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HARITAKI A REVIEW

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ABSTRACT

The drug Haritaki (Terminalia chebula Retz.) belongs to family Combretaceae is used since ancient time for therapeutic purposes. It has been widely used in the traditional Indian medical system of 'Ayurveda' for the treatment of a variety of ailments. Ayurvedic scholar Acharya Bhavprakash described the Haritaki as first drug in Bhavprakash Nighantu. It is called the "King of Medicines" in the Tibet and is always listed first in the Ayurvedic materia medica because of its extraordinary powers of healing with a wide spectrum of biological activity. Haritaki has five Rasa (taste) except Lavana (salt), its Vipaka (taste after digestion) is Madhura (sweet) and Veerya (potency) is Ushna (hot). Due to these virtues the plant performs various pharmacological actions such as Rasayana (rejuvenating), Medhya (brain tonic), Deepana (appetizer), Aampachana (digest Aama or toxins) and SrotasShodhana (cleaning the channels by detoxifying the metabolic waste). It helps to improve physical and mental health, prevents degeneration, extends youth and delays aging or rather reverse the aging process. Nowadays different modern researches have revealed its chemical components and pharmacological activities. Main phyto-chemicals of Haritaki are chebulic acid, gallic acid, corilagin, chebulagic acid, ellagic acid, chebulinic acid, triterpenoids and anthraquinones. It performs various therapeutical actions like; antimicrobial, anti-inflammatory, antioxidant, anti-diabetic, hepatoprotective, anti-mutagenic, anti-proliferative, radio-protective, cardio-protective etc. This paper presented a comprehensive review of T. chebula especially its pharmacological actions on the basis of ancient texts as well as modern literatures.

KEYWORDS: Haritaki, Phytoconstituents, Medicines Treatment.

INTRODUCTION

According to the World Health Organization (WHO) more than 80% of the people living in the developing countries depend on traditional medicine for their primary health needs.[1] The traditional Indian system of medicines like Ayurveda, Siddha and Unani support the importance of medicinal plants to treat diseases.[2]

Living long healthy youthful lifespan is a cherished wish of an every individual. Our natural health, happiness and internal sense of comfort are cloaked by the accumulation of impurities due to sedentary lifestyle, stressful mental conditions, excess use of pesticides, chemicals, preservatives and augmented use immunosuppressive drugs. These impurities or toxins lead to deterioration of normal body functioning and which affects the quality of life as well as lifespan. Ayurveda stands as an answer to solve this issue and provide healthful longevity including mental development and resistance against diseases.

Ayurveda and other ancient Indian literature describe the use of plants in prevention and treatment of diseases of mankind since the time immemorial. Plants are used in traditional herbal medicines, which are being acknowledged in today's society as an important source of health due to their wide range of benefits including low cost of production, higher safety margins, non-toxic property and minimal risk of side effects.[3,4]

Ayurveda mentions herbs that are believed to detoxify the body and mind; restore health; prevent degeneration and postpone aging or rather reverse the aging process. And one of them is Haritaki (Terminalia chebula Retz. Family: Combretaceae) which possesses a great therapeutic value. It is used in traditional medicine due to the wide spectrum of pharmacological activities associated with the biological active chemicals present in this plant.[5] It is one of the constituents of numerous Ayurvedic formulations like Triphala choorna, Abhayarishta, Pathyadi Kwath, Chitrakharitaki avleha, Agastiharitaki avleha etc. which are used in day to day practise.

