* (digestant), *Vatanulomana* (carminative), *Vruna Ropana* (wound healing), *Yakrita Pleeha Uttejaka* (hepatoprotective), *Kasa Swasahara* (cures cough and breathlessness), *Hikka* (cures hiccough), *Mootrala* (act as diuretic), *Rasayana* (rejuvenator), *Vajikara* (aphrodisiac).

***Ritu Haritaki*[9]**: In *Bhavaprakash*, *Ritu Haritaki* is described as *Rasayan* (rejuvenation, antiaging), *Haritaki* is given with various ingredients in different seasons. This is called as *Ritu Haritaki*. *Ritu* means seasons.

- ***Varsha Ritu***- *Haritaki* is taken with *saindhava*.
- ***Sharad Ritu***- It is used with *Sharkara*.
- ***Hemanta Ritu***- It is intaken with *Shunti.*
- ***Shishir Ritu***- It is used with *Pippali*.
- ***Vasant Ritu***- It is taken with *Madhu*.
- ***Greeshma Ritu***- It is given with *Guda.*

Predominance of *Guna, Rasa,* and *Bala* are given in following table.[16]

Ritu* of *Adana Kala	***Guna* (properties)**	***Rasa* (taste)**	***Bala* (strength)**
Shishir	*Alpa Rukshata* (Mild dryness)	*Tikta* (Bitter)	*Uttama Bala* (Superior strength
Vasant	*Madhyama Rukshata* (Moderate dryness)	*Kashaya* (Astringent) *Madhyam*	*Madhyama Bala* (medium strength)
Greeshma	*Atirukshata* (Excess dryness)	*Katu* (pungent)	*Durbala* (inferior strength
Varsha	*Alpa Snigdhata* (Mild unctuousness)	*Amla* (sour)	*Durbala* (inferior strength
Sharad	*Madhyama Snigdhata* (Moderate unctuousne ss)	*Lavana* (salt)	*Madhyama Bala* (medium strength)
Hemant	*Snigdhata* (Excess unctuousness)	*Madhura* (sweet)	*Uttama Bala* (Superior strength

Therapeutic Uses - *Shotha, Arsha, Aruchi, Hrydroga, Kasa, Pandu, Prameha, Udhvarta, Vibandha, Vishamajvara, Shiroroga, Tamaka Swasa, Gulma, Udararoga.*[7]

Useful part: Fruit.

Important Formulations -*Triphala Churna, Triphaladi Taila, Agastya Haritaki Rasayana, Abhayarishta, Chitraka Haritaki, Danti Haritaki, Dashmul Haritaki, Bramha Rasayana, Abhaya Lavan, Pathyadi Lepa.*[7]

Dose - 3-6 g of the drug in powder form, empty stomach in the morning with *Anupana*.

Sr.No.	Name of the texts	*Rasa*	*Vipaka*	*Veerya*	*Guna*
1.	***Dhanwantari Nighantu***[11]	*Kashaya, Amla, Katu, Tikta, Madhura*	-	-	*Ruksha Guna*
2.	***Raj Nighantu***[12]	*Kashaya, Katu, Tikta, Amla, Madhura.*	-	*Ushna Virya*	-
3.	***Kaiyyadeva Nighantu***[13]	*Kashaya, Amla, Katu, Tikta, Madhura*	*Madhura*	*Ushna Virya*	*Ruksha* and *Laghu Guna*
4.	***Bhav-Prakasha***[9]	*Kashaya, Katu, Amla, Madhura* and *Tikta Rasa*	*Madhura*	*Ushna Virya*	*Laghu* and *Ruksha Guna*
5.	***Nighantu Adarsha***[8]	*Pancharasa*	*Madhura*	*Ushna Virya*	-
6.	***Madanapal Nighantu***[14]	*Kashaya, Katu, Tikta, Amla, Madhura Rasa*	*Madhura*	*Ushna Virya*	*Ruksha Guna*
7.	***Priya Nighantu***[20]	*Pancharasa* and *Alavana*	-	-	-
8.	***Shaligram Nighantu***[19]	*Kashaya, Amla, Madhura, Tikta* and *Katu*	*Madhura*	*Ushna Virya*	*Laghu* and *Ruksha Guna*

Roghnata* of *Haritaki* as per *Ayurvedic text.

Rog	*Charaka Samhita*[5]	*Sushruta Samhita*[6]	*Ashtang Hridaya*[16]	*Kaiyyadeva Nighantu* [13]	*Dhanwantri Nighantu*[11]	*Bhav-Prakasha Nighantu*[9]	*Madanapal Nighantu*[14]
Arsha	+	+	+	+		+	+
Atisara	+			+			+
Udarroga	+			+		+	+
Pakwatisara	+			+			
Daruna							
Amlapitta						+	
Shotha		+		+	+	+	
Mutrakrucha					+	+	
Ajeerna						+	
Kushtha	+	+		+	+	+	
Vrana		+		+	+		+
Madatya							
Prameha		+		+	+	+	+
Shleepada	+	+					
Vatarakta	+	+			+		
Pandu	+	+		+			
Hikka	+	+		+		+	+
Katharoga			+			+	
Gulma	+	+		+		+	+

