

UNVEILING THE THERAPEUTIC POTENTIAL OF BHALLATAK (SEMECARPUS ANACARDIUM LINN): AN AYURVEDIC GEM

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ABSTRACT

Bhallatak, a revered medicinal plant in Indian Systems of Medicine, has been utilized for centuries due to its diverse pharmacological activities. Despite its toxicity, which hinders large-scale industrial production, traditional healers continue to harness its potential in various forms. Experimental investigations have elucidated Bhallatak's antioxidant, anti-inflammatory, hypoglycemic, antimicrobial, anti-reproductive, CNS stimulant, anticarcinogenic, anti-atherogenic and hair growth promoter properties. This review aims to highlight the significance of Ayurveda-inspired research on this traditionally acclaimed plant, emphasizing its bioactive compounds and potential therapeutic applications. By exploring Bhallatak's multifaceted benefits, we can unlock its full potential, bridging the gap between traditional knowledge and modern medicine.

Keywords: *Semecarpus anacardium, Marking nut, Bioactive compounds, Ayurvedic drug, Complementary and alternative medication (CAM).*

1. INTRODUCTION

The Indian knowledge of herbal medicines is gaining substantial attractiveness globally. In Ayurveda, nearly all medicinal arrangements are derived from plants, whether inside the easy form of raw plant materials or inside the diffused form of crude extracts, mixtures and forth. In extraordinary elements of the world, the term Complementary and alternative medication (CAM) is used for numerous sorts of traditional drugs. Complementary and alternative medicine (CAM) can be defined as any remedy utilized in conjugation (complementary) or in vicinity of (opportunity) widespread clinical treatment[1]. Plant is a source of massive amount of medicinal compounds to play a dominant function in maintenance of human fitness for the motive that antiquities. Over 50% of all modern -day clinical pills are naturally originated and natural merchandise play an crucial feature in drug improvement in pharmaceutical industry In alternative medication [2].

Semecarpus anacardium Linn (family: Anacardiaceae) is a plant well-known for its medicinal value in Ayurvedic and Siddha system of medication. The word, *Semecarpus* is derived from Simeion in Greek way marking/tracing and *carpus* in Greek means nut. *Anacardium* means like cardium, i.e. heart shaped marking nut. . *Anacardium* means like cardium, i.e. heart shaped marking nut [1]. Chemical and phytochemical analyses of its nut reveal the presence of biflavonoids, phenolic compounds, bhillawanols, minerals, vitamins and amino acids. a spread of nut extract preparations from this source are effective against many diseases, viz., arthritis, tumors, infections and so forth.

however, the mechanism of the pharmacological action of its nut can be greatly aided by way of the isolation of its active precept and determination of structure–function relationship [2] .

In view of its numerous effective medicinal properties, it's far acclaimed as Ardhavaidya in Ayurveda and as a Golden acorn at the time of Galen inside the western world. In India, the plant is used by Ayurvedic practitioners/traditional healers throughout the usa albeit with caution [3] . however, manufacturing units are overtly scared in view of its obvious poisonous nature, and subsequently there are some takers. The plant belonging to Anacardiaceae family has capacity to provide allergic manifestations thru touch dermatitis . Phytoconstituents, viz. alkyl catechols, phenols, quinols and resorcinols are believed to be responsible for various reactions [2].

Ayurvedic properties of Bhallatak are madhur, kashay ras, ushna virya, madhur vipak and laghu, snigdha, tikshna, and ushna gunas. It has several karmas like Kaphavatashamak (alleviates kapha & Vata dosha), Bhootanashan (anti-devil) Pittasanshodhak (expels out pitta dosha), Medhya (beneficial to brain), Vanhikar (improves digestive fire), Vrishya (aphrodisiac), Chedana (excisional functions), Bhedan (incisional function), Bruhan (anabolic in effect), and hence indicated for many diseases like Arsha (haemorrhoids), Udar (ascites), Grahani (inflammatory bowel diseases), Shotha (inflammation), Krumi (helminthiasis), Kushtha (skin disorders, like psoriasis), Vran (wounds), Shwitra (vitiligo), Gulma (abdominal mass), Jwar (fever), Adhman (flatulence), etc , [4,5] .

2. BOTANICAL DESCRIPTION



Fig -1: *Semecarpus anacardium* Linn

Semecarpus anacardium is found in numerous components of the world proper from the outer Himalayas to the Coromandel Coast Africa, East Asia to Indian subcontinent, western peninsula, Indo–Malaysian area, North Africa & in international locations along with China, Nepal, India, N. Australia [1] . it's miles to be had in warmer location in India as much as the altitude of 3500ft and in places inclusive of Maharashtra, Karnataka, Konkan, Bihar, West Bengal, Orissa, Kanara wooded place of Tamil Nadu, Madhya Pradesh, and so forth. *Semecarpus anacardium* flora grows obviously inside the tropical location having dry climate [6] .

