

Current Concepts about Areca Nut Chewing

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ABSTRACT

The habit of chewing areca is a habit of great antiquity. The word 'areca' is derived from the Malay word adakka (areca nut) or from adakeya, the Indian equivalent. Arecoline, the principal alkaloid in areca nut, acts as an agonist primarily at muscarinic acetylcholine receptors and stimulates the central and autonomic nervous system. This leads to subjective effects of increased well-being, alertness and stamina. It is known to improve concentration and relaxation, with other reported effects including lifting of mood, cariostatic property and also exerts a direct antimicrobial effect against bacteria. Arecaidine may have anxiolytic properties through inhibition of gamma-amino butyric acid (GABA) reuptake.

Despite these general effects, the adverse effects have outweighed them. Betel quid chewing is one of the major risk factors of hepatocarcinoma, oropharyngeal and esophagus cancers. Arecoline, the main areca alkaloid of the betel nut, is reported to have cytotoxic, genotoxic and mutagenic effects in various cells. It shows strong correlation to the incidence of oral submucosal fibrosis, leukoplakia and oral cancer, and has also been found to impose toxic manifestations in immune, hepatic and other defense systems of the recipient.

Keywords: Areca, Arecoline, Alertness, Stamina, Oral submucosal fibrosis, Leukoplakia, Oral cancer.

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INTRODUCTION

The habit of chewing areca is a habit of great antiquity. It has been mentioned in the Sanskrit manuscripts and used as food, medicine, social and religious purposes. The areca nut palm (areca catechu) is cultivated mainly in India, Malaysia, Polynesia, Micronesia and most places in the South Pacific Islands.¹ The current production of areca nut in the world is about 0.613 million tonnes from an area of 0.476 million hectares. India ranks first in both area (58%) and production (53%) of areca nut.²

The word 'areca' is derived from the Malay word adakka (areca nut) or from adakeya, the Indian equivalent.¹ Areca nut is the fourth most commonly used social drug, ranking after nicotine, ethanol and caffeine. Arecoline, the principal alkaloid in areca nut, acts as an agonist primarily at muscarinic acetylcholine receptors and stimulates the central and autonomic nervous system. This leads to subjective effects of increased well-being, alertness and stamina. It is known to improve concentration and relaxation, with other reported effects including lifting of mood, staving off

hunger, aphrodisiac properties and as postprandial digestant. It has also been shown to have cariostatic property. Areca nut also exerts a direct antimicrobial effect against bacteria, including *Streptococcus mutans*, *Streptococcus salivarius* and various other microorganisms in the oral cavity. This article reviews the various possible favorable effects of chewing areca nut on the oral and general health.^{3,4}

CHEMICAL CONSTITUENTS

Areca nut (areca catechu) is commonly used as an ingredient of betel quid, which also includes leaf of the creeping vine piper betel and lime with or without tobacco. Betel quid chewing has been popular, especially in many Southeastern Asian countries. Mostly, it is consumed for masticatory and psychoactive purposes.⁴ It has been proven that addiction can be induced following prolonged chewing. Areca nut contents are very complex and controversial chemical entities having variable properties. The major compounds of BQ are polyphenolic compounds, alkaloids, tannin, arecoline, arecaidine and fibers. Areca catechu is the only one of 54 areca species known to contain alkaloids. The arecaine is the active principle of the areca nut. Watery extract yields betel-nut catechu while the 'kernels' contain catechu, tannin 15%, gallic acid, oily matter (fat 14%), gum and alkaloids viz arecoline 0.07%, arecaine 1%, arecaidine and guvacoline, guvacine and choline occur in trace only. All these alkaloids are chemically related; arecoline is colorless volatile resembling nicotine.^{5,6}

Apart from betel and areca nut, the two most common terms, they are also called as: catechu palm, catechu tree, drunken tree, date tree, fasel nut, medicinal cabbage tree, penang palm and supari palm.⁷

PHARMACOLOGY OR DRUG ACTION

Fresh, uncured betel nuts are intoxicating, producing giddiness in some people. But the dried and cured nut, in which form it is mostly used, is a stimulant, astringent and febrifuge, i.e. remover of fever. Chewing the nut increases the formation of saliva. It decreases perspiration, sweetens the breath, strengthens the gums and generates a mild exhilaration giving the feeling of a good disposition. Since arecoline is readily absorbed into the body, it is not advisable to use it in a pure condition for destroying tapeworms for which purpose it is often recommended. Instead, it is better to use the powdered nut.

The nut is used medicinally in various forms, as powders (in dosage of 10-30 gm), fluid extracts (doses of 10 to

30 minims) and tinctures (1 to 2 drachms). Arecoline hydrobromide is a statutory drug in the Indian, British, German and French pharmacopoeias. Taenine is a preparation containing areca nut extract, forming a liquid medicine used in veterinary practices against tapeworms.

