

A REVIEW ON TRIPHALA: AN ULTIMATE PANACEA

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ABSTRACT

Triphala (Sanskrit; tri = three and phala = fruits) Triphala, a well-recognized and highly efficacious polyherbal Ayurvedic medicine consisting of dried fruits of three plant species (also known as the three myrobalans) *Emblica officinalis* (Amalaki), *Terminalia bellerica* (Bibhitaki), and *Terminalia chebula* (Haritaki), these are taken in equal proportion (1:1:1) and are native to the Indian subcontinent. It is classified as a tridoshic rasayana in Ayurvedic medicine are believed to promote health, immunity, longevity and rejuvenation. According to Ayurveda, they strengthen all tissues of the body, prevent aging, promote intellect, and prevent disease. The main aim of this article is to review the complete knowledge about all the three species of triphala and to provide the current literature on the therapeutic uses and efficacy of Triphala. Herbal remedies are among the most ancient medicines used in traditional systems of healthcare such as Ayurveda. In addition, there are numerous therapeutic uses of triphala apart from laxative action, research has found the formula to be potentially effective for several clinical uses such as Wound healing activity, Anti-diabetic activity, Anti-inflammatory activity, Anti-bacterial activity, Anti-hyperlipidaemic activity, Anti- mutagenesis activity, Anti-cancer activity, Anti-oxidant activity, Anti-cataract activity, cardiovascular activity, Anti-aging activity, Anti-obesogenic activity, gastrointestinal activity, Immunomodulatory activity, Analgesic, antipyretic and ulcerogenic activities, and anti-arthritis activity. Polyphenols in Triphala modulate the human gut microbiome and thereby promote the growth of beneficial Bifidobacterium and Lactobacillus while inhibiting the growth of undesirable gut microbes.

KEYWORDS: Triphala, ayurvedic medicine, pharmacological activity, medicinal uses and three myrobalans of Triphala.

INTRODUCTION

Nature always stands as a golden mark to exemplify the outstanding phenomena of symbiosis. Today about 80% of people in developing countries still rely on traditional medicine based largely on the different species of plants for their primary health care. About 500% of plants with medicinal uses are mentioned in ancient literature, and 800 plants have been used in the indigenous system of medicine. The various indigenous system such as Ayurveda, Siddha, Unani use several plant species to treat different ailments. Herbal medicines make up an essential component of the trend toward alternative medicine.^[1]

Herbal medicine, sometimes referred to as botanical medicine or herbalism, involves the use of plants or parts of plants, to treat injuries or illnesses. Herbal medicines are the study or use of medicinal herbs to prevent and treat diseases and ailments or to promote health and healing. It is a drug or preparation made from a plant or plants and used for any of such purposes. Herbal medicines are the oldest form of health care known to mankind.^[2]

For the past few decades, herbal medicines have been increasingly consumed by the people without prescription. Seeds, leaves, stems, bark, roots, flowers, and extracts of all of these have been used in herbal medicine over the millennia of their use. Herbal formulations have reached widespread acceptability as

therapeutic agents like antimicrobial, antidiabetic, antifertility, antiaging, antiarthritic, sedative, antidepressant, anti-anxiety, antispasmodic, analgesic, anti-inflammatory, anti-HIV, vasodilatory, hepatoprotective, treatment of cirrhosis, asthma, acne, impotence, menopause, migraine, gall stones, chronic fatigue, Alzheimer's disease and memory enhancing activities.^[3]

In the last decade, there has been a global surge in the use of complementary and alternative medicine in both developed and developing countries. According to various government and non-government reports from the countries in question, the percentages of the respective populations having used complementary and alternative medicine at least once are as follows: the–Germany – 90 per cent, France – 49 per cent, Canada – 70 per cent, Australia – 48 per cent, the United States – 42 per cent, and Belgium – 31 per cent. Various reasons have been proposed for this increase, including the affordability of the treatments as well as changing needs and beliefs.^[4]

