IJP (2025), Vol. 12, Issue 12 **(Review Article)**

Received on 29 November 2025; received in revised form, 2 December 2025; accepted, 30 December 2025; published 31 December 2025

ACACIA CATECHU: A COMPREHENSIVE REVIEW OF ITS PHYTOCHEMISTRY, PHARMACOLOGY AND TRADITIONAL USES

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Keywords:

Acacia catechu, Biological effect, Medicinal properties, catechin, antimicrobial Study, bioactive molecule

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ABSTRACT: The goal of this review is to have a thorough understanding of Acacia catechu's general description and therapeutic applications. The Khair tree's wood is used to make Catechu. For centuries, people all around the world have used this to heal a variety of illnesses. It is extremely important due to its therapeutic characteristics. The tree's various parts have distinct biological and pharmacological effects, making them widely used in Asia and around the world. A. Catechu's main phytochemical compounds include protocatechuic acid, taxifolin, epicatechin, epigallocatechin, catechin, epicatechin gallate, procyanidin, phloroglucin, aldobiuronic acid, gallic acid, D-galactose, afzelchin gum, L-arabinose, D-rhamnose, and quercetin. The entire plant of *A. catechu* has a wide range of medicinal properties, such as antimicrobial, antidiarrheal, antinociceptive, antihyperlipidemic, antiulcer, antioxidant, antidiabetic, antiproliferative, haemolytic and anti-inflammatory properties due to the presence of bioactive compounds such as flavonoids, alkaloids and tannins. The medication has been used in the treatment of infections, inflammation, pain management, skin diseases, and wounds. Recent studies have shown that this drug contains several phytochemicals with antimutagenic properties that act against cancerous cells. The drug has also been used to treat skin ulcers that do not heal. It also helps with several health-related problems that women face.

INTRODUCTION: Katha/White catechu (*Acacia catechu*) is a shrub and tree genus belonging to the Fabaceae family's Mimosaceae subfamily. Catechu is an extract from the Khair tree's wood. It is obtained through the decoction of Acacia catechu. It exists as a reddish-white crystalline material. It has a wide range of varieties, but the two main forms, Red and White, are available [4].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.12(12).837-46

Article can be accessed online on: www.ijpjournal.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.IJP.12(12).837-46

Khair plantations cover approximately 5,800 square kilometres of land across the country. Extracts from *A. catechu* have been used extensively for hundreds of years. The majority of people drink *A. catechu* boiled water. The heartwood of this plant yields Katha, a powerful medicinal product with a variety of potential uses in therapy.

Katha is used as an ingredient in paan (betel leaf masticatory), giving the saliva a red colour [5]. Katha is used in the treatment of bronchitis, asthma, chest pain, ulcers, vitiligo, cancer, sore throats, diarrhoea, wound healing, mouth sores, and colic, and it also has hypoglycaemic, antifungal, antiviral, and spasmolytic properties.

Leaves are utilised in gonorrhoea; roots for toothaches, rheumatism, and as an antibacterial agent; flowers for dysentery and activity against fungi [3]. The “Rehkuri Blackbuck Sanctuary” in Karjat, Ahmednagar, MH, India, is considered home to a large population of the A. catechu plant. Acacia catechu comes in three varieties in India: Catechuoides, Sundra, and Catechu. They found in Gujarat, Rajasthan, Maharashtra, and the Deccan, Assam, Sikkim, and the Terai region of West Bengal. Some of the variety is found abundantly in Madhya Pradesh, Bihar, Andhra Pradesh, Uttar Pradesh, Himachal Pradesh, Jammu, Punjab, and Odisha. These types play an important role in regional industries and traditional medicine [7]. *A. catechu* is an important bioresource that has long been used commercially in the Katha and tannin industries [11].