Swasa		+		+		+	+
Kasa		+		+		+	+
Shula				+		+	+
Ashmari			+			+	

Traditional values of *Haritaki*

In Charaka Samhita and *Sushruta Samhita*, various medicinal plants has been mentioned but *Haritaki* is placed in prime among medicinal plants. It is extensively used in *Ayurveda*, *Siddha*, *Unani* and *homeopathic* medicines in India. It is a uppermost listed plant mentioned in *Ayurvedic* Materia medica for the treatment of bleeding piles, gout, asthma, sore throat and vomiting.[23] It is used in Thai traditional medicine as an astringent, carminative and expectorant.[24] According to *Vagbhata*, *haritaki* is the drug of choice in the treatment of '*Vata-Kapha'* diseases. The '*Triphala*', a herbal formulation of 'three fruits' i.e. *Terminalia chebula*, *Terminalia Bellerica*, *Emblica Officinalis*, combines used as laxative for food digestive problems (poor digestion and assimilation), chronic constipation, detoxifying agent of the colon, and rejuvenator of the body.[25] The fruits of *Haritaki* are useful in both external as well as internal medicinal purposes. Externally, the paste of fruits efficiently hastens the healing and cleanses the wounds, reduces the swelling, and ulcers. In skin disorders like erysipelas and other, *Haritaki* inhibits collection of pus in skin diseases. The *Haritaki* oil is tremendously helpful in wounds healing particularly in burns. The gargales with decoction form of haritaki gives brilliant results in stomatitis and throat problems. *Haritaki* powder is useful for strengthen the gums as a tooth powder.

Internally, *Haritaki* is used to cure a numerous disease. Common gastrointestinal ailments, tumours, ascites, piles, worms, enlargement of liver and spleen, colitis are treated well with *Haritaki*. Powder of *Haritaki* with honey and ghee is also efficient remedy for anaemia.[26]

Precautions: *Haritaki* should be carefully used by lean individuals, in severe weakness, fast, mental depression, *Pitta* conditions and in pregnancy.[9] After blood-letting treatment, during and soon after menstruation, *Kshut*, *Trishna*, *Ushnarta* – who are having hunger, severe thirst and got exposed to Sun, in patients suffering from indigestion[27], in people with dry mouth, in early stages of fever, in people with neck stiffness, in people with dry throat.[11]

Medicinal qualities and Systemic use as in *Ayurvedic* classics

External uses: Local application of *Haritaki* is Anti-inflammatory. In conjunctivitis it is used for application on eyelids. Decoction of *Haritaki* is used for wound and also for gargling in the diseases of mouth and throat.

Digestive System: Due to *Anulomana Karma* it helps in normalizing bowel movements. (*Haritaki* 1 to 3 grams is administered with hot/lukewarm water to relieve *Ama* (undigested food constituents) in case of Irritable Bowel Disease associated with low digestive power). Further, useful in loss of appetite, vomiting, pain in abdomen, early stage of ascites, Hemorrhoids, Hepatomegaly, Splenomegaly and parasitical infestation. 3-6 gm of Powdered *Haritaki* reduces constipation. *Haritaki* powder in dose of 10 gm with grapes may be taken to get relief in hyperacidity 10. Dry *Haritaki* or *Triphala* i,e. Powder formulation of *Hairtaki*, *Vibhitaki* and *Amalaki* in dose of 10-15 g in equal quantities with lukewarm water should be consumed after dinner to relieve constipation. Useful in spleenomegaly (3 to 5 gram once or twice a day is administered with 2 to 3 grams of jiggery).[5]

Circulatory System: Since *Haritaki* act as *Raktagami* (acting on *Rakta Dhatu*), it is used in weakness of Heart, *Vatarakta* and other disorders of the blood. Haritaki Cures anaemia (5 gram of *Haritaki* powder to be taken with equal quantity of jaggery to form a bolus. 2 bolus twice daily after meals for 60 days is to be consumed)[28], *Haritaki* is useful to reduce anaemia[29], useful in jaundice and oedema.

Respiratory System: Rhinitis, Hiccups, Cough, wheezing, Hoarseness of voice and Dyspnoea, breathing difficulty, COPD, are relieved by *Haritaki* as it reduces congestion.

Reproductive System: Useful in *Shukrameha*, Leucorrhoea and acts as a uterine tonic.

Urinary System: Useful in Dysurea, urine retension, Calculus and urinary tract disorders, useful in diabetes (every morning and evening, 3 gm of *Haritaki* powder with a little honey can be taken. Persistent consumption of *Haritaki* helps to control diabetes).[15]

Nervous System: Useful in weakness of the nerves and the brain, headache, in Vata disorders and diminished vision and improves intelligence (*Medha*).

Skin: Helpful in Erysipelas and other skin disorders, *Haritaki* inhibits collection of pus in skin diseases and acts as a *Rasayana*. *Haritaki* with oil is tremendously helpful in wounds healing especially in burns. It helps to improve skin complexion.

***Rasayana*:** Anti-ageing, rejuvenative, nourishing (pulp of 2 - 4 dry fruits of *Haritaki*, cooked in 4 parts of milk till it becomes soft. After cooling, little ghee and honey will be added. This recipe may be prepared daily and consume to attain good immune power)[15], improves body weight (*Bruhmani*), improves life expectancy/span by maintaining healthiness (*Ayushya*). *Haritaki* acts as a rejuvenator (by clearing the mala present in the body). For the purpose of *rasayana karma* (rejuvenation, anti-ageing purpose), *Haritaki* is given with various ingredients in different seasons (*ritu*) which is known as *Ritu Haritaki* as described earlier. Dose: 2-4 gm for *Rasayanakarma*. It initiates natural detoxification of bodily toxic materials.