Advantages of Herbal Medicine

They have many advantages

- They have better patient tolerance as well as acceptance
- The medicinal plants have a renewable source of cheaper medicines
- Improvements in the quality, efficacy, and safety of herbal medicines with the development of science and technology
- Prolong and uneventful use of herbal medicines may testify to their safety and efficacy
- They are cheaper and cost effective
- They are not harmful
- Strength and effectiveness
- Better tolerance
- More safety
- Less side-effects
- Ready availability
- Eco-friendly
- They are more effective than any synthetic drug throughout the world herbal medicines have provided many of the most potent medicines to the vast arsenal of drugs available to modern medical science, both in crude form as well as a pure chemical upon which modern medicines are constructed.^[5]

Triphala

Ayurveda is India's traditional natural system of medicine that has been practiced for more than 5000 years and is often called "Mother of all healing". Ayurveda is a Sanskrit word that literally means "science of life" or "practices of longevity". For many years Ayurveda flourished and was used by rich and poor in India and South-East Asia. In ayurveda, Triphala is a

well-known poly herbal formulation. In Indian system of medicine (ISM) it is a Rasayana drug.^[6]

Triphala (Sanskrit; tri = three and phala = fruits) is a well-recognized and revered polyherbal medicine consisting of dried fruits of the three plant species *Emblica officinalis* (Family Euphorbiaceae), *Terminalia bellerica* (Family Combretaceae), and *Terminalia chebula* (Family Combretaceae) (are taken in equal proportion) that are native to the Indian subcontinent. It is classified as a tridoshic rasayana in Ayurvedic medicine as it promotes longevity and rejuvenation in patients of all constitutions and ages. The formula consists of the fruits Amalaki or the Indian Gooseberry, Bibhitaki, and Haritaki of the three plants generally in equal proportions and has been used in traditional medicine in India for over 1000 years according to the Charaka Samhita, which says taking the Triphala Rasayana (Triphala with honey and ghee) daily has the potential to make a person live for one hundred years devoid of old age and diseases.^[7,8]

Ayurvedic Classification

Triphala is classified as a tridoshic rasayana, meaning that the energetics are appropriate for Vata, Pitta, and Kapha or all types of patients. Charak describes rasayanas as having the qualities of supporting strength and immunity. Given these qualities and the tonic energetics, Triphala can be considered for use in the very young, the infirmed, and the elderly. Other classical Ayurvedic classifications attributed to the formula are shukrala, digestive, mild laxative at normal doses, bowel tonic at low dose, purgative at high doses, carminative, expectorant, antispasmodic, and bronchodilator. In addition, myriad other uses are described both in the Ayurvedic medical literature and anecdotally.^[7]

Table 1: Showing Classification of Triphala.

Samhita and Nighantu	Varga
Charaka Samhita	Virechanopag Mahakasaya, Jwarhar Mahakasaya, Kasaya Skandha
Sushruta Samhita	Muskadi Gana, Parushkadi Gana, Mustadi Gana, Tripala Gana, Amalakyadi Gana, Kasaya Skandh
Astanga Hridaya	Virecana Gana ,Parushkadi Gana,Muskakadi Gana,Mustadi Gana,
Astanga Sangraha	Virecanopayogi Dravyas,Jwarahara Mahakasaya, Parushkadi Gana, Muskakadi Gana, Mustadi Gana.
Dhanvantari Nighantu	Guduchyadi Gana, Mishrakadi Varga
Sodhala Nighantu	Guduchyadi Gana
Kaidev Nighantu	Aushdhi Varga
Madanpal Nighantu	Abhyadi Varga
Raj Nighantu	Mishrakadi Varga, Audhabhida Gana
BhavPrakash Nighantu	Haritkyadi Nighantu
Priya Nighantu	Haritkyadi Nighantu
Nighantu Adarsh	Haritkyadi Nighantu
Dravyaguna Vigyan	Rasayana Varga and Chednadi Varga

Types of Triphala

There are three types of Triphala

Swalpa Triphala

Draksha, Kharjura, parushaka, these three fruits together as called swalpa Tiphala.

Madhura triphala

Draksha, Kharjura, Kasmarya, these three fruits together called as Madhura Triphal.benificial for vision, appetizer, promotes desire for food.