Vernacular Names:

English: Cutch tree, catechu [5]

Marathi: Kaath [5]

Malay: Kachu [5]

Arabic: Kāt [5]

Persian: Katta [5]

Bengali: Khoyer [5]

Hindi: Khair, Babul [5]

Sanskrit: Khadirah [5]

Siddha / Tamil: Karunkaali (bark) [5], Kalippakku, Kadiram, Katthakkaambu [1]

Urdu: Kattha [5]

Unani: Khair, Kaat, Kattha (heartwood extract) [5]

Botanical Description: *Acacia catechu* is commonly referred to as black catechu. Acacia is derived from the Greek word "thorns", which means "point or barb” [5]. The tanning extraction obtained from the heartwood of Acacia catechu is known as 'cutch'. “Cutch” is the word that determines the species appellation [7]. The tree is small to medium-sized, growing up to 15 meters tall. The bark appears dark grey or dark brown and measures 12-15 mm in thickness [5].

The branches of the deciduous Acacia catechu tree have crooked thorns. The tree exfoliation occurs in long, thin, rectangular flakes that frequently hang from the tough bark. It is hard, 12-15 mm thick, and has a brown or red interior and a dark brown or dark grey exterior. The young branches are dark brown or purple and glabrous [7]. The bipinnate leaves of the acacia plant have 10-30 pairs of pinnae and 20-50 pairs of leaflets. The inflorescence is composed of an auxiliary pedunculate spike and short, hooked spines. The fragrance of the blossom is creamy and milky [17]. The pentamerous, white to pale yellow flowers are grouped in axillary spikes that are 5-10 cm long. The calyx is 1-1.5 mm long, while the corolla is 2.5-3 mm long [7]. When raw, the fruit is a flat pod that tapers on both sides; when ripe, it is shiny brown [5].

Taxonomical Classification:

Kingdom: Plantae [5]

Division: Mangoliophyta [5]

Class: Mangoliopsida [5]

Family: Fabaceae [4]

Sub-family: Mimosaceae [4]

Genus: Acacia Mill [5]

Species: *A. catechu* wild, Black cutch [5]

FIG. 1: *A. CATECHU* BARK [23]

FIG. 2: *A. CATECHU* FLOWERS [23]

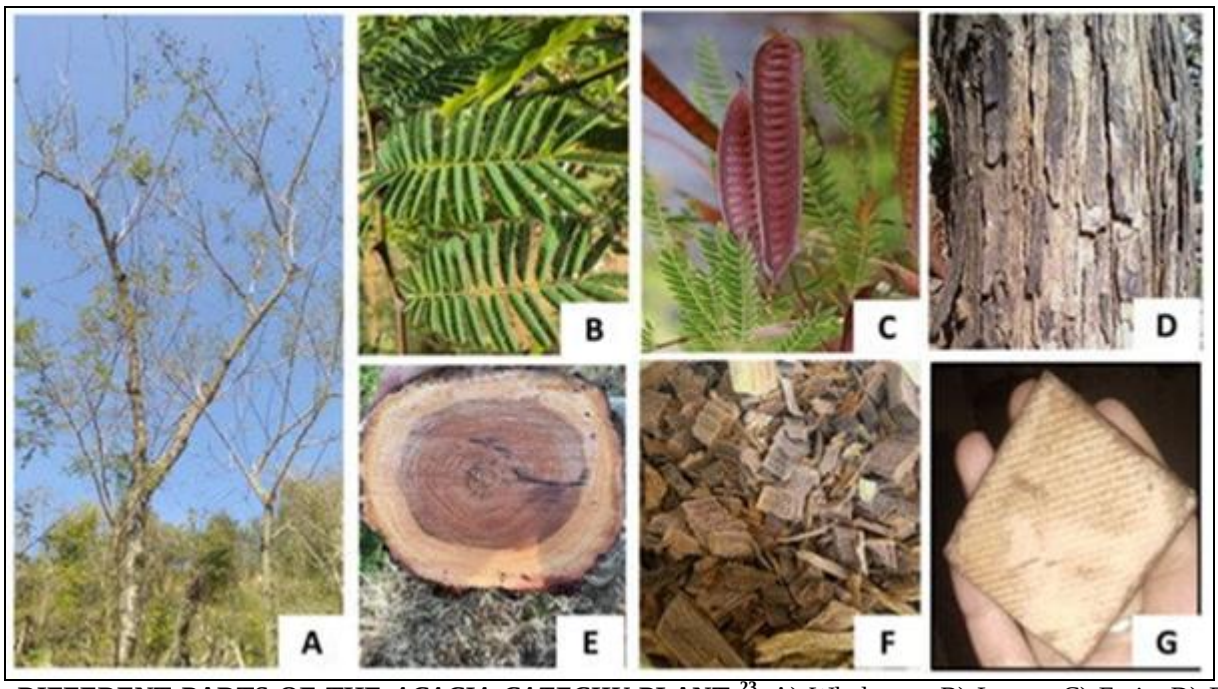

FIG. 3: DIFFERENT PARTS OF THE *ACACIA CATECHU* PLANT [23]. A) Whole tree B) Leaves C) Fruits D) Bark E) Transverse section of wood F) Heartwood chips G) Concentrated extract

