

REVIEW ARTICLE

A REVIEW ON SEMECARPUS ANACARDIUM LINN

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ABSTRACT

A powerful ethnomedicinal plant from the Anacardiaceae family known as “Bhallatak” or “Bhilawa” is *Semecarpus anacardium* Linn. and has strong therapeutic value. Several treatments use bhilawa, both conventionally and ethnobotanically. *S. anacardium* nut phytochemical examination reveals biologically active substances such bhilawanols, biflavonoids, minerals, phenolic compounds, amino acids, and vitamins, and which demonstrate varied therapeutic characteristics. In their clinical work, traditional healers and doctors employ formulations of *S. anacardium*. Numerous formulations are available on the market; some of the more popular ones are Bhallatakasav, Bhallatak Parpati, Amritbhallatak Avaleha, Suran vatak, Narsimha choorna and Sanjeevani Vati. *S. anacardium*'s pharmacological effects, including its hypoglycemic, CNS stimulant, anti-cancer, antioxidant, antiatherogenic, antibacterial, anti-inflammatory, and also promoter activity of hair growth, have been proved in many research study.

Keywords: *S. anacardium*, Medicinal plant, Pharmacological Activity

INTRODUCTION

Plants are essential to human survival and the foundation of life on earth. The local population typically relies on neighboring forested regions to meet their needs for things like medicine, wood, timber, wild veggies, fuelwood, and a variety of other things. Many cultures have used plants and herbs for thousands of years to treat disease and promote wellness. The use of Indian herbal remedies is becoming more widely accepted worldwide. Almost all

therapeutic formulations used in Ayurveda are made from plants. In addition to their active components, minerals, alkaloids, volatile oils, vitamins, glycosides, alcohols, acids, esters, and other compounds make plants and herbs beneficial. Since ancient times, higher plants have been important in maintaining human health as sources of therapeutic chemicals. Different types of conventional medications are referred to as complementary and alternative medicine (CAM) in other parts of the world. Any treatment used in conjunction with (complementary) or in substitute of (alternative) conventional medical treatment is referred to as complementary and alternative medicine (CAM). In alternative medicine, medicinal plant formulations are frequently used, especially for illnesses that cannot be treated with current methods [1]. Natural products are the source of more than 50% of all contemporary clinical medications [2] and are crucial to the pharmaceutical industry's drug research efforts [3].

S. anacardium Linn. is the most adaptable, one of the best, and widely used plant as a household cure, which is found in the sub-Himalayan region, Orissa, Bengal, Bihar, and central parts of India. Since many years ago, it has been extensively utilized throughout India. The Greek words *simeion*, which means marking or trace, and *carpus*, which means nut, are the origin of the word *S. anacardium* means "heart-shaped marking nut" and is similar to *cardium*. It is referred to as *Bhilaavaa*,

Bhallataka, and *Serankottai* in the Unani, Ayurvedic, and Siddha medicine, respectively.

In Ayurveda *bhallatak* are noted to possess *madhur*, *ushnavirya*, *kashayras*, *ushnagunas*, *madhurvipakand*, *snigdha* and *tikshna* qualities [4,5]. It has several *karmas* includes *Bhootanashan* (anti-devil), *Kaphavatashamak* (alleviates *kapha* & *Vatadosha*), *Medhya* (beneficial to brain), *Pittasanshodhak* (expels out *pitta dosha*), *Vrishya* (aphrodisiac), *Chedana* (excisional functions), *Bhedan* (incisional function), *Bruhan* (anabolic in effect), *Vanhikar* (improves digestive fire) due to that it indicated for many diseases like *Arsha* (Haemorrhoids), *Grahani* (Inflammatory bowel disease), *Shwitra* (Vitiligo), *Udar* (Ascites), *Shotha* (Inflammation), *Kushtha* (Skin disorders), *Gulma* (Abdominal mass), *Krumi* (Helminthiasis), *Adhman* (Flatulence), *Vran* (Wounds), *Jwar* (Fever) etc [6].