It is a medium sized to huge tree, 15-25 m in peak, with gray bark exfoliating in small irregular flakes Leaves are simple, alternate, obovate rectangular, rounded at the apex, coriaceous, glabrous above and additional or much less pubescent below, number one nerves 15-25 pairs. Flowering takes location in June and it then onwards the plant bears culmination [1]. plants are greenish white fascicled in pubescent panicles culmination are obliquely ovoid or oblong drupes and a couple of.5 cm lengthy . The top portion of the fruit is cup-shaped, easy, fleshy, orange crimson in color and sweet and match for human consumption when ripe. it is shaped of the thickened disc and accrescent

calyx base. The lower base which can be turned the nut, consists of smooth, black, shining pericarp that's thick, containing amongst its outer and internal laminae oblong cells whole of a corrosive resinous juice [4,5].

The bark is dark grey in colour, quiet rough in texture and exudes an irritant brown colour secretion on incising. Seed appears brown in color and its kernel is eatable after eliminating the pericarp however from time to time may additionally motive cutaneous eruption and seed oil has excessive medicinal value. Seeds are usually accrued for the duration of December- march . [5]

2.1 SYNONYMS

Common name	Language
Agnimukh, Bhallatak	Ayurveda
Bhilawa, Bhilawan	Marathi
Marking nut, Oriental cashewnu	English
Bhilamo	Gujarati
Semecarpus anacardium linus	Punjabi
Bhollataki, Bhola	Kannada
Senkottai, Tatamkottai	Tamil

2.2 TAXONOMICAL CLASSIFICATION

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Rosidae

Order: Sapindales

Family: Anacardiaceae

Genus: Semecarpus

Species: Anacardium

3. PHYTOCHEMISTRY

The most significant components of the *S. anacardium* Linn. Are bhilwanols, phenolic compounds, biflavonoids, sterols and glycosides. Bhilwanol from fruits is a mixture of cis- and transomers of ursuhenol; this compound consists mainly of (1,2-dihydroxy-3(pentadecadienyl 8',11')benzene and 1,2-hydroxy-3 (pentadecadienyl 8')benzene[4]. Other components isolated are, anacardoside, semecarpetin, nallaflavanone, jeediflavanone, semecarpuf flavanone, galluflavanone, anacarduflavone mono-olefin I, diolefin II, bhilawanol-A, bhilawanol-B, amentoflavone tetrahydroamentoflavone semicarpol, anacardic acid, tetrahydrobustaflavone, O-trimethyl biflavanone A1, O- trimethyl biflavanone A2, O-tetramethyl biflavanone A1, O- hexamethyl bichalcone A, O-dimethyl biflavanone B, O- heptamethyl bichalcone B1, O-hexamethyl bichalcone B2, O-tetramethyl biflavanone C., phenolics [8] .

4. PHARMACOLOGY

Anti-inflammatory activity

Ramprasath et al. investigated the anti-inflammatory effects of SA nut extract on developing and developed adjuvant arthritis. *Semecarpus anacardium* significantly decreased the carrageenan-induced paw oedema and cotton pellet granuloma. These results indicate the potent anti-inflammatory effect and therapeutic efficacy of SA Linn. Nut extract against all phases of inflammation is comparable to that of indomethacin[14].

Bhitre et al. prepared the methanolic, ethanolic, chloroform, ethyl acetate and petroleum ether extracts of fruits of SA and tested to study the anti-inflammatory activity using the technique of carrageenan-induced paw edema in albino rats. The extract showed significant anti-inflammatory activity comparable to the reference standard aspirin[15].

Premalatha et al. have been reported for immunomodulatory potency, antioxidative, membrane stabilizing, tumors marker regulative, glucose level restoring and mineral regulation properties of nut extract in hepatocellular carcinoma and found to detoxify a potent hepatocarcinogen aflatoxin B 1 and causes its metabolites to excreted in urine[16].

Antiatherogenic effect

The imbalance between the pro-oxidants and antioxidants is the main cause of development of atherosclerosis. To prevent such condition, antioxidant therapy is beneficial. *Semecarpus anacardium* (SA) shows such antioxidant property. It has capacity to scavenge the superoxide and hydroxyl radicals at low concentrations. The process of atherogenesis initiated by peroxidation of lipids in low-density lipoproteins was also found inhibited by SA .

