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Short Communication

Efficacy and effect of *Areca catechu* nuts

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Abstract

Areca nuts are prevalent in endorsed forms of chewing products like supari, pan and gutka in most of the South Asian countries. The teeth and oral tissues of areca nut masticators spanning school children's to older people were found to be stained extrinsically and also found to be weak and damaged in later stages. Therefore, present study examined the bioactive nature of indigenous palm tree *Areca catechu* nut crude methanol extract against common oral microbes swabbed from a healthy man and different human bacterial pathogens and fish fungal pathogens. Results showed good antibacterial activity against *Escherichia coli* (10 mm), *Staphylococcus aureus* (21 mm), *Salmonella typhi* (12 mm), *Shigella flexneri* (13 mm), *Klebsiella pneumoniae* (11 mm), and *Pseudomonas aeruginosa* (12 mm), and considerably highest inhibition zone (30 mm) against common oral microbes. Antifungal activity was only found against *Aspergillus niger* (8 mm) and *Trichoderma* spp (9 mm). Results infer that *A. catechu* nuts are a potential resource for antimicrobial agents against human bacterial pathogens and fish fungal pathogens, and are appear to be side effectors to masticators. It is important to make awareness on the efficacy and effect of supari.

Keywords: *Areca catechu*, antimicrobial activity, efficacy, effect

Introduction

Areca catechu palm trees are most abundantly found in South Asian countries. These trees have been found to use in preparing pickles, dyes, weaves, lubricants and fuel wood and as traditional medicine from leaves, buds, roots, husks, young shoots and nuts (Staples and Bevacqua, 2006) for healing skin ulcers and burn wounds (Verma et al., 2012). Several studies have indicated the multifaceted highlights of *A. catechu* as antibacterial activity against oral pathogens (Cyriac et al., 2012), antinematodal, anti-venom, taeniafuge, molluscicidal, diarrhea and urinary disorders (Jaiswal et al., 2011), antioxidant, anti-inflammatory, hepatoprotective (Pithayanukul et al., 2009), antifungal activity, insecticidal, larvicidal, anthelmintic (Anjali and Rao, 1995), treating liver disorders (Tsai et al., 1997), antidiabetic, antiallergic, antihypertensive, antidepressant, anti HIV, anticonvulsant, and antiaging activities (Amudhan et al., 2012; Anthikat and Michael, 2009). Interestingly the climbing plant *Pothos aurea* on *A. catechu* also found to show significant antimicrobial activities (Lalitha et al., 2010).

These areca nuts are the fourth most commonly used psychoactive substances in the world (IARC, 2004). The tremendous mastication of these nuts by childrens to older people from several Asian countries (Lee et al., 2011) was found to cause weakened teeth that often found with areca deposits, and stained oral tissue. So, to understand these nuts effect on common oral microbiota and against human and fish pathogenic microorganisms, the present study was carried out.

Materials and Methods

Freshly collected leaves, husk fibres and ripen nuts of *A. catechu* were collected from Brookshabad, South Andaman. Samples were washed thoroughly with distilled water to remove dirt and air dried. These were then cut into smaller pieces and blended using a blender, and mixed with methanol at 1:1 ratio (W/V) in

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separate conical flasks. These mixtures were left on shaker for continuous agitation for 24 hours, and were subsequently filtered through Whatman No.1 filter papers to remove the filtrate. Now the obtained supernatants were concentrated by Buchi rota evaporator. A final volume of 3 ml of each crude extracts were used for antimicrobial assay.

Pathogenic bacteria (*Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi*, *Shigella flexneri*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*) were inoculated in nutrient broth and incubated at 37^{0}C for 18 hrs. Overnight grown bacterial cultures and fungal pathogens (*Aspergillus niger A. flavus*, *Rhizopus* spp. and *Trichoderma* spp.) (each fungal culture was prepared by inoculating a loop culture in 10 ml of distilled water) were used for antimicrobial assay.

The pathogenic bacterial inoculums and common oral microbes (obtained from a healthy person using sterile swabs) were swabbed all over the Muller Hinton agar plates, and fungal pathogens were swabbed over the Potato dextrose agar plates. Antimicrobial assay was performed by well diffusion method (Bauer et al., 1966). Briefly, after spreading pathogenic cultures, wells were bored in the medium using 7 mm sterile cork borers. Then, 150 µl of each crude extracts of nuts, leafs and husks were loaded into the wells. After diffusion of extracts into the medium, bacterial culture plates were incubated at 37^{0}C for 24 hours, and fungal cultures were incubated at room temperature for 24 to 72 hours. Subsequently incubated plates were checked for inhibition zones and results were noted down. All assays were carried out in triplicates.

