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### Kath (*Acacia catechu*): An Overarching Envelop of Traditional and Modern Update

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#### ABSTRACT

*Acacia catechu*, an important drug used in Unani System of Medicine. It consists of dried aqueous extract prepared from heart-wood of *Acacia catechu* commonly known as Katha, is widely used in India for its various pharmacological effects. The plant is a moderate sized, deciduous tree 9-12 m. high. It belongs to the family of Babul tree and distributed throughout in drier regions of the sub-Himalayan tract upto an altitude of 1200m from Punjab to north-eastern States, Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu. It is usually distributed in Pakistan, Nepal, Bhutan, Thailand, and S.China. According to colour, kath can be classified into three type's viz dark greyish brown, reddish and blackish. The use of black catechu could be traced back in history from the time of chewing betel leaf, in which it has been used as adjuvant. Cutch (the concentrated extract) contains tannins 2-20%, catechin 25-33%, phlobatannins including catechutannic acid 20-50%; flavonoids including in quercetin, quercitrin, fisetin; gums, resins, pigments. It possesses various pharmacological properties including Anti-bacterial activity, Anti Mycotic activity, Anti-oxidant activity, Immuno modulatory activity, Anti-pyretic activity, Anti-Diarrhoeal activity, Antisecretory and Antiulcer activity. Due to such properties, the katha has been used in therapeutics, such as in the prevention of Spongy Gums, Bleeding Gums, Stomatitis, Leucoderma, Urinary Disorder, Diabetes, Leprosy, Psoriasis, Syphilis etc. This paper presents a review of phytochemistry, pharmacology activities and therapeutic uses of *Acacia catechu*.

**Keywords:** *Acacia catechu*, Dried aqueous extract, Heart-wood, Katha, Immuno- modulatory activity

#### ARTICLE INFO

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## 1. Introduction

India is a diverse culture country which is a rich source of traditional medicines, many of which are of plant origin. *Acacia catechu* (Family: Fabaceae and subfamily: Mimosoideae), an important drug used in Unani System of Medicine. It consists of dried aqueous extract prepared from heart-wood of *Acacia catechu*. Possibly, the use of black catechu could be traced back in history from the time of chewing betel leaf, in which it has been used as adjuvant. In old days, it was used by women as a colouring agent for the feet. Since 15<sup>th</sup> century, this material has been exported to Europe. The old information about catechu is by a Portuguese writer Garcia de Orta in 1574. Dr Warth first used the scientific process to extract catechu, and showed that catechu consists of two parts, viz. kattha and cutch. [1] In 17<sup>th</sup> century, a European writer first described *A. catechu* as ‘cacho’ and mentioned it as being exported from Cambay to Malacca. By the early 19<sup>th</sup> century, due to commercial importance, catechu was much used in France. The first *A. catechu* to reach European countries had been re-exported from Japan and was called ‘terra japonica’, being thought at that time to be a natural earth or of mineral origin. [2] Sanskrit writers under the name of Khadirah mentioned two kinds of catechu, dark and pale, both prepared from the wood of the *Acacia catechu*, and these two kinds are still to be found in common use. [3]



Figure 1: *Acacia catechu*



Figure 2: Laboratory sample of *Acacia catechu*

### Vernacular Names:

Arabic : Kaat [4, 5]  
 English : Catechu [5, 6, 7]

Hindi : Khair [3, 4, 6, 8]  
 Persian : Katta [4]  
 Sanskrit : Khadirah [6, 8, 9]  
 Unani : Khair, Kaat, Katthaa [4, 7]  
 Urdu : Katthaa [5, 10]

### Mahiyat (Unani Description):

It belongs to the family of Babul tree. Its height ranges from 10 to 15 feet. Bark is whitish or greyish white in colour and its thickness is  $\frac{1}{2}$  - 1 inch. The leaves look like of Babul tree but the stem is thorny. Pods are 2-4 inch long and 1.25-1.75 inch in breadth, greyish brown in colour. Pods contain 4-10 seeds. The flowers are small in size and yellowish in colour.