Recently there are lot of attraction towards natural based herbs as an antimicrobial agent because of its ecofriendly and health hazardless nature.[6-13] The traditional Indian systems of Ayurveda and Siddha medicines support the importance of medicinal plants to treat diseases.[2] At the turn of the century, approximately 170 herbal drugs were officially recognized in the U.S.P and N.F.[14] The Director of WHO Traditional Medicine reported in

1993 that 80% of the world population rely chiefly on traditional medicine, mainly plant based, especially for their primary health care needs.[15]

In India 70% of populations are reported using traditional medicine for primary health care.[16] In India 70% of populations are reported using traditional medicine for primary health care. The present annual turnover of herbal medicinal products manufactured by large companies is estimated to be approximately US $ 300 million, compared to a turnover of approximately US $ 2.5 billion for modern drugs.[17]

According to Ayurveda there are three parts of the lifespan of a person called as Vaya. They include Balavastha (childhood), which lasts up to the age of 16 years and Kapha is the predominant Dosha during this period which is responsible for growth and development; Madhyavastha (young and middle age), which lasts from the age of 16 years to 60–70 years and is governed by Pitta Dosha which is accountable for the vigour and vitality of youth.; and Vriddhavastha or Jirnavastha (old age), which is the period after 60 or 70 years and Vata is the predominant Dosha during this phase of life and which is responsible for most of the manifestations of aging.[18,19] This process of aging generally begins at the age of about 60 years and progress gradually and the effects are fairly noticeable at the age of 70 years.[20] Natural Aging (Kalaja) occurs at or after the age i.e. 60 years but premature Aging (Akalaja) occurs before 60 years of age. The improper food and life habits lead to premature ageing. The process of aging leads to the progressive physiological changes in physical health such as deterioration in functions of body tissues (Dhatu), senses (Indriya), strength (Bala), virility (Virya), digestion and metabolism (Agni), and enthusiasm (Utsaha) together with wrinkled skin (Vali), grey hair (Palitya) and baldness (Khalitya); attack of various diseases like cough (Kasa), dyspnoea (Shwas), tremors (Vepathu) and unable to carry out work. The physiological changes in mental health comprise decline in mental functions like perception (Grahana), retention (Dharana), retrieval abilities (Smarana), speech (Vachana) and general knowledge (Vigyana)[20]

Botanical classification: According to Benthem & Hooker (1862-1883)

- Taxonomical position: TerminliachebulaRetz.
- Kingdom : Plantae
- Division : Magnoliophyta
- Class : Magnoliopsida
- Order : Myrtales

- Family : Combretaceae
- Genus : Terminalia
- Species : chebula Retz.

Vernacular Names

- Assami : Hilikha
- Bengali : Haritaki
- Burma : Pangah
- English : Black myrobalan, chebulic myrobalan
- Gujarati: Hirdo, Harade.
- Hindi : Har, Harara, Harra.
- Konkani : Ordo
- Malayalam : Divya, Katukka, Kayastha, Putanam
- Punjabi : Halela, Har, Harrar, Hurh
- Tamil: Amagola, Arabi, Aridadi, Attan, Kadu, Kadukkay, Kagodagasingi, Nechi, Pattiyam, Piradamai, Seya, Sidegi, Singi, Sirottam, Sittillai, Siva, Sivandi, Taduvairi, Tuvarchigai, Urogini, Vayadaram
- Telugu : Haritaki, Karaka, Karakkaya, Nallakaraka, Resaki, Sringitiga
- Tulu : Anile
- Urdu : Haejarad
- Uriya : Horida, Horitoki, Jonghihorida, Karedha.

- **Botanical Description**

Habitat: It is found throughout the greater parts of India, from Ravi eastwards to West Bengal and Assam, ascending to an altitude of 1500 m in the Himalayas, also in Bihar, Orissa, Madhya Pradesh, Maharashtra, Deccan and South India.

Habit: A moderate sized or large deciduous tree, attaining 15-24 meters in height.

Leaves: Ovate or elliptic with a pair of large glands at the top of the petiole.

Flowers: Flowers all hermaphrodite, 4mm. Across sessile, dull-white or yellow, with an offensives small. Spikes-sometimes simple, usually in short panicles, terminal and in the axils of the uppermost leaves.

Fruit: Drupes ellipsoidal, obovoid or ovoid, yellow to orange brown, and hard when ripe, 3-5cm long, 5 ribbed on drying.(Fig 1)

Seeds: Hard, pale yellow.