In *Bhavprakash Nighantu Acharya* explains the different actions of a *Haritaki* by changing its form of administration.[9]

When *Haritaki* is chewed then it leads to *Agni Vardhana*, if we take *Haritaki* by doing *Peshana Karma* on it leads to *Mala Shodhana*, if we give *Swedana* procedure to *Haritaki* then it do *Sangrahana Karma* and if we do *Bhrushta Karma* to *Haritaki* is helps to maintain equilibrium state in body regarding *Vata, Pitta, Kapha Dosha*.

Taxonomy

Kingdom:	Plantae
Subkingdom:	Tracheobionta
Super division:	Spermatophyta
Division:	Magnoliophyte
Class:	Magnoliopsida
Subclass:	Rosidae
Order:	Myrtales
Genus:	Terminalia
Species:	*Terminalia chebula*

Propagation and Cultivation: It develops on variety of soils and the fruit is ripen from November-March differing based on locality. The fruit mostly picked in first half of January, and drying the seeds can stored for one year. The Germination is obtained because of chipped quality of seeds; hard cover seed requires pre-sowing management. After 15 days, Germination begins and continues for 3-4 weeks. Young plant needed large amount of water during first hot season. The plant growth is slow.[30]

Botanical description[31]: It is a deciduous large tree, attaining 23-30 meters in height, with rusty coloured or silvery hairs over the branch-lets.

Leaves - 8-20 cm long, mostly sub-opposite, alternate, distant, ovate or oblong ovate, laminae broadly elliptic to elliptic – oblong, the bases obtuse, the margins entire, the tips acute, glabrescent, long and deciduous in the cold seasons, and having petioles 25 cm long usually with glands near top.

Flowers - Dull white or yellowish with a strong unpleasant smell, in spikes from the upper axils and in small terminal ponicles.

Bark – 6mm thick, dark brown with many generally shallow vertical cracks, wood very hard, brownish grey with a greenish or yellowish ringe.

Fruit – These are a yellowish-brown drupe, glabrous, sub globose to ellipsoid, from 2.5 to 3.75 cm long, sometimes tapering towards the lower extremity obscurely 5-angulate, ridged, wrinkled, more or less, furrowed longitudinally covered with an astringent pulp enclosing a large rough bony one called endocarp. Fruit turn blackish when dry.

Seed - These are single, rough.

Microscopic: T.S of pericarp shows:

1. Epicarp consist of a layer of epidermal cells in which inner tangential with upper portions of radial wall thick.
2. Mesocarp have 2-3 layers of collenchyma, with a broad zone of parenchyma in which fibres and sclereids are in group and vascular bundles distributed, fibres having peg like out growth and simple pitted walls, sclereids of several shapes and sizes but mainly raphides and tannins in parenchyma.
3. Endocarp comprises of thick-walled sclereids of different shapes and sizes, mostly elongated, epidermal surface view reveal polygonal cells, uniformly thickwalled, several of them divided into two by a thin septa, starch grains simple rounded or 62 oval in shape, measuring 2-7 µ in diameter, found in lots of cells of mesocarp.[32]

Distribution: It is located within the greater parts of India mostly in deciduous forest and areas with less rainfall, also in moist forest climbing to an altitude of 1500-1600 m in

Himalayas, also in Assam, West Bengal, Madhya Pradesh, Bihar, Orissa, Maharashtra, Deccan and South India.[33]

Identity, Purity and Strength.[32]

Foreign matter	NMT 1 per cent
Total Ash	NMT 5 per cent
Acid-insoluble ash	NMT 5 per cent
Alcohol-soluble extractive	NLT 40 per cent
Water-soluble extractive	NLT 60 per cent

*****NMT –Not More than* NLT -Not less than

Powder- It is Brown in colour, under microscope shows a few fibres, vessels with simple pits and groups of sclereids.[32]

Chemical constituents

In *Haritaki*, phytoconstituents present are hydrolysable tannins and are responsible for pharmacological activity. These tannins contain phenolic carboxylic acid such as chebulic acid, gallic acid, ellagic acid, and gallotannins such as 1,6 di-O-galloyl-β-D-glucose, 3,4,6 tri-O-galloyl-βD-glucose, 2,3,4,6 tetra-O-galloyl-β-D-glucose, 1,2,3,4,6 penta-Ogalloyl-β-D-glucose. Ellagitannin such as corilagin, punacalagin, casurarinin and terchebulin and others such as chebulanin, chebulagic acid, neochebulinic acid, and chebulinic acid reported in literature.[34,35] Flavonol glycosides, triterpenoids, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated.[36]

Various methods have been described for extraction of phytoconstituents from *Terminalia chebula* for investigating their pharmacological activities. Total eight compounds viz. gallic acid, ethyl gallate, methyl gallate, chebulagic acid, ellagic acid, chebulinic acid tetra-O-galloyl-β-D-glucose, and penta-O galloyl-β-D-glucose from *Terminalia chebula* were isolated on reverse phase chromatography.[37]

Pharmacological activity – Pharmacological activities of *Terminalia chebula*are antibacterial, antifungal, antiviral, anti-mutagenic, Adaptogenic and anti-anaphylactic, Hypolipidemic/hypocholesterolemic, gastrointestinal motility improving and anti-ulcerogenic, hepatoprotective, cardio-protective, radio-protective, anti-diabetic and retino-protective, antispasmodic, wound healing, purgative, Immunomodulatory and chemo-preventive.