Arecoline, the characteristic alkaloid from the nuts, when given in a dose of 1 mg/kg body weight to rats intraperitoneally, induced slight sedation after 5 minutes. After 30 minutes, however, the rats regained their activity but took more time to reach their goal. They also showed a loss of appetite. This indicates that the alkaloid has a depressing action on the central nervous system.⁸

MEDICINAL USES

Sushruta, in the 1st century AD, wrote that 'it tends to cleanse the mouth, impart a sweet aroma to it, enhance its beauty and cleanse and strengthen the voice, tongue and teeth, the jaws and the sense organs'. Areca was touted as a medicine for digestive and dental health. It was used to facilitate bowel movements and reduce intestinal worms. Apart from its value when chewed, the nut has considerable uses in medicine too. Paan chewing with betel nut is popularly believed to prevent tooth decay.⁹

Ayurveda regards it as heavy for digestion, cooling, dry and astringent in taste. It destroys pitta and kapha, is intoxicating, a stimulant and laxative. The raw and the unripe nut is poisonous and harmful to the eyesight. The cured hard center is excellent for destroying all three doshas. In general, it can be said that the betel nut is like poison when young, purgative in the middle stage, but an elixir when fully ripe and dry. The nut should therefore be taken only in the third stage.

According to Yunani physicians, betel nut is considered digestive, contractive and diuretic, strengthening the heart and regulating menstrual flow. It is used for overcoming swollen eyes, mental confusion, chronic urinary distress and pus formation. It is also a nerve tonic and an aphrodisiac.

A gum-like exudation occurs on the bark of the fully grown trees. This is heavy, cooling, intoxicating, bitter and acid. It causes 'pitta' but destroys 'vata dosha'.

1. Gastrointestinal problems

- Powdered nuts are given in a dosage of five rattis to one masha in cases of diarrhea caused by debility at an interval of 3 to 4 hours. Such a procedure also proves beneficial for disorders in urination.
- Areca nut burnt to charcoal with catechu and 1/4th of its quantity of cinnamon makes a good tooth powder.
- The unripe nut is rubbed with milk and drunk to destroy tapeworms.
- A pinch of its powder mixed with turmeric powder and sugar will stop vomiting.

- The tendency of skin peeling off at the mouth is stopped by sprinkling the ashes of betel nut with cardamom.
- An excellent vermifuge can be prepared by rubbing approximately 4 mg of betel nut powder in 20 ml of fresh lemon juice. It is administered in a dose of 1 teaspoonful, after fasting for 12 to 14 hours, with ghee or more preferably, floating on milk.

A positive action is noticed within an hour of administration for both round and tapeworms. This is also employed for colicky pains in horses and men. In large doses (say 6 drachms to one ounce) however, it causes gripping (painful contractions), irritation and loose motions.

- One drachm of the tincture of areca in 4 ounces of water is used as a gargle against bleeding gums.

2. Eyes

- A lotion from it is sometimes used to constrict the pupils like atropine.
- Nuts are burnt, powdered fine and used as collyrium to prevent discharges and inflammations of the eyes.

3. Muscle relaxant

- An extract from tender young leaves is made for massaging the muscles and tendons of the waist, in case of aches and pains there.

4. Urinary disorders

- A decoction of betel nut and 'khair' (khadira) taken with honey cures minor urinary affections.
- A sprinkling of betel nut powder cures syphilitic ulcers.

5. Lumbago

- The juice of tender leaves is mixed with a bland oil and applied as lotion in cases of lumbago.

6. Ulcers

- In Sri Lanka, the nut is scraped and applied externally to heal ulcers.

7. Poison

- In Malaysia, the green fruit is employed as a poison in combination with opium.

8. Abortion

- The young green shoots are used to bring about abortion in early pregnancy.^{8,10-12}

GENERAL EFFECTS

Arecaidine may have anxiolytic properties through inhibition of gamma-amino butyric acid (GABA) reuptake. The preferred route of administration, chewing, leads to rapid absorption of these alkaloids through the buccal mucosa, leading to an onset of these effects within 5 minutes, lasting for about 2 to 3 hours.³ Areca tannin has been suggested as having a blood pressure regulatory effect

through its ability to inhibit the pressor response to both angiotensin I and II.¹³ Areca nut induced platelet aggregation is associated with iron-mediated reactive oxygen species production, calcium mobilization, phospholipase C activation, and TXB₂ production.

Various active constituents like procyanidins, arecatannin B1 and extracts of seed showed HIV protease inhibition activity.¹⁴

The active-oxygen scavenging activity of methanolic extract of areca catechu used in China and Japan as nourishing tonics was evaluated by electron spin resonance (ESR) technique, in order to evaluate its effectiveness for antiaging and to search for new active-oxygen scavengers from natural resources. It especially showed strong scavenging activity against superoxide anion radical.¹⁵ Various alkaloid constituents from areca nut, alkaloids in dichloromethane has antidepressant activity.¹⁶ Betel nut may cause stimulant and euphoric effects. As a result, it is sometimes used recreationally. Betel nut was once used in toothpaste to prevent cavities.