Sugandhi Triphala

Jatiphalam, ela, lavangam, these three constitute called as Sugandhi Triphala. Useful in breaking constipation.

Table 2: Showing Ayurvedic Properties of Triphala.

Dravya	Haritaki	Vibhitaki	Amalaki	Triphala
Rasa	Panchrasa(Kasaya)	Katu	Panchrasa(Amla)	Kasaya
Guna	Laghu,Ruksha	Laghu,Ruksha	Laghu,Ruksha, Sita	Ruksha,Sara
Virya	Ushna	Ushna	Sita	Anusna
Vipaka	Madhura	Madhura	Madhura	Madhura
Prabhav	Rasayana	Chedana	Rasayana	Rasayana
Dosha-Karma	Vata	Kapha	Pitta	Tridosha
Karma	Anulomana, Caksusya,Dipana, Hridaya,Medhya, Sarvadosha-Prasamana	Caksusya, Kesya, Bhedaka. Krminasana, Kasahara	Vrisya, Caksusya	Caksusya, Dipana, Varnaropana, Rucikara, Medohara

Ayurvedic Pharmacology of Triphala

Dravya guna or ayurvedic pharmacology describes the attributes of herbs. The rasa or taste of triphala is sweet, sour, pungent, bitter, and astringent; the only taste not contained within the formula is salty. The virya, or potency and action, is neutral, and the vipaka, or postdigestive effect of the formula, is sweet. Triphala has a prabhav, meaning special action or trophism, for all doshas (energetics and mind-body types) and thus is balancing for all doshas and constitutions. The gunas, or qualities, of amalaki are heavy and dry, and both haritaki and bhibitaki are considered light and dry.^[9]

Therapeutic Uses and Studies of Triphala

Formulation allows for many applications and studies have validated several potential uses of triphala, which includes:

- Free radical scavenging, antioxidant, anti-inflammatory, immunomodulating, appetite stimulation, gastric hyperacidity reduction, dental caries prevention, antipyretic, analgesic, antibacterial, antimutagenic, wound healing, anticariogenic, antistress, adaptogenic, hypoglycemic, anticancer, hepatoprotective, chemoprotective, radioprotective, and chemopreventive effects.^[10]

- Triphala may also promote proper digestion and absorption of food, reduce serum cholesterol levels, improve circulation, relax bile ducts, prevent immunosenescence, maintain homeostasis of the endocrine system, and increase production of red blood cells and hemoglobin.^[10]
- Triphala is perhaps most well-known for its use in general gastrointestinal health.
- Triphala prevent diarrhea.^[11]
- It is also effective in headache, dyspepsia, ascites, and leucorrhea, also used as a blood purifier and possess anti-inflammatory, analgesic, antiarthritic, hypoglycemic and anti-aging properties.
- Triphala is claimed to have antiviral and antibacterial effect.^[12]
- Triphala is prescribed for fatigue, assimilation, reduces oxidative stress and infectious diseases such as tuberculosis, pneumonia, AIDS, periodontal diseases etc.
- Triphala is reported to reduce considerably the damage due to oxidative stress.^[13]
- Studies show that it inhibits the growth of Gram-positive and Gram-negative bacteria.^[11]
- The recent studies prove that triphala is rich in gallic acid, vitamin C, ellagic acid, chebulic acid, bellaricanin, beta – sitosterol and flavanoids.

Compositions of Triphala

Amalaki

Aonla, or Indian gooseberry, is known for its medicinal and therapeutic properties from the ancient time in India and considered a wonder fruit for a health-conscious population. It has been grown and known in India for more than 3500 years.

The edible fruit tissue contains protein concentration 3-fold and ascorbic acid concentration 160-fold over those of apple. The fruit also contains considerably higher concentration of most minerals and amino acids than apple. Glutamic acid, proline, aspartic acid, alanine, and lysine are 29.6, 14.6, 8.1, 5.4, and 5.3%, respectively, of the total amino acids. The pulpy portion of fruit is highly nutritive and is one of the richest sources of vitamin C, except Barbados cherry.^[15]



Figure 1: Showing picture of Amla.