1. Anti-bacterial activity

Kannan et al has investigated on Gallic acid and ethyl ester (anti-bacterial compounds), against methicillinresistant Staphylococcus, has been isolated from ethyl alcohol extract of fruits of *Terminalia chebula*.[38] *Terminalia chebula* is well efficient against a bacterium Helicobacter pylori, which is responsible for gastritis, ulcer and stomach cancers.[4]

T. chebula extracts show antibacterial activity against a numerous bacterial species.[39] *T. chebula* is well effective against Helicobacter pyroli, a bacterium responsible for gastritis, ulcer and stomach cancers. The ether, alcoholic and aqueous extracts of *T. chebula* were tested against Helicobactor pylori, but aqueous extract of the plant, at a concentration of 1-2.5 mg/ml, inhibited urease activity of H. pylori.[40] Several biologically active components were isolated from butanol fraction of fruit extract of *T. chebula* and tested against six intestinal bacteria. Ethanedioic acid showed strong and moderate inhibitory activity against Clostridium perfringens and Escherichia coli, respectively, with no adverse effects on the growth of the four tested lactic acid-producing bacteria. Ellagic acid exerted a potent inhibitory effect against C. perfringens and E. coli, but little or no inhibition was observed for behenic acid, β-caryophyllene, eugenol, isoquercitrin, oleic acid, α-phellandrene, β-sitosterol, stearic acid, α-terpinene, terpinen-4-ol, terpinolene, or triacontanoic acid.[41]

Ripe seeds of *T. chebula* also exhibited strong antibacterial activity against S. aureus.[42] The aqueous extract of *T. chebula*strongly inhibited the growth of Streptococcus mutans, salivary bacteria.[23] It has also growth inhibitory action against Salmonella typhi[43], Klebsiella.[44] Ethanol extract of *T. chebula* fruit proved strong antibacterial activity against multidrug-resistant uropathogenic Escherichia coli and phenolics were found to be responsible for this antibacterial activity.[45,46]

2. Anti-fungal activity

Shinde et al has decribed the Anti-fungal activity against a number of dermatophytes and yeasts. Alcoholic and ethyl acetate extracts of *Terminalia chebula* leaves were tested pathogenic fungi by paper disc method and were found effective compared to that of the reference standard carbendazim.[47] Aqueous extract of *T. chebula* has been reported to show antifungal activity against a number of dermatophyte[48] (e.g. Epidermophyton, Microsporum gypseum, Floccosum, and Tricophyton rubrum) and yeasts (e.g. Candida albicans).[49,50,51] In vitro anticandidal activity of methanol extract of *Terminalia chebula* was observed against clotrimazole resistant Candida albicans.[42]

3. Anti-amoebic and immune-modulatory activities

Sohni et al has studied in experimental caecal amoebiasis in rats to the anti-amoebic effect of a crude drug preparation of *Terminalia chebula*. In immunemodulation studies, humoral immunity was enhanced where T-cells counts remained unaffected in the animals, but cell mediated immune response was stimulated.[52] The antiamoebic effect of a crude drug formulation of *T. chebula* was investigated in experimental caecal amoebiasis in rats with a curative rate of 89% at 500 mg/kg body weight due varying degrees of inhibition of enzyme activities such as DNase, RNase, aldolase, alkaline phosphatase, acid phosphatase, αamylase and protease in axenically cultured amoebae.[53] Aqueous extract of *Terminalia chebula* produced an increase in humoral antibody (HA) titer and delayed type hypersensitivity (DTH) in mice.[54]

4. Molluscicidal activity

Upadhyay et al has shows that the ethanolic extract of *Terminalia chebula* fruit has molluscicidal activity was studied against the vector snail Lymnaea acuminata and was time and concentration dependent.[55]

5. Anti-helminthes activity

Kamaraj et al has studied the ovicidal and larvicidal activities of ethyl acetate, acetone, and methanol extracts of dried leaves and seeds of *Terminalia chebula* were examined by the in vitro on Haemonchuscontortus on egg hatch and larval growth assays at 50, 25, 12.5, 6.25 and 3.13mg/ml. The extracts of leaves and seeds of *Terminalia chebula* showed complete inhibition at 50mg/ml.[56]

6. Anti-viral activity

Lin et al described that the extract of fruits of *Terminalia chebula* showed inhibitory effects on human immunodeficiency virus-1 reverse transcriptase. Hot water extract of *Terminalia chebula* showed anti-herpes simplex virus (HSV) activity in-vivo and anti-cytomegalovirus (CMV) activity both in-vitro and in vivo in a study. *Terminalia chebula* inhibited HSV-1 entry at non-cytotoxic doses in A549 human lung cells by preventing binding, penetration, and cell to cell spread, as well as secondary infection.[57]