Bhallataka is classified by *Maharsi Charaka* as *Dipaniya*, an appetizer, *Bhedaniya*, a herb that breaks up buildup, *Mutrasangrahaniya*, an antidiuretic, and *Kusthaghna*, an antidermatosis. A popular medication for the treatment of piles of *Kapha* and *Vata* types is *bhallataka*. Additionally, it has the capacity to cause contact dermatitis, which might result in allergic symptoms. Because of its high potency, it is only used after purification processes. The fruit, gum, and oil have all been employed for its medicinal powers since ancient times, and this plant has been

dubbed “HAIF PHYSICIAN” in Ayurveda. The nut of this plant contains biflavonoids, phenolic compounds, vitamins, minerals, bhilawanols, and amino acids, according to chemical and phytochemical tests. Numerous extracts of nut medicines from this plant are beneficial against a wide range of illnesses, including infections, malignancies, and rheumatoid arthritis, among others. However, isolating its active ingredient and figuring out the structure-function relationship can substantially benefit in understanding the pharmacological activity of its nut.

The purpose of this review is to provide an overview of *S. anacardium*'s description, phytochemistry, medicinal activity, and recently identified effects and applications.

TAXONOMICAL CLASSIFICATION

Plantae (Kingdom), Tracheobionta (Subkingdom), Spermatophyta (Super division), Magnoliophyta (Division), Magnoliopsida (Class), Rosidae (Subclass), Sapindales (Order), Anacardiaceae (Family), *Semecarpus* (Genus), *anacardium* (Species)

Synonyms

Sanskrit: Arusharah, Antahsattva, Arzohita, Ballata (Ballata, Bhallata,), Aruskara (Arukara), Bhallatakah, Visasya, Viravrksa.

English: Marsh Nut, Indian Marking Nut Tree, Oriental Cashew Nut

Hindi: Bhelwa, Bhel (Bhela), Bhilwa,

Bhilv (Bhilawa)

Gujarati: Bhilamu

Telugu, Nallajeedi

Tamil: Erimugi (Erimuki)

Assamese: Bhelaguti

Marathi: Bibha, Bibba

Bengali: Bhelatuki, Bhela

Malayalam: Chera, Alakkuceru

Oriya: Bhollataki

Kannada: Bhallika, Bhallataka, Karigeri, Goddugeru

Kannada: Bhallataka, Bhallika, Goddugeru, Karigeri

Punjabi: Bhilawa

BOTANICAL DESCRIPTION

It is a deciduous tree having medium-sized that grows up to 3500 feet in height in the hotter regions of India and the outer Himalayas. In Bihar, Assam, Orissa, and Bengal, as well as in Central India and the Western Peninsula of East Archipelago, Northern Australia the plant is abundant where it is called the ‘marking nut’ by Europeans, because it was used by washermen as an as an indelible ink to mark clothes before washing.

The tree is medium-to-large in size, growing 15 to 25 meters tall, with a grey bark that flakes off in little, and irregular

flakes. Its leaves are simple, alternating, obovate-oblong, 30 to 60 cm long, 12 to 30 cm wide, and apex are rounded. The blooms are greenish white, in panicles, and develop in May and June along with new leaves. They are easily identified by their big leaves and the red blaze of resin that they exude, which turns black when exposed to air. Fruits are obliquely ovoid and 2–5 cm long. The fruit's upper portion, which has a cup-like shape when ripe, is smooth, fleshy, orange red in color, and sweet and delicious. It is composed of the thickened disc and calyx base. The lower base, which is rotatable, is made up of an oblong pericarp with corrosive resinous fluid-filled cells between its inner and

outer laminae. The pericarp is thick, smooth, black, and lustrous. The juice of the fruit is white while it is young, but as it ripens, it turns brownish black. The nut weighs about 3.5g and has dimensions of roughly 1"x 0.75"x 0.33" [7]. Instead of wet environments, it is commonly found in drier ones. The fruit is 2-3 cm wide and ripens between December and March. no particular affinity for soil. It is a modest shade-bearer with an obliquely ovoid that is 2.5-3.8 cm long, compressed, and shines black when ripe. The disk, calyx base, and peduncle extremity are all orange in color. Gray in hue, the bark releases an irritating fluid when cut [8]. (Figure 1)



Fig.1. *S. anacardium* Plant, Fruit and Nuts

PHYTOCHEMISTRY

Bhilwanols, phenolic compounds, [9,10] biflavonoids, [11] sterols, and glycosides are the main constituents of *S. anacardium* Linn. [10,12] Bhilawanol is a mixture of

trans and *cis* isomers of ursuhanol obtained from fruits, with the primary components being 1,2,hydroxy-3 (pentadecadienyl 82) benzene and 1,2,dihydroxy-3 (pentadecadienyl 82 ,112)