Flowering and fruiting time-Rains to summer season[21]

Fig. 1: Haritaki Plant and Dried Fruits.

- **Classification of Haritaki**

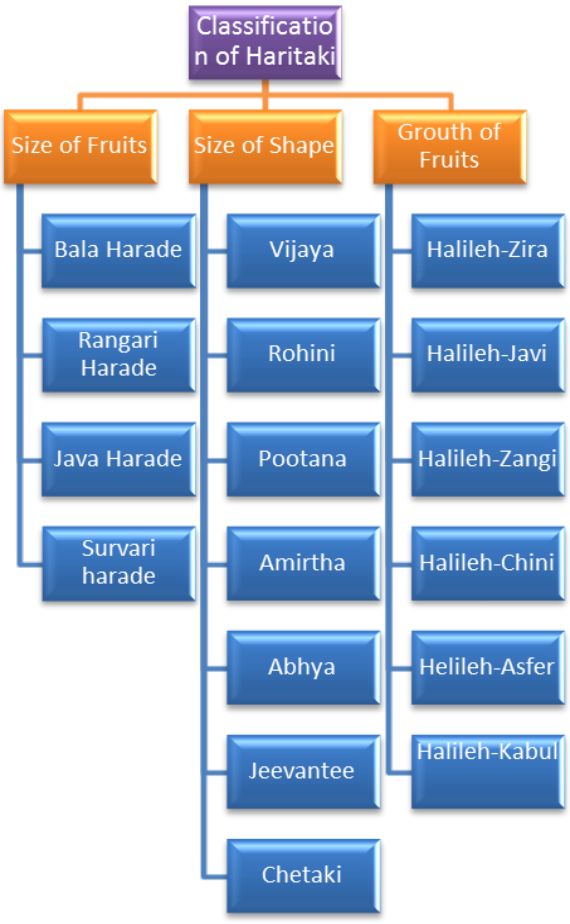


Fig. 2: Classification of Haritaki.

Classification according to the size of the fruit

Survari Harade - which are large, dense and heavy about 2 inches long, yellowish-brown: when cut it contains yellowish or darkish brown, pulp and stone.

Rangari Harade - these are smaller, less wrinkled, and less furrowed than the above variety; in length about an inch; the epidermis is yellow; when cut it presents a yellow dried pulp and a stone. The pulp is less astringent than that of Survari Harade.

Bala Harade - are smaller than the above two varieties. Their color is deep brown or black; highly wrinkled, dark or brown epidermis. Their pulp I dark and homogenous; there is no stone.

Java Harade - these are the smallest of all. Other characters are similar to those of Bala harade.

- **Classification according to shape**

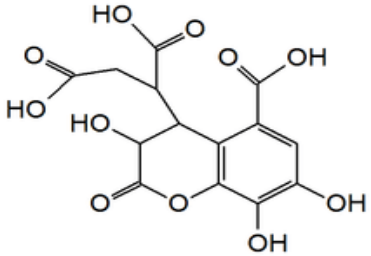
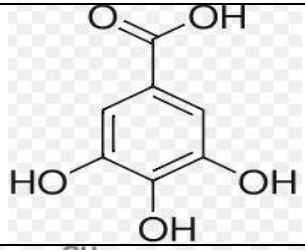
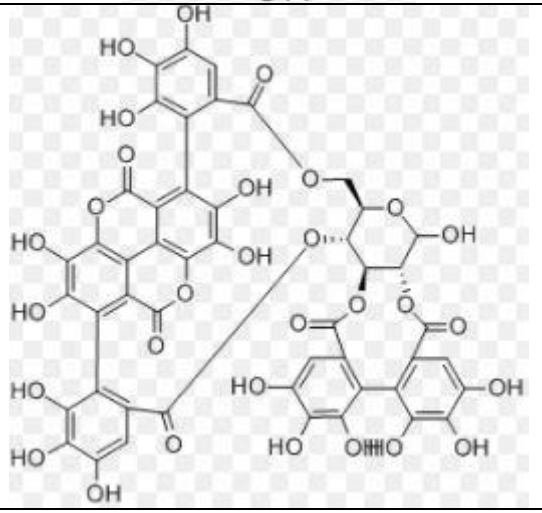
Vijaya - having alabu shape used in all diseases, habitat in vindahya mountains
Rohini - Round in shape- used in vrana, habitat in zansi and other states of india
Pootana - Size is small, mesocarp is less, seed is bigger, externally used, habitate Sind. (iv) Amirtha - Mesocarp is more used for shodhanakarma habituate
Abhya - Fruit having five ribbed used in eye diseases, habitate champaranya, himalaya
Jeevantee - fruit is golden yellow, used in all diseases, habitate himalaya.
Chetaki - Fruit having three ribs, used as purgative.

