IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

Phytoconstituents of *Areca catechu* root and its Therapeutic biomolecules.

Ashwini[1], Ramachandra Y.L[1] and Padmalatha S. Rai[2]*

[1]Department of Biotechnology and Bioinformatics, Kuvempu University, Shankaraghatta, Shivamogga-577 451, Karnataka, India.

[2*]Department of Biotechnology, Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal-576 104, Karnataka. India.

***Corresponding Author: Dr. Padmalatha S Rai.**

Affiliation: Department of Biotechnology, Manipal School of Life Sciences, Manipal Academy of Higher Education, Manipal-576 104, Karnataka. India.

Abstract: Plant-based compounds continue to play a vital role in health protection, and individual use has been astronomically reported. The plants of the Arecaceae family are composed of about 200 genera and 2600 species mainly grow in tropical and subtropical regions. Areca palm is highly popular in the tropical Pacific islands, Asia, and Africa. The plants are important in traditional systems such as Ayurveda, Unani, and homeopathy. The present study aimed to provide general literature on the Arecaceae family as a potential source of new compounds with therapeutic applications. *Areca catechu* has been studied for its phytochemical constituents, this species contains phenolics, condensed tannins, hydrosable tannins, simple phenolics, alkaloids, flavonoids, terpenes, fatty acids, and other classes of compounds. Traditional uses include treating various gastrointestinal diseases, killing parasites, curing kidney asthenia, tinnitus, diarrhea treatment, amenorrhea, venereal diseases, wound healing, etc. Biological activities like anti-bacterial, anti-fungal, anti-helmintic, anti-inflammatory, anti-cancer, and anti-oxidant. The methanol extract of *A. catechu* root has been characterized by GC-MS and FTIR shows the presence of active compounds like 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl-, Arecoline, Quinic acid, FTIR showing the active functional groups like, O-H, C-H, C=O, C-H, C-N, C-O, etc.

Index Term: Arecaceae, GC-MS, FTIR

INTRODUCTION: Plants have formed the basis of sophisticated traditional medicinal systems that have existed for thousands of years and continue to provide mankind with new remedies. There are about 45,000 plant species in India, with concentration hotspots in the Himalayas, Western Ghats, and Nicobar Islands. India is the largest producer of medicinal herbs and is called the Botanical Garden of the world. Areca palm is a popular crop in India and it is a commercial crop. The areca palm is a monocot, it belongs to the family Arecaceae (palm family). Herbal material and crude extracts contain a wide range of compounds that work synergistically or individually to provide therapeutic effects. *A. catechu* has been studied for its phytochemical constituents. This species contains phenolics, condensed tannins, hydrosable tannins, simple phenolics, alkaloids, flavonoids, terpenes, fatty acids, and other classes of compounds (Peng *et al.,*2015).

1.1 Vernacular Names:

Vernacular names of this plant in different languages are as follows:

1. English - Areca nut, Betel nut
2. Sanskrit - Pugah
3. Hindi - Supari
4. Bengali - Suparis
5. Malayalam - Kamuku
6. Tamil - Pukkumamaram (Joy *et. al.,*1998)

1.2 Scientific Classification:

The scientific classification of the *A. catechu* plant is as follows:

Kingdom - Plantae
Order - Arecales
Family - Arecaceae
Genus - Areca

Species - *Areca catechu*

1.3 Plant Description:

Habit: A tall slender non-branched monocot palm, a height of 12-30m.

Stem: The stem has scars of fallen leaves in regular annulated forms. Erect, glabrous, whitish, and with a crow of pinnate leaves.

Leaf: The crown of the adult palm contains 7-12 leaves. Leaves are pinnatisect and consist of the sheath, a rachis, and leaflets. Leaf bears about 70 leaflets

Flower: The Areca palm is monoecious with male and female flowers on the same spadix. Flowers of both sexual characteristics contain 6 petals.

Fruit: 3.8-5cm long drupe, ovoid or oblong, smooth in a bunch of about 200-250 fruits, orange or scarlet when ripe, single-seeded with persistent perianth and fibrous mesocarp.

Seed: Kernel 2-4cm in diameter, greyish brown.

Root system: The areca palm has a fibrous root system and an adventitious root system.

1.4 Geographical Distribution:

A. catechu is originally native to the Malaysian peninsula, but its use has resulted in a long history of cultivation and naturalization throughout South and South Asia. Major areca-growing countries are India, China, Myanmar, Bhutan, Sri Lanka, Bangladesh, Malaysia, Indonesia, and Vietnam. Areca palm is predominantly cultivated in traditional states like Karnataka, Assam, Kerala, Maharashtra, West Bengal, Andaman, and Nicobar group of islands and its cultivation spreads to non-traditional areas in Karnataka and Tamil Nadu (Tree Crops by K.P Nair). It requires a warm, humid, tropical climate to thrive. Chewing betel nut is an ancient practice among Asians. *A. catechu* plant has been widely used in clinical practice in China, India, and South Asian countries.

