



## ***Post-I-Halela Zard (Terminalia Chebula Retz.): An Overview of the Key Medicinal Plant and Therapeutic Uses in the Unani System of Medicine***

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**ABSTRACT:** The Unani System of Medicine (USM) has long employed *terminalia chebula*, a significant medicinal plant in pharmaceuticals, to treat a wide range of illnesses and infections. The distinctive phytoconstituents (chebulenic acid, corilagin and casuarinin) found in this herb are thought to be a valuable and affordable source. These phytoconstituents are commonly used in the production of medications with higher safety margins and fewer harmful effects against various ailments. The mature dried fruits of *terminalia chebula* belong to the combretaceae family. It is also referred to as *Halīlaj Asfar* in Arabic, *Halela Zard* in Persian, *Haritāki* in Hindi and Chebolic Myrobalan in English. According to their level of maturation, each of these varieties can take on different forms, making this categorisation well-known in the USM. *Halela* has been used in Unani medicine for a very long period, either alone or in different compound formulations like *Itrīfal* or *Triphala*. The entire plant, with its great medicinal potential, has been used by Unani physicians to treat a wide range of conditions in humans. It is used as a blood purifier, astringent, cholagogue, carminative, brain tonic, eye tonic, cardiogenic, stomach tonic, gastrointestinal motility, kidney tonic and digestive anthelmintic. *Terminalia chebula* possesses a multitude of pharmacological and therapeutic qualities, including hepatoprotective, wound-healing, anti-oxidant and anti-diabetic effects. In an effort to clarify further research in this field, this study aims to shed light on *T. chebula* by describing its widely recognised medicinal benefits.

**KEYWORDS:** *Halela Zard*, *Halīlaj Asfar*, Chebolic Myrobalan, chebulinic acid, *Pīli Har*

### **INTRODUCTION**

*Post Halela Zard* is the skin of the mature dried fruits of *Terminalia chebula*, belongs to the *Combretaceae* family. It is also known as myrobalan <sup>[1,2]</sup>. Myrobalan is the second biggest genus in the *Combretaceae* family and has about 250 species, the majority of which are medium to large trees <sup>[3,4]</sup>. The word "*terminalia*" is derived from the Latin word "*terminus*" which denotes that the leaves are found at the branch's extremity (terminal branches). Cracks and branches hidden in layers can be found in the bark of *Terminalia* plants <sup>[4,5]</sup>. In Unani, Ayurveda and other conventional medicinal systems, *Terminalia chebula* Retz. is used either alone

or in a "triphala" or "Itrīfal" formulation with *Emblīca officīnalis* and *Beleric Myrobalans* to treat a variety of illnesses. Because of its exceptional healing properties, this medicinal plant is also known as "the king of medicine," particularly in Tibet. This medication is referred to as "*Haritaki*" in Sanskrit literature, which refers to the yellowish dye (*harita*) that it contains. Additionally, it is claimed that this name was given since the plant is frequently grown in the temple of the god Shiva (Hari, i.e., the Himalayas) [6]. The old tree with fractured grey or dark grey bark. The majority of the time, the *terminalia chebula* leaves are subopposite, ovate or elliptic, whole, sharp, silky hairy while young, and glabrous or almost so when they are grown. pubescent or tomentose spikes, flowers are white with extremely dense white villous within, often 5 ribbed, ellipsoid-shaped drapes [7]. The fruits are used to treat inflammatory diseases of the mucous membranes of the gastro intestinal tract, genitourinary. They are used to treat *Bwāsīr* (piles), *Qabḍ* (constipation), *Al-Nakāl/Sayalān/Zuhrī/Hurqa/Sozāk/‘Uqūba* (gonorrhoea), duodenal ulcers, *Muzmin Zahīr* (chronic dysentery) and *Ishāl* (diarrhoea). After colostomy, *Isabgol* (*Plantago ovata*) preparations are administered to help with the generation of a smooth, solid faecal matter. Enzymes and intestinal bacteria in the gut do not breakdown the mucilage, thus it exits the body undigested. Mucilage that resembles jelly collects irritants and poisons from the intestines and excretes them from the body. The seeds are utilised for kidney, bladder, and urethral ailments as well as feverish conditions. Seeds are decocted for colds and coughs, and crushed seeds applied as a poultice for rheumatism and glandular swellings [8].