Habitat: Khair plantations cover approximately 5,800 sq. Km of land across the country. Each year, approximately 63,000 Tons of Khair heartwood are used to create Katha [5]. In Madhya Pradesh, Gujarat, Himachal Pradesh, Uttar Pradesh, and Bihar, khair trees are widely distributed in Maharashtra, as well as to a lesser degree in the southern states of Tamil Nadu, Andhra Pradesh, and Karnataka. Khair trees are cultivated as a highly profitable commercial crop in Uttar Pradesh and Gujarat. Khair trees also grow in Nepal [4]. The height at which Acacia catechu (Khair) trees can be found is 1300 meters above sea level [18].

Appearance: Heartwood is initially light red initially which turns brownish-red to almost black as it grows. Has whitish sapwood, is hard to break and has an astringent taste [5].

Microscopic: Numerous uniseriate and biseriate medullary rays can be seen in a transverse section of the heartwood of A. catechu, with vessels appearing singly or in small clusters of two or four. The majority of wood is made up of xylem fibres with narrow lumens, and xylem parenchyma is typically primarily paratracheal, covering vessels with a sheath. Calcium oxalate prismatic crystals are found in the crystal fibres that make up wood. A few scalariform tracheids thickening and the presence of certain cells, including vessels [5].

Phytochemical Constituents of *Acacia catechu*: Catechin content in *A. catechu* heartwood was 3.30%, 66.9%, and 3.580% [2]. Ascorbic acid, calcium, phosphorus, iron, niacin, flavonoids, phenolics, tannins, crude protein, ether extractive, nitrogen-free extract, glycolipids, phospholipids, and steroids/terpenoids were all present in the pods [4]. It was discovered that the leaves contained cellulose, hemicellulose, lignin, and total minerals, whereas quercetin, poriferasterol-β-D-glucoside, quercetin-3-0-arabinofuranoside, quercetin-3-o-rhamnoside, and quercetin-3-o-galactoside were present in the ethanolic extract [4].

The concentrated extract of Cutch contains 2-20% tannins, 25-33% catechin, 20-50% phlobatannins including catechutin acid; flavonoids including quercetin, quercitrin, fisetin; gums, resins, and pigments. Gum Arabic can be effectively replaced by the gum derived from *A. catechu*. Leuco-agglutinating activity against leukaemic cells is demonstrated by the saline extract of seeds. White blood cells from patients with various forms of leukaemia are agglutinated by it [5]. Optically active Catechin can inhibit the function of some hormones, and injecting the extract with thyroxin retards basal metabolic rate. Its tanning property in human skin may work as an active agent in treating leucoderma [10].

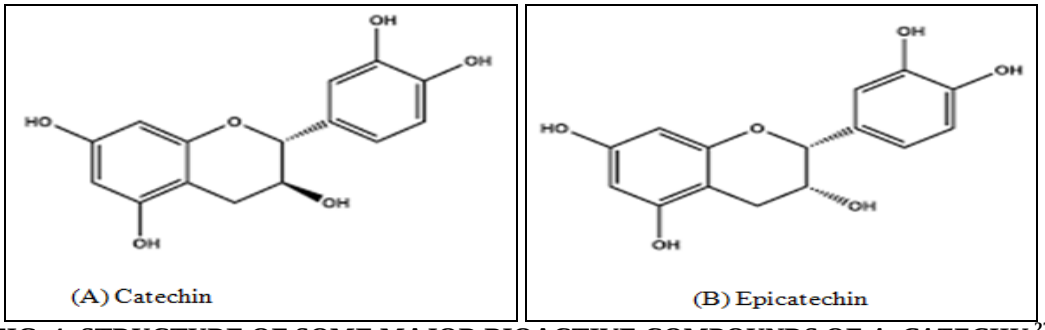

FIG. 4: STRUCTURE OF SOME MAJOR BIOACTIVE COMPOUNDS OF *A. CATECHU* [23]

