Review Article

A Review on the Ingredients of Triphala (Harro, Barro and Amala)

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ABSTRACT

Triphala is a poly-herbal formula made up of three equal proportions of herbal fruits, Harro, Barro, and Amala, found in tropical and sub-tropical regions of Asia. This study aimed to review the phytochemicals, potential uses, and constituents of Triphala using PRISMA standards. Data was collected from well-known bibliometric information sources. All the obtained information was analysed systematically and represented in a tabular and descriptive form. The result shows that the main chemical constituents of Triphala include Vitamin C, carotene, nicotinic acid, riboflavin, tannins, tannins, anthraquinones, polyphenolic compounds, and gallic acid, tannic acid, and glycosides. Triphala is crucial for balancing and rejuvenating three constitutional elements that govern human life. Its biological activities include anti-microbial, anti-oxidant, anti-arthritic, anti-stress, antipyretic, analgesic, anti-diarrheal, gastrointestinal protective, hepatoprotective, anti-hyperglycemic, cardioprotective, hypolipidemic, wound healing, antineoplastic, radio-protective, chemoprotective, chemopreventive, mutagenesis and DNA damage prevention, anti-cataractogenesis, anti-lipid peroxidative, free radical scavenging, and anti-inflammatory. Triphala is a novel drug with numerous therapeutic potentials, effective in maintaining health, preventing diseases, and treating various ailments. This herbal aptitude of Triphala promotes the development of a medical system with minimal side effects. Therefore, it is necessary to ensure that the local population is provided with accurate information regarding triphala.

Keywords: *Ayurveda, constituents, disorder, herbal, Phyllanthus, phytochemicals, Terminalia, therapeutic.*

INTRODUCTION

Triphala, which derives its name from the Sanskrit term for "three fruits," is a combination of three plants' dried fruits in equal parts: *Terminalia chebula* (Harro), *Phyllanthus emblica*

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(Amala), and *Terminalia bellerica* (Barro) (Nadvi et al., 2023). According to Ayurveda, it is a Tridoshic Rasayana capable of restoring harmony to and revitalizing the three constitutive forces that control human life., which are Vata (energy of movement), Pitta (energy of digestion and metabolism), and Kapha (energy that forms the body's structure) (Kumar et al., 2017). The formulation's three rejuvenating herbs, or rasayanas, are soo complex allowing it for many applications promoting longevity and rejuvenation in patients of all constitutions and ages (Peterson et al., 2017).

It is used as a blood purifier and is effective in headache, dyspepsia, leucorrhoea, ascites, and curing cataracts (Kumar et al., 2016). Triphala is found to have the capacity to provide hepatoprotective benefits. (Nadvi et al., 2023). Moreover, Triphala treats periodontal diseases. Not only that, but it is also known for the anti-microbial, anti-oxidant, anti-arthritic, anti-stress, antipyretic, analgesic, anti-diarrheal, gastrointestinal protective, hepatoprotective, anti-hyperglycemic, cardioprotective, hypolipidemic, wound healing, antineoplastic, radio-protective, chemoprotective, chemopreventive, mutagenesis and DNA damage prevention, anticataractogenesis, anti-lipid peroxidative, free radical scavenging, and anti-inflammatory activities (Baliga et al., 2012). The principal chemical elements included in this formulation are phenolics (25–38%), primarily tannin (35%), gallic acid (3–7%), ellagic acid (~2%), chebulagic acid (~5%), chebulinnc acid (~5%) and a significant amount of ascorbic acid (0.050–0.33%), flavonoids and saponin (Sharma, 2015).

Triphala can be used in variety of ways such as Triphala churna (powder form), Kwatha (decoction), Taila (oil), Mashi (ash), Gritha (Triphala cooked with clarified butter or Ghee) (Gahatraj et al. 2020) and also as a tablet (Prakash & Shelke, 2014). However, many studies of triphala and its phytochemicals' mechanisms of healing have not been thoroughly examined. Therefore, the purpose of this paper is to examine the phytochemicals and possible applications of Triphala and also to know the ecology and distribution patterns of constituents found in Triphala.