## MATERIAL AND METHODS

We prepared this review using every accessible textual, digital, and online resource. The description, identification, temperament, pharmacological studies, effects, medicinal applications, etc. were investigated in both modern and Unani books. Published articles and research papers were searched from Science Direct, PubMed, Google Scholar, Scopus, and other databases, etc. Further information about the material were searched using the key words *Post-i-Halela Zard*, *Chebulic Myrobalan*, *Terminalia chebula*. The relevant Unani terminology was provided by the Standard Unani Medical Terminology, which was published by the Central Council for Research in Unani System of Medicine in collaboration with the World Health Organisation and WHO international standard terminologies on Unani medicine.

### Scientific classification [9]

Kingdom	:	Plantae
Subkingdom	:	Tracheobionta
Super division	:	Spermatophyta
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Subclass	:	Rosidae
Order	:	Myrtales
Family	:	Combretaceae
Genus	:	<i>Terminalia</i> L.
Species	:	<i>Chebula</i> [3]

### Morphology/Botanical description

It is a medium sized or large deciduous tree which attains a height of 25-30 m. The leaves, leaf-buds, branchlets possess soft shining rust-coloured hairs. Leaves are 7-20 cm long and 4-8 cm broad, alternate, elliptic-oblong, acute, round on maturing; petioles are 2-5 cm long, pubescent, having 2 glands at the top. Flowers are hermaphrodite, 4 mm across, sessile, dull-white or yellow in colour with offensive smell; calyx is campanulate which is 3 mm long and hairy within. Bark is 6 mm thick with dark brown colour and shallow vertical cracks.

Wood is very hard, brownish grey colour with greenish or yellowish tinge <sup>[10]</sup>. The flowers are monoecious, dull white to yellow, with a strong unpleasant odour, borne in terminal spikes or short panicles. The flowers appear in May-June and the fruits in July-December. The fruit or drupe is about 1-2 inches in size. It has five lines or five ribs on the outer skin. Fruit is green when unripe and yellowish grey when ripe (Fig.1). Fruits were collected from January to April, fruit formation started from November to January <sup>[11]</sup>.



**Fig. 1: Dried fruits of *Post-i-Halela Zard* (*Terminalia chebula* Retz.)**

### **Habit and habitat**

*Terminalia chebula* is a moderate sized or large tree found throughout India, chiefly in deciduous forests and areas of light rainfall, but occasionally also in slightly moist forests, up to the altitude of 1500 m elevation, throughout India <sup>[12]</sup>. Myrobalan trees is wild in forests of Northern India, the Satpura mountains of Madhya Pradesh, Maharashtra, Pancha-mahal region in Gujarat, Satpura, Kanara, Belgaum, central provinces and Bengal, common in Madras, Mysore and in the southern part of the Bombay presidency. Additionally, Sri Lanka and Myanmar both have it <sup>[2,8,11]</sup>.

### **Cultivation and collection**

The fruit that has fallen is first picked and carefully dried. Later, the calcified flesh is cut away. The best results for germinating stones come from fermentation, but decent results can also be obtained by cutting off the broad end of the stone without harming the embryo and then immersing it in cold water for 36 hours. In India, seeds are often planted in nursery beds or boxes in the spring or just prior to the rainy season, covered with soil, and given constant irrigation. The best soil types for growing them are clay and sand. They need a lot of water and direct sunlight to flourish correctly. It is possible to make a transplant from the nursery to the field during either the first or second wet season. Early on in the nursery and after transplanting, shading is preferred. Cuttings can be used for propagation, however transplanting seedlings grown in a nursery is more effective. Below-16°C, these trees cannot withstand the cold. Small canopy breaches are made to encourage regeneration in the forest, and this process may be complemented by planting seeds in the openings. From late February through the beginning of April, these deciduous trees are leafless. The flowers are in bloom from April until August. Between November and February, the trees produce fruit. The fruit usually appears during November to January and it is collected during January to April <sup>[11,13]</sup>.

### **Māhiyat (Description of drug in Unani literature)**

*Halela* is the fruit of a large wild tree. Its trees are found in abundance in Assam, Bengal, Madras and Bombay. There are three types of *Halela* depending on the volume and colour <sup>[14]</sup>.

1. **Halela Siyah:** *Halela Siyah* refers to the unripe and tiny fruit of *Terminalia chebula*. At this stage, the fruit is usually black in colour and has a *kasīla* (acidulous taste) [6,15,16].
2. **Halela Zard:** *Halela Zard* is the ripe but not totally developed fruit of *Terminalia chebula*. The fruit is yellow at this time, and the flavour is *kasīla* (acidulous) [6,15,16].
3. **Halela Kabuli:** The ripe and fully mature fruit of *Terminalia chebula* is known as *Halela Kabuli* [6,17,18].