Physico-chemical & Fluorescence Analysis of the Heartwood of *A. catechu*: With reference to Ayurvedic Pharmacopoeia of India, the physico-chemical parameters are listed in **Table 1**, and the fluorescence behaviour were observed under UV light for better results than ordinary light. When the powder of heartwood is allowed to react with different chemicals shows changeable colours that are mentioned in **Table 2** [12].

TABLE 1: SHOWS THE PHYSIO-CHEMICAL PARAMETERS OF THE HEARTWOOD OF *A. CATECHU* [12, 21, 24, 25, 26, 27, 28, 29]

S. no.	Parameters	Results % (approx range)
1.	Total ash	1.16 - 2.8 %
2.	Acid-insoluble ash	0.22 - 1.67 %
3.	Water-soluble ash	0.09 - 0.26 %
4.	Loss on drying (moisture content)	3 - 11 %
5.	Water-soluble extractives	15.78 - 25.30 %
6.	Alcohol soluble extractives	12 - 21 %
7.	pH of water extract	4.95 - 6.02

TABLE 2: FLUORESCENCE BEHAVIOUR OF THE HEARTWOOD OF *A. CATECHU* [12, 24, 25]

Sr. no.	Chemical reagent	Visible light	Short wavelength	Long wavelength
1	Distilled water	Light brown	Yellow	Dark green
2	Methanol	Brown	Orange	Green / Greenish brown
3	1 N HCl	Brown	Yellowish Brown	Dark Brown
4	6 N HCl	Colorless	Dark violet	Colorless
5	Hexane	Transparent	Violet	Dark violet
6	50 % HNO_3	Dark Brown	Dark Green	Black
7	NaOH	Brown	Dark brown	Greenish brown
8	50 % H_2SO_4	Brown	Light Green	Blackish Brown

MATERIALS AND METHODS:

Collection of Sample: The sample was collected from different areas.

Preservation: After collecting wet drugs, they dried naturally. After drying, grind with a pulverizer. The powder was safely stored in airtight jars [20].

Separation of Catechu: In a 10:1 proportion of water: dried Acacia catechu chips were added to an aluminium pot so that the chips were completely submerged. Boiled over an open fire for four hours and then left for twenty-four hours. The extract was decanted off in a pot and filtered. The filtrate was evaporated, and the resulting residue was air-dried and weighed [10].

Preparation of Crude Extracts: The *A. catechu* bark was ground up after air drying. Macerate powder with ethanol for a full day, followed by filtration and concentration of the extract using vacuum [14]. Finely powdered, shade-dried leaves were boiled with distilled water till only a quarter of the original extract remained after evaporation. Aqueous extract was then stored in sterile bottles at 4°C till further use. Crude extract can also be prepared using organic solvents like methanol, hexane, and acetone. The mixture was treated with a suitable organic solvent for 24 hours at room temperature. By using Muslin cloth followed by Whatman filter paper No. 1 final filtrate was collected. The resulting filtrate was concentrated to produce the pure extract by completely evaporating

the solvent under low pressure using a rotatory vacuum evaporator. The antimicrobial screening of both types of extracts can be done by determining a set of concentrations with suitable antimicrobial screening methods [6].

Isolation of Catechin from Crude Extract: For full dissolution in distilled water, isolated crude catechu was placed in a stainless-steel beaker, heated to boil with continuous stirring then it was filtered through filter paper. After that, it was evaporated half of its initial volume and it was left for a full day. A filter paper was used to filter the precipitate that was produced, and the aqueous filtrate was rejected. Partial purification was made by dissolving the residue in ethanol. After being dissolved in ethanol, the residue was filtered, and the ethanolic solution was completely evaporated. Re-crystallization from water was carried out three times. The isolated catechin's melting point was recorded [10].