II. Materials and Methods:

Selection and Collection of Plant Roots: The fresh areca plant root (*A. catechu*) was collected from Karnataka Uttar Kannada district, Sirsi in March 2024. The roots generally grow in red loamy soil, laterite rich with minerals. The sample was collected in a sterilized polythene bag for further use.

fig.2.1 *A. catechu* root

fig.2.2 areca root

2.1 Materials:

Equipment: Laminar air flow was used for sterile inoculation and preparation (Technic flow systems Model: TFS/INMTR), Incubator, and Rotatory shaker (ROTEX, Model: Rosi-2).

Solvents: Methanol (SDFCL), Chloroform (SDFCL), Distilled water.

Chemical reagents:

Sodium hypochlorite (Himedia), Alcohol, Double distilled water.

2.2 Methods:

2.21 Surface sterilization of roots:

The explants are immersed in a 1% concentration of chemical sterilant or disinfectants for a specified time, establishing contamination-free roots. The roots were surface sterilized by washing them in running tap water for 5 minutes to remove the soil debris. The roots were immersed in distilled water for 2 minutes and then rinsed with 70% alcohol for 5 minutes with continuous stirring. They were then reimmersed in 1% sodium hypochlorite for 1 minute and rinsed with 70% alcohol for 2 minutes. Finally, the roots were rinsed thrice in sterile water and used for the extraction.

2.22 Crude extract:

The roots were separated and chopped into small pieces. 3 grams of root was finely ground with mortar and pestle with 6ml of sterile distilled water. It was filtered through Whatman filter paper No.1, and the filtrate was collected in a stopper bottle and labeled for further use. (Madike *et.al.,* 2017).

Fig 2.3 chopped roots of *A. catechu*

Fig.2.4 crude extraction of *A. catechu*

2.23 Maceration:

The collected fresh roots were dried in an oven for 60-80°C for 3 days, and ground into a fine powder, and 2gm of root powder was soaked in 30ml of methanol. The flask was kept in a rotatory shaker for 3 days with continuous agitation (S. N. Masola *et.al.,*2009).

fig. 2.5.fine powder of *A. catechu* root

fig.2.6.maceration extraction of roots in methanol

The solvents from the total extract were filtered through Whatman filter paper No.1, and the extracts were collected and stored at 4°C.

2.24 Soxhlet extraction:

Soxhlet extraction was performed in a Soxhlet apparatus. Depending upon the polarity of the solvents chosen i.e., Methanol was carried out for 5 hours (8 cycles) for methanol at 55°C (A.B.A Prempeh *et. al.,*2008) After the extraction of roots, the color of the solution turned to a brownish tint in (Methanol), total 137 ml of methanol extract of solvents. The extracts were collected in a stopper bottle and stored at 4°C for further analysis.

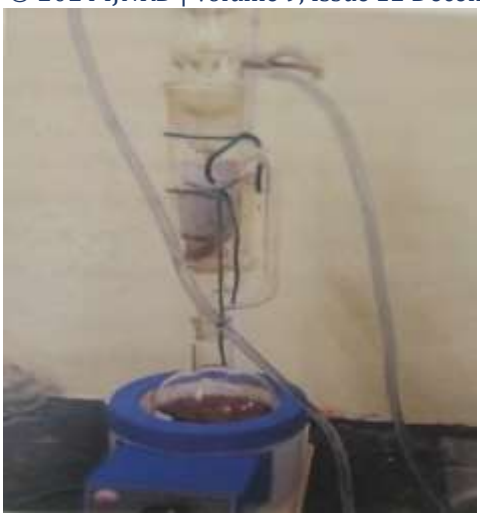


fig.2.7. soxhlet extraction method using methanol

2.3 Antimicrobial assay:

2.31 Preparation inoculum:

The bacterial organisms were maintained on the Nutrient agar medium and fungal organisms were maintained on the SDA medium. The test organisms used for work are *Staphylococcus aureus*, *Escherichia coli*, and *A. niger* and can be used for antimicrobial assay. Active cultures for experiments were prepared by transferring a loop full of microorganisms from stock cultures to a conical flask of nutrient broth and incubated for 24 hours at 37°C (Rahul Shukla *et.al.,* 2009) and SDA broth inoculated and was kept for 48-72 hours at room temperature.

2.32 Agar well-diffusion method:

The antimicrobial activity was performed by the agar well-diffusion method. *S. aureus*, *E. coli*, and *A. niger* were spread onto the surface of nutrient agar and SDA medium respectively with a sterile L shape spreader (100µl containing 10^6 cell ml). 6mm diameter well was punched into the agar and filled with aqueous root extract (100mg/50µl, 200mg/50µl, 300mg/50µl, 400mg/50µl, 500mg/50µl). Plates were incubated overnight at 37°C and SDA plates were incubated at room temperature for 72 hours. All the experiments were carried out in triplicates. After incubation inhibition zones were observed and measured with a zone inhibition scale (Asma'a A. Faden, 2018) control wells were filled with standard antibiotics and anti-fungal such as (Amoxycillin and Fluconazole 100µg/ml).