- **Latin name** - *Embllica officinalis* or *Phyllanthus emblica*

- **Family** - Euphorbiaceae
- **Classical name** - Amalaki, Dharti
- **Hindi name** - Awala, Amla, Aonla
- **Sanskrit name** - Amalaki, Dhatri, Vyastha
- **English name** - Indian gooseberry
- **Swaroop (Habit)** - A medium sized tree
- **Habitat** - Found throughout India; often planted in gardens and cultivated also in small and large scale. The aonla tree is native to tropical Southeast Asia, particularly central or southern India, Pakistan, Bangladesh, Sri Lanka, Malaya, Southern China, and the Mascarene Islands.^[14]
- **Ayurvedic Pharmacodynamics**
- **Rasa** - Pancharasa (Amla predominance and Lavanarahita)
- **Guna** - Laghu, Ruksha, sita
- **Virya** - Sita
- **Vipaka** - Madhura
- **Prabhava** - Rasayan
- **Dosh Karma** - Tridoshhara, Pittasamarka (mainly)
- **Parts used** - Fruits
- **Chemical Composition** - Fruit is a well-known rich source of Vitamin C. Seeds contains fixed oil, phosphatides, and an essential oil. Fruits, barks, and leaves are rich in tannins.^[15]

TABLE 1
Chemical composition of aonla

Constituent	Amount (%)	Constituent	Amount (mg/100 g pulp)
Moisture	77.1–82.20	Iron	1.20
Protein	0.50	Nicotinic acid	0.20
Fat	0.10	Vitamin C	200–1814
Minerals	0.50–0.70	Carotene	0.01
Fibre	1.90–34.00	Thiamine	0.03
Carbohydrates	14.10–21.89	Riboflavin	0.05
Calcium	0.012–0.050	Niacin	0.18
Phosphorous	0.020–0.026	Tryptophan	3.00
		Methionine	2.00
		Lysine	17.00

- **Therapeutic Uses** - Fruits are the most useful part of the plant and are used medicinally in various diseases adopting different forms. Fruits are used for supplementing Vitamin C and other contents also. It is one of the most popular, common, and highly reputed drugs of indigenous system of medicine. It is used in anemia, hyperacidity, peptic ulcer, dyspepsia, anorexia, diarrhoea, dysentery, hemorrhage, eye inflammations, irritability of bladder, leucorrhoea, spermatorrhoea, epitaxis, menorrhagia, jaundice, weak memory condition, nervine debility, oedema, and liver condition. The juice of fresh fruit is given as tonic, refrigerant and antiscorbutic, diuretic, laxative and anti-bilious remedy.^[14]

Haritaki

The fruits of *T. chebula* are used as edible ones and also as medicine in many Asian countries from ancient times. The kernels of fruits are edible.^[16]

Vernacular Names

The pericarp of the mature fruits, known as *Chebulae* Fructus, is used as crude drug in many traditional medicine systems. Followings are the local names of *T. chebula* in different languages: Harad (Hindi), Harro (Nepali), Haritaki (Bengali & Sanskrit), Halela (Urdu), Karaka, Karakkaya (Telugu), Kadukkai (Tamil), Harada (Marathi), Hirdo, Himaja, Pulo-harda (Gujrati), Halela, Harar (Panjabi), Katukka (Malayalam), Alalekai (Kannada), Halela (Kashmiri) (Anonymous, 2010). Haritaki is used in many ayurvedic formulations such as, Triphala Churna, Triphaladi Taila, Abhayarista, Agastya Haritaki Rasayana, Citraka Haritaki, Danti Haritaki, Dasamula Haritaki, Brahma Rasayana, Abhaya lavana and Pathyadi Lepa.^[17]

Terminalia chebula is a medium to large size deciduous tree attaining a height of 15-24m. Leaves are ovate or elliptic with a pair of large glands at the top of the petiole. Flowers are yellowish white in terminal spikes. Seeds are hard and pale yellow.^[18]

Taxonomical/Scientific Classification^[18]

Kingdom: Plantae
Division: Phanerogams
Subkingdom: Angiosperm
Class: Monocotyledons
Subclass: Epigynae
Order: Scytaminiales
Family: Combretaceae
Genus: *Terminalia*
Species: *chebula*



Figure 2: Showing picture of Haritaki.