TLC: Thin Layer Chromatography:
Apparatus: TLC Chamber, prepared TLC plate

Method: Thin Layer Chromatography. The basis of thin layer chromatography (TLC) is the adsorption phenomenon. In this kind of chromatography, the stationary phase's surface is covered by a mobile phase that contains the dissolved solutes [20].

General Procedure for TLC [15]:
Sample Preparation: The initial step involves preparing the sample, which differs based on the material being analyzed. For binding media analysis, two main sample preparation methods are employed: dissolving the sample in a suitable solvent (for waxes or resins) or performing acid hydrolysis to break down the sample into its components (for proteins and carbohydrates). The solvent choice is based on the sample's solubility.

Selection of the Chromatographic Plate: Both the stationary phase and the mobile phase selected for the analysis affect how well a sample's components are resolved. Thin layer chromatography frequently uses silica gel G, which is a great stationary phase for a variety of uses. Many manufacturers offer prepared silica gel plates for sale.

Development of the TLC Plate: After complete drying of the loaded sample, the plate is then placed in a saturated development chamber containing a solvent system. With no any physical disturbance plate is allowed to run. After use, the plates are dried at room temperature in a fume hood, with the drying time varying based on the solvent system.

Detection of Separation Zones: The chemical components of the sample are separated on a TLC plate, which may contain colored or colorless compounds. Colorless compounds require visualization through chemical reagents that create visible spots under normal or ultraviolet light.

Visual Examination: After detection, the plate undergoes an examination to locate components. Initially, it is inspected under normal light for discolorations indicating separation zones, which are marked with a pencil. Subsequently, the plate is assessed using two types of ultraviolet (UV) light: short-wavelength UV light (254 nm) and long-wavelength UV light (366 nm), with any fluorescence also being noted with a pencil.

TABLE 3: DIFFERENT MOBILE PHASES

Mobile phase	Ratio	Solvent used for sample preparation	Rf value	Observation	Ref.
Toluene: Ethyl acetate: Formic acid	10:8:1	Alcohol	0.27	Substance displayed a single spot in the iodine chamber	10
Chloroform: Ethyl acetate: Formic acid	5:4:1	Alcohol	0.34, 0.51, 0.64, 0.82	Substance displayed four different spots under different wavelengths	20
Chloroform: Methanol: Water	8:2:0.5	Ethyl acetate	0.2, 0.4, 0.5, 0.6	Substance displayed four different spots with chemical treatment and under UV.	22

Pharmacological Studies: Many studies have been conducted in recent years to investigate the pharmacological properties of *A. catechu* extract. This review has covered the in vivo and in vitro studies, which include immunomodulatory, antihyperglycemic, hepatoprotective, antidiarrheal,

antinociceptive, antihyperlipidemic, antiulcer, antioxidant, and antidiabetic. It has antiproliferative, antibacterial, antifungal, hemolytic, and anti-inflammatory properties [2].

Immunomodulatory Activities: Immuno-modulatory agents either increase or decrease an organism's immune response to invading antigens. Numerous plant items have been shown to have immunomodulatory properties, and there are numerous ways to improve the immune system using these plant components [19]. *A. catechu* extract significantly increased serum immunoglobulin levels and improve hemagglutination titer values. As a result, a particular aqueous extract of *A. catechu* may have a notable effect on both cellular and humoral immunity, indicating that *A. catechu* is an effective immune-modulatory agent [12].

Anti-ulcer Activity: Peptic ulcers are the most common type of ulcer in humans. It is sometimes referred to as *Ulcus pepticum*, a gastrointestinal peptic ulcer condition that is usually extremely painful and acidic. About 80% of ulcers are caused by spiral-shaped bacteria called Helicobacter pylori, which live in acidic environments [2]. Both aqueous and ethanolic extract of the root of acacia catechu was used to determine their anti-ulcer properties in the management of peptic ulcer. The aqueous form of the extract significantly reduced ulcer severity and offered protection, while the ethanolic form had a strong inhibitory effect [13].

Anti-obesity Activity: The bark of Acacia catechu, a member of the Fabaceae family, lowers the conversion of carbohydrates to fats and preserves a healthy fat metabolism. Betel nut extracts considerably reduced triglycerides and cholesterol in animals fed a diet containing cholesteryl oleate [5].

