

**A STUDY OF PHARMACOGNOSTIC AND PHARMACOLOGICAL
REVIEW ON TERMINALIA BELLIRICA**

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Article Received on
20 October 2023,

Revised on 10 Nov. 2023,
Accepted on 01 Dec. 2023

DOI: 10.20959/wjpr202321-30443



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ABSTRACT

Terminalia bellerica is used to cure a variety of ailments including conjunctivitis, asthma, migraine, baldness, constipation, and poor vision. Because of its numerous folk medicinal and traditional applications, the genus *Terminalia* has gained increased attention in terms of assessing and validating therapeutic potential and obtaining clinical approval. Various *Terminalia* species are used in the treatment of diseases such as headache, fever, pneumonia, flu, geriatric, cancer, to improve memory, abdominal and back pain, cough and cold, conjunctivitis, diarrhea, heart disorder, leprosy, sexually transmitted diseases, and urinary tract disorders in the form of herbal medicine and formulations. To maximize efficacy, eco-friendliness, and sustainability in beauty management, research and development are essential. The anti-aging benefits, skin wrinkle and elasticity improvement, and the development of bellerica extract as a whitening and wrinkle functional cosmetic material. Plants and plant components

are employed in traditional medicinal systems such as Ayurveda, Siddha, Unani, and Chinese medicine. The plant contains Glucoside, Tannins, Gallic acid, Ethyl Gallate, and Chebulinic acid, which acts as an antioxidant, antibacterial, antidiarrheal, anticancer, antihypertensive, and antipyretic. This review focuses on the pharmacological properties of *Terminalia*

bellerica, which may be useful for future research projects.

KEYWORDS: Terminalia bellirica, phytoconstituents, pharmacological effects, Therapeutic uses.

INTRODUCTION

Terminalia bellirica is an Ayurvedic herb that has been utilized for both preventative and medicinal purposes. Bheda is made out of dried fruit pericarp. Terminalia bellirica Roxb. is a huge deciduous tree with widely elliptical leaves. It contains antibacterial, antioxidant, and anthelmintic property.^[1] It is widely used all throughout the world, particularly in India, Sri Lanka, Pakistan, Nepal, and Southeast Asia. Properties linked with the biological active secondary metabolites present in Terminalia, it is used in the medicinal system. Alkaloids, coumarins, flavones, steroids, lignans, tannins, glycosides, terpenoids, saponin, and other phytochemicals have been identified from diverse parts of plants. Nature serves as primary source for the cure of ailments. It is estimated that, in many developing countries, two third of the population is dependent on medicinal plants to meet primary healthcare needs. The use of herbal medicine is increasing due to its safety, efficacy and therapeutic potential as compared to synthetic pharmaceutical products.^[2] It is a compound of rasayana preparation, made up of three myrobalan fruits, known as Triphala, which is important in Indian as well as Tibetan traditional medicines. It is also grown as an avenue tree. Glucoside, tannins, gallic acid, ellagic acid, ethyl galate, gallyl glucose, chebulanic acid are the main active phytoconstituents of medicinal importance. These phytoconstituents are responsible for many of the pharmacological roles.

Different parts of the tree have various medicinal activities viz., antisecretory, analgesic, antihypertensive, antidiarrheal activity, antimicrobial activity antidiabetic, antioxidant, antiulcer, antipyretic, hepatoprotective, anticancer, angiogenesis, antidepressant-like and anti-urolithiatic activity. This affects the LDL oxidation and macrophage inflammatory response and also nephrotoxic effects. Also having antipsychotic potential helpful in preventing delaying clot formation and have immunostimulant activity. Their traditional uses include relief in a cough, asthma, indigestion, dental problems, sore throat and wounds.^[3]

Taxonomy^[4]

Family: Combretaceae

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida Order: Myrtales

Genus: Terminalia Species: belerica

Vernacular Names^[5]

Assam - Bhomora, Bhomra, Bhaira

English – Beleric Myrobalan Gujarati - Bahedam, Baheda

Hindi - Bahera

Kannada - Shanti, Shantikayi, Tare, Tarekayi

Malayalam - Tanni, Tannikai

Marathi - Baheda

Sanskrit - Vibhita, Aksa, Aksaka, Bibhitaki

Tamil - Thanakkai, Tanri, tanrikkai.

