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A Comprehensive Review on Medicinal Properties and Health Benefits of Aegle Marmelos, Azadiacha Indica and Tinospora Cordifolia

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Abstract:

Introduction Aegle marmelos (Bael)Azadirachta indica (Neem)Tinospora cordifolia (Giloy) are the three traditionally medicinal plants having rich diverse medicinal values. Bioactive molecules in them, including their various health benefits like antioxidant, anti-inflammatory, antimicrobial, antidiabetic and immunomodulatory actions, have been discussed. In traditional medicine, they use to treat diseases, particularly related to the gastrointestinal disorders, infections and chronic conditions of diabetes, cancer and inflammation. There are several studies showing their efficacy, but their optimal dosages and application in modern healthcare need more research to ensure safety.

Keywords: Health Benefits of Aegle Marmelos, Azadiacha Indica, Tinospora Cordifolia

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Introduction

Aegle Marmelos (Bael), Azadirachta Indica (Neem), and Tinospora Cordifolia (Guduchi) are very popular plants in traditional medication systems, especially Ayurveda, for their incredible medicinal properties. These drugs have been in use since thousands of years due to their exceptional therapeutic potential varying from antibacterial and anti-inflammation to antioxidant as well as immunopromoter effects.

Aegle Marmelos (Bael):-

Aegle marmelos, a member of the Rutaceae family, is also known as Bael in indigenous medicine and is thought to have a variety of therapeutic characteristics. The bael is a sacred tree in Hinduism. Leaves have been

donated in prayers to Shiva and Parvathi from ancient times1. Bael is a deciduous sacred tree associated with the Gods and has medicinal benefits, particularly as a cooling agent.[1]

Nature has provided a vast treasure trove of remedies for humankind's afflictions. About 80% of the world's population either fully or partially depends on traditional medicine to meet their fundamental health needs.[2].The quest for natural antioxidants has become a search for food plants, especially spices and herbs.[3].

Azadirachta Indica (Neem):-

The World Health Organization defines "Good-Health" as a condition of physical and mental well-being unaffected by any disease or ailment.[4].Neem compounds are used in Ayurveda, Unani, Homeopathy, and modern medicine to treat several ailments, including viral, metabolic, and cancer. Plant-based preparations are widely used in disease control across several countries [5].Various religious texts, including the Bible and the Quran, encouraged the use of herbs in treatment and prevention. The Islamic view also supports the significance of herbs in curing diseases. Prophet Mohammed (PBUH) has prescribed several plants/fruits for curing ailments [6]. Several biological and pharmacological activities have been reported, such as antimicrobial activity[7]. antifungal [8].

Tinospora cordifolia (Guduchi):-

Tinospora cordifolia is referred to as "Guduchi" in Sanskrit, which is a big, deciduous climbing plant in the family Menispermaceae.

This is a shrub with greenish yellow flowers and mostly occurs at high altitudes.

[9].The plant contains numerous active components, including alkaloids, steroids, diterpenoid lactones, aliphatics, and glycosides.[10]. According to the World Health Organization, 80% of the world's population is dependent on traditional medicine that often involves plant extracts. Active components. India's mega-biodiversity and ancient traditional medicine systems (Ayurveda, Siddha, Unani, Amchi, and local health traditions) provide a strong basis for the use of plants in healthcare and alleviation of common ailments. [11].It also provides relief from digestive disorders such as hyperacidity, colitis, worm infestations, loss of appetite, abdominal pain, excessive thirst, and vomiting, and even liver diseases like hepatitis. [12].Tinospora cordifolia is a deciduous climbing shrub belonging to the Menispermaceae family; it is a plant with many medicinal properties. Menispermeaceae is a flowering plant family with about 70 genera and 450 species that thrive in tropical conditions. It is widespread throughout India, parts of Sri Lanka, Bangladesh, and China[13]. The Ayurvedic Pharmacopoeia of India has also described its antidiabetic activities.[14].