Antibacterial Activity: Using the well diffusion method with Mueller-Hinton Agar (MHA), the antibacterial activity of *A. catechu* extract against Gram-positive bacteria like *Staphylococcus aureus* and Gram-negative bacteria such as *Escherichia coli*, *Klebsiella pneumoniae*, *Salmonella typhi*, and *Shigella* was evaluated. With a zone of inhibition (ZoI), the ethyl acetate and aqueous extracts of *A. catechu* demonstrated notable inhibition against *Staphylococcus aureus*. Flavonoid and phenolic secondary metabolites were successfully identified by LC-HRMS dereplication, demonstrating its potency in rapid and precise compound profiling. The community-based use of *A. catechu* and its therapeutic efficacy are further supported by the identification of these metabolites and their biological implications [5].

Anti-inflammatory Activity: Both leaf and seed extract of Acacia catechu may have a beneficial anti-inflammatory effect on conditions like rheumatoid arthritis. Because *Acacia catechu* seed extract inhibits protein denaturation and is more effective than diclofenac, it is a good option for regulating the synthesis of autoantigens [5].

The main active chemical components of Khadira (*Acacia catechu*) are flavonoids, which reduce inflammation by inhibiting 5-Lipoxygenase and Cyclooxygenase. In human osteosarcoma cells that express COX-2, a mixed extract of *Scutellaria baicalensis* and Acacia catechu inhibits the formation of prostaglandin E2. It also inhibits the production of leukotrienes in human cell lines, immortalized THP-1 monocytes, and HT-29 colorectal cancer [13].

Antipyretic Activity: This study will conduct an investigation to demonstrate the effect of *A. catechu* on yeast-induced pyretic rats. The above study demonstrates that the ethyl acetate extract of Acacia catechu has significant antipyretic activity, effectively lowering elevated body temperature and demonstrating potential as a natural fever treatment [5].

Anti-cancer Activity: The anticancer and cytotoxic properties of A. catechu extract show effect against several cancer cell types, such as HeLa (cervical cancer), COLO-205 (colon cancer), and HT-1080 cells (fibrosarcoma), can be studied in vitro. However, the effectiveness of *A. catechu* seed extract against human oral squamous carcinoma SCC-25 cells is still unknown. Thus, in this study, we evaluated the anticancer effect of seed extract in human oral squamous carcinoma SCC-25 cells. The levels of several cell-death signals, consisting of cytochrome-c, caspase-8, caspase-9, and the Bax gene, increased when *A. catechu* seed extract was administered to SCC-25 oral cancer cells. This indicates that the cancer cells

were instructed to die naturally by initiating the process of apoptosis [5, 16].

Anti-diabetic Activity: In type 2 diabetes, insulin is secreted in lower amounts than necessary, allowing more glucose to stay in the bloodstream. Acacia also increases the number of beta cells, urging them to produce more insulin. This is beneficial for type 2 diabetes. It also helps you shed weight. Its adrenergic amine concentration stimulates beta receptors, which break down lipids in the body. Consequently, this increases metabolism by reducing appetite and breaking down cholesterol [13]. Rats with glucose hyperglycemia were used to test the anti-hyperglycaemic effects of *A. catechu* Willd (Leguminosae) ETO extract. Alloxan was given to diabetic rats to assess the anti-diabetic effects of the ETO extract. Various parameters such as Glucose, urea, creatinine, serum cholesterol, triglycerides, HDL, LDL, haemoglobin, and glycosylated haemoglobin were measured. Significant anti-hyperglycaemic action and dose-structured hypoglycaemia were observed in fasted rats treated with *A. catechu* ETO extracts. As a result, *A. catechu* has significant antihyperglycemic potential [16].

Anti-Fungal Activity: The antifungal (antimycotic) activity of an ethanolic extract of *Acacia catechu* heartwood was evaluated against *Candida albicans, Aspergillus niger, Aspergillus fumigates, Mucor* spp. and *Penicillium marneffei*. Antifungal activity was screened by using the disc diffusion method. Different amounts of ethanolic extracts were put onto the discs. Amphotericin B and fluconazole were employed as positive controls. The zone of inhibition was assessed, followed by an incubation period. In comparison to the standard, the extract exhibited various degrees of antifungal activity against the microorganisms tested at different doses. The antifungal activity of Acacia catechu aqueous and methanol extracts against fourteen human pathogenic fungi was tested using the agar disc diffusion method. The methanol extract of *A. catechu* was found to be efficacious against *Aspergillus, Candida*, and *Dermatophytes*, which is important to find the active principle [13].