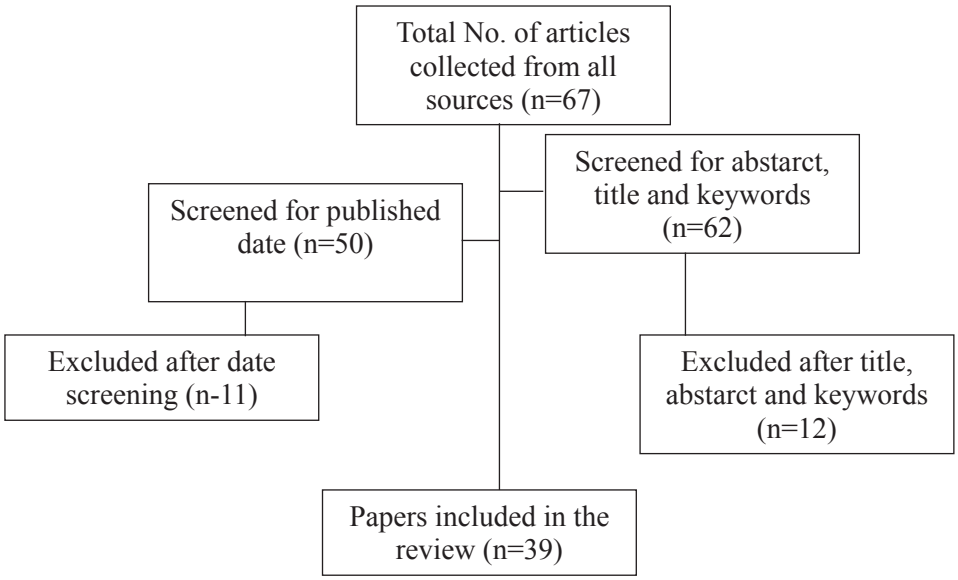
DATA AND METHODS

This study followed the PRISMA guidelines for systematic literature reviews and data-analyses. The information regarding Triphala and its ingredients was collected from secondary sources. Popular bibliometric information sources were used to download the related articles. For this a strategic combination of keywords and controlled vocabulary terms was employed to search the research papers. Studies were considered for inclusion if they provided insights

into the desired properties. Exclusion criteria were applied to filter out studies not directly related to the specified focus or lacking relevance to the research objectives. Only published papers from the year 2010 to 2024 were used as reference for this study. After gathering the data, analysis was done by categorization and comparison with other relevant articles and represented in tabular and descriptive form. The methodology is presented in a PRISMA flowchart as shown in figure 1.

Figure 1

Prisma Flowchart Showing Methodology



RESULTS AND DISCUSSION

In this article we discussed the three ingredients of Triphala which are *Phyllanthus emblica, Terminalia chebula,* and *Terminalia bellirica*.

1. Phyllanthus emblica (Amala)

Amala is a deciduous tree of the Phyllanthaceae family. The taxonomic classification of Amala is shown in table 1. It is referred to as emblic myrobalan in English, Nellikkai in Tamil, amala in Nepali, aamla in Gujrati, amalaka in Sanskrit and amla in Hindi (Gupta et al., 2014).

Table1

Taxonomy of Amala

Kingdom	Plantae
Division	Flowering plant
Class	Magnoliopsida
Order	Malpighiales
Family	Phyllanthaceae
Tribe	Phyllantheae
Subtribe	Fluegginae
Genus	Phyllanthus
Species	*P. emblica*

Distribution and ecology of Amala

The Indian gooseberry, or *Phyllanthus emblica Linn.*, is a member of the Euphorbiaceae family. It grows in a mixed forest of the tropical and subtropical region at an elevation of 150-1400 m (Gaire & Subedi, 2014). It thrives in saline-sodic soil and other circumstances typical of wasteland, and the fruits are readily available for more than ten months (Gantait et al., 2021)

