

A Mini Review of the Latest Pharmacognostical and Pharmacological Research on Acacia Catechu Heartwood

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Abstract: For thousands of years, Austronesians have used *Acacia Catechu L.* (Fabaceae) in huge amounts as a holistic treatment. Anti-inflammatory, antibacterial, antifungal, astringent, anthelmintic, analgesic, anti-diabetic, wound healing, anti-tumor, and immune-boosting activities characterize the whole *A. Catechu* plant. Chemical study has shown substantial quantities of flavonoids, phenolic chemicals, and tannins in this widely grown plant, including epicatechin/catechin, epigallocatechin, quercetin, taxifolin, and procyanidin. These active components show the drug's outstanding anti-inflammatory, antioxidant, astringent, and anti-diabetic actions. Katha, a potent medicine, comes from this plant's heartwood. Epicatechin, or catechin, is the major phytoconstituent in heartwood. Catechin in this plant is anti-inflammatory, antioxidant, antibacterial, and anticancer. *A. Catechu* heartwood has several medicinal effects, indicating a wide research area. This review covers solely the latest *A. Catechu* Heartwood pharmacological and pharmacognostical characteristics.

Keywords: Acacia catechu, heartwood, recent update, pharmacognostical.

I. INTRODUCTION

Acacia Catechu, a rapidly growing shrub, grows at 1200 meters in the sub-Himalayan region of India, Pakistan, Nepal, Bhutan, Thailand, China, and other wooded places [1]. *A. Catechu L.* (Fabaceae) heartwood, called a Katha in marketing, yields 10% hydro-alcoholic solution [2]. Before Ayurveda and Unani medicine, it was employed in holistic therapy with Austronesia for thousands of years [3]. The complete *A. Catechu* plant offers several medicinal advantages, including analgesia, anti-diabetes, wound healing, anti-tumor, immunological booster, antioxidant, anti-inflammatory, antibacterial, antifungal, astringent, and anthelmintics [4]. Chemical study shows that this widely dispersed plant contains large levels of flavonoids, phenolic chemicals, and tannins, including epicatechin/catechin, epigallocatechin, quercetin, taxifolin, and procyanidin [5]. These active components show that the drug is astringent, anti-inflammatory, antioxidant, and anti-diabetic [6]. Katha, a potent medicine, comes from this plant's heartwood. Epicatechin, a catechin found in the heartwood, may have anticancer, antimicrobial, and antioxidant activities [7]. The fast metabolism of catechins in vivo adds to their antioxidant effects [8]. Due to their inherent diversity of benzene ring geometries, inappropriateness as passive drug carriers, lack of a carrier-mediated drug transport mechanism, or low partition coefficient values, flavonoids and polyphenols have poor absorption [9]. The pharmacognosy and pharmacological activity of *A. catechu* heartwood in the body will form the basis of this review.

Morphology Feature of *a. Catechu* Willd

A. Catechu plant apexes are usually 5–15 meters tall [10]. *A. Catechu* has a straight grayish brown stem [11]. The chocolate-brown bark of *A. Catechu* peels in thin reddish-brown streaks [12]. *Acacia bipinnate* leaves feature 20–50 leaflets and 10–30 distinct pinnae [13]. An additional pedunculate spike and tiny, hooked spines adorn the inflorescence. The flower smells milky white. Figure 1 shows five to fifteen seeds in brown, flat pods. Figures 1 and 2 depict *A. Catechu*'s bark, sapwood, and heartwood [14].



Figure 1 The Plant Khadira (Acacia Catechu Willd)

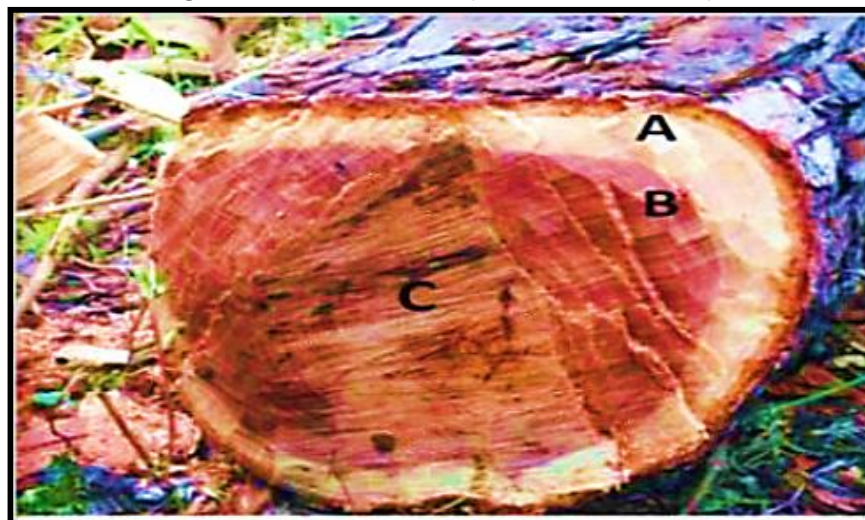


Figure 2 Wood of Acacia Catechu (A: Bark, B:Sapwood, C:Heartwood)

Physico-Chemical & Fluorescence Analysis of Heartwood of a. Catechu

Indian Ayurvedic Pharmacopoeias [15] state that A. catechu's physiochemical characteristics ought to provide a range of effects. The many privileged and physicochemical factors are listed in Table 1. Under normal light or UV light (UV 366 nm), the heartwood of the botanical medicine A. Catechu displays continuous fluorescence activity [16]. Table 2 is a tabular list of the catechu heartwood sample powder and different chemical combinations that influence the visibility of color-changing pigments.