Telugu - Tannikkaya, Vibhitakami, Tani

Synonyms

Bahera, Baheda, Bibhitaki, Belleric Myrobalan, Bedda Nut Tree, Beach- Almond, Aksha, Karshaphala, Kalidruma, Bhutavasa, Kaliyugalaya.

Distribution and habitat

It grows wild at an elevation of up to 2000m in wide variety of ecologies. It is native to Sri Lanka, India, Bangladesh, Bhutan, Thailand, China, Indonesia, Pakistan, Malaysia, Nepal, Cambodia and Vietnam. In India, it is commonly found in Madhya Pradesh, Uttar Pradesh, Punjab and Maharashtra.

Ecology

It is mostly found in monsoon forests, mixed deciduous forests or dry deciduous dipterocarp forests, associated with teak.

Biology

It flowers in the month of October-November and fruits in November-December. The tree sheds leaves in November with young ones appearing together with flowers.

Plant Layout

It is large deciduous tree with the height of 50m and diameter of 30m with a rounded crown. It is branchless up to 20m. It is perennial and requires cold climate.

Bark

The outer bark is bluish or ashy-grey whereas inner bark is yellow in color. The bark contains number of longitudinal cracks.

Leaves

- ❖ Young leaves are copper red in color which turns into parrot green and later they become dark green. Leaves are large, alternate and glabrous, with the dimension of 4-24cm x 2-11cm, mostly clustered at the twig ends.
- ❖ Leaf tip is narrowly pointed. Base of the leaf is rounded to cuneate; rufous-serious which turn to glabrescent, having 6-9 pairs of secondary veins.
- ❖ Secondary and tertiary venation is prominent on both the surfaces generally clustered towards the ends of branchlets.
- ❖ Petiole is 2.5-9cm long, flat above, with pair of sessile glands just above the middle, sometimes indistinct.
- ❖ Lamina is broad elliptical or broad obovate with the dimension of 8-20 x 4-14 cm. Apex is rounded to abruptly short acuminate. Margin is entire.



Fig. 1: Leaves of Terminalia bellirica.

Flowers

- ❖ They are greenish white in color usually appear along with new leaves having an offensive odor or strong honey like smell.
- ❖ Flowers are simple, solitary and sessile.
- ❖ Inflorescence is axillary spikes generally 3-15cm long.
- ❖ Upper flowers of the spike are male.

- ❖ Lower flowers are bisexual
- ❖ Calyx tube is sericeous or tomentulose.



Fig. 2: Flowers of Terminalia bellirica.

Fruit^[6,7]

- ❖ It is light yellow in color.
- ❖ It is drupe, globose or ovoid, densely velutinous or sericeous, 2-4 x 1.8-2.2 cm.
- ❖ It is slightly 5 ridged, 3cm across.
- ❖ It is one seeded and covered with minute pale pubescence.