2.33 Disc diffusion method:

The disc diffusion method was used to screen the antimicrobial activity. *In-vitro* antimicrobial activity was screened by using Nutrient agar (NA) and Sabouraud dextrose agar (SDA). The NA and SDA plates were prepared by pouring 15 ml of molten media into sterile petri plates. The plates were allowed to solidify and 100µl inoculum suspensions were spread uniformly with L shaped glass rod the inoculum was allowed to dry for 5 minutes and 3 mm discs were dipped into the different concentrations of extracts (100mg/20µl,120mg/20µl, 140/20µl, 160/20µl, 180/20µl)and placed on the surface of the medium and the compound was allowed to diffuse for 5minutes and the NA plates were kept for incubation at 37°C for 24 hours and SDA plates were incubated at room temperature for 72hours. At the end of incubation, the zone of inhibition formed around the disc was measured with the zone inhibition scale. These studies were performed in triplicate by using standard antibiotics and anti-fungal (Amoxycillin, Fluconazole 100µg/ml). (Rahul Shukla et.al.,2009).

2.4 Qualitative Phytochemical Analysis: (Sofowra, A 1993)

Test for alkaloids:

- Iodine test: 3ml of the extract was mixed with a few drops of iodine solution in the test tube, a blue color that disappears on boiling and reappears on cooling.

Test for Carbohydrates:

Borfoed's test: 1ml of extract is mixed with 1ml of borfoed's reagent and heated for 2min, a red ppt indicated monosaccharide is present. Borfoed's test: 1ml of extract is mixed with 1ml of Borfoed's reagent and heated for 2min, a red ppt indicated monosaccharide is present.

Test for Glycosides and cardiac glycosides:

- Aqueous NaOH test: Alcoholic extract is dissolved in 1ml of water and add few drops of aqueous NaOH solution a yellow color indicates the presence of glycosides.

Test for amino acids:

- Ninhydrin test: 2ml of extract is mixed with 2 drops of ninhydrin solution (10mg ninhydrin+200ml acetone).

Test for Flavonoids:

- Ammonia test: 2ml of extract is mixed with 5ml of dilute Ammonium solution and add concentration H_2SO_4 gives a yellow color solution.

Test for Phenolic Compounds:

- Potassium dichromate test: 1ml of the extract is mixed with a few drops of potassium dichromate solution gives a dark color solution.

Test for tannins:

- Braymer's test: 1ml of extract was mixed with 3ml of distilled water and 3 drops of 10%Ferric chloride solution gives a blue-green color.

Test for Phlobatannis:

- HCL test: 2ml of aqueous extract was boiled with 2ml of 1%HCL giving a red precipitation.

Test for Phytosterols:

- Acetic anhydride test: 0.5 ml of extract was mixed with 2ml of acetic anhydride and 2ml of conc. H_2SO_4 gives change in color from violet to blue/green solution.

Test for terpenoids:

- Conc.H_2SO_4: 2ml of chloroform was mixed with 5ml of root extract (evaporated on water bath) and add 3ml of conc.H_2SO_4 gives a gray color solution.

Test for diterpens:

- Copper acetate test: Root extract was dissolved in distilled water and add 3-4 drops of copper acetate solution gives emerald green color.

Test for Coumarins:

- NaOH test: Root extract was mixed with 10% NaOH and chloroform gives the yellow color solution.

Test for Saponins:

- Foam test: 0.5gm root extract mixed with 2ml of water and shaken vigorously shows a persistent foam for 10min.

Test for lignin:

- Labat test: extract solution was mixed with gallic acid gives a olive green color.

Test for Quinones:

- Conc. HCL test: root extract was added with Conc. HCL gives green color solution.

Test for anthocyanins:

- HCL test: 2ml of root extract was mixed with 2ml of 2N HCL giving a pink red solution that turns blue violet after the addition of ammonia.

Test for Carboxylic acid:

- Effervescence test: 1ml of plant extract was mixed with 1ml sodium bicarbonate solution giving the appearance of effervescence.

Test for resins:

- Turbidity Test: 10ml of extract mixed with 20ml 4% HCL gives turbidity.

2.5 GC-MS (gas chromatography and mass spectroscopy):

To identify the presence of active constituents and the chemical composition of *A. catechu* root extract was analyzed gas chromatography and mass spectroscopy GC-MS by using module Agilent 8890 and the compounds were validated using the NIST database version.

2.6 FT-IR ATR (Fourier transform infrared spectra-Attenuated total reflection):

Attenuated total reflection is a sampling technique used in conjugation with infrared spectroscopy, which enables samples to be examined directly in the solid or liquid state. ATR uses a property of total reflection resulting in an evanescent wave. Fourier transform infrared was used to identify the characteristic functional groups in the extract. It provides information about the structure of a molecule that could frequently be obtained from its absorption spectrum. The mixture was placed in a sample cup of a diffuse reflectance accessory. The IR spectrum was obtained by using BRUKER RFS27 MultiRAM FT Raman Spectrometer.