[13]. Other Compounds also presents like, Semecarpetin [14], Anacardoside [15], Jeediflavanone,[16,17] Nallaflavanone [18], Galluflavanone [19,20] Anacarduflavone [21] Semecarpuflavanone [22] Bhilawanol-A, mono-olefin I, diolefin II, Bhilawanol-B, amentoflavone anacardic acid, o-trimethyl

biflavone A2, Tetrahydroamentoflavone, O-hexamethyl bichalcone A, O-tetramethyl biflavanone C O-tetramethyl biflavanone A1, O-heptamethyl bichalcone B1, O-dimethyl biflavanone B, O-hexamethyl bichalcone B2. [23] Figure 2 showed the chemical structure of few chemical constituents of plants.

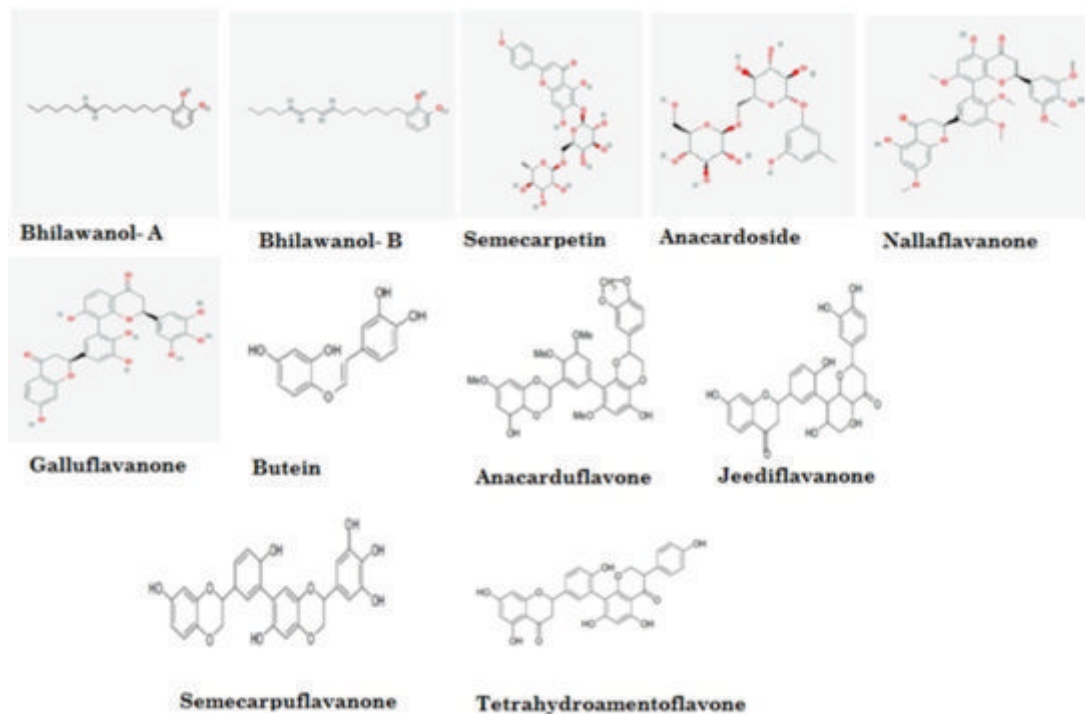


Figure 2 Phytoconstituent of *S. anacardium*

MEDICINAL PROPERTIES

S. anacardium have an astringent (kashaya), pungent (katu) and bitter (tikta) in taste (rasa) and three qualities (guna) like piercing (Ikshna), unctuous (snigdha), light to digest (laghu) and veerva is hot in potency (ushna); vipaka is madhura (after digestion, undergoes sweet taste

conversion); karma is vrsya, medhya, vatahara, bhedana, dipna; and are indicated in arsas, kustha, vatavyadhi, kapha vikara, krmi, gulma and grahani.

THERAPEUTIC USES

External uses- Bhallataka juice is given to the snake bite location after incisions have been made because it causes blisters and is

an antidote for snake bite. Haemorrhoids are made to dry up and fall out by burning bhallataka incense. It causes abortion when administered to the vagina. Any discomfort from an injury is relieved by applying this nut or cauterizing it with the seed.