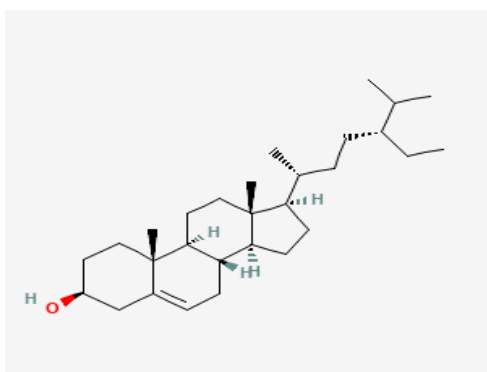
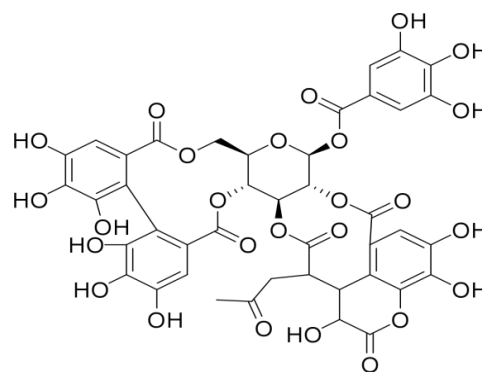
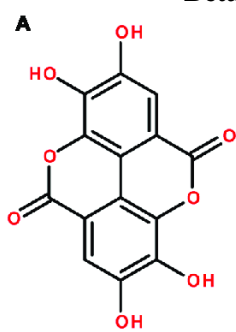
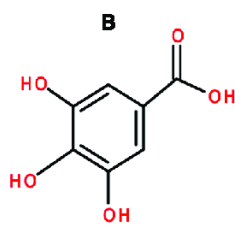
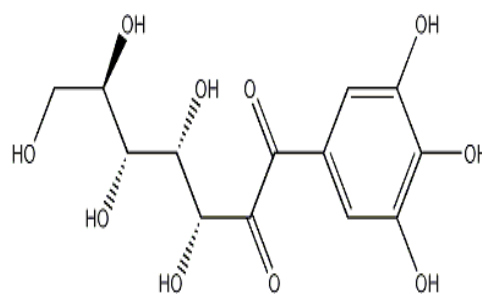
Fig. 3: Fruits of Terminalia bellirica.

Phytoconstituents of Terminalia bellirica^[8,9]

Terminalia bellirica contains several phytochemical (chemical compounds that occur naturally in plant) constituents, such as

- ❖ Beta- Sitosterol

- ❖ Gallic acid
- ❖ Ellagic acid
- ❖ Ethyl gallate
- ❖ Galloyl glucose
- ❖ Chebulagic acid
- ❖ Cardiac glycoside
- ❖ Bellaricanin

**Beta-Sitosterol****Chebulagic acid****Ellagic acid****Gallic acid****Galloyl glucose**

Pharmacological Effects^[10]

- ❖ Antioxidant Effect
- ❖ Antimicrobial Effect
- ❖ Antidiarrheal Effect
- ❖ Anticancer Effect
- ❖ Antidiabetic Effect
- ❖ Antihypertensive Effect
- ❖ Hepatoprotective Effect
- ❖ Analgesic Effect
- ❖ Antipyretic Effect

Antioxidant Effect

Free radical scavenging activity and antioxidant potential of acetone extract of *T. bellerica* fruit was determined by in-vitro assays. Acetone extract was subjected to partitioning with ethyl acetate and water. Ethyl acetate fraction was found to be more effective as compared to crude acetone extracts in all anti-oxidant assays i.e., DPPH, β - carotene bleaching inhibition and reducing power whereas for chelating ability on Fe^{+2} ion, crude acetone extract showed higher activity. It was concluded that polyphenolic rich fractions were more effective than the crude extract.^[11]

Antimicrobial Effect

The antimicrobial activity of TB against 9 human microbial pathogens. The Aqueous extract of dry fruit at 4 mg concentration showed highest zone of inhibition against *S. aureus*. These pathogens were highly sensitive to the methanol extract also except *E. coli* and *P. aeruginosa*. Finally they concluded that TB dry fruit possesses potential broad spectrum antimicrobial activity.

Antidiarrheal Effect

The Anti diarrheal activity was performed using Castor oil induced diarrhea, PGE2 induced entero pooling and gastrointestinal motility test. Aqueous and ethanolic extract of fruit pulp of TB at the doses of 334 mg/kg, 200 mg/kg, 143 mg/kg were used.