Wound Healing Property: Wounds are disturbances in cellular or histological structures that impair their functionality and integrity [8]. Because *Acacia catechu* is a highly effective medicinal plant for wound healing, its crushed bark is applied topically to wounds. It is an excellent plant for healing wounds because of its astringent properties and ability to precipitate skin. Additionally, it has antimicrobial qualities that stop bacteria from growing on wounds. Tannins, flavonoids, and other active ingredients are responsible for this characteristic [13].

Antioxidant Potential: Catechu must have a potent antioxidant activity because it contains both catechins and epicatechins. An experiment using aqueous extracts of *A. catechu* employs a radical scavenging assay. The most common treatment for cancer patients is radiation therapy. Based on individual experimental evaluation, he discovered that certain polyphenolic compounds in the polar extracts have a higher antioxidant interest and could be useful in the treatment of tumours [12]. Acacia catechu's antioxidant principles were examined using the Dot-blot assay and the DPPH radical scavenging assay, which used ascorbic acid as a standard for quantitative analysis [13].

Antimicrobial Activity: Depending on the species, the antibacterial activity ranged from fair to excellent. The agar well diffusion method was utilized in a study to test *A. catechu* extracts against *Escherichia coli, Staphylococcus aureus, Salmonella typhi, Klebsiella pneumonia,* and *Shigella sonnei.* Diethyl ether extract was used to determine the maximum zone of inhibition (ZOI) against the Pseudomonas bacterial strain. Diethyl ether, methanol, and ethyl acetate extracts demonstrated greater inhibition than hexane and chloroform. At minimum bactericidal concentrations (MBC), *Bacillus subtilis* and *Shigella* sp. showed significant inhibitory effects in the ethyl acetate extract [2]. *A. catechu's* aqueous extract was modestly effective against drug-resistant *Salmonella typhi*. The chloroform extract showed effectiveness against *Staphylococcus aureus,* while the petroleum ether extract exhibited excellent activity against *Pseudomonas aeruginosa*. Additionally, an aqueous extract of *A. catechu* resin from heartwood displayed excellent activity against *Bacillus subtilis*. Heartwood's ethyl acetate extract demonstrated antimicrobial activity against *Shigella species, B. subtilis, S. aureus,* and

Klebsiella pneumonia. Furthermore, *B. subtilis, S. aureus, Sal. typhi, Escherichia coli, P. aeruginosa*, and *Candida albicans* were all susceptible to the antimicrobial effects of a methanol extract of *A. catechu*. Although *A. catechu* heartwood extracts showed antimicrobial qualities, the specific active chemical components causing these effects were not found [9].

TABLE 4: THERAPEUTIC USES AND TRADITIONAL MODES OF PREPARATION OF DIFFERENT PARTS OF THE PLANT

Parts Used	Condition/ Disorder/ Uses	Dosage Form	Method of Application	Ref.
Roots	Mouth Ulcer	Powder; Combine with tabasheer (Bamboo Silica) Or Paste	Make a paste and powder, and apply to the mouth.	2, 4
Stem or Bark	Diarrhoea	Decoction, Powder	One or two spoonfuls of powder are mixed with one glass of water.	2, 4, 7
Leaves	Dysentery, gonorrhoea	Extract	Leaf extract is utilized	2
Flower	Dysentery	Powder	In a glass of water, combine one or two teaspoons of the extract. For 5 days, take this mixture daily.	2, 7
Heartwood	Cure fever during pregnancy	Decoction	Heartwood and other ingredients are boiled to create the decoction. It is consumed as tea by expectant mothers to keep their bodies warm. Additionally, it is used to treat pregnant women's fevers.	2
Root	Tuberculosis	Paste	Two teaspoons of the paste are taken orally on an empty stomach for 60 days.	7
Katha (Catechu)	Piles	Powder with Lemon juice	A mixture of Katha powder in lemon juice on an empty stomach regularly for a few days.	7
Gum	Body pain	As it is	Take gum on a regular basis for fourteen to fifteen days.	7, 2

Traditional Uses of *Acacia catechu*:

Fuel: *Acacia catechu's* dried wood is widely used as firewood or fuel. Another fuel source is charcoal made from burned wood. To increase soil fertility, the ash left over after burning coal is mixed with the soil [7].