**Mutrādifāt (Vernacular names):**

Arabic	:	Halīlaj Asfar [15,16,19,20] Ahlīlaj [21] Ahlīlaj Asfar [22,23]
Assam	:	Hilikha [10]
Ayurvedic	:	Haritaki, Kāyasthā, Pathya, Shreyasi, Shivā [24]
Bengali	:	Haritaki [10,25]
English	:	Black Myrobalan, Chebulic Myrobalan [10,24,25]
Gujarati	:	Hirido, Kabuli-Harda, Pilo-Harda [25]
Hindi	:	Har, Harra [25,26] Bari Har and Zard Har [16] Har Pīlī [20]
Kannada	:	Aralaikai, Harade, Haritaki [26]
Kashmiri	:	Zard Halela [25]
Malayalam	:	Dirya, Katukka, Kayastha, Putanam [25]
Marathi	:	Habra, Hirada, Hirda [10,25]
Nepali	:	Harra, Herro [10]
Oriya	:	Harida, Horitoki, Janghi-Horida, Karedha [25]
Persian	:	Halelah, [21] Halela zard [15,22,23,25]
Punjabi	:	Halela, Har, Harrar, Huch [26]
Sanskrit	:	Amogha, Haritaki, Himaja, Kayastha, Pachani, Triphala [25]
Sikkim	:	Hana, Silimkung [10]
Tamil	:	Amagola, Aridali, [26] Nechi, Pirasdamai, Sivani [25]
Telugu	:	Haritaki, Karaka, Karakkaya, Nallakaraka, Sringitiga [25]
Urdu	:	Halela zard [25] Har Pīlī [20]
Unani	:	Harad, Halela Siyah, Halela Zard, Halela Kabuli [24]

**Ajzā-i-Must'milā (Parts used):** Different parts (i.e. *Post-i-Halela* and *Tukhm*, dried fruit, fruit, stem, bark, mature and immature fruits) of plant are used in USM [7,9,20,25].

**Mizāj (Temperament):** In Unani literature, the temperament of this drug is mentioned as according to Shaikh bu ali sina and their experience. *Baarid 1<sup>0</sup> wa Yabis 2<sup>0</sup>* (Cold 1<sup>0</sup>& Dry 2<sup>0</sup>) [16,19,21] *Baarid wa Yabis* (Cold & Dry) [15,25]

**Af'āl (Action):** The pharmacological actions of *Post-i-Halela Zard* are:

*Muqawwī-i-Dimāgh* (Brain tonic), *Muqawwī-i-Mi'da wa Am 'ā'* (Stomachich), *Mushil-i-Balgham* (Phlegmatic Purgative), *Mushil-i-Safra* (Purgative of bile), *Sudā* (Headache) *Muqawwī-i-Chashm* (eye tonic), *Muqawwī-i-Sha'ar* (hair tonic), *Mushil-i-Sawda* (Purgative of black bile), *Jādhīb Rutūbat* (Absorbent), *Musaffi-i-Dam* (Blood purifier), *Mudirr-i-Bawl* (diuretic, *Muqawwī-i-Qalb* (cardio-tonic), *Muqawwī-i-Asnan* (Tooth tonic), *Mufattih Sudad* (Deobstruent) [14,15,16,21,23,25,27]

**Isi'mālāt (Therapeutic uses):** According to renowned Unani physician Ibn Hubal Baghdadi, mentioned in his well-known book "Kitab Al-Mukhtarat Fi-Al-tib," *T. chebula* is a great blood purifier, brain tonic, eye tonic and cardiogenic. Thus, this herb was employed by Unani physicians to cure palpitations, dementia and weakness of eye (cataracts, conjunctivitis) [28] and other therapeutic uses of *Post-i-Halela Zard* are:

*Ihtibās al-Tamth* (Amenorrhoea), *Du'fī -Qalb* (Weakness of Heart), *Du'fī -Basarat* (Weakness of eyesight), *Dam 'a* (Epiphora), *Nuzūl al-Mā'* (Cataract), *Waja ' al-Asnān* (Odontalgia/Toothache), *Sadr-o-Duwār* (Vertigo)

and giddiness), *Ṣar'* (Epilepsy), *Zahīr* (Dysentery), *Sabal* (Vascular keratitis/Pannus), *Waja' al-Ṭihāl* (Splenetic pain), *Khafaqān* (Palpitation), *Nisyān* (Amnesia), *Hummā Muzmina* (Chronic fever, *Ḍu'fī -Dimagh* (Weakness of brain), *Mālankhūliyā* (Melancholia), *Laqwa* (Facial palsy), *Bawāsīr* (Haemorrhoids), *Judhām/Al-'Illa al-Kubrā* (Leprosy, *Waram al-Ṭihāl* (Spenitis), *Ishāl* (Diarrhoea), *Ḍu'f al-Am 'ā'* (Enteropathy), *Ḍu'f al-Mi'da* (Gastric debility) [14,15,16,21,23,25,27]

**Tarkīb-i-Isti'māl (Method of uses):** The methods of use of this drug are as follows:

- The fine powder of *Halela Zard* (*Terminalia chebula*) along with *Anzarūt* (*Astragalus sarcocolla*) is to be sprinkled into eyes in cases of epiphora [19].
- The infusion prepared with *Halela Zard* (*Terminalia chebula*), *Sapistan* (*Cordia myxa*), *Unnab* (*Ziziphus sativa*) and *Alū Siyah* is used to treat stomach disorders [19].
- *Post Halela Zard* (*Terminalia chebula*) (31.5-45 g) is soaked into plain water for whole night. Next morning, it is boiled by adding *Aftīmūn* (*Cuscuta reflexa*) (4.5-9 g) and is given in the treatment of bilious disorders [19].
- Infusion of *Halela Zard* (*Terminalia chebula*) prepared in the extract of pomegranate is purgative of bile [19].
- *Murabbā-i-Halela* is given at bed time to the patients of constipation [21].
- The powder of *Halela Zard* and *Misri* (Rock candy) is prescribed to improve digestion [21].
- The powder of *Halela Zard* (*Terminalia chebula*) is given along with honey in cases of vomiting, diarrhoea and abdominal pain [21].
- The powder of *Halela Zard* (*Terminalia chebula*) along with honey is use in the treatment of spermatorrhoea [21].
- Decoction of *Halela Zard* (*Terminalia chebula*) with castor oil for seven (7) days in used to treat elephantiasis [21].
- *Halela Zard* (*Terminalia chebula*) powder mixed with castor oil is used as linctus in the management of orchitis [21].
- Unani physicians cure patients by applying and ingesting the fruits of the *Halela Zard* plant. Unani physicians treated piles externally with an ointment (Marham) of *Halela Zard*, which was made from roughan gul, *Halela Zard* powder and mom [28].
- The ash of *Halela Zard* mixed with butter and is applied locally for wounds healing [21].
- *Halela Zard* fruit with honey paste is also effective in conjunctivitis due to its anti-inflammatory properties [28].
- *Halela's Murabbah* is well-suited for treating constipation and acting as a stomach, brain and cardiogenic [28].
- According to Zakariyyā Rāzī (Rhazes), *Halela Zard* powder when taken on a regular basis, improves memory, thinking and reasoning skills; it also strengthens the neurological system by having positive effects on brain nerves; it also treats headaches, colitis, leprosy, ascites and splenomegaly. Another efficient treatment for anaemia is *Haritāki* powder combined with honey and ghee. When brewed with honey, it helps those with obesity lose excess body fat [28].

**Maḍarrāt (Harmful/adverse effects):** *Post Halela Zard* is harmful for intestines, colon and anus. When it is used without detoxification, it causes spasm [15,21,23]

**Muslih (Corrective):** To counter its harmful effects *Unnāb* (*Ziziphus jujuba*) and *Sapistān* (*Cordia myxa*) is used as correctives [19,21,23] *Roghan-i-Badam* is also can be used as a corrective [15].