Sharma et al. demonstrated the cardiac activity of SA, as it generally reduces the tissue and serum hyperlipidemia by the inhibition of intestinal cholesterol absorption coupled with peripheral disposal thus possessing anti-atherosclerotic activity. It is possible that the beneficial antiatherogenic effect may be related to its antioxidant, anticoagulant, hypolipidemic, platelet anti- aggregation and lipoprotein lipase releasing properties. The mechanism of hypo triglyceridemic effect has also been shown to be partly due to stimulation of lipoprotein lipase activity[17].

Hepatoprotective Effect

Abirami studied the plant to understand the antioxidant and protective effect of *Semecarpus anacardium* against lead acetate induced toxicity. He analysed the phytochemicals such as flavonoids, alkaloids, resins, tannins, carbohydrates, proteins present in the plant which are probably responsible for the hepatoprotective efficacy[18] .

Antioxidant Activity

Verma et al. has been reported in various studies of *Semecarpus anacardium* possess potent antioxidant activity. Verma et al. investigated antioxidant activity of the aqueous extract of nuts of medicinal plant SA in AKR mouse

liver during development of lymphoma. Administration of the aqueous extract of SA to lymphoma- transplanted mouse leads to increase in the activities of antioxidant enzymes, whereas LDH activity is brought down significantly indicating a decrease in carcinogenesis[19].

Sahoo et al. investigated the antioxidant activity of ethyl acetate extract of stem bark of *Semecarpus anacardium*. Ethyl acetate extract shown the stronger antioxidant activity (due to presence of highest total phenolic content of 68.67% measured as pyrocatechol equivalent) compared to the other hexane, chloroform and methanol extracts[20].

Veena et al. measured antioxidant status in blood, and vital organs (liver, kidney and breast tissue) of control and experimental animals. In cancer condition, lipid peroxidation (LPO) was increased and antioxidant levels were decreased. when drug (*Semecarpus anacardium* and *kalpamrutha*) administered, it was found that decreased lipid peroxidation and increased antioxidant activity[21].

Hypoglycaemic effect

Krishnamurthy et al. developed *Kalpaamrutha* (KA), a modified Siddha preparation, which contains SA Linn., EO and honey, and studied for the variations in lipids, lipid-metabolizing enzymes and lipoproteins in cancerous animals and the effect of KA on the lipid metabolism. The increased levels of total cholesterol, free cholesterol, phospholipids, triglycerides and free fatty acids and decreased levels of ester cholesterol in plasma, liver and kidney found in cancer-suffering animals were reverted back to near normal levels on treatment with KA and SA. The effects of KA were found to be more effective than SA [23].

Arul et al. studied the effect of ethanolic extract of dried nuts of SA on blood glucose and investigated in both normal (hypoglycaemic) and streptozotocin-induced diabetic (antihyperglycemic) rats. The ethanolic extract of SA (100 mg/kg) reduced the blood glucose of normal rats. The blood glucose levels were measured at 0, 1, 2 and 3 h after the treatment and antihyperglycemic activity of SA was compared with tolbutamide, a sulfonyl urea derivative used in diabetes mellitus[24].

Anti-carcinogenic activity

Mathivadhani et al. studied SA nut extract for inhibitory effect on human breast cancer cells (T47D). Cytotoxicity analyses suggested that these cells had become apoptotic. *Semecarpus anacardium* was discovered to induce rapid Ca^{2+} mobilization from intracellular stores of T47D cell line, and its cytotoxicity against T47D was well correlated with altered mitochondrial transmembrane potential. At the molecular level, these changes are accompanied by decrease in Bcl(2) and increase in Bax, cytochrome c, caspases and PARP cleavage, and ultimately by internucleosomal DNA fragmentation. Taken together, our results provide unprecedented evidence that SA triggers apoptotic signals in T47D cells [25].

Sugapriya et al. showed restoration of energy metabolism in leukemic mice treated by *Semecarpus anacardium* nut milk extract. *Semecarpus anacardium* treatment was compared with standard drug imatinib mesylate. *Semecarpus anacardium* nut extract administered to leukemic animals which shown result of clearance of the leukemic cells from the bone marrow and internal organs[26].

Anthelmintic Activity

Pal have studied anthelmintic activity of different extracts of nuts of *semecarpus anacardium* on adult Indian earthworm (*Pheritima posthuma*). They found that petroleum ether, chloroform extracts of *Semecarpus anacardium* shows better anthelmintic activity than ethanol and aqueous extracts of *Semecarpus anacardium*[27].