### Kath:

It is available in the form of pieces which are of brown in colour. The taste at first is acrid and bitter but later on it becomes tasteless. It is marketed in adulterated form with mixture of carbohydrates, sand and clay. [10] According to colour, kath can be classified into three types viz dark greyish brown, reddish and blackish. Type which is dark greyish brown in colour, easily breakable like daarchini. Thousands of fine crystals are found on the microscopic examination of the kath surface which are resembling the needles. Taste is astringent, bitter, gummy and later it is sweetish in taste. It is commonly used with the chewing beetles and compounded with other drugs. Second type is of reddish colour which is not used as a drug. Third one is black in colour; it is also not used as a drug. The latter two types are very hard to break. All the three types are odourless and completely dissolved in water. [11]

### Hissae Mustamela (Parts Used):

Gum and Dried Bark Decoction [4]

Extract of Heartwood [12]

### Mizaj (Temperament):

Cold 2° and Dry 2° [5, 10, 11, 13]

### Miqdare Khurak (Therapeutic Dose):

Upto 4 Masha (Gm) [11]

### Mazarrat (Adverse Effects):

Muzife Bah (Anaphrodisiac) [5, 11, 13]

Muwallide Hisaat Gurda wa Masana [5,11,13]

### Musleh (Correctives):

Mushk Khalis (*Moschus moschiferus*); [13] Mushk wa Ambar (*Moschus moschiferus* and *Ambra grasea*); [5, 11, 10, 13] Ilaichi khurd (*Elettaria cardamomum*) [4]

### Badal (Substitute):

Kibr and Mazu (*Capparis spinosa* and *Quercus infectoria*) [4, 5, 10]

### Compounds:

Zaroore Qula, Sunun Mustahkam Dandan, Sunun Poste Mughilan and Habbe Leemu [5, 10]

### Habitat And Distribution:

It is an evergreen weedy perennial native to India, commonly found in Chhindwara district of M.P. at Chintipur. [14] In drier regions of the sub-Himalayan tract

upto an altitude of 1200m from Punjab to north-eastern States, Madhya Pradesh, Gujarat, Maharashtra, Andhra Pradesh and Tamil Nadu. [15] It is usually distributed in Pakistan, Nepal, Bhutan, Thailand, and S.China. [16]. Lighter variety of catechu is imported from Malaya and Singapore and derived from Uncaria gambier. [17] Sandy loam soil and sunny situation are ideal. Propagated from seeds or cutting of half ripened shoots. [14]

## 2. Experimental

### Botanical Description:

A moderate sized tree 9-12 m. high; bark dark coloured, rough; young shoots dark brown or purple, glabrous. Leaves 2-pinnate, 10-15 cm long; main rachis pubescent, with glands between many of the pairs of pinnae and a large conspicuous gland near the middle of the petiole; stipular spines short, hooked, from a broad triangular base, polished; pinnae 10-30 pairs, 3.8-5 cm. long, nearly sessile, their rachises pubescent. Leaf let 30-50 pairs, 4.5-5 by 1.25 mm. linear, subacute, sessile, often ciliate. Flowers sessile, pale yellow, in peduncled 1-4-nate axillary spikes 5-10 cm. long. Calyx campanulate, 1.25-1.5 mm. long, hairy outside; teeth deltoid, ciliate. Corolla 2-3 times as long as the calyx; lobes ovate-oblong, subacute, pubescent. Pods stalked, 5-7.5 by 1.1.6 cm., flat, thin, brown, shining, with a triangular beak at the apex and narrowed at the base into a stalk 3-6 mm. long, seeds are usually 3-10. [18] Flowers light greenish-yellow in axillary spikes. Pods flat, thin, straight, glabrous, dark brown, shining, seeds 4-10, greyish, shining. [16]