Laboratory studies suggest that betel nut may have antibacterial effects, which may reduce the development of cavities. However, other therapies to prevent tooth decay are safer, and the risks associated with betel nut likely do not outweigh the possible benefits. Areca nut is made into a dentifrice on account of its astringent properties.¹ It is considered to strengthen the gum, sweeten breath. The seed, reduced to charcoal and powdered, forms an excellent dentifrices.¹⁷

Arecoline hydrobromide, a commercial salt, is a stronger stimulant to the salivary glands than pilocarpine and a more energetic laxative than eserine.

It has also been reported that areca nut extract exerts a direct antimicrobial effect against oral bacteria, including *Streptococcus mutans*, *Streptococcus salivarius*, *Candida albicans* and *Fusiform nucleatum*. Tannic acid at concentrations varying from 1.8 to 18 mg/ml inhibited growth of *E. corrodens*, *Porphyromonas gingivalis*, *C. rectus* and *fusiform nucleatum*.³ Although little is known about the cariostatic properties of areca, it has been suggested that the betel stain, which often coats the surface of the teeth, may act as a protective varnish. In addition, chronic chewers also have marked attrition of cusps of teeth leading to loss of occlusal pits and fissures, which may reduce the risk of pit and fissure caries by eliminating potential stagnation areas. The increased production of sclerosed dentine in response to attrition may confer protection against microbial invasion. Furthermore, the process of chewing itself brings copious amounts of saliva to the mouth and in the presence of added slaked lime may increase the pH in the oral environment; this may act as a buffer against acid formed in plaque on teeth.¹⁸

The possible reasons that betel quid chewing diminishes dental caries are as follows:

1. Mechanical cleansing due to abrasive properties of betel quid chewing.
2. Increased salivary buffer capacity.
3. High pH of lime in betel quid chewing neutralizes acid formation.
4. Ion effect of calcium inhibits enamel dissolution.
5. Betel film covers the enamel preventing acid attack.
6. High fluoride content of betel quid.
7. Anticariogenic effect of etheric oils present in betel quid.¹⁹

Despite these general effects, the adverse effects have outweighed them. The Central Committee on Food Safety (CCFS) had recommended a complete ban to the Central Government of India. They wanted a complete ban on manufacture and marketing of gutka for three reasons as follows:

1. Children were getting addicted to these products in large numbers.
2. Users develop oral submucous fibrosis and oral cancer over a relatively shorter duration and die earlier compared to smokers.
3. Women prefer smokeless tobacco due to social disapproval of their smoking and therefore may be particularly vulnerable to gutka addiction.

TOXIC EFFECTS

Suppression of Immune System

The cellular level of glutathione was diminished by areca nut extract (ANE) in splenic T-cells. Collectively, these results demonstrated that ANE markedly suppressed T-cell activation and Th1 cytokine production, which was mediated, at least in part, by the induction of oxidative stress.²⁰

Oxidative Stress and Genetic Damage

Long-term exposure to sublethal doses of ANE, intracellular antioxidative activity may also be enhanced in response to increased oxidative stress and genetic damage in human keratinocytes.²¹

Hepatocarcinoma, Oropharyngeal and Esophagus Cancers

Betel quid chewing is one of the major risk factors of hepatocarcinoma, oropharyngeal and esophagus cancers. Arecoline, the main areca alkaloid of the betel nut, is reported to have cytotoxic, genotoxic and mutagenic effects in various cells. It shows strong correlation to the incidence of oral submucosal fibrosis, leukoplakia and oral cancer, and has also been found to impose toxic manifestations in immune, hepatic and other defense systems of the recipient.²²

Fibrotic Diseases

Substantial amounts of copper released from areca products induces lysyl oxidase activity upregulating collagen synthesis by fibroblasts, facilitating its crosslinking and, thereby, inhibiting its degradation. The role of copper from areca products in the pathogenesis of oral submucous fibrosis merits further investigation, particularly since it is thought to be involved in other fibrotic diseases, such as scleroderma and liver fibrosis.²³

During Pregnancy

Scientific teams from Taiwan, Malaysia and Papua New Guinea have reported that expectant mothers who chew paan (and/or other areca nut and betel leaf formulations) during pregnancy significantly increase adverse outcomes for the baby. The effects were similar to those reported for mothers who consume alcohol or tobacco during pregnancy. Incidences of lower birth weight, reduced birth length and early term were found to be significantly higher.²⁴

CONCLUSION

The use of areca nut chewing has been of centuries old. The general effects of chewing areca nut have much impact not just on the oral cavity but also on the general health of an individual. However, many a times, the deleterious effects can outweigh the general effects to a large extent when it becomes a habit. Unfortunately, the habit is becoming prominent among the younger individuals. In such cases, it is very difficult to restrict the usage, and it becomes mandatory to curb the habit as 'habits die hard'.

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