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THERAPEUTIC APPLICATIONS OF *ARECA CATECHU* (BETEL NUT TREE)

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Abstract: *Areca catechu*, commonly known as betel nut tree belongs to the family Arecaceae. It grows in much of the tropical Pacific, Africa and parts of East Asia. It has some beneficial parts like husk, leaves, nuts and sheath which can be used for different purpose. It contains alkaloids and tannins that have anthelmintic, antibacterial, antifungal, anti-inflammatory and antioxidant activities. The plant contains phytochemicals and phenols that have potential bioactivity against diseases in humans. Traditional use of the plant for medicinal applications has to be documented for their possible use as future medicines or drugs. The nuts and leaves of the plant have also proved to be effective in the removal of heavy metals and in bioremediation. In this article, the medical applications of the areca plant as an herbal drug and its therapeutics application have been elaborated.

Keywords: Betel tree, alkaloids, tannins, antioxidant, antihelmintic, effective herbal drug

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1) INTRODUCTION

From ancient days, *Areca catechu* (species of palm) has been used for its variety of medical and other economic benefits. The areca plant finds its application in a wide range of fields since it contains alkaloids and tannins. Areca nut has been used as a traditional intoxicating agent and slightly addictive. It is more prevalent in the South eastern regions which is cultivated on a large scale and is found naturalised in Southern China, Taiwan, India, New Guinea, Bangladesh, Maldives, Ceylon, Islands of Pacific Ocean, Cambodia, Laos, Thailand, Vietnam, Malaysia, Indonesia, and West Indies[2][5]. It is known by different names around different regions such as areca palm, areca nut palm, betel palm, Indian nut and Pinang palm. The areca palm tree is of medium size that grows straight up to a height of 20m. The diameter of its trunk ranges from 10- 15cm. For survival every living organisms exhibit certain adaptive features to defend them from predators. In that way plants produce certain chemical compounds to protect them from their predators such as insects, fungi and herbivorous mammals. In that way, areca plant contains alkaloids, flavanoids, tannins, triterpenes and steroids, fatty acids and other compounds in trace amounts. These compounds make the areca tree products find their application in pharmacology, toxicology and cancer studies. The use of areca nut and fruit extract varies among regions and areca nut has an important role in the medical formulations and used prevalently as a sialagogue (drug that promotes secretion of saliva) in the South Eastern region [1]. It is also reported that there is an increasing risk for “oral malignancy” in “only areca users” [8]. It also resulted in the precursors of oral malignancy such as leukoplakia and sub mucous fibrosis.

The application of areca plant is wide and extends as follows

- 1) Antimicrobial activity (Anti-bacterial & Anti-fungal activity)
- 2) Antioxidant activity
- 3) Wound healing
- 4) Hepatoprotective activity
- 5) Hypoglycaemic activity
- 6) Antiulcerogenic activity
- 7) Antifertility activity
- 8) Abortifacient activity
- 9) Antiimplantation activity

- 10) Antihyaluronidase activity
- 11) Anti inflammatory or Anti melanogenesis
- 12) Anti hypersensitive activity
- 13) Hypolipideamic activity
- 14) Vascular relaxation activity
- 15) Antiradical activity
- 16) Anti HIV activity
- 17) Proteasome activity
- 18) Anthelmintic activity
- 19) Insecticidal and Lavicidal activity
- 20) Corrosion Inhibition activity
- 21) Molluscicidal activity

The extracts from *Areca catechu* have also been an effective cure for the treatment of parasitic diseases, digestive function disorder and depression. Areca nuts, husks, young shoots, bud and leaves have curative abilities for diseases such as obesity, leprosy, anaemia and leukoderma [30][23]. It is also used as a TCM in the treatment of abdominal distension, dyspepsia, dysentery and constipation. Parasitic diseases and edematous diseases are also cured with the help of the extracts from areca catechu. In addition to this, the areca nut, husk and leaf sheath have been researched for their bio remedial activity of heavy metals and dye degradation capacity.

2) ANTIMICROBIAL ACTIVITY:

2.1. ANTI-BACTERIAL ACTIVITY:

Senthil Amuthan et al., concluded that the mystiric acid and oleic acids - fatty acids present in the areca nut acts against a primary cariogenic bacterium (*Streptococcus mutans*) [2]. The fatty acids show an inhibitory activity against the glucosyltransferase from *S.mutase*.

An experiment conducted to check the activity of boiled areca nut inhibited the growth of *Streptococcus mutans*, *Streptococcus sallivarius*, *Fusobacterium nucleatum*, and *Staphylococcus aureus*.

It is also stated that the pericarp of areca Linn seeds contains β -sitosterol, leukocyanidins, tannins and some lipids which exhibit antibacterial and anti-fungal activity [2].

2.2. ANTI-FUNGAL ACTIVITY:

The extract from *Areca catechu* contains three triterpenes (fernenol, arundoin and mixture of stigmasterol and β - sitosterol) and five fatty acids (Lauric acid, Myristic acid, Pentodecanoic acid, Palmitic acid, Stearic acid) and they tend to exhibit activity against the mycelial growth of *C.gleosporoides*. The three triterpenes inhibited both spore germination and germ tube elongation. This antifungal compounds have no cytotoxicity and phytotoxicity [2][17].