**Table 1:** AF'AL (Medicinal Actions)

As per Unani literature	As per Ethno botanical literature
Muqawwie-Lissa (Gum Tonic) [4, 5, 11, 12, 13]	Strengthen of Gums [3, 7, 8]
Muqawwie-Asnan (Strengthen of Teeth) [4, 5, 12, 11]	Strengthen of Teeth [18]
Qabiz (Astringent) [4, 5, 11]	Astringent [15, 19, 20]
Habis ( Retentive) [4, 10, 11]	Haemostatic [7, 21]
Mujaffif (Desiccant) [4, 5, 10, 13]	Cooling [1, 3, 6, 8, 15, 21]
Muhalillele Waram (Anti-inflammatory) [11]	Anti-inflammatory [17, 18, 21]
Muqawwi (Tonic) [4, 5, 13]	Tonic [16, 18, 21]
Muzir Bah (Anaphrodisiac) [5, 11]	Anaphrodisiac [21]
Musaffie-Dam (Blood Purifier) [5, 13]	Blood Purifier [7]
Muwallide Lubn (Lactagogue) [11]	Lactagogue [21]
Rade (Derivative or Repellent, Restraint) [4,11]	Abortifacient [16, 21]
	Digestive [1, 6, 8, 15, 21]

**Table 2:** Istemal (Medicinal Uses)

As per Unani literature	As per Ethno botanical literature
Spongy Gums [4, 5, 11, 13]	Spongy Gums [3, 8, 7, 17]
Bleeding Gums [4, 5, 10]	Bleeding Gums [7, 17, 21]
	Toothache [16, 17, 21]
Nafe-Qula (Stomatitis) [4, 5, 10, 11, 13]	Stomatitis [7, 16, 21]
Ulcers, Boils and Eruptions of Skin [4, 10, 11]	Ulcers, Boils and Eruptions of Skin [1, 3, 6, 7, 8, 15, 18]
Istarkha-e-Luhath (Relaxation of Uvula) [5, 11, 12]	Relaxation of Uvula [21, 22]
Bahtussaut (Hoarseness of Voice) [11]	Hoarseness of Voice [17]
Otorrhoea [11]	Otorrhoea [17]
Sahaj-e-Ama (Enteritis) [4, 11, 10]	Enteritis [7, 21]
Tape-Garam (Antipyretic) [4,11]	Antipyretic [18, 21, 22]
Bars (Leucoderma) [4, 11]	Leucoderma[16,18, 21]
Is'hal (Diarrhoea) [10,11]	Diarrhoea [1, 3, 6, 14, 15, 17]
Antihelminthic [4, 5, 11, 12]	Antihelminthic [16,18]
Sozish-e-Bol (Urinary Disorder) [4, 11]	Urinary Disorder [7, 18, 21]
Fasad-ud-Dam (Putrefaction of Blood) [4, 5, 11, 13, 10, 12]	Anaemia [18]
Haemorrhoids [11]	Haemorrhoids [21]
Ramad (Conjunctivitis) [11]	Conjunctivitis [16]
Ateshak (Syphilis) [11]	Syphilis [21]
Soozak (Gonorrhoea) [4, 11]	Gonorrhoea [3, 16, 17, 21]
Juzaam (Leprosy) [4,11]	Leprosy [7, 8, 15, 16, 18]
Jiryan-e-Mani (Spermatorrhoea) [4,11]	Otitis [17]
Kasrat-e-Ahtlam (Nocturnal Emission) [4, 11]	Psoriasis [18, 21]
Yarqaan (Jaundice) [4, 11]	Diabetic [16]
	Cure Itching [18]
	Hypertrophy of Tonsils [21, 22]
	Haemoptysis [16, 21]
	Cough [1, 3, 8, 15, 21]
	Scurvy [21, 22]
	Sore Throat [18, 17, 21]