Anticancer Effect

A comparative study was performed to determine in-vitro anti-cancer and antioxidant effects as well as total phenolic contents of five different extracts of *Terminalia bellerica* leaves i.e., methanol, aqueous methanol, ethyl acetate, chloroform and pet ether. A moderate correlation was observed between the total phenolic content of all the extracts whereas the anti-oxidant activity and the total phenol content increased with increase in polarity. Pet ether extract showed most potent anti-cancer activities followed by chloroform against all cell lines namely ovarian carcinoma, liver carcinoma, breast carcinoma, HeLa contaminant, cervical carcinoma, breast carcinoma, cervical carcinoma, CNS-human glioblastoma, non-small lung cancer, colon adenocarcinoma, fibrosarcoma, leukemia and melanoma. Other extracts showed potent anticancer activity against leukemia and melanoma. According to results, petroleum ether extract exhibited the highest anti-cancer activity which would be used for further purification.^[12]

Antidiabetic Effect

Terminalia bellerica possessing anti-diabetic activity. Gallic acid was isolated from *Terminalia bellerica* by bioassay-guided fractionation. Isolated and synthetic gallic acid was administered to Streptozotocin (STZ) – induced diabetic male wistar rats at different doses for 28 days. A significant dose-dependent reduction in plasma glucose level was observed. Gallic acid treated rats showed regeneration of β -islets cells as compared to untreated diabetic rats in histopathological examination. Oral administration of gallic acid showed decreased serum total cholesterol, triglyceride, LDL-cholesterol, urea, uric acid, creatinine along with marked increase in plasma ~ 374 ~ Journal of Pharmacognosy and Phytochemistry insulin, C-peptide and glucose tolerance level. It also restored totalprotein, albumin and body weight of diabetic rats. Hence gallic acid isolated from *Terminalia bellerica* could be used as anti-diabetic agent.^[13]

Antihypertensive Effect

The effect of TB in hypertension. After administration of TB, they observed that fall in the arterial BP of rats under anaesthesia. In isolated guinea-pig atria, inhibition of force and rate of atrial contractions noted. In rabbit thoracic aorta, relaxation was observed the induction of contractions which was induced by phenylephrine. The effect of *T. bellerica* against *Salmonella typhi* and *Salmonella typhimarium*.

Hepatoprotective Effect

The protective effect of TB fruit extract and its active principle, Gallic acid against CCl₄intoxication. Treatment with extract (200, 400 and 800mg/kg, p.o.) and gallic acid (50, 100 and 200 mg/kg, p.o.) showed dose dependent recovery in biochemical parameters such as SGOT, SGPT and lipid peroxidase, glutathione but the effect was more pronounced with gallic acid.^[14]

Analgesic Effect

Analgesic activities of the crude extract of *Terminalia bellerica*. *T. bellerica* extract at the dose range of 300 - 1000 mg/kg inhibited the castor oil induced intestinal fluid secretion in mice. The extract also dose-dependently (50 - 100 mg/kg) where it reduced the numbers of acetic acid-mediated in mice. These results indicate that TB exhibit antisecretory and antinociceptive effects, hence justifying its medicinal use in diarrhea and pain.

Antipyretic Effect

The antipyretic activity of ethanolic and aqueous extracts of *Terminalia bellirica* fruits (200 mg/kg, p.o.) was studied in brewer's yeast-induced fever models in mice and rats. Both extracts showed a significant inhibition of elevated body temperature when compared to corresponding control.^[15]

CONCLUSION

Traditional medicine has made use of *Terminalia bellirica*. The plant has key phytoconstituents such as bellericanin, ellagic acid, gallic acid, termilignan, thannilignan, flavone and anolignan B, tannins, ellagic acid, ethyl gallate, galloyl glucose and chebulaginic acid, phenyl emblin, and beta-sitosterol, according to extensive research. *T. belerica* has antioxidant, anticancer, anti-diabetic, wound healing, antibacterial, anti-inflammatory, and hepatoprotective properties. The presence of different phytochemicals is linked to therapeutic activity. *Terminalia bellirica* offers a wide range of medicinal applications in the treatment of many ailments. Characterization of bioactive substances is required to address the knowledge gap in this plant's pharmacological effects and phytochemical profile.

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