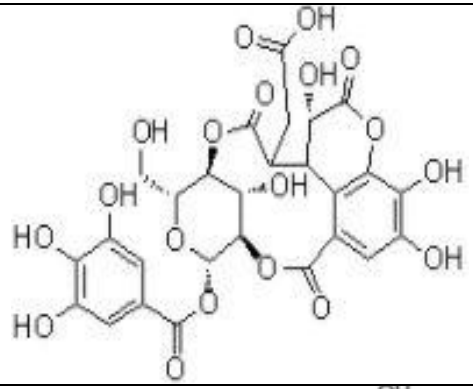
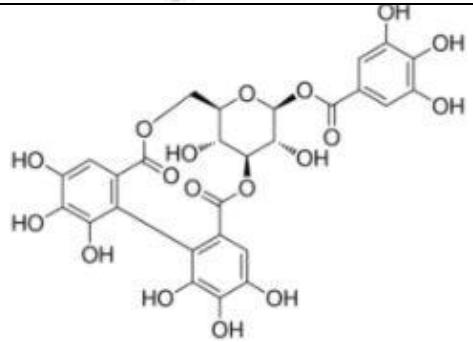
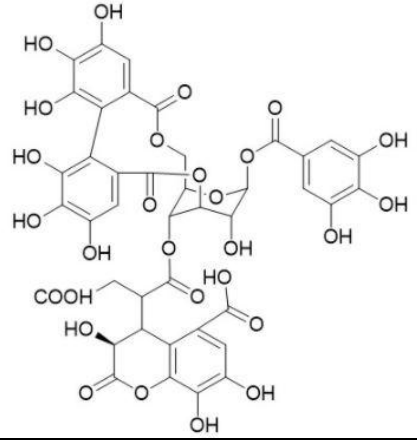
Classification according to the growth of the fruit
Halileh - Zira. When the size is that of a cumin seed.
Halileh - Javi, when the size is that of a barely corn.
Halileh - Zangi when the size is of a raisin
Halileh - Chini when fruit is greenish yellow and somewhat hard.
Halileh - Asfer when it is very nearly mature Halileh - Kabul or fully matured fruit

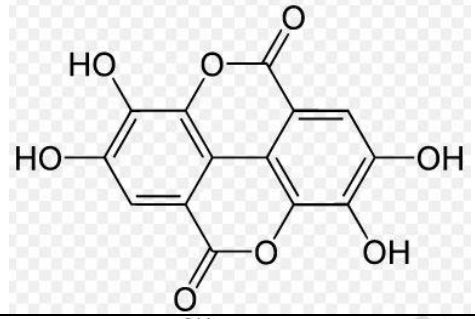
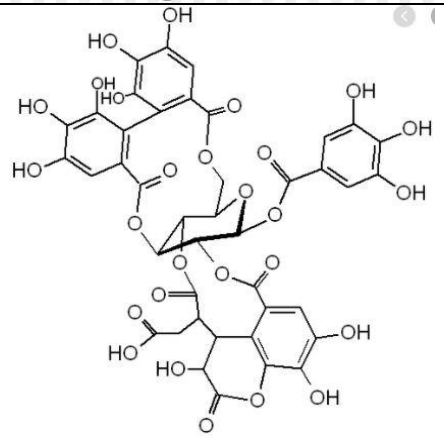
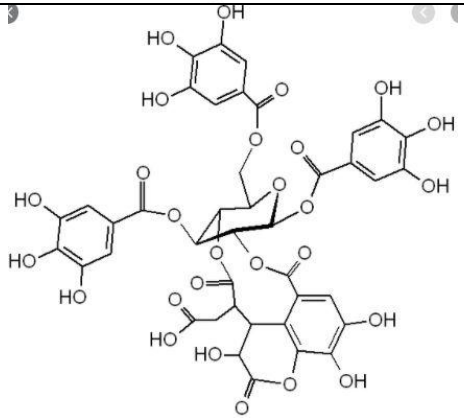
- **Phytochemical Contituents**