Timber: House frames, windows, doors, and agricultural tools are all made from Acacia catechu wood because it is more resilient, long-lasting, and insect-repellent than wood from other trees [7].

Mastication: Following the meal, a katha (cutch) and a betel leaf are distributed in rural areas as part of the meal program [7].

Hedges: Farmers use Acacia catechu to fence fields to keep crop-grazing animals away from crops because of its spiky branches.

In this way, thorny *Acacia catechu* branches are used to make fences that keep domestic animals safe from wolves, foxes, leopards, and other predators [7].

Gum: High-quality gum used for paper adhesion is released by the plant [7].

Fodder Source: The leaves of the *Acacia catechu* plant are fed to goats and sheep [7].

Curative Applications [7]:

1. Colds and coughs can be relieved by taking two teaspoons of Acacia catechu bark extract daily for five days.
2. Body pain is believed to be relieved by regularly consuming Acacia catechu gum for 14 to 15 days. On the other hand, an oral boiled extract of its heartwood is believed to relieve stomach discomfort.
3. Bark from Acacia catechu is believed to help heal wounds, diarrhoea, and dysentery. For a few days, piles can be relieved by regularly consuming lemon juice and Katha powder on an empty stomach.

4. Acacia catechu heartwood is cooked in water, and the water is given to women after childbirth for bathing. It is said to relieve pain in the body.

5. An Acacia catechu leaf extract is thought to be a miracle treatment for diarrhoea. Diarrhoea is also believed to be effectively treated with an extract made from its flower.

6. It is thought that applying a paste made from Acacia catechu roots to the teeth and joints will alleviate joint and tooth pain. Likewise, using the paste in the

7. Oral ulcers are said to be healed by the mouth. Two spoonfulls of root paste taken orally on an empty stomach for 60 days is believed to be effective in treating tuberculosis.

CONCLUSION: *Acacia catechu* is thorny tree found all over India. These are widely planted up to 1200 meters above sea level in tropical and subtropical regions. To determine the pharmacognostic standards of the plant and to identify the characteristics of a particular part of the plant, morphological and microscopical studies were conducted. *Acacia catechu* has long been used in traditional medicine, either by itself as a drug or with combination to treat a wide range of illnesses. It can also be very helpful in treating and preventing certain diseases. *Acacia catechu*, commonly referred to as Khair or Cutch tree, is a plant of great pharmacological and ethnomedical importance with significant medicinal properties like antioxidant, anti-inflammatory, antibacterial, antidiabetic, hepatoprotective, and anticancer effects. Its heartwood extract called katha comprises of high concentration of bioactive substances like tannins, epicatechin, and catechin highlights its therapeutic value. Due to high terpene content, *A. catechu* leaf extracts shows antibacterial and antifungal properties. Terpenes act as a "phytoprotectants" which are found in plants.

ACKNOWLEDGEMENTS: We express our deepest sense of gratitude to our respected Guide, Mr. Kumar. S. Swami Sir, [Department of Pharmacognosy, ASPM College of Pharmacy], for their invaluable guidance, constant motivation, and insightful suggestions throughout the preparation of this review article. We are profoundly thankful to the Principal, Dr. Mahesh. J. Patil Sir, [ASPM College of Pharmacy], for providing us with the necessary facilities, resources, and a supportive academic atmosphere that enabled us to carry out this work efficiently. We are equally grateful to our colleagues for their cooperation, kind assistance, and constructive feedback, which have enriched the quality of this article.

CONFLICT OF INTEREST: Nil

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How to cite this article:
Sangare S, Patil T, Sawant S, Salaskar A, Swami K and Patil M: *Acacia catechu*: a comprehensive review of its phytochemistry, pharmacology and traditional uses. Int J Pharmacognosy 2025; 12(12): 837-46. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.12(12).837-46.