Internal Uses

Helpful for people with hemiplegia, epilepsy, sciatic neuralgia, and nervous system impairment. Using its functions as appetizers, digestants, purgatives, and liver stimulants, the digestive system is employed to treat GIT problems. It is the greatest treatment for intestinal colic and is useful in cases of loss of appetite, digestive issues, constipation, gulma, ascites, sprue, piles, and many forms of worms. Acts as an expectorant in the respiratory system and is helpful for coughing and asthma. Within the reproductive system, it activates penile nerves and increases virility, making it an aphrodisiac. It's hot and sharp qualities stimulate the uterus. It is used to treat seminal indisposition, impotence, and dysmenorrhea; godambi is best consumed in the winter. It is eliminated via the skin. The best treatment for dermatoses, vitiligo, and vatrakta is bhallataka. Milk and shevate are helpful for joint inflammation. It functions as a tonic and rejuvenator in addition to enhancing each dhatu's agni. helpful for overall ill health.

SHODHANASANSKARA OF BHALLATAKA:

Shodhanasanskara (purification process) is the procedure by which specific chemicals

are treated with processes like as rubbing, heating, and so on in order to remove their detrimental or toxic effects. Before being used for therapeutic purposes, poisonous plant medications are treated to shodhanasanskara. The shodhanasanskara method significantly lowers the toxicity of dangerous plants. One such poisonous plant that is still utilized in Indian medicine is *S. anacardium*. Bhilwanols are among the plant's hazardous chemical constituents.

The detoxification/purification process known as sodana involves both purification and a decrease in the concentrations of harmful substances in fruits [24]. Following are the various methods for purification of fruits.

1. **With gomutra:** The fruits of *S. anacardium* contain tarry oil in their pericarp, which is composed of 90% anacardic acid and 10% cardol, as well as bhilwanols, semecarpol, and anacardol. Bhilwanol and anacardic acid are the culprits behind blisters, irritation, contact dermatitis, and toxicity. The fruits of *S. anacardium* are soaked in gomutra for about seven days before being rubbed with brick powder or brick gravels and ultimately washed with water in this purification process. While processing *S. anacardium* nuts, dermatitis can be prevented by using coconut oil. This process results in the decarboxylation of oil and the conversion of anacardic acid to the less poisonous anacardol. The soaking of the fruits in gomutra may cause the oil to be diminished. Fruits' irritating oil is absorbed by the brick gravel's absorbent

properties. The amount of total flavonoid and total carbohydrate content is not affected by the purification procedure, but there has been a noticeable fall in total phenolic content. *S. anacardium*'s antioxidant capacity declines, while its safety profile improves [25].

2. With gomutra and cow milk: Using this technique, a sharp knife is used to cut away the fruit's thalamus portion. The nuts are then exposed to fresh cow pee every day for seven days, then cow milk every day for seven days, and finally thoroughly rubbed with brick powder for three days. The nuts are cleaned every day with water prior to the addition of new cow milk or urine during the treatment with cow urine and cow milk. Such fruits are rubbed with brick gravel and left in touch with it for 3–4 days after the nuts are removed from cow milk or urine. The nuts were rinsed in hot water on the final day (18th day) to get the brick powder off. Three times this shodhana process is performed [24].

3. With brick powder: For shodhanasanskara, ripe bhallataka fruits that are submerged in water are chosen. Fruits that float in water are not accepted. A pottali (little cotton bag) constructed of three to four folds of cotton cloth is used to hold bhallataka fruits and ishtika churna (brick powder). Hands are used to rub this pottali with mild pressure. After the skin of the bhallataka fruit has been scraped off, brick powder is wetted with oil and then washed in hot water. bhallataka becomes shuddha (pure) through this technique. [26].

4. With coconut water: Bhallataka fruits are split in half, put in a swinging device called a dolayantra, and heated for a period of one to two hours. During this procedure, bhallataka turns into shuddha. Sanskara coconut oil should be used with caution during shodhana to exposed body regions such as the face, hands, legs, and other areas. [26].