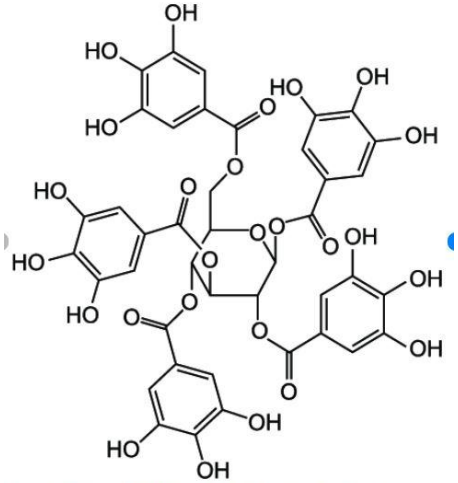
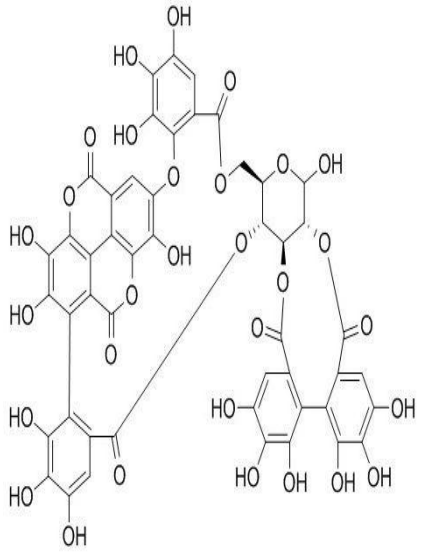
Haritaki is recognized to possess a wide range of phyto-chemical constituents. T. chebula have a number of phytoconstituents like tannins, flavonoids, sterols, amino acids, fructose, resin, fixed oils etc. and it is fairly loaded with different tannins (approximately 32% tannin content). The chebulic acid, chebulinic acid, chebulagic acid, gallic acid, corilagin and ellagic acid are the chief components of tannin.[22] The studies showed that Phytochemicals such as anthraquinones, ethaedioic acid, sennoside, 4,2,4 chebulyl-d glucopyranose, terpinenes and terpinenols have also been present.[23,24] These tannins contain phenolic carboxylic acid like

gallic acid, ellagic acid, chebulic 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 punacalagin, casurarinin, corilagin and terchebulin and others such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid reported in literature.[25,26] The tannin content varies with the geological variation. Flavonol glycosides, triterpenoids, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated.[27]

Phytochemical		IUPAC Name	Structure	References
Phenolic & Tannin	Chebulic acid	2-(3-carboxy-5,6,7-trihydroxy-1-oxo-3,4-dihydro-1H-2-benzopyran-4-yl)butanedioic acid		
	Gallic acid	3,4,5-Trihydroxybenzoic acid		
	punicalagin,	2,3-(S)-hexahydroxydiphenoyl-4,6-(S,S)-gallagyl-D-glucose α-**punicalagin** β-**punicalagin**		