The extract of fruits of *T. chebula* showed inhibitory effects on human immunodeficiency virus-1 reverse transcriptase.[58] Hot water extract of *T. chebula* showed anti-herpes simplex virus (HSV) activity in vivo and anti-cytomegalovirus (CMV) activity both in vitro and in

vivo in a study.[59] Ledretan-96 and each of its 23 separate components were tested on an epithelial tissue culture cell line for their protective activity against cytotoxic effects caused by influenza A virus. Of the 23 components tested, only one component showed a significant protective effect when applied to the epithelial cells individually.[60] A study has conducted which shows that *T. chebula* fruits consists of 4 human HIV-type 1 integrase inhibitors like gallic acid and three galloyl glucoses, and advised that galloyl moiety had a chief role for inhibition of the 3 ′-processing of HIV-1 integrase by these compounds.[61] *T. chebula* can also be used in sexually transmitted diseases and AIDS.[62] Recently, acetone extract of *T. chebula* has emerged as a new alternative to treat pandemic swine influenza A infection due to its low cost, easy preparation and potential effect.[63] *T. chebula* fruits afforded four immunodeficiency virus type 1 (HIV-1) integrase inhibitors, GA (I) and three galloyl glucoses (II-IV). Their galloyl moiety plays a major role for inhibition against the 3'-processing of HIV-1 integrase of the compounds.[64] *T. chebula* has also retroviral reverse transcriptase inhibitory activity.[65] The methanol and aqueous extracts of *T. chebula* showed a significant inhibitory activity with IC505 µg/mL on human immunodeficiency virus-1 reverse transcriptase.[66] It also demonstrated the therapeutic activity againstherpes simplex virus both in vitro and in vitvo tests.[67] Ajala et al.[68] described that chebumeinin A, chebumeinin B and two new hydrolysable tannins together with 8 identified and associated compounds from the dried fruits displayed activity against Hepatitis C virus. *T. chebula* extracts have been displayed important antiviral activity on influenza A virus H3N8 viral assays when used at higher doses.[69] *Terminalia chebula* has also retroviral reverse transcriptase inhibitory activity.[70]

7. Anti-mutagenic and anti-carcinogenic activities

Ponnusankar et al has concluded that effect of 70% methanolic fruit extract of *Terminalia chebula* was considered as growth of several malignant cell lines. It also showed antiproliferative activity against HCT-15, COLO-205, MDAMB-231, DU-145 and K562 cell lines. A recent study has shown the ability of triphala to inhibit cytochrome P450.[71]

Acetone extract of *T. chebula* has been reported to contain phytochemicals with promising antimutagenic and anticarcinogenic properties.[72] One of the compounds from ethanolic fruit extract of *T. chebula*, chebulagic acid, consist of potent dual inhibition against COX and 5-LOX. It also showed anti-proliferative activity against HCT-15, COLO-205, MDA-MB-231, DU-145 and K562 cell lines.[73] A group of researchers have reported the inhibitory action on

cancer cell growth by the phenolics of *T. chebula* fruit found that chebulinic acid, ellagic acid and tannic acid were the most growth inhibitory phenolics of *T. chebula*.[74] Antimutagenic activity of aqueous extract and hydrolyzable tannins from *T. chebula* in Salmonella typhimurium has been documented.[75]

T. chebula has been shown to act against cancer. Methanolic plant extract of *T. chebula* against five diverse human cell-lines like breast cancer (MCF-7), prostate cancer cell line (PC-3), osteosarcoma (HOS1), mouse (S115) breast cancer cell line, and a normal prostate cell line (PNT1 A) was established. Compounds like chebulinic acids, ellagic and 2,4-chebulyl-β-D glucopyranose from *T. chebula* showed cytotoxic action and maximum efficacy was observed on PC3 and PNT1A cell lines. Chebulagic acid was shown to inhibit the development of 5 cell lines like HCT-115, COLO-205 (colon cancer), MDAMB-231 (breast carcinoma), DU-145 (prostate cancer) and K-562 (myeloid leukemia). *T. chebula* was tested for chemo-modulatory effect against the nickel chloride induced toxicity in Wistar rats. Triphala was shown to reduce the tumor size in animals engrafted with human pancreatic tumors.[76] Ahuja et al.[77] stated that ethanolic extract of *T. chebula* fruit considerably inhibited tumor in Ehrlich-Ascites carcinoma induced cancer in Swiss Albino mice. *T. chebula* studied by Achari et al.[78] showed the effect on human hepatocellular carcinoma cell line HepG2. Apoptosis and cell cycle arrest where the main mechanisms of *T. chebula* fruit extract inhibited cell proliferation in A549 lung cancer cells.[79] Ravishankar et al.[80] described the anticancer activities of *T. chebula* leaf gall extracts on BRL3A, A-549 cells and MCF-7. Authors approved the activity in part to the phenolics/flavanoids features of the extract whuch has been demonstrated to act as cytotoxic agents. Wani et al.[81] reported anticancer activity of commercially available homeopathic preparations of *T. chebula* against breast cancer and revealed their nanoparticulate nature.