5. Frying method: 200 g of randomly chosen fruits are placed in an iron pan, where heat is provided from underneath by the ignition of charcoal. After 4-5 minutes of heating, smoke began to emanate from the nuts. The pan holding bhallataka nuts is then covered with burning charcoal. The hot nuts caught fire right away. After two minutes, the fire is put out by spreading it with a long ladle as soon as the flaming nuts are removed from the pan to the ground. The nuts were then allowed to cool before being placed in an airtight glass container for future research. The same process was carried out three times. [27]

BHALLATAK FORMULATIONS

Fifty mahakasayas are detailed in sutra sthana of the charakasamhita. Bhallataka has described some of these mahakasayas in the deepaniya mahakasaya. [28] Kusthagna mahakasayas (a collection of plants that aid in digestion). [29, 30]

The 10 various types of Bhallataka preparations are listed in Rasayanaadhyaya [31] in the Charakasamhita are bhallatakakshir, bhallatakapalala, bhallatakakshoudra, gudabhallataka,

bhallatakataila, bhallatakasarpi, bhallatakakalavana, bhallatakayusha, bhallatakatarpana, bhallatakasaktu.

Sushrut and Vagbhata have suggested using roughly 1,000 bhallatak seeds for the course of one therapeutic course of Vardhman prayog. Bhallatak is currently employed as a primary or minor ingredient

in several formulations. Bhallatakasava, sanjeevani vati, amritbhallatak avaleha, narsimha choorna, suran vatak, bhallatak parpati, and other formulations are regularly used. Bhallatak is subjected to shodhana (purification and detoxification) before being used for medical purposes. [32] (Table 1)

Table 1. Bhallatak containing Formulations used in Markets

Formulation	Product Nature	Dose	Indication
Amrut bhallatakavaleha	Electuary	1-2 tsf, 2 times a day	Vitalizer, General tonic
Narsimha choorna	Powder	1-2 gm, 2 times a day	Restorative
Suran vatak	Pills (500 mg each pill)	2 pills, 2 times a day	Anorectal and Piles diseases
Sanjeevani vati	Pills (250 mg each pill)	2 pills, 3 times a day	Diarrhea, Dysentery
Bhallatakasava	Wine	2-4 tsf, 2 times a day	Asthma, Neuralgia
Bhallatak parpati	Powder	250 mg, 3 times a day	Rheumatic diseases

Precaution required during consuming bhallataka containing formulation

Bhallataka must be consumed with a substantial amount of milk, rice, and ghee. After taking the formulation, avoid walking in sunrays, excessive sexual intercourse, salt, meat eating, exercise, and oil massage. Formulations of Bhallataka are contraindicated in pitta illnesses, pregnant women and children, patients with a history of hemorrhage, diarrhea, and nephritis. [26]

Manifestation of toxicity of bhallataka

Contact of Bhallataka fruits or blossoms with the body is one of the causes of Agantuja shotha according to Charaka samhita. If Bhallataka juice (even in trace amounts) comes into contact with the body, it causes severe burning feeling and ulcer. When it comes into touch with the face, it generates an intense burning sensation due to the presence of inflammation and ulcer. Some people are allergic to bhallataka, which manifests as itching all over the body, black and bloody

urine, red patches, fever, diarrhea, blisters. Oligouria, murky urine, and irritation at the anus and penis may also be discovered. There have been some reports of bhallataka having a negative influence on pile treatment.

Treatment of bhallataka toxicity

Sesamum paste rubbed with milk of buffalo and mixed with Ghee is applied locally or locally rubbed *Glycyrrhiza glabra* and sesamum paste, or rubbed shalapatra (*Desmodium gangeticum*). In shotha caused by bhallataka, paste of sesamum with milk of goat and butter or black clay is employed. For quick relief from bhallataka shotha, some local applications are as follows - Mixture of *Cedrus deodara*, *Brasica juncea*, *Cyperus rotundus* and butter or mixture of *Amaranthus spinosa* juice and butter or mixture of butter, sesamum, sugar and milk Or *Azadirachta indica*, sesamum, sesamum oil are boiled together and made concentrated to apply locally. When signs of toxicity are seen, bhallataka medicine is stopped, and coconut white albumen, *Tamarindus indica* leaf juice, sesame seeds, or coconut is given to consume. Ghee, coconut oil, and lead lotion are administered externally. *Terminalia bellirica*, a specialized antidote for the toxicity of Bhallataka, is used. For sudden reactions and systemic effects, *Terminalia bellirica* fruit rind and bark decoction or powder preparations work well. It is also possible to utilize medications that reduce pitta, such as milk, clarified butter, and other medications with a low potency. Due

to inappropriate handling of equipment and disposal of media used in the shodhana technique, there were five occurrences of contact dermatitis that developed during various stages of shodhana sanskara of bhallataka fruits. The affected individuals were instructed to apply crushed *Azadirachta indica* leaves externally to the affected areas and internally to take sarivadyasava 30 ml three times daily after meals and triphala churna 5 gm twice daily before meals. [32]