Results: Crude extract of *A. catechu*:

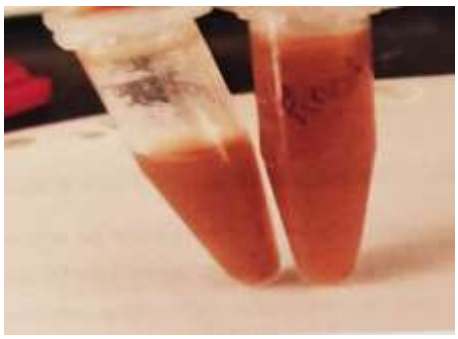


fig. 2.8 crude extract from *A. catechu* root

The hydro extract of the *A. catechu* root extract appeared as a brownish slurry as shown in 2.8

3.1 Soxhlet extraction:

The final volume of methanol extract obtained was 157ml. The methanol extract obtained was brown (fig 2.9) solvent. The extract is used for phytochemical analysis GC-MS and FT-IR analysis and analysis of the antimicrobial activity by using Bacterial and Fungal microorganisms.

fig. 2.9 methanol soxhlet extract

Table 1:

Sl. No	Solvent used	Temperature set	Literature value
01.	methanol	54°C	64.7°C

3.2 QUALITATIVE ANALYSIS OF PHYTOCHEMICALS:

The extracted compounds can be readily used for the analysis to identify both the Qualitative and Quantitative analysis. Qualitative analysis was conducted to identify the secondary metabolites, functional groups, and other elements of the secondary metabolites. It is also considered the primary test to analyze the phytochemical compounds present in the root extract of *A. catechu*. A qualitative analysis was performed to identify the presence of bioactive compounds. The results have been mentioned in Table. The tests were performed with the methanolic extracts of *A. catechu* root. The details of phytochemical tests are presented in Table 2.

Table2:

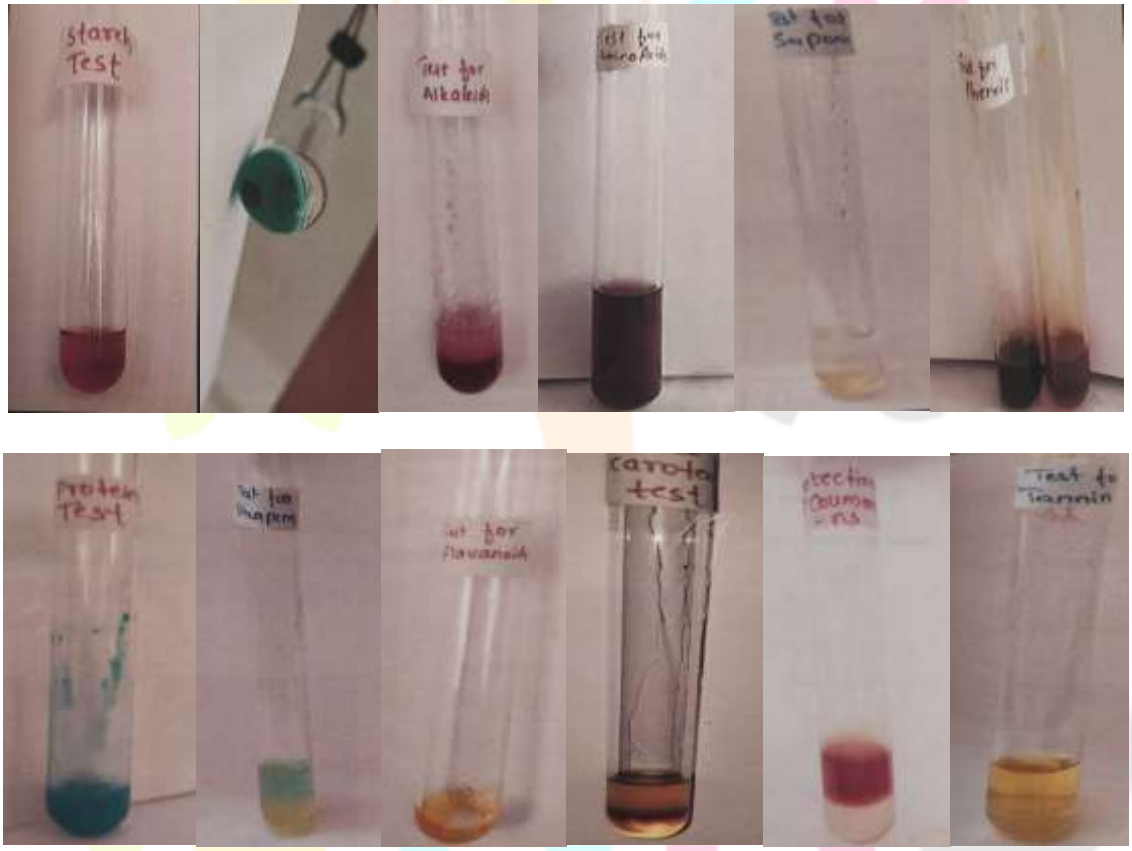
SL.NO	Test	Methanol
1	Test for Alkaloids:	
	Iodine	+
2	Test for Carbohydrates:	
	Borfoed's test	+
3	Test for Glycosides and cardiac glycosides	
	Aqueous NaOH test	+
4	Test for proteins	
	Millon's test	+
5	Test for aminoacids	
	Ninhydrin test	+
6	Test for Flavonoids	
	Ammonia test	+
7	Test for Phenolic compounds	
	Potassium dichromate test	+
8	Test for tannins	
	Braymer's test	-
9	Test for Phytosterols	
	Acetic anhydride test	-
10	Test for terpenoids	
	Conc. H_2SO_4	-
11	Test for diterpens	
	Copper acetate test	+
12	Test for Coumarins	
	NaOH test	-
13	Test for Saponins	