8. Anti-oxidant activity and free radical scavenging activity

Chen et al has studied the *Terminalia chebula* is atremendous anti-oxidant. In a study, 6 extracts and 4 pure compounds of *Terminalia chebula* exhibited in-vitro antioxidant properties of anti-lipid peroxidation, antisuperoxide radical formation and DPPH activities at different concentration. The outcomes demonstrated that triethyl-chebulate was a strong antioxidant and free-radical scavenger, which might contribute to the anti-oxidative ability of *Terminalia chebula*.[82]

T. chebula is an excellent anti-oxidant. In a study, 6 extracts and 4 pure compounds of *T. chebula* exhibited anti-lipid peroxidation, antisuperoxide radical formation and free radical scavenging activities at different magnitudes of potency. Antioxidant activity.[83] The aqueous extract of *T. chebula* protected the antioxidant enzymes from reactive oxygen species (ROS) produced by gamma radiation in the rat liver microsomes and mitochondria. The ethanolic extract of the fruits of *T. chebula* decreased the level of lipid peroxidase in albino rats.[2] Both treatment and pretreatment of the cultured rat primary hepatocytes with *T. chebula* aqueous fruit extract (500 or 1000 mg/kg body weight for 5 days) significantly reversed the t-BHP induced cell cytotoxicity and lactate dehydrogenase leakage. In addition, *T. chebula* extract exhibited in vitro ferric-reducing antioxidant activity and 2,2-diphenyl-1-picryhydrazyl free radical scavenging activities. Histopathologic examination of the rat livers showed that *T. chebula* extract reduced the incidence of liver lesions including hepatocyte swelling and neutrophilic infiltration, and repaired necrosis induced by t-BHP.[84] Further, a hepatoprotective compound, isolated from the ethanolic extract of the fruits of *T. chebula*, was identified as a mixture of chebulic acid and its minor isomer, neochebulic acid that also reduced the tert-butyl hydroperoxide (t-BHP)-induced cell cytotoxicity in isolated rat hepatocyte experiment.[85] The leaves, bark and fruit of *T. chebula* possessed high antioxidant activity and phenolics were found to be responsible for this activity.[86] Aqueous extract of *T. chebula* inhibited xanthine/xanthine oxidase activity and was also an excellent scavenger of DPPH radicals.[87] *T. chebula* in a polyherbal formulation (Aller-7/ NR-A2) inhibited free radical induced hemolysis andknowingly inhibited nitric oxide release from lipopolysaccharide stimulated murine macrophages.[88] Six extracts and four compounds of *T. chebula* fruit exhibited antioxidant activity at different magnitudes of potency.[89] *Haritaki* shows In vitro evaluation of tri-ethyl chebula is a strong antioxidant and free radical scavenger, which is help for anti-oxidative ability.[90] An evaluation of extracts of five traditional medicinal plants viz, Quercus infectoria Olive., *Terminalia chebula* Retz., Lavendula stoechas L., Mentha longifolia L., Rheum palmatum L from Iran on the inhibition of mushroom tyrosinase activity and scavenging of free radicals. *T. chebula* and *Q. infectoria* significantly inhibited tyrosinase activity and DPPH radical. Both activities were concentration-dependant but not in linear manner. It is needed to study the cytotoxicity of these plant extracts in pigment cell culture before further evaluation and moving to in vivo conditions.[91] Recently Majid et al.[92] showed the antioxidantpotential of *T. chebula* in DMBA croton oil-treated mice following topical application. Eshwarappa et al.[93] evaluated antioxidant activity of leaf gall extracts of *T. chebula* and showed the highest free radical

scavenging potential with ethanolic extract. Advanced antioxidant activities were detected in 95% ethanolic and methanolic extracts of *T. chebula*. Its fruit extract is similarly established to have its antioxidant action in rats and is reported to reduce the lipid peroxidase enzyme.[94] It has stronger antioxidant activity than alpha-tocopherol; HPLC analysis with diode array detection indicated the presence of hydroxybenzoic acid derivatives, hydroxycinnamic acid derivatives, flavonol aglycones and their glycosides, as main phenolic compounds.[95]

9. Anti-diabetic activity

Murali et al has studied that 75% methanolic extract of *T. chebula* (100 mg/kg body weight) decreased the blood sugar level in normal and alloxan diabetic rats significantly within 4 h by the oral administration. The chloroform extract of *T. chebula* seeds (100, 200 and 300 mg/kg body weight) produced dose-dependent reduction in blood glucose of diabetic rats in both short term and long term study (300 mg/kg body weight for 8 weeks).[96] Oral administration of 75% methanolic extract of *T. chebula* (100 mg/kg body weight) reduced the blood sugar level in normal and alloxan diabetic rats significantly within 4 hour Continued daily administration of the drug produced a sustained effect.[97] The chloroform extract of *Terminalia. chebula* seeds (100, 200 and 300 mg/kg body weight) produced dose-dependent reduction in blood glucose of diabetic rats in both short term and long term study (300 mg/kg body weight for 8 weeks). Further, remarkable renoprotective activity was also observed in *T. chebula* treated rats.[3] Oral administration of ethanolic extract of fruits of *Terminalia chebula* (200 mg/kg body weight for 30 days) reduced the levels of blood glucose and glycosylated hemoglobin in streptozotocin (STZ)-induced experimental diabetic rats.[98] *T. chebula* fruit and seeds exhibited dose dependent reduction in blood glucose of streptozotocin induced diabetic rats both in short term and long term study and also had renoprotective activity.[99,29]

The fruit extract of *Terminalia chebula* exerts a significant and dose-dependent glucose lowering effect in the rat model of metabolic syndrome.[100]