PHARMACOLOGICAL ACTIVITY

Analgesic activity: Ilanchezhian Rangasamy used the tail flicking method to test the analgesic activity of three distinct *S. anacardium* extracts, including petroleum ether, methanol and chloroform extracts. As a standard reference, they have employed acetyl salicylic acid (aspirin). At 50 mg/kg, the methanol extract demonstrated a substantial analgesic effect. They discovered that the extract of methanol was more powerful than the extracts of chloroform and petroleum ether [33].

Hypoglycemic effect

Arul investigated how dried, ripe *S. anacardium* nuts in ethanolic extract affected blood sugar levels. Both regular and streptozotocin-induced hyperglycemias in rats were studied for the impact. Levels of blood glucose were decreased by 100 mg/kg dose of the ethanolic extract of *S. anacardium*, but no antihyperglycemic effect was visible. [34].

Hypolipidemic effect

S. anacardium, *Emblica officinalis*, and honey are all included in the modified Siddha preparation known as Kalpamrutha (KA), which was created by Krishnamurthy after extensive research on the differences in lipids, lipid-metabolizing enzymes, and lipoproteins in malignant animals. The impact of *S. anacardium* and kalpamrutha on elevated levels of free cholesterol, phospholipids, total cholesterol, free fatty acids and triglycerides, and decreased levels of plasma cholesterol, the liver, and the kidney was also investigated. Levels were found to be normal in cancer-suffering animals. [35]

Hepatoprotective effect

S. anacardium's antioxidant and protective effects against lead acetate-induced toxicity was the subject of Abirami's study of the plant. He examined the plant's phytochemicals, including alkaloids, flavanoids, tannins, resins, proteins, and carbohydrates, and which are probably substance for its hepatoprotective effectiveness. [36]

Anthelmintic activity

Pal has investigated the anthelmintic effects of several *S. anacardium* nut extracts on adult Indian earthworms. They discovered that *S. anacardium* extracts in petroleum ether and chloroform exhibit greater anthelmintic action than those in ethanol and water solution [37].

Anti-cancer activity

Mathivadhani investigated the inhibitory effects of Nut extract of *S. anacardium* on the T47D- Cancer cell line of human breast. At the molecular level, it was accompanied by an increase in Bax and a decrease in Bcl, as well as caspase, PARP, cytochrome c, and internucleosomal DNA fragmentation [38]. Leukemic induced mice when treated with *S. anacardium* nut milk extract shown restored energy metabolism, according to Sugapriya. Treatment for *S. anacardium* was contrasted with imatinib mesylate, when Leukemic animals were given *S. anacardium* nut extract, the results indicated that the leukemic cells had been cleared from internal organs and bone marrow [39].

Arulkumaran looked into the effectiveness of the Kalpaamrutha preparation, which contains honey, dried *Emblica officinalis* fruit powder, and *S. anacardium* nut milk extract, in preventing peroxidative damage and aberrant levels of antioxidant. Preparation comprising Kalpaamrutha and *S. anacardium* has demonstrated anticancer action in breast cancer induced by dimethyl benzanthracene. [40]

Prabhu investigated the anti-mutagenic properties of *S. anacardium*. They chose mice for this investigation that had received two doses (250 and 500 mg/kg, i.p.) of *S. anacardium*, which demonstrated 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. [41]. Krishnarajua discovered that the brine shrimp lethality test was used to check the cytotoxicity of aqueous preparations of medicinal herbs. With an LD50 of 29.5 µg *Semecarpus anacardiaceae*, one of the 120 species studied, demonstrated notable cytotoxicity [42].

Joseph investigated the anticancer properties of an Ayurvedic *S. anacardium* nut preparation. He had given one group the ayurvedic remedy that contained *S. anacardium* and another group its nut milk extracted. He discovered that both liver enzymes and the HCC - Hepatocellular Carcinoma marker had increased after 154 days of testing, associated with neoplastic alterations in the liver and had decreased in the *S. anacardium* milk extract-treated group. The Ayurvedic medicine and the effects of doxorubicin were positively correlated. This study showed that *S. anacardium* milk extract is effective in the treatment of hepatocellular cancer [43].