Uses of Amala

Amala is popularly utilized in the medicinal, culinary, and cosmetic industries (Gul et al., 2022). All parts of Amala (leaves, bark, flowers, roots, and fruits) have several uses in different medicinal systems like Ayurveda, Unani, Sidda, etc., but fruits are mostly used (Dasaroju & Gottumukkala, 2014). It is frequently employed in traditional Tibetan medicine to address issues with the liver, kidneys, and bladder (Wu et al., 2021). Its uses for improving memory, treating respiratory, skin, and ocular conditions, and detoxifying-including detoxifying from snake venom-are also highlighted (Ahmad et al., 2021). It is used to treat hyperactive gastrointestinal disorders like diarrhea (Mehmood et al., 2011), jaundice, inflammation, and control hair fall (Pariyar et al., 2021). Similarly, it is intensely used to treat jaundice, eczema, nausea and vomiting, acts as skin lighter, and prevents hair graying (Mirunalini & Krishnaveni, 2010). Amla shows biological effects like anti-microbial, anti-oxidant, laxative, anti-diabetic, anti-inflammatory, hypocholesterolemic, analgesic, antipyretic, hypo-lipidemic, hepatoprotective, antiproliferative, immunomodulatory, anti-cancer, cardio-protective, antitussive, neuro-protective and chondroprotective (Bag et al., 2013; Gaire & Subedi, 2014).

Phytochemistry of Amala

Phyllanthus emblica is high in polyphenols and minerals and is considered the best source of vitamin C (Charoenteeraboon et al., 2010). It provides an outstanding amount of bioactive molecules such as acid (vitamin C), flavonoids, phenolics, terpenoids, tannins, rutin, curcuminoids, emblicol, phyllembelic acid, phyllembelin, emblicanin A, emblicanin B, ellagitannin, ellagic acid, gallic acid, essential amino acids, and alkaloids (Kumar et al., 2016). Major chemical constituents of *P. emblica* are shown in table 2 with its nutritional value (see table 3).

Table 2

Chemical Constituent in P.emblica Fruit

Type	Chemical constituents
Hydrolyzable Tannins	Tannins Emblicanin A and B, Punigluconin, Pedunculagin, Chebulinic acid (Ellagitannin), Chebulagic acid (Benzopyran tannin), Corilagin (Ellagitannin), Geraniin (Dehydroellagitannin), Ellagotannin
Alkaloids	Phyllantine, Phyllembein, Phyllantidine
Phenolic compounds	Gallic acid, Methyl gallate, Ellagic acid, Trigallayl glucose
Amino acids	Glutamic acid, Proline, Aspartic acid, Alanine, Cystine, Lysine
Carbohydrates	Pectin
Vitamins	Ascorbic acid
Flavonoids	Flavonoids Quercetin, Kaempferol
Organic acids	Citric acid

Source (Dasaroju and Gottumukkala, 2014)

Table 3

Nutritional Value of Fruit of P. emblica (% or per 100g)

Chemical components	Percentage
Moisture	81.2%
Protein	0.5%
Fat	0.1%
Mineral matter	0.7%
Fibre	3.4%
Carbohydrates	14.1%
Bulk elements Mg/100g	Net weight

Calcium	0.05%
Phosphorous	0.02%
Iron	1.2 mg/100g
Nicotinic acid	0.2 mg/100g

Source (Singh et al., 2012)

2. Terminalia chebula (Harro)

T. chebulo is a tracheophyte of order Myrtales and family Combretaceae (see table 3).

Table 4

Taxonomy of Harro

Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida
Order	Myrtales
Family	Combretaceae
Genus	Terminalia
Species	*T. chebula*

Distribution and Ecology of Harro

Terminalia chebula, also known as black myrobalans, Haritaki (Sanskrit), and Harad (Hindi), is a medium to large-sized tree found throughout tropical and subtropical Asia, including China and Tibet. It is only found naturally on the Indian subcontinent and its adjacent areas, such as Pakistan, Nepal, and southwest China. (Rathinamoorthy & Thilagavathi, 2014). It occurs at an altitude of 1500-2000 m and is found on various soils, clayey and shady.