**Phyto-Chemical Studies:** Cutch (the concentrated extract) contains tannins 2-20%, catechin 25-33%, phlobatannins including catechutannic acid 20-50%; flavonoids including in quercetin, quercitrin, fisetin; gums, resins, pigments. [7] The chief constituents of the heartwood are catechin and catechutannic acid. The wood contains 1-epicatechin. (+)-afzelchin, catechin tetramer, dicatechin, gallocatechin, gossypitin, isorhamnetin, kaempferol and its dihydro derivative, procyanidin AC, quercetin, and taxifolin have been obtained. Acid hydrolysis of the gum afforded L-arabinose, D-galactose, D rhamnose, aldobiuronic acid (6-D-glucuronosyl-D-galactose), 6-O-glucopyranosyluronic acid-D-galactose, 3-O- -D-galactopyranosyl-D-galactose, 3-O- -galactopyranosyl (1→3)-O- -D-galactopyranosyl (1→3)-D-galactopyranose, 5,7,3,4'-tetrahydroxy-3-methoxy-7-O- -D-galactopyranosyl (1→4)-O- -D-gulcopyranoside. [15].

### 3. Results and Discussion

#### Pharmacological Studies

##### Anti-bacterial activity

Lakshmi.T et al revealed that *Acacia catechu* heartwood extract is found to be an effective antibacterial agent. A study conducted in ethanolic and aqueous heartwood extract of *Acacia catechu*, proved its efficacy as a potent anti-bacterial agent. Taxifolin present in heartwood of *Acacia catechu* is found to be responsible for its Anti-bacterial effect. [23] Similar study was conducted by same to evaluate the potency of *Acacia catechu* heartwood extract against dental caries causing microbes and organism associated with endodontic infections like *streptococcus mutans*, *streptococcus salivarius*, *Lactobacillus acidophilus* and *Enterococcus faecalis* using disc diffusion method. [24]

*Streptococcus mutans* and *Lactobacillus acidophilus* are potent initiator for dental caries that results in destruction of mineralised tissues in the teeth. Hence our study shows that *Acacia catechu* heartwood extract is highly active on oral pathogens and can be applied in Dental practice in the field of periodontal diseases like dental caries, gingivitis, mouth sores and in Endodontal treatment as *Enterococcus faecalis* is found to be the root cause of failure in root canal treatment.[25]. In a Study Pawar et -al explained a dentifrice / herbal tooth powder which was comprised of *Acacia catechu*, Menthol and camphor in the proportion 91%, 2.7% and 6.3% respectively. The powder of *Acacia catechu* was used to remove tarter, plaque, stain and in cleansing and polishing tooth surface without producing any abrasion whereas menthol and camphor were used as flavouring agents. A clinical study on this herbal dentifrice , reported 87-95%, 70-72% and 80-95% reductions in plaque, gingivitis and dental calculus respectively, in about 15 days of treatment. [26]

Katha, a resin part of *Acacia catechu* Wild, is used as a chewing ingredient. The Antimicrobial screening and phytochemical analysis were performed to prove the antibacterial property and presence of active phytochemicals in extracts of *Acacia catechu*. A phytochemical analysis was done using a HPTLC International Journal of Current Trends in Pharmaceutical Research

instrument. Antimicrobial testing demonstrated excellent results with the petroleum ether extract against *Pseudomonas aeruginosa* (10µg/mL), followed by the aqueous extract against *Bacillus subtilis* (20µg/mL) and the chloroform extract against *Staphylococcus aureus* (30µg/mL). Two major phytochemical constituents, epicatechin and quercetin, were identified by HPTLC as active ingredients in the extract. [27]

Gulzar et al also has conducted a similar study on Preliminary phytochemical and antimicrobial activity of the crude extract obtained from the leaves of *Acacia catechu* (AC.).The presence of carbohydrates, steroids, alkaloids, glycosides, tannins, saponins, flavones and phenolic compounds was indicated by the tests conducted. Antimicrobial activity of petroleum ether, ethanolic and ethanol: water (1:1) extracts of leaves of *Acacia catechu* was evaluated against some pathogenic fungi and gram positive and negative bacteria. Ethanolic extract was found to possess the broadest and potent antimicrobial activity. [28]