Protective effect on CNS

Farooq studied the effects of Nut extract of *S. anacardium* on the Central Nervous System (CNS), focusing on its nootropic and locomotor properties. Vinutha

discovered that the cholinergic cells losses, particularly in the forebrain basal, are associated with a decrease in the neurotransmitter acetylcholine (ACh). The *S. anacardium* inhibits acetylcholinesterase, hence lengthening the half-life of acetylcholine. *S. anacardium* can help with cognitive decline and memory improvement [44].

Anti-inflammatory activity

Sushma used a carrageenan-induced rat paw edema model to examine the anti-inflammatory effects of an ethanolic extract of Nuts of *S. anacardium* in albino rats. Ethanolic extract of Nuts shown dose-dependent anti-inflammatory effects [45]. *S. anacardium* considerably reduced the cotton pellet granuloma and carrageenan-induced paw edema, according to Ramprasath's research [46]. *S. anacardium* has been shown to have anti-inflammatory properties for both non-immunological and immunological causes, according to Satayavati and Bajpai [47]. In hepatocellular carcinoma, Premlatha has reported that Nut extracts of *S. anacardium* gives immune-modulatory potency, tumor regulating activity, also give anti-oxidative and membrane-stabilizing activity, its restore the glucose level and regulate the mineral and found a potent effect against the hepatocarcinogen aflatoxin B1 [48]. Salvem noted that Tetrahydroamentoflavone (THA), a biflavonoid, was the main active ingredient that was isolated from the Ethyl acetate extract of *S. anacardium*. THA inhibited

prostaglandin synthesis by cyclooxygenase (COX-1) *in vitro* and showed dose dependent anti-inflammatory activity in carrageenan-induced paw edema experiment [49]. Bhitre synthesized Petroleum ether, Ethanolic, Methanolic, Ethyl acetate, and Chloroform extracts of Nuts of *S. anacardium* and investigated their anti-inflammatory effect in albino rats using the carrageenan-induced paw oedema approach which showed all extract had anti-inflammatory activity which was comparable to aspirin [50].

Singh studies the *in vitro* anti-inflammatory activity of ethanolic extract of Nuts of *S. anacardium* using synovial fluid mononuclear cells and peripheral blood of healthy individuals and Rheumatoid Arthritis (RA) patients. Extract of *S. anacardium* shows inhibition of the LPS-induced production of pro inflammatory cytokines IL-12p40 and IL-1 β but had no effect on IL-6 and TNF- α [51].

Mythilypriya showed that extract of *S. anacardium* have anti-inflammatory activity using an Adjuvant-Induced Arthritic rat model [52].

Antioxidant activity

Shanmugam discovered that albino rats receiving Kalpaamrutha had normal lipid peroxide levels as well as antioxidant defenses in *S. anacardium* [53]. Veena assessed the antioxidant status of control and experimental animals' blood as well as key organs (liver, kidney, and breast

tissue). When a medicine (*S. anacardium* and kalpaamrutha) was supplied to cancer patients, it was discovered that it decreased lipid peroxidation and improved antioxidant activity [54].

Sahoo studied the antioxidant activity of an Hexane, Methanol, Chloroform and ethyl acetate extract of *S. anacardium* stem bark and the ethyl acetate extract had the best antioxidant activity. The ethyl acetate extract of the stem bark of *S. anacardium* generated a bright yellow solid crystal, which was recognized as butein. This chemical was found to have antioxidant activity [55].

Antimicrobial activity

Sharma investigated the antifungal efficacy of *S. anacardium* at 400 mg/ml concentration against (*Aspergillus fumigatus* and *Candida albicans*). Both fungi were reported to have growth inhibition, cell size reduction, and decreased sporulation [56].

Sharma discovered that nut oil of *S. anacardium* has high antibacterial activity against numerous Gram positive and Gram negative bacteria [57]. Mohanta synthesized organic solvent and aqueous extracts of the *S. anacardium* and tested them for antibacterial and phytochemical characteristics using the disc diffusion method. At 100 mg/ml, Aqueous and Petroleum Ether extract inhibited *S. flexneri* and *S. aureus* and respectively, while chloroform extract inhibited *V. cholera*, *P. aeruginosa*, and *B.*

licheniformis, and ethanolic extract inhibit the *P. aeruginosa* and *S. aureus* [58].