**Badal (Substitute):** If it is not available at the time then, *Post-i-Anar* (*Punica granatum*) or *Māzū* (*Quercus infectoria*), *Halela Kābli* (*Terminalia chebula*) can be used [15,21]. Whereas, *Habb-ul-Aas* (*Myrtus communis*),

*Banafsha* (*Viola odorata*), *Khubbāzi* (*Malva sylvestris*), *Aftīmūn* (*Cuscuta reflexa*) and *Afsantīn* (*Artemisia absinthium*) are also used as substitute according to their need <sup>[19]</sup>

**Miqdār-i-Khūrāk (Therapeutic dose):** The therapeutic dose of *Post-i-Halela Zard* is 7 g to 17.5 g <sup>[21]</sup> Azam Khan has mentioned the dose as 10.5-28 g <sup>[19]</sup>. Other have mentioned as 9 g, <sup>[15]</sup> 5-7 g <sup>[16,27]</sup> and 9-12 g <sup>[23]</sup>

**Murakkabāt (Compound Formulations)**

*Post-i-Halela Zard* (*Terminalia chebula*) is one of the most ingredient used in the preparation of various compound formulations in the Unani system of medicine (Table 1).

**Table 1. Compound Preparations Containing *Post-i-Halela Zard* (*Terminalia chebula*)**

S.N.	Name of formulations	Dose and method of administration	Action and uses
1.	Habb-i-Adrak	150-250 mg	Cough suppressant, expectorant, helps in wet cough <sup>[29]</sup> .
2.	Habb-i-Hayāt	5-10 g	Laxative and constipation <sup>[29]</sup> .
3.	Habb-i-Kābūs	5-10 g	Purgative, cleansing of morbid matter from brain, melancholia and mental weakness <sup>[29]</sup> .
4.	Habb-i-Mastagī	0.5-1 g	Stomachic, carminative, helps in weakness of stomach and flatulence <sup>[29]</sup> .
5.	Habb-i-Musaffi-i-Khūn	500 mg	Blood purifier, helps in gonorrhoea and septicaemia <sup>[29]</sup> .
6.	Itrīfal Mundī	10-20 g	Blood purifier, helps in septicaemia conjunctivitis, scabies and pruritis <sup>[29]</sup> .
7.	Itrīfal Sana Qawī	5-10 g	Laxative, helps in constipation <sup>[29]</sup> .
8.	Tiryāq-i-Pechis	3-5 g	Deobstruent, carminative, helps in flatulence and dysentery <sup>[29]</sup> .
9.	Habb-i-Pechis	1-pill (each 220 mg) at bed time	Constipation, to stop bleeding, helps in dysentery and diarrhoea <sup>[30]</sup> .
10.	Habb-i-Rasaut	2-pills in morning and evening	To stop bleeding, help in bleeding haemorrhoid <sup>[30]</sup> .
11.	Qurs Mulaiyin	2-3 tablets (each 675 mg)	Laxative properties, it's used for constipation, catarrh and otalgia <sup>[30]</sup> .
12.	Kohlul Jawāhar	Q. S.	Eye tonic properties and used to weakness of eyes <sup>[30]</sup> .
13.	Itrīfal Zamāni	5-10 g	Laxative, helps in catarrh, melancholic and intestinal colic <sup>[30]</sup> .
14.	Ma'jūn Māsikul Bawl	5 g at bed time	Bladder tonic, helps in weakness of bladder and diuresis <sup>[30]</sup> .
15.	Ma'jūn Musaffi Khās	5 g	Blood purifier, helps in septicaemia, gonorrhoea and syphilis <sup>[30]</sup> .
16.	Aujaia	2-tablets twice a day with warm water	Resolving of swelling, analgesic, helps in arthritis and gout <sup>[31]</sup> .
17.	Māski	Adult 4 tablets with water twice a day	Antidiuretic, helps in polyuria, incontinence of urine <sup>[31]</sup> .

