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Overview on Terminalia Chebula Retz.

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ABSTRACT: Terminalia chebula Retz (Combretaceae) is a medicinal plant widely distributed throughout India, Buma, and Srilanka. Many Indian plants have been used from time immemorial to treat various diseases and infections in traditional medicinal systems. This plant commonly used in traditional systems of medicinal in India sub-constituent. Terminalia chebula is called as 'King of medicine' in Tibet and is always listed at the top of the list in Ayurvedic material medical due to its extraordinary power of healing. Terminalia chebula has been well reported to possess antioxidant, antidiabetic, antibacterial, antiviral, antifungal, anticancerous, antiulcer, antimutagenic and wound healing activities. In addition, Terminalia chebula has been used extensively in the preparation of many Ayurvedic formulations for infectious diseases like chronic ulcer, leucorrhoea, pyorrhea and fungal infections of the skin. This review attempts to summarize the various pharmacological and biochemical studies on Terminalia chebula which gives a wide knowledge about the herb and their importance in personal health care and hygiene.

KEYWORDS: Terminalia chebula; Ayurveda, Anti-oxidant, anti-cariogenic, anti-diabetic, Phytochemicals.

I. INTRODUCTION:

During screening numerous therapeutic plants, investigators exposed one of the best valued therapeutic plant, Terminalia chebula, which possesses many therapeutic activities because of diverse ingredients. The fruit part displays various health benefits and also acts as a folk medicine for home therapy against many human diseases since early times[1,2]. Terminalia chebula is a native to various parts of Southern Asia including India, Nepal, China (Yunnan), Sri Lanka, Malaysia and Vietnam[3]. Terminalia chebula is common medicinal plant used in folk medicines like Unani, Ayurveda and homeopathy. In Ayurveda Terminalia chebula is considered to destroy all diseases and eliminate all waste from the body. At the same time, it is known to promote tissue growth and health. It is most powerful Ayurvedic herb used in the treatment of any kind of gastric infection in any part of the body Recent studies have demonstrated that Terminalia chebula exhibits a wide range of biological activities including cardioprotective [4], antispasmodic [5], antioxidant [6], free radical scavenging [7] and hypolipidemic [8]. Its antimicrobial [9], antiviral [10,11], anticancer [12] , antianaphylaxis [13] and antidiabetic [14] activities.

PLANT PROFILE:

Biological source **:** It consists of dried fruit, root, bark of plant knows as Terminalia chebula.
Geographical source **:** Dhaka,Bangladesh.
Family **:** Combretaceae.
Common name **:** Haritaki.
Synonyms**:**
China **:** Zhang-Qin-Ge,Hezi
Germany **:** Myrobalane
Bengali **:** Haritaki
Hindi **:** Harre, Harad ,Harar
Tamil **:** Ammai ,Amutam, Pethiyam, Varikkai
Malayalam **:** Katukka
Telugu **:** Karakkaya
Urdu **:** Halela
Punjabi **:** Hakeka, Harar

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Tree of Terminalia chebula

Leaves of Terminalia chebula

Fruit of Terminalia chebula

Seeds of Terminalia chebula

TAXONOMICAL CLASSIFICATION:

Kingdom : Plantae-Plants
Subkingdom : Tracheobionta-Vascular Plant
Superdivision : Spermatophyta-Seed Plants
Division : Magnoliophyte-Flowering Plants
Class : Magnoliopsida dicotyledons
Subclass : Rosidae
Order : Myrtales
Genus : Terminalia
Species : Terminalia chebula.

MACROSCOPIC CHARACTERS:

Various macroscopic characters associated with the plant are as follows

Tree: It is a deciduous tree, younger stems glabrescent and woody . Leaves: These are 10-20cm long, sub-opposite, simple ; exstipulate; petiolate; laminae broadly to elliptic –oblong rarely ovate the bases obtuse, the margins entire, the tips acute, glabrescent[15]. Fruit: These are a drupe, glabrous, sub globose to ellipsoid, 2.5-5.0cm by 1.5-2.5cm usually smooth or frequently 5-angulate, ridged, wrinkled, turning blackish when dry. Fruits contain astringent substances -tannic acid , chebulinic acid, gallic acid. Resin and a purgative principle of the nature of anthraquinone and sennoside are also present[16] Seed: These are single rough, ellipsoid, 1.0-2.0cm by 0.2-0.7cm and without ridges.