According to Nair, the alcoholic extract of dry Nuts of *S. anacardium* exhibited bactericidal activity *in vitro* against three gram negative strains (*P. vulgaris*, *E. coli*, and *S. typhi*) and two gram positive strains (*C. diphtheria* and *S. aureus*). According to studies, Alcohol extracts of the plant's leaves and green fruit have anti-bacterial capabilities [59].

Anti-spermatogenic effect

S. anacardium extract consumption had an anti-spermatogenic effect in male albino rats as indicated by a decrease in spermatogenic cell and spermatozoa counts. According to Sharma's research, changes in the androgen metabolism may be to blame for the cauda epididymis' decreased sperm density. Meiotic and post-meiotic germ cells were extremely sensitive to levels of androgen, and changes in androgen levels in the testes may have an impact on how spermatocytes develop into spermatids [60].

According to Narayan, *S. anacardium*'s aerial part's aqueous extract had spermicidal properties. *S. anacardium* fruit extract administered orally to albino rats causes spermatogenic arrest. Sperm motility and density were found to have significantly decreased. The number of primary spermatocytes, secondary spermatocytes, and spermatids were likewise significantly decreased as a result of the fruit extract feeding. These findings

unequivocally demonstrate *S. anacardium*'s anti-spermatogenic action [61].

Antiatherogenic effect

According to Mary, the primary factor contributing to the development of atherosclerosis is an imbalance between pro-oxidants and antioxidants. *S. anacardium* exhibits antioxidant properties. At low concentrations, it has the ability to scavenge superoxide and hydroxyl radicals [62].

Hypolipidemic and hypocholesterolemic activity

In rats fed an atherogenic diet, Tripathi has found that Nut extract oil of *S. anacardium* at a dose of 1 mg/100 g dramatically decreased cholesterol levels in serum and elevated HDL levels [63].

Memory enhancing effect

S. anacardium enhances cholinergic activity to enhance memory [64]. *S. anacardium* nut extract in methanol exhibits nootropic action. Fruit shodhana may be caused by cholinesterase activity being inhibited and have lower nootropic activity [65].

Cardioprotective effect

Asdaq examined that hydroalcoholic extract of Nuts of *S. anacardium* in isoproterenol induced myocardial injury in rat. In comparison to isoproterenol control, mice treated with low and high dosages of

Nut extract had decreased blood CK-MB activities and increased CK-MB activities in heart tissue. Both low and high dosages of nut extract considerably lowered the LDH activity in the serum, however neither dose had any effect on the LDH activity in the heart tissue when compared to isoproterenol as a control. Therefore, it can be said that *S. anacardium* has the ability to lessen the cardiac damage that isoproterenol causes in rats [66].

Aphrodisiac activity

Male mice were used in Gupta's evaluation of the effects of *S. anacardium* chloroform extract. The conventional medication Penegra (Sildenafil citrate) was compared to mounting behavior and mating performance. Male mice's mounting behavior and mating prowess were both found to be greatly improved by *S. anacardium* extract. The *S. anacardium* extracts improved the sex behavior of male mice [67].

Anti-tuberculosis activity

Singh conducted a study to isolate, characterize, and assess the bioactive components of *S. anacardium* nuts that were extracted using GC-MS. *S. anacardium* nuts were solvent extracted using Methanol, petroleum ether, ethyl acetate, and water. The bioactivity of each extract was examined in relation to the potential pathogen *M. tuberculosis*. *In vitro* bioassay studies on nut extract revealed anti-tuberculosis efficacy [68].

CONCLUSION

One of the most significant medicinal plants that can be utilized as an alternative medicine is *S. anacardium*. In their clinical work, traditional healers and doctors use *S. anacardium* (Bhallatak). According to numerous studies, the extract from *S. anacardium* nuts has a variety of phytochemicals that can combat a number of ailments. Shodhana method can reduce *S. anacardium*'s toxicity. The nut extracts exhibit a range of properties, including those that are antiatherogenic, antioxidant, anti-inflammatory, antibacterial, CNS stimulant, anti-reproductive, anticarcinogenic, hypoglycemic, and hair growth promoter. Studying the plant's traditional applications, such as its capacity to heal wounds, requires more work.

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