18.	Qurs-i-Mulayyin	2-tablets with warm water at bedtime	Laxative, help in chronic constipation <sup>[31]</sup> .
19.	Qurs-i-Zahīr	Two tablets with water twice a day	Antidysentery, stomachic, helps in dysentery and weakness of stomach <sup>[31]</sup> .
20.	Surma-i-Zahiri	Q.S for local application at night	Eye tonic, refrigerant, repellent, helps in cataract and conjunctivitis <sup>[31]</sup> .
21.	La‘ūq Khayar Shambar	10 g with warm water twice a day	Expectorant, concoctive of phlegm, laxative, helps in catarrh, cold and productive cough <sup>[31]</sup> .
22.	Ma‘jūn Musaffi A‘zam	6 g with 50 ml ‘Araq Musaffi Murakkab twice a day	Blood purifier, helps in boils, carbuncle, syphilis, arthralgia <sup>[31]</sup> .
23.	Tiryāq-i-Pechish Jadīd	3 g twice a day	Antidysentery, antidiarrhoeal, helps in bilious and phlegmatic dysentery <sup>[31]</sup> .
24.	Sufūf Mulaiyin	6 g with lukewarm water at bedtime	Laxative, anti-gastralgic, helps in constipation and gastralgia <sup>[31]</sup> .
25.	Sufūf Suranjan	6 g twice a day with lukewarm water	Resolving, analgesic, helps in arthralgia and gout <sup>[31]</sup> .
26.	Sufūf Tabkhiri	3-6 g after meals	Anti-flatulent, digestive, carminative, helps in flatulence and dyspepsia <sup>[31]</sup> .
27.	Sunūn Pyria	Q.S to be applied locally	Tooth and gum strengthening, haemostatic, help in bleeding gum <sup>[31]</sup> .
28.	Qutūr-i-Chashm	2-drops twice a day	Conjunctivitis <sup>[31]</sup> .
29.	Habb-i-Ustukhuddūs	2-5 g	Cleansing of morbid matter from brain, helps in paralysis and bell’s palsy <sup>[32]</sup> .
30.	Habb-i-Zahab	4.5 g	Evacuates the hot morbid matter of the head <sup>[33]</sup> .
31.	Sufūf-i-Malancholia	4 Dirhams (one dirham is 3.5 g)	Melancholic diseases like leprosy, itching, scabies and ringworm <sup>[33]</sup> .
32.	Ma‘jūn-i-Zabīb	7 g. with water in the morning	It is used in epilepsy <sup>[34]</sup> .
33.	Ma‘jūn -i-Ushba	12 g with ‘Arq murakkab musaffi khūn	It is used in joint pain, syphilis, piles and septicaemia <sup>[34]</sup> .

### Chemical constituents

The fruit of *T. chebula* is rich in tannins (about 32%-34%) and its content varies with geographical distribution. *T. chebula* contains pyrogallol (hydrolysable) tannins, 14 components of hydrolysable tannins were discovered by a team of researchers (gallic acid, chebulagic acid, neochebulinic acid, punicalagin, chebulanin, corilagin, casuarinin, 1,2,3,4,6-penta-O-galloyl-D-glucose, chebulinic acid, 1,6-di-o-galloyl-D-glucose Terchebulin (3,4,6-tri-o-galloyl-D-glucose) from *T. chebula* fruits. Some other components include phenolics and such as chebulinic acid, ellagic acid and anthraquinones. Other phenolic compounds such as flavanol, glycosides, triterpenoids, coumarin conjugated with gallic acids known as chebulin, and others were also

discovered. The fatty acids palmitic acid, linoleic acid, and oleic acid made up the majority of the twelve fatty acids that were extracted from *T. chebula*. There have also been reports of triterpenoid glycosides such chebulosides I and II, arjunin, arjunglucoside, 2-hydroxyursolic acid, and 2-hydroxymicromiric acid. The presence of polyphenols such punicalin, punicalagin, and terflavins B, C, and D in the leaves was discovered [2,11]. These are single, rough, ellipsoid, 1.0-2.0 cm by 0.2 -0.7 cm and without ridges [35].

### Scientific Studies

**Antibacterial activity:** Nayak, *et al.* (2014) carried out an in vitro study to determine the effect of extract of *Terminalia chebula* and its formulation on *Streptococcus mutans*. In this study minimum inhibitory concentration was found to be 10% for aqueous extract of *Terminalia chebula* and 2.5% for ethanolic extract of its fruit. Furthermore, maximum inhibitory effect of ethanolic extract was seen at concentration of 2.5% on the aggregation of *Streptococcus mutans* [36].

**Anti-oxidant activity:** Cheng, *et al.* (2003) carried out a study on anti-oxidant and free radical scavenging activities of *Terminalia chebula*. In this study 6 extracts and 4 pure compounds of *Terminalia chebula* were evaluated for anti-lipid peroxidation, free radical scavenging activity and anti-superoxide radical formation. The results of this study showed that all the above-mentioned extracts and pure compounds of *T. chebula* exhibited potent anti-oxidant activity at different concentrations [37].

**Anti-ulcer activity:** Raju, *et al.* (2009) evaluated the anti-ulcer activity of methanolic extract of fruits of *Terminalia chebula* in pylorus ligation and ethanol induced ulcer model in albino Wistar rats. The methanolic extract was administered at doses of 250 and 500mg/kg p.o. The common parameter which was assessed in both these models was ulcer index. The results showed the potent anti-ulcer as well as ulcer healing properties of the fruit extract of *Terminalia chebula* in both the models [38].