MICROSCOPIC CHARACTERSISTICS:

Transverse section of the fruit shows epicarp composed of a layer of epidermal cells, the outer tangential wall and upper portion of the thick radial walls. Mesocarp, 2 or 3 layers of collenchymas followed by a broad zone of parenchyma with fibres and sclereids in groups and vascular bundles, scattered; fibres, simple pitted walls; porous parenchyma; sclereids, various shapes and sizes, mostly elongated ; tannins and aggregate crystals of calcium oxalate in parenchyma; starch grains simple rounded or oval in shape, measuring 2-7 µm in

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diameter [17]. Endocarp consists of thick walled sclereids of various shapes and sizes, mostly elongated . Fibres, sclereids and vessels appear lignified . Testa, one layer of large cubical cells, followed by a zone of reticulates parenchyma and vessel; tegmen consists of collapsed parenchyma. Cotyledon folded and containing aleurone grains, oil globules and some rosette aggregate crystals. The powder of the plant is brown in color, shows a few fibers under the microscope vessels with simple pits and groups of sclereids [18].

CHEMICAL CONSTITUENTS:

The main phytoconstituents found in Terminalia chebula are Tannis, Phenolic compounds and some miscellaneous constituents, which are responsible for therapeutic acitivity of this herb[19] . The fruits of Terminalia chebula is rich in tannins (about 32%-34%) and its content varies with geographical distribution [20]. A group of researchers found 14 components of hydrolysable tannins (gallic acid , chebulagic acid , punicalagin, chebulanin, corilagin, neochebulinic acid, ellagic acid, chebulinic acid, 1,2,3,4,6-penta-O-galloylβ-D-glucose, 1,6-di-o-galloyl-D-glucose, casuarinin, 3,4,6-tri-o-glloyl-D-glucose, terchebulin) from Terminalia chebula fruits [21]. Twelve fatty acids were isolated from Terminalia chebula of which palmitic acid, linoleic acid and oleic acid were main constituents.

TRADITIONAL USES:

Used as a mouth rinse, anti-cancer agent, Prevents accumulation of pus in skin disease. Healing of wounds especially in burns & Used as a anti-astringent [22]

PHARMACOLOGICAL ACITIVITY:

Terminalia chebula has been noted posses potent antioxidant properties due to presence of phenolic compound present in this extract [23]. Terminalia chebula extract has been found to possess various pharmacological effects, a term referred to as its pleiotropic effects . Various pleiotropic effects such as anti-oxidant, anti-diabetic, Reno protective, hepato-protective, anticancer, anti-anaphylactic, immune modulator and pro-kinetic have been found to be associated with the plant . In addition, the plant has been significantly used in people having leprosy , anemia, chronic intermittent fever, heart disease, diarrhea, anorexia, cough and excessive secretion of mucus and a range of other complaints and symptoms [24].

Anti-oxidant acitivity;

The leaves, bark and fruit of Terminalia chebula possessed high antioxidant activity and phenolics were found to be responsible for this activity [25]. Aqueous extract of Terminalia chebula inhibited xanthine/xanthine oxidase activity and was also an excellent scavenger of DPPH radicals [26]. Terminalia chebula in a polyherbal formulation (Aller-7/ NR-A2) inhibited free radical induced hemolysis and also significantly inhibited nitric oxide release from lipopolysaccharide stimulated murine macrophages [27].

Anti-carcinogenic acitivity:

It is used traditionally as anticancer drug in Africa and Asia. A group of researchers have reported the inhibitory action on cancer cell growth by the phenolics of Terminalia chebula Retz fruit and found that chebulinic acid, tannic acid and ellagic acid were the most growth inhibitory phenolics of Terminalia chebula [28]. Ethanol extract of Terminalia chebula fruit inhibited cell proliferation and induced cell death in a dose dependent manner in several malignant cell lines including human (MCF-7) and mouse (S115) breast cancer cell line, human osteosarcoma cell line (HOS-1), human prostate cancer cell (PC-3) and a non-tumorigenic immortalized human prostate cell line (PNT1A) [29]. The parameters used to prove anticancer acitivity were proliferation thymidine incorporation and coulter counting . cell viability was determined by ATP determination. The results revealed that concentration of 100 g/ml inhibit cell growth.