	Foam test	+
14	Test for lignin	
	Labat test	-
15	Test for Quninones	
	Conc. HCl test	-
16	Test for anthocyanins	
	HCl test	-
17	Test for Carboxylic acid	
	Effervescence test	+
18	Test for resins	
	Turbidity test	-

Phytochemical analysis from the *A. catechu* root methanol extract was performed by different phytochemical tests. The test showed positive results for Alkaloids, Carbohydrates, Glycosides, and cardiac glycosides, Amino acids, Flavonoids, Phenolic compounds, Diterpenes, Carboxylic acids.

Phytochemical analysis of *A. catechu* root methanol shows negative results like Phlobatannins, lignin, quinones, Tannins, Phytosterols, terpenoids, anthocyanins, coumarins, and Resins.

Phytochemical test results:



3.3 Antimicrobial activity of *A. catechu* root crude extract by using distilled water as a solvent was performed and only in the disc diffusion method one zone of inhibition was observed about a very fine zone (C) disc for 500µg/ml concentration in the fig3.2 against the microorganism *Staphylococcus aureus*.

fig 3.1 control NA plate root extract fig 3.2 antimicrobial activity in NA

Maceration:

Fig 3.3 Disc Diffusion Method fig 3.4 Control NA plate fig 3.5 Well Diffusion Method

The maceration process was performed for *A. catechu* root extraction and the extract was used for the antimicrobial assay both disc diffusion as well, diffusion methods there were Positive results, showing the Zone of inhibition. In Fig 3.3 the disc diffusion method of NA plates shows the 4mm(B), and 6mm(C) zone of inhibition for 800µg/ml against the *Staphylococcus aureus* as a test organism. Fig 3.5 shows the well diffusion method and zone of inhibition observed. 4mm(B), and 6mm(D) zones were observed for 200µg/ml, and 400µg/ml concentration against the test organism *S. aureus*.

Soxhlet extraction:

Antimicrobial activity was performed from the *A. catechu* root Methanolic extract by using Staphylococcus aureus as the test organism in the nutrient agar (NA) medium plates. The agar disc diffusion method was performed using the sterile discs and shows the zone of inhibition of 6mm (D), 8mm(E), and 12mm(B),16mm(D) for the concentration of 1000µg/ml which was shown in the fig. 3.6 and the control amoxicillin antibiotic is used. Agar well diffusion also shows the Zone of inhibition of 6mm(C), 12mm(D), and 14mm(B) for the concentration of 600, 800, and 1000 µg/ml, as is shown in Fig 3.7

fig 3.6 disc diffusion method NA fig 3.7 well diffusion method fig 3.8 disc method of SDA plate

Antifungal activity was performed from the A. catechu root Methanolic extract by using the *A. niger* as the test organism in the sabouraud dextrose agar (SDA) medium plates. Agar disc diffusion methods show the zone of inhibition of 6mm(A), 8mm(C), and 12mm(B)for the concentration of 1000µg/ml, and controlled use is Flucanzole as shown in Fig 3.8.

3.4 GC-MS Analysis

GC-MS (Gas chromatography- Mass spectroscopy) analysis was carried out to investigate the Phytoconstituents present in the *A. catechu* methanol extract. GC-MS analysis is a combined technique that is used to identify different substances within the sample. It works on the separation of individual compounds by Gas Chromatography according to their Retention Time, separated compounds are further analyzed at a molecular level by Mass Spectroscopy. The GC-MS analysis of our sample revealed the presence of three Phytoconstituents they are H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, Arecoline, and Quinic acid. The details of chromatography are shown below.