- **Latin name** - *Terminalia chebula* Linn.
- **Family** - Combretaceae
- **Classical name** - Haritaki
- **Sanskrit synonyms** - Haritaki, Pathya, Abhaya, Avyatha, Vayastha, Haimavati, Shiva
- **Hindi name** - Harre, Harad
- **English name** - Chebulic Myrobalan
- **Swaroop (Habit)** - A moderate sized / large deciduous tree
- **Habitat** – It is found throughout the greater parts of the India, chiefly in the deciduous forest and areas of light rainfall, also in slightly moist forest ascending

to an altitude of 1500m in Himalayas also found in MP, W. Bengal, Karnataka and Maharashtra in India, Burma, and Ceylon.^[18]

- **Types** - Seven types namely Vijaya, Rohini, Putana, Amrita, Abhaya, Jivanti and Chetaki
- **Ayurvedic Pharmacodynamics**
- **Rasa** - Pancharasa (Kashaya predominance, Lava rahita)
- **Guna** - Laghu, Ruksha
- **Vipaka** - Madhura
- **Virya** - Ushna
- **Prabhava** - Tridosahara
- **Dosha karma** - Mainly kapha pitta samaka
- **Parts used** - Fruits
- **Chemical Composition** - Fruit contains tannin up to 30%, chebulic acid and gallic acid and some purgative constituents of the nature of Anthraquinone. *T. chebula* fruits are widely reported for their high contents of phenolic compounds including phenolic acids, tannins and flavonoids. Fruits are also known for their high content of vitamin C (ascorbic acid). Main compounds among tannins (hydrolysable tannins) are terflavin A, terchebulin, punicalagin, chebulagic acid (CA), chebulinic acid, corilagin.^[19]
- **Therapeutic Uses** - Commonly and widely used in Indian system of Medicine and is a frequent addition in many formulations. It is useful in asthma, sore throat, thirst, vomiting, eye disease, heart and bladder diseases, strangury, urinary discharges, ascites, biliousness, inflammation, bleeding piles, typhoid, constipation, anaemia, elephantiasis, and delirium. The ripe fruit are purgative, tonic, carminative and strengthens the brain, eyes, and gums.^[14]

Vibhitaki

Terminalia bellerica commonly known as bibhitaki belongs to the family Combretaceae. It is called vibheetaki in Sanskrit which means “fearless”, the fruit that takes away the fear of disease. In Indian history, it is said that, *T. bellerica* is inhabited by demons and those who sat under its shade were vulnerable to an attack by the same. Due to its medicinal properties tree has Sanskrit synonym of Anila-ghnaka, or “wind-killing”. The generic name ‘Terminalia’ is derived from Latin word, ‘terminus’ or ‘terminalis’ (ending), which means habit of the leaves being crowded or borne on the tips of shoots. 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.^[20]

Taxonomical/Scientific Classification^[20]

Kingdom: Plantae
Division: Magnoliophyta
Class: Mangoliopsida
Order: Myrtales
Family: Combretaceae
Genus: *Terminalia*

Species: *Terminalia bellerica*

Vernacular Names^[21]

English: Belleric myrobalan, Hindi: Bahera, Baheda, haira, Bulla, Assam: Bhomora, Bhomra, Bhaira, Bauri, Hullach, Bengali: Bayada, Bahura, Gujarati: Bahedan, Bero, Bahasa, Kannada: Tara kai, Santikayi, Yahela, Kashmiri: Babelo, balali, Malayalam: Tannikka, Thanni, Marathi: Baheda, Bhirda, Oriya: Bahada, Bhara, Punjabi: Bahera, Balela, Tamil: Thanrikkai, Kaattu-elupoe, Telugu: Thanikkaya, Tandra, Bahadrha, Urdu: Bahera.^[21]



Figure 3: Showing picture of Vibhitaki.