Anti-Spermatogenic Effect

Sharma et al. *Semecarpus anacardium* extract feeding in male albino rats caused Anti-spermatogenic effect evidenced by reduction in numbers of spermatogenic cells and spermatozoa. He studied reduction in sperm density in cauda epididymis may be due to changes in the androgen metabolism. Meiotic and post meiotic germ cells were

highly sensitive to androgen concentration and the alteration in androgen level in testes may affect the transformation of spermatocytes to spermatids [28].

Vinutha et al. investigated for SA (stem bark), extracts including methanolic and successive water extracts for acetylcholinesterase (Ach) inhibitory activity (in vitro). Results indicated that methanolic extracts to be more active than water extracts. The potent Ach-inhibiting methanolic plant extracts of SA (stem bark) comes to be 38 g/ml[29].

Cardio protective effect

Asdaq evaluated the cardio protective effect of hydroalcoholic extract of *S. anacardium* nuts against isoproterenol induced myocardial damage in rats. The CK-MB activities were fallen in serum and elevated in heart tissue of animals treated with low and high doses of *Semecarpus anacardium* nut extract as compared to isoproterenol control. The LDH activity were significantly reduced in serum with both low and high doses of *Semecarpus anacardium* nut extract while no change was noted in heart tissue with both doses compared to isoproterenol control. Hence it is concluded that SA possesses potential to ameliorate the myocardial damage induced by isoproterenol in rats[30].

Nephrotoxicity

Choudhari et al. studied the toxicity study on a few blood parameters in male albino rats at acute and sub-chronic levels with SA nut oil extract (50% w/v) in ground nut oil. Albino rats (Wistar strain) were treated orally with three sub-lethal doses. There was a significant decrease in haemoglobin percent and lowering of erythrocytes, indicating 'anaemia' during toxicity study. He also evaluated the acute and sub-chronic effect of crude extract on activity of some kidney enzymes GOT, GPT, SDH, LDH and histology of kidney of albino rat (Wistar strain) in either sex. Significant alteration in activity levels of marker enzymes of kidney as well as histological structure leading to nephritis were observed, indicating renal dysfunctioning in albino rat. Results exhibited nephrotoxicity inducing potential of SA nut oil extract[31].

Prabhu et al. studied the antimutagenic effect of SA under in vivo condition. Mice were intraperitoneally treated with 500 and 250 mg/kg of SA, which showed a significant inhibition of induced aberrations at the 12 h pretreatment period. The results on the reduction of induced chromosome aberrations clearly show that SA serves as an antioxidant because of the presence of flavonoids which scavenge free radicals. The action of SA oil extract has definite beneficial role against mitomycin-C induced mutagenicity and its administration may be protective and therapeutic[32].

5. TOXICITY AND ANTIDOTE

Bhallatak is generally classified in Ayurveda under the category of toxic plants. Bhallatak is usually avoided in pediatric age group, pregnant women, predominant pitta prakruti persons and also in certain diseased conditions such as bleeding diatheses, renal function disorder, history of vesications and past history of intolerance to Bhallatak. Bhallatak is known to have a narrow therapeutic range. The commonly seen Bhallatak-related adverse events are generalized itching, vesication, erythematous patches, mucocutaneous papular eruptions, stomatitis, gastritis, proctitis, urethritis, etc. Practitioners are known to use several antidotes either locally or systemically. It is always advised to avoid substances, which would aggravate pitta while consuming Bhallatak. Taking Bhallatak with Anupana of ghee, milk, sugar, rice (Shashtisali) is believed to reduce the incidence of adverse events.

Before using of *Semecarpus anacardium* as internal medicinal purpose, it is necessary to detoxifying it by washing with warm water or other method. one should adopt a bland and cooling diet consisting of rice, milk, butter, ghee because they suppress the side-effect of it.

The salt and spices should be strictly restricted and during bhallataka treatment, it is recommended to avoid exposure to sun, heat. The fresh juice of the leaves of amlika (*Tamarindus indica*) internally, is one of the antidotes for such symptoms.

6. CONCLUSION

Semecarpus anacardium is one of the most important medicinal plants which can be used as an alternative medicine. Traditional healers and physicians are using *Semecarpus anacardium* (Bhallatak) in their clinical practice. Several studies show that SA nut's extract has various phytochemicals which are able to fight against several diseases. The toxicity of *Semecarpus anacardium* can be minimized by the shodhana process. The nut extract shows various activities like antiatherogenic, anti-inflammatory, antioxidant, antimicrobial, anti-reproductive, CNS stimulant, hypoglycemic, anticarcinogenic and hair growth promoter. More efforts are needed to study the traditional uses of the plant such as wound healing activity.

7. ACKNOWLEDGEMENT

The author is thankful to the management of Vidya Bharati College of Pharmacy Amravati, Maharashtra India, 444602, for supporting us by providing facilities to do work.

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