Phytochemical constituent:-

aegle marmelos:-

Organic extracts of A. marmelos leaves have been found to include alkaloids, cardiac glycosides, terpenoids, saponins, tannins, flavonoids, and steroids.[15] Aegle marmelos fruit pulp has been found to include steroids, terpenoids, flavonoids, and phenols. Compounds include lignin, fat/oil, inulin, proteins, carbohydrates, alkaloids, cardiac glycosides, and flavonoids. [16]

azadirachta indica :-

The extracts were tested to identify alkaloids, glycosides, flavonoids, reducing sugars, terpenoids, saponins, and tannins.[17].Neem (Azadirachta indica) produces several bioactive chemicals with complicated structures. Chemically diverse.[18]. Azadirachtin, meliantriol.[19].

tinospora codifolia:-

Tinospora cordifolia contains different kinds of chemicals, such as alkaloids and diterpenoids. Some examples are lactones, glycosides, steroids, sesquiterpenoid, phenolic, aliphatic, and polysaccharides. Structures of some phytoactive substances from Tinospora cordifolia is shown in Figure.[20]The primary phytochemicals present in T.

cordifolia are tinosporide, tinosporine, tinosporaside, cordifol, cordifolide, diterpenoid furanolactone, clerodane furano diterpene, tinosporidine, columbine, and b-sitosterol.[21]

Medicinal property

aegle marmelos:-

The leaves are considered to be of most utility in the management of fever, arresting the abdominal pain, intermittent fever, relieving urinary straitness, palpitation of the heart, diarrhea, dyspepsia,[22].It has been found of great utility in the management of jaundice and asthma.[23],

azadirachta indica:-

Various parts of the neem tree have been in use as traditional ayurvedic medicine in India from time immemorial. [24].Diseases include leprosy, intestinal worms, eye problems, skin conditions like acne and ulcers, biliousness, and epistaxis.

Neem leaf extraction has been used to treat anorexia and related conditions. [25].Neem leaves have anti-inflammatory and antioxidant properties, can treat dental and gastrointestinal ailments, malaria fevers, skin diseases, and act as an insect repellent. The Balinese also used them as a diuretic. The possible side effects include diabetes, headaches, heartburn, increased hunger, leprosy, eye problems, epistaxis, intestinal worms, anorexia, biliousness, skin ulcers, fever, skin illnesses, and dental issues. It includes the following characteristics : immunomodulation, anti-inflammatory, anti-hyperglycemic, anti-ulcer, anti-malarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, and anticarcinogenic. Eczema, Psoriasis.[26]

tinospora cordifoli:-

The plant is also used in the treatment of wounds, pneumonia, asthma, and cough. Tinospora cordifolia has anti-cancer, immune stimulating, nerve cell protecting, antidiabetic, cholesterol-lowering and liver-protective actions. Tinospora cordifolia is also responsible for the reduction of tissue damage from radiation, side effects from certain chemotherapy treatments and quickening healing of diabetic foot ulcers.[27].Tinospora cordifolia is widely used in the practice of Ayurvedic medicine in India for its biological properties, including anti-inflammatory, immunomodulatory, anti-oxidant, anti-diabetic, anti-periodic, anti-spasmodic, antineoplastic, anti-stress, anti-leprotic, and anti-malarial properties.[28].

Health advantages of aegle marmelos

Digestive system:-

1. Antidiarrheal activity: Aegle marmelos leaves have antidiarrheal properties which minimize the frequency and intensity of diarrhea. [29]

2. Anti-inflammatory activity: The leaves are full of anti-inflammatory substances which may help reduce inflammation of the digestive system. [30]

Antidiabetic and antioxidant activity: -

1. Antidiabetic activity: The Aegle marmelos leaves have been found to possess antidiabetic activity, which decreases blood sugar levels in the patient suffering from diabetes. [31]

2. Antioxidant activity: It contains antioxidants, which act as a shield against oxidative stress and cell damage.[29]

Immune System and Infection:-

1. Immunomodulatory effects: Aegle marmelos leaves have been proved to possess immunomodulatory action, which increases the immunity in the body. [30]

2. Antibacterial activity: The leaves possess antibacterial properties that might help in the treatment of a number of diseases. [31]

Cardiovascular Health:-

1. Cardioprotective effects: The leaves of Aegle marmelos have been established to possess cardioprotective effects, which inhibit the progression of heart ailments. [29]

2. Antihypertensive effects: The leaves contain antihypertensive compounds that may contribute to the reduction of blood pressure. [30]

Anticancer and neuroprotective Effects:-

1. Anti-cancer activity: It is now reported that the leaves of Aegle marmelos exhibit anti-cancer activity against numerous cancer cells. [31]

2. Neuro-protective effects: It is even reported that the leaves could have neuro-protective effects and inhibit neuro-degenerative illnesses. Kumar et al. [29]

Health benefits of Azadirachta indica

Anti-microbial and anti-inflammatory effects:-

1. Antibacterial activity: Neem is found to show antibacterial effects against numerous types of microorganisms. [32]

2. Anti-Inflammatory activity: Neem contains anti-inflammatory properties which can be used to lower inflammation and alleviate symptoms from inflammatory diseases.[33]