- **Latin name** - *Terminalia bellerica* Roxb.
- **Family** - Combretaceae.
- **Sanskrit synonyms** - Aksha, Kaliphala, Bhutavasa, Kalidruma, Karnaphala
- **Hindi name** - Bahera, Baheerha
- **English name** - Belleric Myrobalan
- **Swaroop (Habit)** - A large deciduous tree
- **Habitat** - It grows wild at an elevation of upto 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. Throughout the deciduous forests of India and Burma.^[22]
- **Ayurvedic Pharmacodynamics**
- **Rasa** - Kashaya
- **Guna** - Laghu, Ruksha Virya - Ushna
- **Vipaka** - Madhura
- **Prabhava** - Tridoshagna
- **Dosha karma** - Kapha hara Parts used - Fruit
- **Chemical Composition** - Glucoside (bellericanin), Ellargic acid, gallic acid, lignans, flavone and anolignan B10. Tannins, ellargic acid, ethyl gallate, galloyl glucose and chebulaginic acid, phenyllembin, β -sitosterol, mannitol, glucose, fructose and rhamnoid. Fruit contains 17% tannin and gallo-tannic acid (colouring matter) and resin. Seeds contain greenish yellow oil.^[23,24,25]
- **Therapeutic Uses** - The bark is beneficial in asthma and leucoderma. The fruit is digestible, laxative and anthelmintic and is employed for bronchitis, sore throat, biliousness, inflammation and in diseases of eye, nose, heart, and urinary bladder. The oil is a good application for the hair. On the fresh cuts and wounds, the fine powder is dusted to arrest bleeding

as an astringent and styptics agent.^[14]

Pharmacological and clinical studies

Wound healing activity of triphala

Triphala extract ointment (10% w/w) was assessed for in vivo wound healing on infected rat model by rate of healing, bacterial count, biochemical analysis, and expression of matrix metalloproteinases. Topical application of Triphala ointment on infected wound not only reduces the risk of infection but also improved the healing 26

Anti-Bacterial Activity of Triphala

Srikumar et al. confirmed the antibacterial activities of aqueous and ethanol extracts of Triphala and its individual components against *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Shigella sonnei*, *Shigella flexneri*, *Staphylococcus aureus*, *Vibrio cholerae*, *Salmonella paratyphi-B*, *Escherichia coli*, *Enterococcus faecalis* and *Salmonella typhi* isolated from human immunodeficiency virus (HIV) infected patients.^[27]

Anti-Diabetic Activity of Triphala

Oral administration of the extracts (100 mg/kg body weight) reduced the blood sugar level in normal and in alloxan (120 mg/kg) diabetic rats significantly within 4 h. Continued, daily administration of the drug produced a sustained effect.^[28]

Anti-Hyperlipidemic Activity of Triphala

Rats which were fed with a diet consisting of 4 % Cholesterol, 1% cholic acid and egg yolk for forty-eight days resulted in a significant increase in the total cholesterol, LDL, VLDL and FFA making them hypercholesteraemic. But administration of Triphala at 1 g/kg body weight daily for forty-eight days caused significant reduction in total cholesterol, LDL, VLDL and FFA.^[29]

Immunomodulatory Activity of Triphala

Study by Srikumar et al. have shown that administration of Triphala enhanced the phagocytosis, phagocytic index, antioxidant activities and decreased corticosterone levels in animals exposed to noise stress.^[30] It was done by testing the various neutrophil functions like adherence, phagocytosis (phagocytic index (P.I) and avidity index (A.I))

Anti-Inflammatory and Anti-Arthritic Activity of Triphala

Rasool et al. evaluated the anti-arthritic effect of Triphala. The physical and biochemical changes observed in arthritic animals were altered significantly to near normal conditions after oral administration of Triphala (1 g/kg/bw). In another study Rasool studied the efficacy of Triphala on monosodium urate crystal-induced inflammation in mice where significant inhibition in paw volume, levels of lysosomal enzymes, LPO and inflammatory mediator tumour necrosis factor- α was found.^[31]