Uses of Harro

Due to its exceptional healing abilities, Terminalia chebula is known as the "King of Medicine" in Tibet and is frequently ranked first in Ayurvedic material medicine (Upadhyay et al., 2014). The fruit powder is used to treat jaundice, colic, asthma, hoarse voice, hiccups, vomiting, diarrhea, abdominal distention, cough, fever, pneumonia, tuberculosis, and gas. In contrast, the paste can be used for chronic ulcers, wounds, and scalds (Ashwini et al., 2011). *T. chebula* mouth rinse effectively reduces microbial plaque and gingival inflammation and neutralizes salivary PH (Gupta et al., 2014). Similarly, it has high cosmetic use due to its properties of Haile melanin inhibition, anti-inflammatory action, and cellular ageing inhibition (Muhammad et al., 2012). Some of the biological activities shown by *T. chebula* are: anti-

bacterial, anti-fungal, anti-amoebic, immune-modulatory, molluscicidal, anti-helminths, anti-viral, anti-mutagenic, anti-carcinogenic, anti-oxidant, anti-diabetic, anti- anaphylactic, anti-nociceptive, anti-ulcerogenic, anti-arthritic, wound healing, cytoprotective, radio-protective, cardio-protective, hepato-protective and anti-spermatogenic (Basha & Code, 2017).

Phytochemicals of Harro

T. chebula plant includes a number of constituents like tannins, flavonoids, sterols, amino acids, fructose, resin, and fixed oils (Ashwini et al., 2011). It has a high concentration of tannin (99.55456 mg/gm) (Saxena et al, 2013) which accounts for about 20-40%of the total phytoconstituent. It is rich in gallic acid, ellagic acid, anthraquinones, triterpenoids, and other miscellaneous compounds like palmitic acid, stearic acid, linoleic acid, and arachidic acid (Walia & Arora, 2013) as shown in table 5. A good concentration of mannitol and ascorbic acid (vitamin c) is also found in *T. chebula* (Saha & Verma, 2016).

Table 5

Phytochemicals in T. chebula

Hydrolyzable tannin	Gallic acid, chebulagic acid, punicalagin, Chebulanin, corilagin, Neochebulinic acid, ellagic acid, chebulinic acid, 1,2,3,4,6-penta-O-galloyl-β-D-glucose, 1,6-di-o-galloyl-D-glucose, casuarinin, 3,4,6-tri-o-glloyl-D-glucose, terchebulin
Phenolics	Chebulinic acid, ellagic acid, and anthraquinones
Polyphenols	Corilagin, Galloyl glucose, punicalagin, terflavin A, maslinic acid
Fatty acids	Mainly palmitic acid, linoleic acid, and oleic acid
Triterpenoid glycosides	Chebulosides I and II, arjunin, arjunglucoside, 2α-hydroxyursolic acid, and 2α-hydroxymicromiric acid also have been reported

Source (Bhattacharyya and Chattopadhyay, 2013).

3. Terminalia Bellerica (Barro)

Barro is a deciduous Tracheophyte of family Combretaceae (see table 6).

Table 6

Taxonomy of T. Bellirica

Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida

Order	Myrtales
Family	Combretaceae
Genus	Terminalia
Species	*T. bellirica*

Distribution and Ecology

Terminalia bellirica Roxb., also called Bahera, Beleric, or bastard myrobalan, is a large deciduous tree that is commonly found in Southeast Asia's plains and lower hills. It can also be found grown as an avenue tree (Kumar and Khurana., 2018). It is a member of the Combretaceae family of the Rosales order. Details are shown in table 7.

Table 7

Biophysical Limits of T. bellirica

Altitude	0-200
Mean annual rainfall	900-3000mm
Mean annual temperature	22-28 degree C
Soil type	Fertile soil and good drainage

Source (Sharma et al., 2021)

Uses of Barro

The fruit of *T. bellirica* has been used in traditional medicine to treat anemia, asthma, colic, constipation, diarrhea, dysuria, headache, hypertension, inflammation, rheumatism, and diabetes mellitus (Latha, 2014) due to its various medicinal properties (see table 8). It is renowned for its wound healing and anti-cancer activities (Li et al., 2018). It is also used for hepatitis, bronchitis, dyspepsia, piles, coughs, hoarseness of voice, eye diseases, scorpion-sting, and as a hair tonic (Deb et al., 2016).