3) ANTI-OXIDANT ACTIVITY:

Oxidative stress induced diseases is an urgent problem around the world and its prevention requires effective solutions. The methanolic extract of *areca catechu* used as an antioxidant leading to the possibility of developing natural antioxidant material. The ethanolic extract from areca nut exhibited antioxidative property by free radical scavenging along with anti-hyaluronidase activity [1]. The hyaluronidase lowers the viscosity of hyaluronan, thereby increasing tissue permeability by catalysing the hydrolysis of hyaluronan which is a constituent of extracellular matrix. The polyphenol or phenolic compounds are the secondary metabolites that are most prevalent antioxidant phytochemicals. They exhibit antioxidant activity that has both singlet oxygen quenching activity and radical scavenging activity. Procyanidins are also reported to have free radical scavenging activity [22]. Areca nut extract also showed *invitro* inhibitory effect of "H₂O₂ induced hemolysis" [1].

4) WOUND HEALING ACTIVITY:

Areca catechu extract helped in the healing of wound in normal as well as in steroid suppressed rats. The topical *areca catechu* showed an increased rate of burn wound extraction and period of epithelisation in rats. Arecoline alkaloid polyphenol of areca nut helped to enhance the breaking strength in the incision wound model [1]. They are also used to enhance the healing of burn wound, leg ulcers and skin graft surgery.

5) SKIN AGING AND COSMETICS:

The degradation of elastase by the enzyme elastase was found to be inhibited by protection of the elastic fiber of skin in an *invitro* assay. The results of the treatment showed increase in collagen synthesis, improvement in skin hydration, skin elasticity and skin wrinkles [1]. It is also stated that *Areca catechu* has anti-ageing effect by protecting connective tissue.

6) α - GLUCOSIDASE INHIBITORY AND HYPOGLYCAEMIC ACTIVITY:

The extracts from areca nut are effective in the suppressive elevation in blood glucose after oral administration of maltose to rats and they are found to be potential for the inhibition of α -Glucosidase. The subcutaneous administration of an alkaloid fraction from areca nuts to alloxanized rabbits showed a significant hypoglycaemic activity for four to six hours. Anti-diabetic effect of *Areca catechu* flower extract in alloxan induced diabetic rats [1]. The results were positive with an increased body weight.

7) HYPOLIPIDEMIC ACTIVITY:

Areca nut extracts found to exhibit *invitro* strong inhibitory activities against pancreatic cholesterol esterase (pCEase) [30]. It lowers the absorption of dietary cholesterol and small intestinal pCEase activity.

8) ANTI-HYPERSENSITIVE ACTIVITY:

The extracts of areca nut showed *invitro* inhibitory activity on angiotension converting enzyme (ACE).

9) VASCULAR RELAXATION ACTIVITY:

Arecoline an important alkaloid present in the areca nuts helps in the relaxation of the human umbilical artery and veins rings in a concentration dependent manner. The relaxing effects of arecoline on the umbilical artery and the vein rings were endothelium dependent through the No-cGM [1].

10) ANTI-ALLERGIC ACTIVITY:

Four extracts from the nuts of *Areca Catechu* induced degranulation in mast cells in the treatment of various immediate and delayed allergic diseases [1][26][30].

11) ANTI OVULATORY AND ABORTIFACIENT EFFECTS:

Jyothi Shrestha et al., stated that the ethanolic extract of areca nuts showed antiovlatory and abortifacient effect at a dosage of 100 mg/kg to 300 mg/kg. The extract contained 15% of tannins, gallic acids, oily matter and gum. In addition to this the three main alkaloids present are arecoline (0.07%), arecaidine (1%) and guracine [7].

12) ANTI-PARASITIC ACTIVITY:

The extracts from *areca catechu* were found to be effective in the killing of parasites such as tapeworms, pinworms and lumbricus [4]. 1% decoction of areca nut effectively kills blood flukes by disrupting their nervous system.

13) MOLLUSCICIDAL ACTIVITY:

The need of bio molluscicide to replace chemical molluscicide is increasing since the bio molluscicide is less expensive, effective and environmentally acceptable. It is reported that a combination of extract from *Carica papaya* and areca nut acted as potential inhibitors for the freshwater snail and does not affect the fish *Colisa faciatus* that shares the same habitat [24]. The presence of alkaloid arecoline hydrobromide exhibited toxicity and is confirmed from the report of thin layer chromatography.

14) PLATELET AGGREGATION INHIBITORY ACTIVITY:

Senthil Amuthan et al., stated that the extracts from areca nut possess arachinidonic acid that inhibits the platelet aggregation inhibitory activity. It also exhibits acetylcholine esterase inhibitory activity [2].

15) CONCLUSION:

Areca catechu – the palm tree or betel nut tree is of economical and medical importance. Several research on various parts of that tree resulted in the disclosure of valuable properties and medical applications of the plant. The different parts of areca plant are predominantly used in traditional medical practices for curing gastrointestinal disorders. Implication of modern research method with the traditional medical practices could favour the formulation of effective medicines.

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