Table 1: Shows the Physio-chemical parameters of the heartwood of A. Catechu

Sr. No.	Test	Results % (range)
1.	Loss on drying at 105°C	8.20 - 11.70 percent
2.	Total ash	1.23 - 2.11 percent

3.	Acid insoluble ash	0.16 - 0.4.20 percent
4.	Water-soluble ash	0.08 - 0.33 percent
5.	Water-soluble extractives	22.30 - 24.70 percent
6.	Alcohol soluble extractives	18.30 - 20.30 percent
7.	the pH of water extract	5.95 - 6.05
8.	Volatile oil	None
9.	Content of fiber	47.00 - 55.00 percent
10.	Index of swelling	4.00 - 5.00 ml/gm
11.	Index of foaming	<100
12.	Total sugar amount	1.15 - 1.85 percent
13.	Reducing sugar amount	0.66 - 1.40 percent

Table 2: Fluorescence behavior of heartwood of A. Catechu

Treatment	Visible light	Short wave (254 nm)	Longwave (365 nm)
Distilled water	Light brown	Yellow	Dark green
Methanol	Brown	Orange	Green
Hexane	Transparent	Violet	Dark violet
6 N HCl	Colorless	Dark violet	Colorless
NaOH	Brown	Dark brown	Greenish brown

Chemical Constituents of a. Catechu Heartwood

Many active components in the heartwood, bark, leaves, flower, and root make this plant an effective herbal treatment. Heartwood from A. Catechu is important to the inquiry and prospective perspective; it should be utilized medicinally. Catechin, (-) epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate rocatechin, phloroglucin, protocatechuic acid, quercetin, poriferasterol glucosides, acylglucosides, lupenone, lupeol, procyanidin AC, kaempferol, dihydrokaemferol, L-arabinose, D-galactose, D-rhamnose, andaldobiuronic acid, afzelchin gum, Due to its antioxidant properties, A. Catechu is therapeutic. Its antioxidant qualities, high tannin concentration, and intense astringency make this drug ideal for wound healing [18].

Phyto-Chemical Analysis of a. Catechu Heartwood

The functional moiety shown in tables Nos. 3 and 4 below was detected during the preliminary phytochemical screening of the A. Catechu heartwood extracts, which was carried out in compliance with standard practice [19].

Table 3: Phyto-chemical analysis of heartwood of A. Catechu

Treatment	Visible light	Short wave (254 nm)	Longwave (365 nm)
Distilled water	Light brown	Yellow	Dark green
Methanol	Brown	Orange	Green
Hexane	Transparent	Violet	Dark violet
6 N HCl	Colorless	Dark violet	Colorless
NaOH	Brown	Dark brown	Greenish brown

Phyto-Constituents and Pharmacological Activity of Varying Fragments of a. Catechu Willd

Table 4: Phyto-constituents and pharmacological potential of drugs [20]

Scientific title	Common name	Family	Part utilized	Active constituents	Pharmacological activity
A. Catechu	Katha Khadira Karungali Black cutch	Fabaceae –pea family Subfamily: Mimosaceae	Heartwood	Phenolics, Tannin & Flavonoids as a potent compound is as follow: a) Catechin b) (-) Epicatechin, c) Epigallocatechin, d) Epicatechin gallate, e) Epigallocatechin gallate, f) Rocatechin, g) Phloroglucinol, h) Procatechuic acid, i) Catecutannic acid, j) Quercetin, k) Quercitrin.	Antibacterial & Anti-mycotic action. To cure the sore mouth, Gingivitis, Dental carries, it posses Anti-oxidant, Anti-inflammatory, chemoprotective, & Antidiarrhoeal action. ETA extract of A. Catechu occupies Analgesic, antipyretic, Hepato-protective & Anti-diabetic potential.

Pharmacological Potential of a. Catechu Heartwood

Antibacterial potential

Antimicrobial potential of pets: ether, ETA, and ETO % The heartwood-appropriate water (one proportion one) extracts from A. Catechu have been tested against gram (+) and gram (-) type bacteria as well as a number of harmful fungi. It's crucial to remember that ETO and ETA were shown to have the strongest and broadest antimicrobial capability, even if pet-ether and ET extract also exhibit some antibacterial activity [21].

Anti-mycotic potential

Research indicates that A. Catechu's heartwood has anti-mycotic properties that will impact fungi like penicilium marneffi, aspergillus fumigates, aspergillus niger, and mucor spp. Disc diffusion techniques worked well for disguising antifungal effects. According to the examination's findings, a particular ETO extract has shown potent antimycotic efficacy against the selected fungal species. This suggests that the A. Catechu-specific extract must be demonstrating remarkable growth-retarding activity against the different fungus species [22].