Table 8

Medicinal properties of T. bellirica

Pharmacological activity	Plant part	Extract
Analgesic activity	Fruit	Aqueous-Methanolic
Antibiofilm activity	Plant	Ethanolic
Anticancer activity	Plant	Extracts
Antidepressant activity	Fruit	Aqueous/Alcoholic
Antidiabetic activity	Fruit	Methanolic
Anti-diarrhoeal activity	Fruit pulp	Aqueous and Ethanolic

Antifertility activity	Fruit	Ethanolic
Antiandrogenic activity	Fruit	Ethanolic
Antifungal activity	Fruit	Ethanolic
Anti-helminthic activity	Fruit	Aqueous and Ethanolic
Antihypertensive effect	Fruit	Extracts
Anti-inflammatory activity	Whole plant	Extracts
Antimicrobial activity	Fruit	Aqueous
Antimutagenic activity	Whole plant	Water, acetone, and chloroform
Antioxidant	Fruit	Methanolic
Antipyretic activity	Fruit	Aqueous/Alcoholic
Anti-salmonella activity	Fruit	Aquous/Alcoholic
Antisecretory activity	Fruit	Aqueous-Methanolic
Anti-spasmodic and bronchodialatory	Fruit	Methanol/water
Antithrombotic and thrombolytic activity	Fruit	Aquous/alcoholic
Antiulcer activity	Fruit	Ethanolic
B-lactamase inhibitor activity	Plant	Methanolic
Glucoamylase activity	Fruit	Chloroform, Ethyl Acetate
Hepatoprotective activity	Fruit	Methanolic
Immunomodulatory activity	Bark	Ethanolic
Wound healing	Fruit	Fruit Paste
Coughs, Spleen, Dysentery, Gastrointestinal disorders, Clear bowels, Flatulence	Fruit	Aqueous

Source (Kadian et al., 2014)

Phytochemistry of Barro

Some of the primary chemicals found in *T. bellirica* are Glucoside (bellericanin), Gallo-tannic acid, Coloring matter, resins, greenish-yellow oil, ellagic acid, gallic acid, lignans(termilignan and thanni-lignan), 7-hydroxy 3'4' (methylenedioxy), flavone, anolignan, Tannins, ellargic acid, ethyl gallate, galloyl glucose, chebulaginic acid, phenyllemblin, β-sitosterol, mannitol, glucose, fructose, rhamnose (Saraswathi Motamarri et al., 2012) as shown in table 9.

Table 9

Phytochemicals in T. bellirica

Compounds	Chemical constituents
Flavone	7-hydroxy 3', 4' (methylenedioxy)flavone , luteoline
Steroids	β- sitosterol
Lignins	Termilignan , thannilignin, anolignan B
Tannins	Gallic acid, ellagic acid, methyl gallate, ethyl gallate (Phenyllemblin), chebulagininc acid, chebulagic acid, hexahydroxydiphenic acid ester
Glycosides	Fructose, sucrose, galactose, D-glucose, mannose, rhamnose
Terpenoids	Belleric acid , chebulagic acid, arjungenin
Saponins	Bellericoside and bellericanin
Cardenolide	Cannogenol 3-O-β-galactopyranosyl-(1→4)-Oα-L-rhamopyranoside
Flavonol aglycones	Quercetineand kampferol
Flavonol glycoside	Quercetin-3-O-[6’’-α-L-rhamnopyranosyl]-(1→6)-β-D-glucopyranoside (rutin), quercetin3-O-α-L-rhamnopyranoside, quercetin-3-O-βD-glucopyranoside and kaempferol-3-O-β-Dglucopyranoside
Fatty acids present in the oil	Palmitic acid, linoleic acid, stearic acid, myristic acid, and oleic acid
Glycerides of fatty acids	Palmitooleolinolein, stearo-oleolinolein, palmitodiolein, stearodiolein, dioleolinolein and triolein

Source (Kumari et al., 2017)

CONCLUSIONS

Triphala is a novel drug with a myriad of therapeutic uses which is not only used for treating various illnesses but also for preventing diseases and maintaining homeostasis in humans. The phytochemical research has revealed the existence of potent phytochemicals such as sugars, tannin, alkaloids, phenols, flavonoids, terpenoids, glycosides, and saponins, etc. According to some authors, bioactive principles include phenolic acids, flavonoids, terpenoids, steroids, and flavonoids. The combination of knowledge from traditional uses and the array of scientific studies of its phytochemicals have revealed the significant potential of Triphala with minimal side effects. However, detailed scientific inquiry and research are still

required into various aspects of knowing its pharmacological and clinical effects so that the people get maximum benefits from this without having any side effects.

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