Analgesic, Antipyretic and Ulcerogenic Activities of Triphala

The analgesic, antipyretic and ulcerogenic activities of Triphala (500/1000 mg/kg bw) were compared with the non-steroidal anti-inflammatory drug Indomethacin (10 mg/kg bw) on the experimental models in mice and it was found that Triphala at both the dose levels produced excellent analgesic and antipyretic effect, without any gastric damage.^[32]

Anticancer Activity of Triphala

The use of Triphala in diet has been shown to significantly reduce the benzo pyrene induced stomach papilloma-genesis in mice. It was observed that the concomitant use of multiple agents seemed to have a high degree of chemoprevention potential." The cytotoxic effects of aqueous extract of Triphala, an ayurvedic formulation, were investigated on human breast cancer cell line (MCF-7) and a transplantable mouse thymic lymphoma (barcl-95), which suggests that Triphala possesses the ability to induce cytotoxicity in tumour cells but spares the normal cells by increasing concentrations of Triphala.^[33] Exposure of the human pancreatic cancerous cells Capan-2 cells to Triphala for 24 hours caused significant decrease in cell survival and induce apoptosis. Triphala failed to induce apoptosis in normal human pancreatic ductal epithelial cells.^[34]

Gastrointestinal Activity of Triphala

Triphala is perhaps most well-known for its use in general gastrointestinal health. Animal studies have shown that both aqueous and alcohol-based extracts of Triphala prevent diarrhea.^[35] Triphala also induces enteroprotective effects, which are likely due, at least in part, to the high antioxidant content. In a rodent model, Triphala replenished depleted protein in the intestinal villi of the brush border as well as glutathione and phospholipid levels; the formula simultaneously decreased myeloperoxidase and xanthine oxidase levels in intestinal epithelium.^[36] In rats, Triphala exerted a gastroprotective effect on stress-induced ulcer³⁷. One human clinical trial that investigated the use of Triphala in patients with gastrointestinal disorders reported that treatment reduced constipation, mucous, abdominal pain, hyperacidity, and flatulence while improving the frequency, yield, and consistency of stool.^[38] Triphala also reduced colitis in a mouse model, and the treatment effect was attributed to antioxidant effects and high levels of flavonoids contained in Triphala.^[39]

Anti-Obesogenic Activity of Triphala

Deregulation of eating behaviour is common in industrialized countries. Studies have demonstrated the potential of Triphala as a therapeutic agent for weight loss and reduction of body fat. In an animal study, Triphala was administered for 10 weeks to diet-induced obese mice.^[40] Triphala treatment decreased the percentage of body fat, body weight, and energy intake. Triphala also decreased total cholesterol, triglycerides, and low-density lipoprotein cholesterol in the

experimental group compared with the control group. In a 12-week, double-blind, randomized placebo-controlled trial, human subjects treated with Triphala lost around 5 kg compared with the placebo control group.^[41]

Cardiovascular Activity of Triphala

Study in rats fed an atherogenic diet revealed that Haritaki (Administration of 1.5, 2.1 mg/kg per day of Haritaki), one of the herbs in Triphala, induced hypolipidemic effects in the herb-treated group. A reduction in total cholesterol, triglycerides ($p < 0.001$), and total protein ($p < 0.001$) and elevation of high-density lipoprotein cholesterol ($p < 0.05$), were found in the herb-treated group compared with control group at over a period of 14 days.^[42] Triphala is a powerful herb to address imbalances in the gastrointestinal tract and cardiovascular system and should be more widely studied in the context of these common diseases.

Anti-Aging Activity of Triphala

Triphala extract exerted highly protective antiaging effects on human skin cells in vitro. Triphala extract affects gene expression of human skin cells, stimulating collagen-1 and elastin-synthesizing genes and antioxidant genes responsible for the cellular antioxidant, SOD-2. Triphala extract was found to inhibit melanin production and hyperpigmentation due to the presence of protective phytochemicals. Furthermore, Triphala extract exhibited significant free radical scavenging activity on hydrogen peroxide-induced cell damage and senescence.^[43] These results demonstrate potential dermal antiaging effects of Triphala, such as increasing collagen and elastin, increasing cellular antioxidants, and decreasing hyperpigmentation.