Anti-bacterial acitivity:

Anibacterial activity of Terminalia chebula is well established. Many Gram-negative and Gram-positive human pathogenic bacteria were apparently inhibited by Terminalia chebula fruit extracts [30,31]. Ethanolic extract of Terminalia chebula and its main component – gallic acid has been reported to possess antimicrobial activity against methicillin-resistant S.aureus [32]. Butanol fraction of Terminalia chebula fruit extract which contains ethanedioic acid and ellagic acid has good antibacterial

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action against enteric pathogens such as E. coli and Clostridium perfingens [33]. Terminalia chebula fruit extract were also active in preventing the urease activity of Helicobactor pylori, which is associated with the increase in gastritis, ulcers and stomach cancers [34]. Terminalia chebula fruit and seed extracts were described as strong antibacterial agents against S.aureus and Streptococcus mutans, salivary bacteria [35,36]. Extracts from Terminalia chebula wa s also effective on plant pathogenic bacteria like Xanthomonas campestris pv. citri and in that way useful in the controlling of citrus canker disease [37].

Anti-protozoal activity:

A combination of Terminalia chebula and four other botanicals (Boerhavia diffusa, Berberis aristata, Tinospora cordifolia, and Zingiber officinale) had a maximum cure rate of 73% in experimental amoebic liver abscess in hamsters [38] and 89% in experimental caecal amoebiasis in rats showing its antiamoebic activity against Entamoeba histolytica [39]. The acetone extract of Terminalia chebula seeds showed anti plasmodial activity against Plasmodium falciparum [40].

Anti fungal acitivity;

An aqueous extract of Terminalia chebula exhibited antifungal activity against a number of dermatophytes and yeasts [41,42]. Its inhibitory effect on three dermatophytes (Trichophyton spp.) and three yeasts (Candida spp.) has also been documented[43]. In vitro anticandidal activity of methanol extract of Terminalia chebula was observed against clotrimazole resistant Candida albicans. Seed extract exhibited antifungal activity against Trichophyton glabrata [44].

Anti-viral acitivity:

HSV-1 (Herpes Simplex Virus) is a common human pathogen that causes life long latent infection of sensory neurons . Non-nucleoside inhibitors that can limit HSV-1 recurrence are particularly useful in treating that immuno compromised individuals or cases of emerging acyclovir –resistant strains of herpes virus . The extract of Terminalia chebula showed a strong anti- HSV-1 activity in combination with acyclovir [45] .The Terminalia chebula has also retroviral reverse transcriptase inhibitory activity [46]. Its protects epithelial cells against influenza A virus, supporting its traditional use for aiding in recovery from acute respiratory infections [47]. The methanol and aqueous extracts of Terminalia chebula showed a significants inhibitory activity with IC50<5 µg/mL on human immunodeficiency virus -1 reverse transcriptase [48].

Anti – diabetic acitivity:

The aqueous extract of the fruits of Terminalia chebula retz has been evaluated for antibiotics activity in sterptozotocin (STZ) induced mild diabetic rats and compared with known drugs tolbutamide .The aqueous of Terminalia chebula daily once for two months reduced elevated blood glucose by 43.2% ($p<0.01$). The invitro studies with pancreatic islets showed that the insulin release nearly two times more then untreated diabetic animals [49]. Chebulagic acid, isolated from Terminalia chebula proved to be a reversible and non-competitive inhibitor of maltase with a KI value of 6.6 mµM . The inhibitory influence of chebulagic acid on the maltase-glucoamylase complex was more potent than on the sucrase- isomaltase complex. The magnitude of the inhibition is greatly affected by its origin[50].

Anti- inflammatory acitivity:

Terminalia chebula fruit extract displayed anti- inflammatory activity, mediated by inhibition of inducible nitric oxide synthesis [51]. Chebulagic acid from seed extract of Terminalia chebula considerably repressed the increase of arthritis in collagen induced mice model [52]. The chebulanin, isolated from Terminalia chebula suppresses the expression of inflammatory mediators and prevents cartilage destruction and bone erosion in mice .so authors concluded that chebulanin is strong therapeutic alternative for treatment of rheumatoid arthritis [53].