##### Anti mycotic activity

A study was conducted by Lakshmi .T et al to evaluate the anti mycotic activity of heartwood of *Acacia catechu* willd on selected fungal species like *Candida albicans*, *Aspergillus niger*, *Aspergillus fumigates*, *Mucor spp* and *Penicillium marneffeii*. Disc diffusion technique was followed for screening anti-fungal activity. The results obtained from our study shows that ethanolic extract has got a very good anti mycotic activity against the selected fungal species. [29]. An attempt was made to assess the antimycotic activity of *Acacia catechu* Willd. extracts using three different solvents such as ethanol, acetone and hexane. Agar well diffusion technique was followed for screening against chosen fungi like *Aspergillus niger*, *Fusarium oxysporum*, *Alternaria alternata*, *Rhizopus stolonifer* and *Macrophoma phaseolina*. The maximum inhibition was recorded in ethanol, acetone and hexane roots extracts.A. *niger* growth was controlled by acetone extract of bark, whereas *F. oxysporum*, *A. alternata*, *R. stolonifer* and *M. phaseolina* by acetone extracts of *A. catechu* extract. These extracts can be utilized for the management of this plant. It is recommended to isolate, identify and integrate the bioactive principle in these pathogens management. [30]

Nagaraja T.G et al reported that the antifungal activity of the aqueous and methanol extract of twenty Indian medicinal plants against fourteen human pathogenic fungi. Antifungal assay was done using agar disc diffusion method. The result showed that the aqueous extract of *Andrographis paniculata* was only found active while the methanol extract of seven plants i.e. *Acacia catechu*, *Hemidesmus indicus*, *Andrographis paniculata*, *Pongammia pinnata*, *Carica papaya*, *Cannabis sativa* and the *Oroxylum indicum* exhibited significant antifungal activity against one or more test organism. The methanol extract of *Acacia catechu* was established most promising, and found active against *Candida*, *Dermatophytes*

and *Aspergillus* species therefore stressing the need to locate the active principle. [31]

#### Anti-oxidant activity

K.I. Priyadarsini et al revealed that four aqueous extracts from different parts of medicinal plants used in Ayurveda viz., *Momardica charantia* Linn (AP1), *Glycyrrhiza glabra* (AP2), *Acacia catechu* (AP3), and *Terminalia chebula* (AP4) were examined for their potential as antioxidants. The antioxidant activity of these extracts was tested by studying the inhibition of radiation induced lipid peroxidation in rat liver microsomes at different doses in the range of 100–600 Gy as estimated by thiobarbituric acid reactive substances (TBARS). Of all these extracts, AP4 showed maximum inhibition in the TBARS formation and hence is considered the best antioxidant among these four extracts. The extracts were found to restore antioxidant enzyme superoxide dismutase (SOD) from the radiation induced damage. The antioxidant capacities were also evaluated in terms of ascorbate equivalents by different methods such as cyclic voltammetry, decay of ABTS radical by pulse radiolysis and decrease in the absorbance of DPPH radicals. The results were found to be in agreement with the lipid peroxidation data and AP4 showed maximum value of ascorbate equivalents. Therefore AP4, with high antioxidant activity, is considered as the best among these four extracts. [32]