	Chebulanin Acid	2-[13,17,18,21-tetrahydroxy-7-(hydroxymethyl)-2,10,14-trioxo-5-(3,4,5-trihydroxybenzoyl)oxy-3,6,9,15-tetraoxatetracyclo[10.7.1.1^{4,8}.0^{16,20}]henicosa-1(19),16(20),17-trien-11-yl]acetic acid		
	Corilagin	[(1*S*,19*R*,21*S*,22*R*,23*R*)-6,7,8,11,12,13,22,23-octahydroxy-3,16-dioxo-2,17,20-trioxatetracyclo[17.3.1.0^{4,9}.0^{10,15}]tricosa-4,6,8,10,12,14-hexaen-21-yl] 3,4,5-trihydroxybenzoate		
	Neochebulinic acid	(2R)-2-[(3S)-3-carboxy-5,6,7-trihydroxy-1-oxo-3,4-ihydroisochromen-4-yl]butanedioic **acid**		

	Elagic Acid	2,3,7,8-Tetrahydroxy-chromeno[5,4,3-cde]**chromene**-5,10-dione		
	Chebulegic Acid	2-[(4*R*,5*S*,7*R*,25*S*,26*R*,29*S*,30*S*,31*S*)-13,14,15,18,19,20,31,35,36-nonahydroxy-2,10,23,28,32-pentaoxo-5-(3,4,5-trihydroxybenzoyl)oxy-3,6,9,24,27,33-hexaoxaheptacyclo[28.7.1.$0^{4,25}$.$0^{7,26}$.$0^{11,16}$.$0^{17,22}$.$0^{34,38}$]octatriaconta-1(37),11,13,15,17,19,21,34(38),35-nonaen-29-yl]acetic acid		
	Chebulinic Acid	2-[(4*R*,5*S*,7*R*,8*R*,11*S*,12*S*,13*S*,21*S*)-13,17,18-trihydroxy-2,10,14-trioxo-5,21-bis[(3,4,5-trihydroxybenzoyl)oxy]-7-[(3,4,5-trihydroxybenzoyl)oxymethyl]-3,6,9,15-tetraoxatetracyclo[10.7.1.$1^{4,8}$.$0^{16,20}$]henicosa-1(19),16(20),17-trien-11-yl]acetic acid		

	Pentagallyglucose	[(2*R*,3*R*,4*S*,5*R*,6*S*)-3,4,5,6-tetrakis[(3,4,5-trihydroxybenzoyl)oxy]oxan-2-yl]methyl 3,4,5-trihydroxybenzoate		
	Terchebulin Acid	10-(2,3,4,7,8,9,19-heptahydroxy-12,17-dioxo-13,16-dioxatetracyclo[13.3.1.$0^{5,18}$.$0^{6,11}$]nonadeca-1,3,5(18),6,8,10-hexaen-14-yl)-3,4,5,11,17,18,19,22,23,34,35-undecahydroxy-9,13,25,32-tetraoxaheptacyclo[25.8.0.0^{2,7}.$0^{15,20}$.$0^{21,30}$.$0^{24,29}$.$0^{28,33}$]pentatriaconta-1(35),2,4,6,15,17,19,21,23,27,29,33-dodecaene-8,14,26,31-tetrone		

- **Pharmacological Properties of haritaki**

- **Antibacterial activity**

Gallic acid and ethyl ester, both antibacterial substances against methicillin-resistant Staphylococcus, were recovered from an ethyl alcohol extract of T. chebula. T. extracts in various forms Chebula have antibacterial properties against a variety of microorganisms. T. Helicobacter pyroli, the bacteria that causes gastritis, ulcers, and stomach tumours, is resistant to chebula. T. extracts in ether, alcoholic, and aqueous form Chebula was tested against Helicobactor pylori, however an aqueous extract of the plant reduced H. pylori's urease activity at a dosage of 1-2.5 mg/ml. pylori.

- **Antifungal activity**

Antifungal activity of T. chebula aqueous extract against dermatophytes (e.g. Epidermophyton, Floccosum, Microsporum gypseum, and Tricophyton rubrum) and yeasts has been observed (e.g. Candida albicans). Aqueous, alcoholic, and ethyl acetate extracts of T. chebula leaves were tested using the paper disc method against five pathogenic fungi (Aspergillus flavus, Aspergillus niger, Alternaria brassicicola, Alternaria alternata, and

Helminthosporium tetramera) and found to be effective when compared to the reference standard Carbendazim.