**Anti-diabetic activity:** Subramanian, *et al.* (2006) evaluated the anti-diabetic activity of fruits of *Terminalia chebula* on streptozotocin induced diabetes in rats. In this study ethanolic extract of fruits of *T. chebula* at a dose of 200mg/kg b.w. was administered daily for 30 days and it was seen that the extract reduced the levels of blood glucose and glycosylated haemoglobin in diabetic rats [39].

**Wound healing effect:** Sivakumar, *et al.* (2002) reported the wound healing effect of *Terminalia chebula* on dermal wound healing in rats. In this study topical application of alcoholic extract of leaves of *T. chebula* were evaluated for their potential wound healing effect on dermal wounds and the results of this study showed that there was improvement in rates of contraction and decreased period of epithelialization. The levels of amino sugars like hexosamine and uronic acid was also increased after 8 days of wound induction [40].

**Hepatoprotective effect:** Son Gue-Chang, *et al.* (2015) carried out a study on the hepatoprotective effect of aqueous extract of *Terminalia chebula* against tert-butyl hydroperoxide (t-BHP) induced acute liver injury in C57/BL6 mice. The parameters which were taken into consideration were liver enzymes, histopathology, oxidative stress parameters, inflammatory cytokines and antioxidant components and these were assessed 18h after t-BHP injection. The findings of this study revealed that aqueous extract of *T. chebula* significantly prevented the acute and severe liver injury [41].

**Anti-inflammatory activity:** In 2014, Yang, *et al.* reported 12 compounds from the methanolic extract of fruits of *Terminalia chebula* and this activity was evaluated by inhibition of enzymes such as nitric oxide synthase and cyclooxygenase in lipopolysaccharide stimulated macrophages. In this study, 2-gallotannins, 2-triterpenoids and arjunolic acid effectively reduced the production of nitric oxide [42].

**Anti-convulsant activity:** Debnath, *et al.* (2010) reported the anti-convulsant effect of ethanolic extract of fruits of *Terminalia chebula* in albino mice. The activity was assessed by giving maximal electric shock (MES) to experimental animals as well as by pentylenetetrazol and picrotoxin. The extract significantly reduced the



duration of convulsions produced by MES and latency of seizures produced by pentylenetetrazol and picrotoxin [43].

**Cardioprotective activity:** Devi, *et al.* (2004) suggested that ethanolic extract of *T. chebula* for the prevention of myocardial injury induced by isoproterenol in rats. It was seen that the pretreatment by this extract helped in retaining the activity of enzymes to near normal levels. Histopathological examination further revealed that the rats which were pretreated with *T. chebula* alone had myocardium within normal limits [44].

**Immunomodulatory activity:** Shivaprasad, *et al.* (2008) evaluated the aqueous extract of fruit of *Terminalia chebula* for its effect on cellular as well as humoral immune response in mice. The extract exhibited increase in levels of humoral antibody (HA) titer and delayed type hypersensitivity activity in mice. This study confirmed that the *T. chebula* is having immunostimulant property [45].

### Conclusion:

Since ancient times, Unani physicians have utilised the vital herb *Post-i-Halela Zard*, which possesses numerous therapeutic characteristics, to treat a wide range of illnesses. *T. chebula's* major actions include stomachic, blood purifying, diuretic, anti-dysenteric, purgative (*Şafrā'*), sedative, astringent, and mildly cardio-tonic, cerebral, and ocular tonic properties. As a result, it is frequently used in Unani medicine to treat gout, joint pain, conjunctivitis, piles, low vision, epilepsy, melancholia, and leprosy. It also helps to strengthen the gums, brain, and eyes, as well as activate the digestive system. Many biologically active phytoconstituents, including gallic acid, corilagin, ellagic acid, punicalin, chebulosides I and II, casuarinin, chebulinic acid, chebulagic acid and other related compounds, are abundant in it. These compounds have antimicrobial, antioxidant, antihyperglycemic, anticancer, and protective properties for various human vital organs, including the liver, heart, kidney, and nerves. *Terminalia chebula* has historically been used as a remedy for a wide range of illnesses. Thus, it is imperative to look into the biological activity of its phytoconstituents in order to create a new herbal medication that is more dependable, affordable and has a higher safety margin.

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### AUTHOR'S CONFLICT

The authors declare that there are no conflicts of interest.

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