Anti-Oxidant Activity of Triphala and Eye Health

Antioxidant effects of Triphala have the potential to help maintain eye health. Triphala is a rich source of vitamin C and flavonoids. One study used Triphala as a pretreatment in selenite-induced cataracts in mice. Triphala significantly restored glutathione levels in eye lenses. Triphala also increased the activities of antioxidant enzymes, such as superoxide dismutase, catalase, glutathione-S-transferase, and glutathione peroxidase, in the lenses of the experimental group when compared with the control group. While 100% of the mice in the control group developed cataracts, only 20% of the mice pretreated with Triphala developed cataracts. This effect may be linked to the antioxidant activity of Triphala.^[44]

Anti-Mutagenesis Activity of Triphala

Studies have concluded that Triphala may help prevent and reverse DNA damage and mutagenesis. The prevention of DNA damage is important given that it is often an initiating event in carcinogenesis. Research in animal models and in vitro has shown that Triphala is effective in prevention of mutagenesis induced by both chemical- and radiation-induced damage.

It was noticed that acetone and chloroform extracts exerted significant inhibition against tester strains TA98 and TA100 of *S. typhimurium*. Among the two extracts, acetone extract showed maximum inhibition of 87.4% with direct-acting mutagens, which was enhanced remarkably with S9- dependent mutagen. On the contrary, chloroform extract showed inhibition of 59.8% and 65.4% in direct-acting and S9-dependent mutagens. The results demonstrate that the extracts inhibited the mutagenicity induced by both direct- and indirect-acting mutagens, but the inhibition was greater for S9-dependent mutagens.^[45]

CONCLUSION AND OUTCOMES

Conclusion: After gone through literature of lots of review and research paper, which has been taken from different search engines like Google Scholar, PubMed, Scopus, Science Direct etc., a review paper is being prepared based upon the evidences that has been provided by the different authors in the different journals. This article is provided with the description about the Triphala (the Triphala Churna) along with their compositions, numerous therapeutic uses, various pharmacological activities, types of Triphala, also brief description about ayurveda system of medicines and their synonyms. The main ingredients *Emblica officinalis* (Amalaki), *Terminalia bellerica* (Bibhitaki), and *Terminalia chebula* (Haritaki) have been discussed in detailed which includes- vernacular names, taxonomical classification, Latin names, Sanskrit names, Hindi names, pharmacodynamic (such as- rasa, guna, vipaka, prabhava and dosh karma) their habit and habitat and chemical composition. The current review work signifies the different pharmacological activities which have already been performed with Triphala (mostly in aqueous extracted form). These activities includes- Wound healing activity, Anti-diabetic activity, Anti-inflammatory activity, Anti-bacterial activity, Anti-hyperlipidaemic activity, Anti- mutagenesis activity, Anti-cancer activity, Anti-oxidant activity, Anti-cataract activity, cardiovascular activity, Anti-aging activity, Anti-obesogenic activity, gastrointestinal activity, Immunomodulatory activity, Analgesic, antipyretic and ulcerogenic activities, and anti-arthritis activity.

Outcomes: Summarizing the descriptive overview on Triphala along with their compositions, numerous therapeutic uses, various pharmacological activities, types of Triphala, and their synonyms. The main ingredients *Emblica officinalis* (Amalaki), *Terminalia bellerica* (Bibhitaki), and *Terminalia chebula* (Haritaki), which includes- vernacular names, taxonomical classification, Latin names, Sanskrit names, Hindi names, pharmacodynamic (such as- rasa, guna, vipaka, prabhava and dosh karma) their habit and habitat and chemical composition might help the researchers while writing either a review article or a research paper. In future, it might help the researchers to know what kind of activities have already been performed by using triphala and what more could be done (those, which is

unidentified till the date). By going through the sequential references on the pharmacological activity the researchers can actually access the full paper on the experiments performed.

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