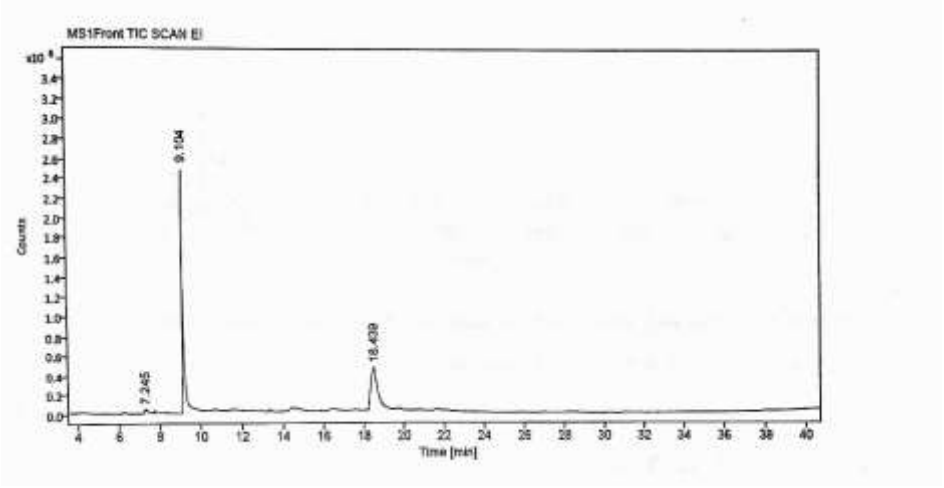


fig: gas chromatography of *A. catechu* root extract.

The GC-MS analysis of the A. catechu root extract shows different compounds:

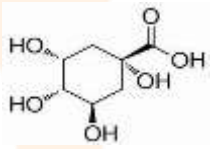
1. 4H-Pyaran-4one,2,3-dihydro-3,5-dihydroxy-6-methyl- (Retention time of: 7.244 minutes).

2. Arecoline (Retention time: 9.107 minutes).

3. Quinic Acid (Retention time18.440 minutes).

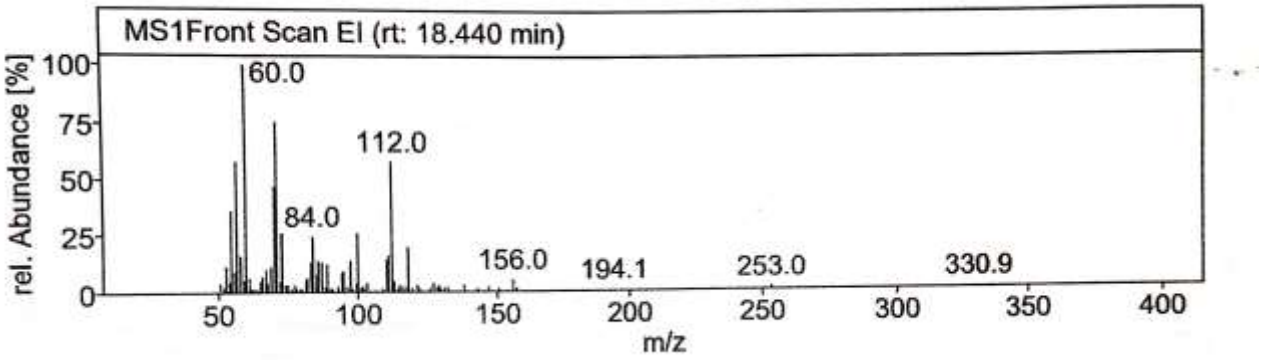
The therapeutic value of Phytoconstituents obtained from the GC-MS Analysis:

1.Quinic acid:



Chemical formula: $C_7H_{12}O_6$

SAIF-IIT, MADRAS-GCMS REPORT

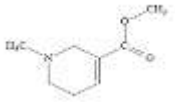


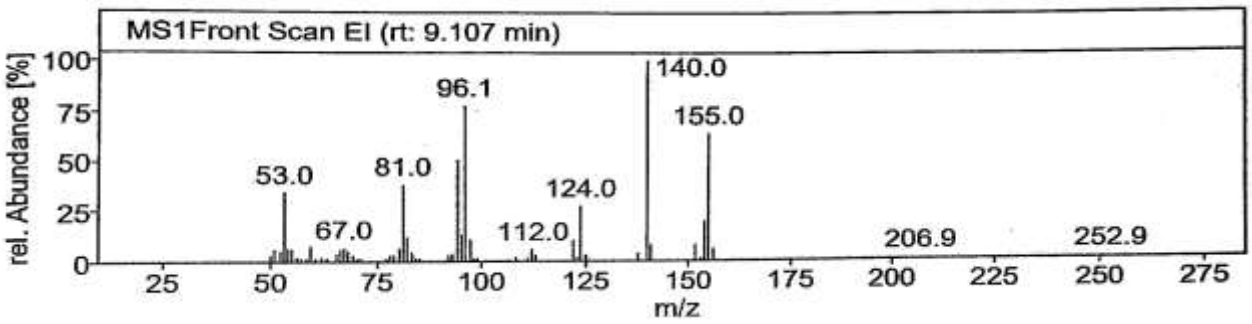
1. Quinic acid inhibits the TNF-alpha-Stimulated indication of vascular cell adhesion molecule by inhibiting the MAP kinase and NF-kb signaling pathways, Which may explain the ability of Qunic acid to inhibit vascular inflammation such as Atherosclerosis. It is the building block of Oseltamivir which is used to treat influenza A and B.