Anticancer and Immunomodulatory effects:-

1. Anticancer activity: Neem is found to have anticancer properties against various cancer cells. [34]

2. Immunomodulatory effects: Neem comprises immunomodulatory property that can be used for improving the immune system. [32]

Cardiovascular Health:-

1. Cardioprotective activity: Neem has shown cardioprotective activity that helps bring in less risk of heart disease. [33]

2. Antihypertensive activity: Neem consists of antihypertensive activities that could help in decreasing the blood pressure. [34]

Skin Benefits:-

1. Antiacne activity: Neem has been proven to have antiacne activities that help in reducing the severity of the acne.[32]

2. Antifungal activity: Neem consists of antifungal properties that may help treat the fungal infections.[33]

Other Health Benefits:-

1. Antidiabetic activity: Neem has been demonstrated to have antidiabetic properties, which reduce blood sugar levels in diabetics. [34]

2. Antioxidant activity: Neem contains antioxidants, which can help protect against oxidative stress and cellular damage. [32]

Health benefits of tinospora cordifolia

Immunomodulatory action:-

Researchers discovered that Tc can affect the immune system in CCL4-.

To enhance the number of macrophages in the peritoneal cavity and protect the liver, rats were administered 100 mg/kg body weight for 15 days.[35].Greater amounts of IL-1, IL-2, IL-4, and IFN-γ in peripheral blood mononuclear cells.[36].T.cordifolia's bioactive chemicals, such as 11-hydroxymustakone, N-methyl-2-pyrrolidone, N-formylannonain, and syringing, have been reported to possess immune regulating and cytotoxic activities.[37].

Antioxidant activity:-

Oxidative stress arises from the negative impacts caused by reactive oxygen species on biological tissues, radical and non-radical.[35].T. cordifolia aqueous extract of inhibited both the Fenton reaction (FeSO4) and the degradation of 2-deoxyribose caused by radiation in a dose-related manner, with both Fenton and radiation-mediated 2-DR degradation having an IC50 value of 700/mL each. Similarly, at 500/mL and higher, it inhibited the chemically generated superoxide anion in a moderate but dose-related manner, with an IC50 value of 2000/mL.[36].

Anticancer activity:-

The stems are thin and silky white, spirally and longitudinally detached with large rosette like lenticels in between. The wood is white, fragile and transparent. On exposure to air the surface of the subsequent cut is projected to They appear yellowish. The leaves are transparent, alternate, without stipules, long petioles, notochord like, with a perfect and healthy appearance. They possess multi-coated mesh veins. [38].

Antidiabetic activity: -

Many pharmacologic studies have clearly confirmed the antidiabetic effects of genus Tinospora in vivo. Compared with other commonly seen antidiabetic drugs, T. crispa and T. cordifolia exhibit more powerful antidiabetic activity and have been widely used in Asia and Africa as a remedy mainly in regard to type 2 diabetes mellitus.[39].

Anti-inflammatory Activity:-

The invitro anti-inflammatory activity by the method in acute and sub-acute models of inflammation. According to the researcher, Guduchi induced odema arthritis and human arthritis. The dried leaves of Guduchi produced an anti-inflammatory effect that was more effective and useful than acetylsalicylic acid and effective in joint inflammation. Guduchi shows a significant antiinflammatory effect in both acute and sub-acute models of inflammation.[40].

Neuroprotective Activity :-

Kosaraju et al. investigated the neuroprotective potential of T. cordifolia ethanolic extract (TCEE). against Parkinsonism caused by 6-hydroxydopamine [41].

Antimicrobial activity:-

T. cordifolia is known to have antimicrobial activity, especially the methanolic extract. Ethanol extract possesses higher antimicrobial activity. Escherichia coli, Proteus vulgaris, Enterobacter faecalis, Salmonella typhi, Staphylococcus aureus, and Serratia marcescens. [42].

Gastrointestinal and antiulcer action:-

The Ayurvedic properties of cordifolia include Sangrahani, Arshahara, Aruchinashaka, Deepana, Chhardihara, Trishnahara, and Hikkahara. Treatment with a formulation including T. cordifolia has been shown to decrease ulcer index total acidity.[43].

Conclusion:-

Aegle marmelos, Azadirachta indica, and Tinospora cordifolia are three significant plants that have been used traditionally in the Ayurvedic system of medicine. Due to their several medicinal properties that include antioxidant, anti-inflammatory, antimicrobial, antidiabetic, hepatoprotective, and immune-stimulating activities, they form valuable therapeutic agents for disease management. Therapeutic properties of those plants are also under research concerning their capacity to treat the vast area of health-related disorders and the bioactive compounds from those plants have also indicated potential in pharmacological current research.

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