#### Immuno modulatory activity

Syed Ismail and Mohammed Asad have studied the Immuno modulatory activity of aqueous extract of *Acacia catechu* after oral administration of two doses of 5 mg/kg and 50 mg/kg. The effect was studied in neutrophil adhesion test, mice lethality test, carbon clearance assay, cyclophosphamide induced neutropenia, serum immunoglobulin levels and the haemagglutination test. *Acacia catechu* extract showed an increase in the neutrophil adhesion to the nylon fibres, produced a significant increase in the phagocytic index and a significant protection against cyclophosphamide induced neutropenia indicating its effect on cell mediated immunity. On the other hand, *Acacia catechu* extract produced a significant increase in the serum immunoglobulin levels, increase in the haemagglutination titre values and decreased the mortality ratio in mice, suggesting its effect on the humoral arm of the immune system. Hence, it can be concluded that the aqueous extract of *Acacia catechu* has a significant effect on both cell mediated and humoral immunity. [33]

#### Anti-pyretic activity

A study was conducted by Ray D et al to prove the effect of *Acacia catechu* in yeast induced pyretic rats Ray et al conducted a study in Albino rats (150-200 g) after inducing fever by injecting, subcutaneously, 20% suspension of dried yeast in 2% gum acacia in normal saline at a dose of 20 ml/kg of body weight. Animals in the various groups were treated as Group A: 3% aqueous suspension of *gum acacia* (1 ml/200 g) as vehicle, orally. Group B: Aqueous suspension of ethyl acetate extract of *Acacia catechu* 250 mg/kg (1 ml/200 g) with 3% gum acacia as 5% suspension, orally. Group C: Aqueous suspension of ethyl acetate extract of *Acacia catechu* 500 mg/kg (1 ml/200 g) with 3%

*gum acacia* as 10% suspension, orally. Group D: Aqueous acetyl salicylic acid, 300 mg/kg (1 ml/200 g) with 3% gum acacia as 6% suspension, orally. Rectal temperature was recorded every hour for four hours after administration of drugs. The ethyl acetate extract of *Acacia catechu* and aspirin significantly decreased the temperature of pyretic rats at 2nd, 3rd and 4th hour after drug or extract treatment. [34]

#### Anti-diarrhoeal activity

The study was carried out by Nongyao S and Kitja S that the activities of *n*-hexane, dichloromethane and methanol extracts from five anti-diarrheic Thai medicinal plants, *Acacia catechu* (Fabaceae) resin, *Amaranthus spinosus* (Amaranthaceae) whole plant, *Brucea javanica* (Simaroubaceae) seed, *Piper longum* (Piperaceae) fruit and *Quercus infectoria* (Fagaceae) nut gall were tested against the in vitro growth of fresh isolates of the intestinal protozoan parasite, *Blastocystis hominis*. The extracts at concentrations that ranged from 62.5 to 2000 µg/mL, were incubated with several isolates of *Blastocystis hominis* for 48 h. The activities were classified as killed, inhibited, moderately inhibited and not-inhibited. Dichloromethane and methanol extracts from the *Brucea javanica* seed and a methanol extract from *Quercus infectoria* nut gall showed the highest activity. At a concentration of 2000 µg/mL, the three extracts killed 82, 75 and 67% of the *Blastocystis hominis* samples tested and inhibited 94, 100 and 76% of them, respectively. Metronidazole, used as a reference antiprotozoan drug, at a concentration of 40 µg/mL, killed 97% of the *Blastocystis hominis* isolates and inhibited all samples tested at concentrations that ranged from 1.25 to 20 µg/mL. [35]

#### Antisecretory and Antiulcer activity

Karwani.G et al conducted a study on Antisecretory and Antiulcer activity of *Acacia catechu* against indomethacin plus pyloric ligation induced gastric ulcers in rats. The results of their study suggest that *Acacia catechu* causes an inhibitory effect on release gastric hydrochloric acids and protects gastric mucosal damage. [2]

## 4. Conclusion

The review focus on the various pharmacological activities and Unani literature about *Acacia catechu* which will surely help the researchers to further continue their studies based on the identification and isolation of the active compounds responsible for treatment of various diseases. It is thus considered as a potent medicinal plant to mankind. This review aims to highlight the medicinal importance of the *Acacia catechu* and journey of this traditional medicine to modern medicine.

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