Antioxidant potential

Strong antioxidants called epicatechins and catechins are present in A. catechu [23]. Radical scavenging is used in an experimental study on hydro extracts of A. Catechu & R. Aquatica. Radiation therapy is the most frequent treatment for tumor patients. Based on individual experimental evaluation, he found that some polyphenolic compounds contained in the polar extracts have a greater antioxidant interest that may be helpful in the treatment of tumors [24].

Immunomodulatory potential

A. Hemoglobulin titer values were improved and serum immunoglobulin levels were dramatically raised by the Catechu extract. It has been shown that this improves the immune system and lowers the transience percentage in mice. The outcome allowed for the determination that a specific A. Catechu hydro-extract had a significant impact on two types of humoral & cellular immunity, suggesting that A. Catechu might be a useful immune-modulatory drug [25].

Antipyretic potential

This research needs to conduct an investigation to show how A. Catechu affects yeast-induced pyretic rats, looking at rats weighing between 150 and 200 grams. Later, using injection, SC methods, and a 20% suspension of dry yeast in 2% gum Acacia in normal saline at a dosage of 20% ml/kg were used to induce fever. At the two, third, and fourth hours after the medication or extract analysis, the ETA extract of A. Catechu and aspirin significantly lowered the

temperature of elevated temperature animals, particularly rats. This test must show that the ethyl acetate extract of *A. Catechu* has been operating as a highly effective antipyretic agent against fever [26].

Hepatoprotective potential

Examine the possible mechanism and hepatoprotective effects of *A. catechu* in acetaminophen (APAP)-induced hepatotoxicity by doing a demonstration using a female Wistar rat version. The measurements' outcomes make it clear that *Acacia Catechu* offered high-quality hepatoprotective healing. His work on the Wistar rat version demonstrated the amazing hepatoprotective qualities of *A. catechu*. A separate scientific investigation looked at the hepatoprotective activity of *catechu* extract against CCl₄-induced liver injury in rats [27].

Anti-diarrhoeal potential

a study of intestinal infections to assess *A. catechu* duramen extract's antibacterial capabilities. ETO and the hydro-extract of duramen from *A. Catechu* have no antimicrobial potential against *S. Typhi*, *S. flexneri*, *E.Coli*, *K pneumonia*, *V cholera*, *P aeruginosa*, and *S. aureus* on an agar diffusion plate. A scientific examination showed that both extracts, at various concentrations, were bactericidal against the germs tested. Thus, *A. Catechu* duramen extract may be a strong herbal treatment for intestinal infection-induced diarrhea [28].

Anti-diabetic potential

This study examined the anti-hyperglycemic effects of *A. Catechu* willd (Leguminosae) ETO extract in rats with full glucose hyperglycemia. Effective ETO extract *A. Catechu* was tested for anti-diabetic effects in diabetic rats given four hundred and two hundred mg/kg alloxan. Glucose, urea, creatinine, serum cholesterol, triglyceride, HDL, LDL, hemoglobin, and glycosylated hemoglobin were measured in rats. Fasted rats treated with *A. Catechu* ETO extracts revealed significant anti-hyperglycemic action and dose-structured hypoglycemia. Thus, *A. Catechu* possesses strong antihyperglycemic potential [29].

Anti-secretary and antiulcer potential

An experimental trial on the anti-secretary and antiulcer capabilities of *A. Catechu* across indomethacin + pyloric ligation resulted in stomach ulcers in study mice. According to the study's results, *A. Catechu* has an inhibitory impact on released stomachic HCl and protects against injury to the stomach's mucosa [30].

Anti-cancer potential

A. Catechu An IC₅₀ value of 100µg/ml was observed for the cytotoxicity of *Catechu* ethanol seed extract treatment in SCC-25 cells. The markedly elevated expressions of the apoptotic detector caspases 8 and 9, cytochrome C, and Bax genes after ACS extract treatment indicated the initiation of apoptosis in SCC-25 cells. The ETO seed extracts of *A. Catechu* were shown to be cytotoxic in human oral squamous carcinoma SCC-25 cells because of their lowered concentration and capacity to cause apoptosis.

Anthelmintic potential

A. Catechu ethyl acetate fragment from alcoholic extracts shown potent anthelmintics pharmacology. The time it takes to become paralyzed and die has been decreased, suggesting a possible connection to alcohol extract. The key factor might be the presence of primary flavonoids, or phenolic compounds, in the extract being studied. This in vitro investigation indicates that *A. catechu* willd is a rich source of naturally occurring anthelmintics, and that various parasite illnesses may be effectively slowed down by its efficacy.

II. CONCLUSION

A. Catechu heartwood has been used for centuries in traditional Chinese medicine to treat a wide range of illnesses. Experimental studies have shown its antidiabetic, antihypertensive, antibacterial, antifungal, antiplaque, antioxidant, antiviral, anti-inflammatory, anticancer, and wound healing effects. The claims made by the traditional medical system have been verified by science. To further explore its therapeutic potential and establish it as a conventional drug, more clinical investigations are necessary.

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