Chebulagic acid, isolated form *Terminalia chebula* Retz, proved to be a reversible and non-competitive potent alpha-glucosidase inhibitor of maltase with a K (i) value of 6.6 muM. The inhibitory influence of chebulagic acid on the maltase-glucoamylase complex was more potent than on the sucraseisomaltase complex. The magnitude of alpha glucosidase inhibition by chebulagic acid was greatly affected by its origin. These results show a use for chebulagic acid in managing type-2 diabetes.[101]

3 new polyhydroxytriterpenoid derivatives, 23-O-neochebuloylarjungenin, 23-O-4'-epi-neochebuloylarjungenin, 28-O-β-dglycopyranosyl ester, and 23-O-galloylpinfaenoic acid 28-O-βd-glucopyranosyl ester have been reported to be isolated from the fruits of *T. chebula* along with fourteen known ones.[102] Specifically, 23-O-galloylarjunolic acid and 23-O-galloylarjunolic acid 28-O-βd-glucopyranosyl ester showed potent inhibitory activities against α-glucosidase. Shyni et al.[103] showed that chebulagic acid isolated from *T. chebula* enhances insulin mediated glucose uptake in 3T3-L1 adipocytes via PPARγ signaling pathway, according to authors it can be useful in the treatment of type 2 diabetes.

10. Anti-anaphylactic activity and adaptogenic activities

Shin et al has Studied that*Terminalia chebula* with several other medicinal plants helps to resist against a number of stressors in several ways. *Terminalia chebula*, when given following anaphylactic shock, reduces the serum histamine levels showing a strong Anti Anaphylactic Activity.[104] *T. chebula* along with several other medicinal plants helps to resist against a number of stressors in different ways.[105]

11. Anti-nociceptive activity

Kaur et al has investigated that concentrations of *Terminalia chebula* fruits extracted from the petroleum ether, chloroform, and ethanol and water extracts were showed the analgesic activity by using the tail immersion method in mice. The ethanolic extract of the plant exhibited analgesic response at 200,400 and 800mg/kg body weight day.[106]

12. Gastrointestinal motility improving and Anti-ulcerogenic activity

Sharma et al has examined on the animals pretreated at 200 and 500 mg/kg body weight with hydro alcoholic extract of *Terminalia chebula* showed reduction in lesion index, total affected area and percentage of lesion in comparison with control groups in the aspirin, ethanol and cold restraint stress induced ulcer models.[107] Comparison of enteroprotective efficacy of *Triphala* formulations (Indian Herbal Drug) on methotrexateinduced small intestinal damage in rats and foundthat triphala unequal formulation provides significantly more protection against methotrexate induced damage in rat intestine.[108] The methanolic fruit extract of *T. chebula* was assessed for antiulcer action in the ethanol treated and pylorus ligation ulcer models. Results of this study displayed *T. chebula* as a very good antiulcer agent. Histopathological evaluation performed in the pylorus ligation model showed recovery from the edematous form of the gastric tissue, hemorrhageand deterioration.[109,110] Mishra et al.[111] showed anti-secretory and cyto-protective effects of chebulinic acid isolated from the

fruits of *T. chebula* on gastric ulcers in cold restraint, aspirin, alcohol and pylorus ligation induced animal models. This action appeared to be balanced with a protective effect on the gastrointestinal mucosa, withthe improvement in the secretory status of Brunner's gland involved in the protection against duodenal ulcer.[112]

13. Anti-inflammatory and Anti-arthritic activity

Nair et al has studied the hydro-alcoholic extract of *T. chebula* produced a significant inhibition of joint swelling as compared to control in both CFA-induced and formaldehyde-induced arthritis. *Terminalia chebula* treatment also reduced serum TNF-α level and synovial expression of TNF-R1, IL-6 and IL-1β.[113]

Aqueous extract of dried fruit of *T. chebula* showed anti-inflammatory by inhibiting inducible nitricoxide synthesis.[114] *Terminalia chebula* in a polyherbal formulation (Aller-7) exhibited a dose dependent antiinflammatory effect against Freund's adjuvant induced arthritis in rats.[115]

14. Wound healing activity

Choudhary et al has described the alcoholic extract of the leaves of *T. chebula* does much faster healing of rat dermal wounds in-vivo due to improved rates of contraction and a decreased period of epithelialization for the topical administration. Biochemical studies revealed increase in total protein, DNA and collagen contents in the granulation tissues of treated wounds.[116]

Biochemical investigation revealed that increase in total protein, DNA and collagen contents in the granulation tissues of treated wounds. The levels of hexosamine and uronic acid also increased up to day 8 post-wounding. The tensile strength of tissues in extract-treated incision wounds increased by about 40%. These results strongly documented the beneficial effects of *T. chebula* in the acceleration of the healing process.[117]

In alloxan induced diabetic rats, the hydroalcoholic extract of *T. chebula* fruit exhibited 82% reduction in the wound area due to faster epithelialization compared to controls.[118] Tannins extracted from immature fruits of *T. chebula* inhibited Staphylococcus aureus and Klebsiella Pneumonia in vitro and promoted cutaneous wound healing in rats due to a powerful anti-bacterial and angiogenic activity of the extract.[119]