- **Antiamoebic and immunomodulatory activities**

The antiamoebic effect of a crude T. chebula drug formulation was investigated in experimental caecal amoebiasis in rats with an 89 percent cure rate at 500 mg/kg body weight due to varying degrees of inhibition of enzyme activities such as DNase, RNase, aldolase, alkaline phosphatase, acid phosphatase, - amylase, and protease in axenically cultured amoebae. T. chebula was also tested in golden hamsters with an artificial amoebic liver abscess and in immunomodulation investigations.

- **Antiplasmodial activity**

T. chebula water extract inhibited the absorption of [Antiplasmodial activity 3H] hypoxanthine into the Plasmodium falciparum K1 multidrug-resistant strain in vitro and in vivo, indicating antiplasmodial activity.

- **Anthemintic activity**

The ovicidal and larvicidal properties of ethyl acetate, acetone, and methanol extracts of dried leaves and seeds of T. chebula were evaluated in vitro on Haemonchus contortus using egg hatch and larval development tests at 50, 25, 12.5, 6.25, and 3.13 mg/ml on Haemonchus contortus. At 50mg/ml, preparations of T. chebula leaves and seeds exhibited full suppression.

- **Antiviral activity**

Human immunodeficiency virus-1 reverse transcriptase was inhibited by a fruit extract from T. chebula. In a research, T. chebula hot water extract demonstrated anti-herpes simplex virus (HSV) activity in vivo as well as anti-cytomegalovirus (CMV) activity in vitro and in vivo. On an epithelial tissue culture cell line, Ledretan-96 and each of its 23 separate components were evaluated for their ability to protect against the cytotoxic effects of the influenza A virus. Only one of the 23 components examined had a substantial protective effect when administered to epithelial cells alone. A research found that T. chebula fruits contain four human HIV-1 integrase inhibitors, including gallic acid and three galloyl glucoses, and that the galloyl moiety played a key role in these compounds' inhibition of HIV-1 integrase 3′ -processing.

- **Antimutagenic and anticarcinogenic activities**

The effect of a 70 percent methanolic T. chebula fruit extract on the growth of several malignant cell lines, including a human (MCF-7) and mouse (S115) breast cancer cell line, a human osteosarcoma cell line (HOS-1), a human prostate cancer cell line (PC-3) and a nontumorigenic, immortalised human prostate cell line (PNT1A), was investigated using proliferation (3H-thymidine incorporation and cAMP The extract reduced cell viability, hindered cell growth, and caused cell death in all cell lines tested in a dose-dependent manner.

- **Antioxidant activity**

T. chebula is high in antioxidants. Six extracts and four pure components of T. chebula were tested and shown to have anti-lipid peroxidation, antisuperoxide radical generation, and free radical scavenging properties at various potencies.

- **Antidiabetic and retinoprotective activities**

In normal and alloxan diabetic rats, oral treatment of a 75 percent methanolic extract of T. chebula (100 mg/kg body weight) decreased blood sugar levels substantially within 4 hours. The medication has a long-lasting impact when used on a regular basis.

- **Anti-arthritic activity**

In both formaldehyde-induced and CFA-induced arthritis, the hydroalcoholic extract of T. chebula inhibited joint swelling much more than the control. T. chebula therapy also decreased serum TNF levels as well as TNF-R1, IL-6, and IL-1 expression in the synovium. T. chebula might be utilised as a disease-modifying drug in the treatment of rheumatoid arthritis, according to the scientists.

- **Wound healing activity**

Because of increased rates of contraction and a shorter duration of epithelialization, topical application of an alcoholic extract of T. chebula leaves produced considerably quicker healing of rat cutaneous wounds in vivo. In the granulation tissues of treated wounds, biochemical analyses.

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