2. Quinic acid nutritionally supports the synthesis of tryptophan and nicotinamide in the gastrointestinal (GI) tract, and this, in turn, leads to DNA repair enhancement and NF-kB inhibition via increased nicotinamide and tryptophan production. (Ronald W. Pero, Harald Lund *et.al.*,2008)

2. Arecoline:

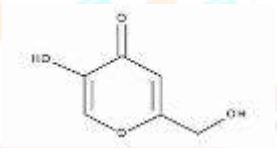
Chemical Formula: $C_8H_{13}NO_2$



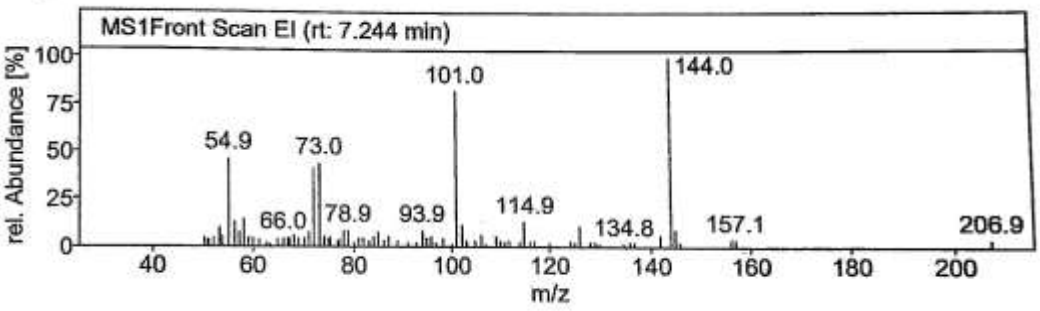


- The Pharmacology, toxicology, and Potential applications of arecoline(a review Yu-Jie Liu)
- Arecoline was reported to have wide Pharmacological activities including effects on the nervous, cardiovascular, endocrine, and digestive systems, and anti-parasitic effects, etc. the main toxic effects of arecoline are oral submucous fibrosis(OSF), oral squamous cell carcinoma (OSCC) and genotoxicity.

3. 4H-Pyran-4-one-2,4-dihydro-3,5—dihydroxy-6-methyl-



Chemical formula: $C_6H_8O_4$



- It affects autonomic neuro-transmission, blood pressure, body activity, and anti-proliferative and pro-apoptotic effects.
- It is usually formed in the Maillard reaction and it contributes to the antioxidant properties of the Maillard reaction intermediate.

3.5 FT-IR analysis:

FT-IR spectroscopic studies were conducted to investigate the information regarding the functional groups in the A. catechu root methanol extract. The representative spectral results show that functional groups enumerated peaks shown in the table and below figure which were decoded later using the standard Fourier-Transform Infrared microscopy chart. The compounds identified based on the peaks belong to the wavelength 3336.17 cm^{-1} to 1032 cm^{-1} and are shown in the table. The strong absorption peaks found are 3336.17, 2923.89, 1600.89, 1392.08, 1274.41, and 1058.53 for the O-H acid group, C-H alkane group, C=O ketone, and C-H(Alkane), C-N (Cyano), C-O*(Carbonyl). The compounds mentioned above are all made up of carbon, hydrogen, and oxygen molecules. Six prominent peaks were recorded: one is broader and the other four are medium-sized.

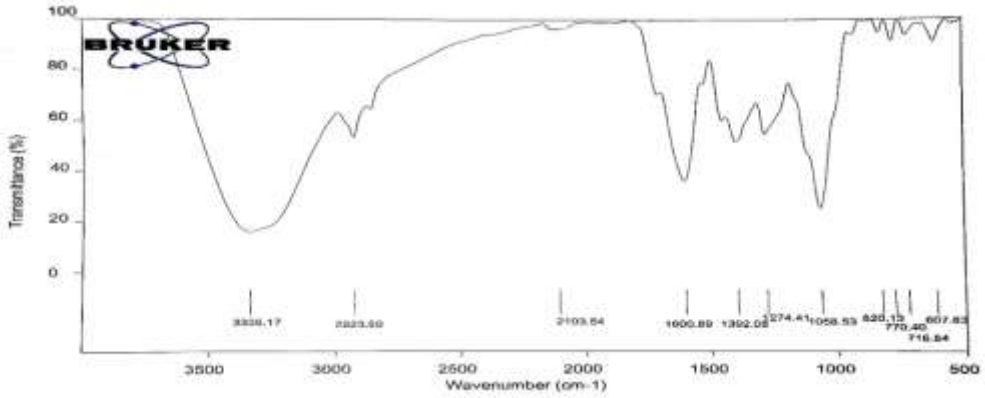


Table 3: showing ft-ir analysis of A. catechu root methanol extract

SI.No.	Peaks	Functional groups
1.	3336.17	O-H(Acid)
2.	2923.89	C-H(Alkane)
3.	1600.89	C=O(Ketone)
4.	1392.08	C-H(Alkane)
5.	1274.41	C-N(Cyano)
6.	1058.53	C-O*(Carbonyl)

Discussion:

Secondary metabolites associated with the plant *A. catechu* extract with bioactive compounds have wide applications. These bioactive compounds are secondary metabolites, which are useful for medicinal purposes. In recent years, *A. catechu* has gained importance, due to its ethnomedical value and capacity to produce novel bioactive compounds, and received the attention of the scientific community. The studies performed have mainly concentrated on the root extract of the plant, very few on leaves and almost one on seeds and stem. The antibacterial properties of the A. catechu root extracts determined by the agar well-diffusion method against *S. aureus* inhibited the growth of bacteria. These extracts are now compared with root extract to identify the new bioactive compounds or new compounds to have a better understanding and relation to the medicinal mechanism of the plant. The study of GC-MS analysis from the methanolic extract of the *A. catechu* root sample revealed the presence of three phytoconstituents they are H-Pyran-4-one,2,3-dihydro-3,5-dihydroxy-6-methyl-, Arecoline and Quinic acid. Quinic acid contains high medicinal properties like anti-oxidant, and anti-inflammatory. Arecoline was reported to have wide pharmacological activities including effects on the nervous, cardiovascular, endocrine, and digestive systems, and anti-parasitic effects, etc. 4H-pyran-4-one-2,4-dihydro-3,5-dihydroxy-6-methyl- these phytoconstituents contribute to the antioxidant properties of the Maillard reaction intermediate.

FT-IR spectroscopic studies were conducted to investigate the information regarding the functional groups in the *A. catechu* root methanolic extract. The compounds identified based on the peaks were belonging to the wavelength 3336.17, 2923.89, 1600.89, 1392.08, 1274.41, and 1058.53 for the O-H acid group, C-H alkane group, C=O ketone, and C-H (Alkane), C-N(Cyano), C-O (Carbonyl) respectively.

Conclusion:

Methanol extract of *A. catechu* root showed better antimicrobial and antifungal activity against *S. aureus* bacteria and *A. niger*. The preliminary phytochemical tests of Methanol extract showed the presence of Carbohydrates, Proteins, Alkaloids, Flavonoids, Polyphenols, and Amino acids GC-MS technique characterizes the presence of 4H-pyran-4-one 2,3-dihydro-3,5-dihydroxy-6-methyl, Arecoline and Quinic acid in Methanol extract. FT-IR results showed the presence of O-H(Acid) (3336.17), C-H(Alkane) (2923.89), C=O (Ketone) (1600.89), C-H(Alkane) (1392.89), C-N(Cyano) (1274.41), C-O (Carbonyl) (1058.53) functional groups.

Reference :

1. Asma'a A. Faden. 2018. Evaluation of Antibacterial Activities of Aqueous and Methanolic extracts of Areca catechu against some opportunistic oral bacteria. *Biosciences Biotechnology Research* ASIA, 15(3), P. 655-659.

2. Joy, P.P., Thomas, J., Mathew, S.,& Skaria, P.B.(1998). Medicinal plants, Kerala Agricultural University. *Aromatic and Medicinal Plants Research Station*, 4-6.

3. Madike, L. N., Takaidza, S., & Pillay, M. (2017). Preliminary phytochemical screening of crude extracts from the leaves stems, and roots of Tulbaghiaviolacea. *Int J PharmacognPhytochem Res*, 9(10), 1300-1308.

4. Masola, S. N., Mosha, R. D., & Wambura, P.N. (2009). Assessment of antimicrobial activity of crude extracts of stem and root barks from Adansonia digitata (Bombacaceae)(African baobab). *African Journal of Biotechnology*, 8(19).

5. Peng, W., Liu, Y.J., Wu, N., Sun, T., He, X.Y., Gao, Y.X., & Wu, C. J. (2015). Areca catechu L.(Arecaceae): A review of its traditional uses, botany, phytochemistry, pharmacology and toxicology. *Journal of Ethnopharmacology*, 164, 340-356.

6. Prempeh, A.B.A. (2008). Analgesic activity of crude aqueous extract of the root bark of Zanthoxylum xanthoxyloides. *Ghana Medicinal Journal*, 42(2).

7. Ronald W. Pero, Harald Laund, Tomas Leanderson.(2008). Antioxidant metabolism induced by quinic acid increased urinary excretion of tryptophan and nicotinamide. *Phytotherapy Research*. https://doi.org/10.1002/ptr.2628.

8. Sofowora, A., Ogunbodede, E., & Onayade, A. (2013). The role and place of medicinal plants in the strategies for disease prevention. *African journal of traditional, complementary, and alternative medicines*: *AJTCAM*, 10(5), 210-229. https://doi.org/10.4314/ajtcam.v10i5.2.

9. Shukla, R., Satish, V., Singh, V.K., Kumar, S., Gupta, S., & Gavani, U. (2009). Antibacterial activity of fresh leaves of Piper betlelinn. *Pharma Res*, 1,110.

10. Staples, G. W., & Bevacqua, R.F.(2006). Areca catechu (betel nut palm). *Species profiles for Pacific Island agroforestry*, 1(13), 1-9.