15. Cyto-protective activities and antiaging activities

Manosroi et al has conducted the different concentrations of gallic acid and chebulagic acid, isolated from fruit extract of *T. chebula*, blocked cyto-toxic T lymphocyte (CTL)-mediated cyto-toxicity. Granule exocytosis in response to anti-CD3 stimulation was also blocked by the above phyto-chemicals at the equivalent concentrations.[120] Gallic acid and chebulagic acid, isolated from fruit extract of *T. chebula*, blocked cytotoxic T lymphocyte (CTL)-mediated cytotoxicity. Granule exocytosis in response to anti-CD3 stimulation was also blocked by the above phytochemicals at the equivalent concentrations.[121] The ethanol extract of the fruits of *T. chebula* inhibited oxidative stress and the age-dependent shortening of the telomeric DNA length. In the peroxidation model using t-butanol, *T. chebula* extract have a notable cytoprotective effect on HEK-N/F cells. In addition, the *T. chebula* extract exhibited cytoprotective effect against UVB-induced oxidative damage. The life-span of the HEK-N/F cells was elongated by 40% as a result of the continuous administration of 3 µg/ml of *T. chebula* extract compared to controls.[122]

Gallic acid and Chebulagic acid were isolated from the extract of *Haritaki* (*Terminalia chebula*) as active principal that blocked the cytotoxic T-lyphocyte-mediated cytotoxicity. Granule exocytosis in response to antiCD3 stimulation was also blocked by GA and CA at the equivalent concentrations.[77] It exhibited the development of duodenal ulcers and appeared to exert a cytoprotective effect on the gastric mucosa in vitro.[123]

16. Radio-protective activity

Gandhi et al has investigated on the aqueous extract of the fruit of *Terminalia chebula* (50µg) was able to neutralize 1, 1-diphenyl-2picrylhydrazyl, a stable free radical by 92.9% and protected the plasmid DNA pBR322 from undergoing the radiation-induced strand breaks.[124] Treatment of mice with aqueous extract of *Triphala* in different doses consecutively for five days before irradiation delayed the onset of mortality and reduced the symptoms of radiation sickness compared to controls.[125]

17. Cardio-protective activity

Suchalatha et al has concluded the Cardio-protective effect of ethanolic extract of *Terminalia chebula* fruits (500 mg/kg body weight) was studied in isoproterenol induced myocardial damage in rats. It was reported that the pre-treatment with *Terminalia chebula* extract had cardioprotective effect due to the lysosomal membrane stabilization preventing myocardial necrosis and inhibition of alterations in the heart mitochondrial ultra-structure and function in

the experimental rats.[126] Its pericarp has also been reported to have cardioprotective activity in isolated frog heart model.[127]

18. Hepato-protective activity

Tasduq et al has studied the 95% ethanolic extract of *Terminalia chebula* fruit showed hepatoprotective activity for anti-tuberculosis (anti-TB) drug induced toxicity which may be attributed to its prominent anti-oxidative and membrane stabilizing activities.[128]

19. Anti-Spermatogenic activity

Gupta et al has concluded that the oral administration (300 mg/kg body weight for 28 days) of bark of *Terminalia chebula* extracted consists of acetone, methanol, 50% ethanol, and in aqueous solvents caused histological alterations in seminiferous tubules in testes of treated mice.[129]

20. Anti-Spasmodic activity

A stuy shows that *T. chebula* has 'anti-vata' or 'anti-spasmodic' properties by the reduction of abnormal blood pressure as well as intestinal spasms. This confirm its traditional usefulness for spastic colon and other intestinal disorders.[130]

21. Hypolipidemic and hypocholesterolemic acivity

Hypolipidemic activity of *Terminalia chebula* extract against experimentally induced athersclerosis have been documented.[131] It also possessed hypocholesterelomic activity against cholesterol-induced hypercholesterolemia and atherosclerosis in rabbits.[132] *T. chebula* extract administration showed hypolipidaemic activity against experimentally induced atherosclerosis[133] and hypocholesterolemic activity against cholesterol-induced hypercholesterolemia and atherosclerosis.[134] Triphala formulation was found to have hypolipidaemic effects on the experimentally induced hypercholesteremic rats.[135]

22. Purgative property

Purgative action of an oil fraction from *T. chebula* has been documented.[136]

23. Anticaries activity

The aqueous extract of *T. chebula* strongly inhibited the growth, sucrose induced adherence and glucan induced aggregation of Streptococcus mutans. Mouth rinsing with a 10% solution of the extract inhibited the salivary bacterial count and glycolysis of salivary bacteria for upto 90 min post rinsing.[23,137]

24. Nephroprotective effect

The fruit extract of *T. chebula* is useful to reduce the cadmium induced nephrotoxicity in rats.[138]

CONCLUSION

Haritaki is highly regarded as a magic drug in the *Ayurvedic* medicine. It has been used since decades because of its rich ethnomedical significance. It is the source of a different biologically active phytoconstituents like chebulic acid, chebulinic acid, chebulagic acid, ellagic acid, gallic acid, corilagin and other related compounds which are responsible for antimicrobial, antioxidant, anti-hyperglycemic, anticancer and protective effects on various vital organs such as nerves, heart, kidney and liver. It is one of the most versatile plants having a wide range of pharmacological and medicinal activities. This review comprises the detailed information about Pharmacognostic and pharmacological properties of *Haritaki* and the constituents may provide encouragement for proper evaluation of the use of this plant in medicine. Because of these vast medicinal properties, *Haritaki* can be called as a 'wonder herb'.

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