Anti-ulcer acitivity:

The methanolic fruit extract of Terminalia chebula was assessed for antiulcer action in the ethanol treated and pylorus ligation ulcer models. Results of this study displayed Terminalia chebula as a very good antiulcer agent [54] . Examined in of Terminalia chebula reduction in lesion index, total affected area, percentage of lesion in comparison with control groups in aspirin, ethanol ,cold restraint stress induced ulcer models [55].

Wound healing acitivity:

Hydroalcoholic extract of Terminalia chebula fruit studied for wound restorative function in an animal model of diabetes

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induced by alloxan with the excision and dead space wound. Topically applied Terminalia chebula extract decreased the wound contraction in diabetic rats induced by alloxan through increase in rate and extent of wound closure [56,57] .

Gastrointestinal acitivity:

The anti microbial action of Terminalia chebula especially on gastro intestinal tract is considered in supplementation of soothing to mucosal lining. It is commonly advocated for increasing the gastrointestinal motility thus relieving the symptoms of gastroparesis for better bio availability and fast absorption of the micronutrient [58]. Terminalia chebula was found to increase the percent gastric emptying (86.57 +/- 6.65%; $p < 0.01$). Thus from this study it appears that Terminalia chebula can be serve as a useful alternative to prokinetic drugs available today [59].

Antispasmodic acitivity:

Terminalia chebula demonstrated its 'anti-spasmodic' properties by the reduction of abnormal blood pressure as well as intestinal spasms. This confirm its traditional use fullness for spastic colon and other intestinal disorder [60].

Cardiotonic acitivity:

The different extracts of fruits of Terminalia chebula exhibited cardiotonic activity when tested on isolated frog hearts. The benzene and chloroform extracts showed a moderate cardiotonic activity, though at high doses because they were not completely soluble in the experimental Ringer solution. Ethyl acetate, butanone , butanol and aqueous extracts exerted fairly potent cardiotonic activities. These all gave easily dispersible solutions, produced dose dependent positive isotropic effects and an increase in the cardiac output [61].

Antimutagenic acitivity:

Tannin fractions and gallic acid from the dried pulp of Terminalia chebula were evaluated for their antimutagenic potential. They all were highly significant active against S9-dependent mutagen 2AF. The effect corresponds with the nature of the fractions; the monomeric gallic acid was the least effective [62]. The water extract of dried Terminalia chebula fruits inhibited the direct acting mutagens sodium azide and 4-nitro-ophenylendiamine in the strains TA100, TA1535, TA97a, TA98 of Salmonella typhi murium and S9-dependent mutagen 2-aminofluoren in TA97, TA98 and TA100 strains [63].

Anti-arthritic acitivity;

Hydro-alcoholic extract of Terminalia chebula produced significant inhibition of joint swelling as compared to control in both formaldehyde-induced and CFA-induced arthritis. Terminalia chebula treatment also reduced serum TNF-α level and synovial expression of TNF-R1, IL-6 and IL-1β [64].

Hepato-protective acitivity:

95% ethanolic extract of Terminalia chebaula fruit show hepatoprotective acitivity against anti-tuberculosis drug induced toxicity [65].Hydrolyzable tannis are generally exhibit an intense enzyme inhibitory action on glutamic pyruvic transaminase

II. CONCLUSION:

Terminalia chebaula is among the most widely used herbal medicine in home remedies.

Terminalia chebaula is considered as a 'King of Medicine' due to its promising in the management of various diseases and disorders such as antidiabetic, antimicrobial, antioxidant, anti-mutagenic, anti-proliferative, anti inflammatory, cardioprotective and wound healing activity. Wide range of therapeutic potential of Terminalia chebula could be utilized as an alternative medicine for various illnesses. Terminalia chebula effective against different types of diseases and also to overcome the problem of drug resistance after extensive investigation of its bioactivity, mechanism of action, pharmaco therapeutics, toxicity and after proper standardization and clinical trials.

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