Results and Discussion

Methanol extractions of leaves, nuts and husks have showed an average inhibition zone of 8 mm (in 150 µl volume) against all the tested pathogenic microorganisms. However nut extractions deemed to show good antimicrobial activity (Table 1) against human pathogens, *E. coli* (10 mm), *S. aureus* (21 mm), *S. typhi* (12 mm), *S. flexneri* (13 mm), *K. pneumoniae* (20 mm), and *P. aeruginosa* (12 mm), and fungal pathogens, *A. niger* (8 mm) and *Trichoderma* spp. (9 mm). While, highest inhibition zone, 30 mm was observed against common oral microbes rather than pathogenic microorganisms. For fungal pathogens *A. flavus* and *Rhizopus* spp. no inhibition zones were observed.

Table 1: Inhibition zones of crude methanol extractions of *A. catechu* nuts against different pathogens.

S.No	Pathogens	Nature of microbe	Volume of crude extract tested	Zone of Inhibition in diameter
Antibacterial activity against				
1.	*E. coli*	Human pathogen	150 µl	10 mm
2.	*S. aureus*	Human pathogen	150 µl	21 mm
3.	*S. typhi*	Human pathogen	150 µl	12 mm
4.	*S. flexneri*	Human pathogen	150 µl	13 mm
5.	*K. pnuemoniae*	Human pathogen	150 µl	20 mm
6.	*P. aeruginosa*	Human pathogen	150 µl	12 mm
Antifungal activity against				
1.	*Rhizopus* spp	Fish pathogen	150 µl	-
2.	*A. niger*	Fish pathogen	150 µl	8 mm
3.	*A. flavus*	Fish pathogen	150 µl	-
4.	*Trichoderma* spp	Fish pathogen	150 µl	9 mm
Against common oral microbes				
1.	Common oral microbes (unidentified)	Non pathogens	150 µl	30 mm

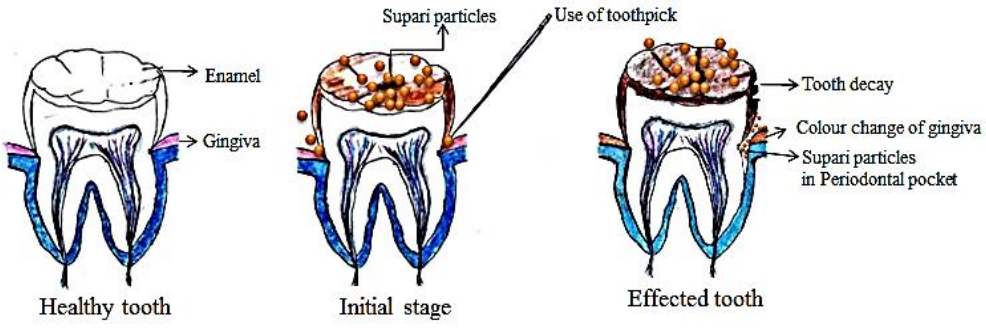

Fig 1. Depicting the effect of supari mastication on healthy tooth

and other trace elements (Sharan et al., 2012; Amudhan et al., 2012; Zhang et al., 2011). While, studies have indicated that the biological effectiveness of *A. catechu* is due to a major constituent, alkaloid arecoline (Jaiswal et al., 2011). It was also detailed that antibacterial activity of areca nuts against different microbes is due to phenolic compounds (Zhang et al., 2011) and tannin compounds (Amudhan et al., 2012). These areca nuts found to exhibit various antimicrobial properties against several pathogenic microorganisms. So, they were implicated as medicinally important plants. However, beside their medicinal importance in health problems, mastication of areca nuts was found to inhibit the pathogenic salivary microbes such as *Streptococcus mutans*, *S. salivarius*, *Fusobacterium nucleatum* and *Staphylococcus aureus* due to the presence of hydrolysable tannins in the nuts (Amudhan et al., 2012).

Beside inhibition of pathogenic bacteria, other oral resident beneficial bacteria (such as *Streptococci*, *Neisseria*, *Veillonella*, *Actinomyces*, *Veillonella*, *Simonsiella* and *Eubacterium*) that are known to prevent colonization of exogenous microbial species (Marsh, 2000) were also inhibited. This might eventually resulted in extrinsic staining of oral tissue of the masticators. The prolonged mastication of addicting nature of these nuts (Sharan et al., 2012) along with the use of toothpicks or any other small needle like structures to remove the clung supari particles cause gaps between gingiva and enamel (Fig. 1), and eventually adverse effects such as dental caries, submucous fibrosis, oral lesions, oral leukoplakia, joint arthrosis (Trivedy et al., 2002) and cancer (Sharan et al., 2012). The present study results also found areca nuts usefulness as antimicrobial activity against human and fish pathogens, and as well their effect on common oral microbes. Thus for the public health sake, preventive efforts like awareness programs, strict rules and regulations are need to be put forth to mitigate supari mastication.

Conclusion

Present study infers that *A. catechu* tree is a biologically potential source to prevent and to develop drugs against human and fish pathogens. Conversely its effect on oral microbes indicated that chewing of this plant nuts in any of the form available in market are not recommended, thus awareness programs are to be conducted on the efficacy and side effects like carcinogenicity.

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References

1. Amudhan, MS., Begum, VH. and Hebbar, KB. (2012). A review on phytochemical and pharmacological potential of *Areca catechu* L. seed. Int. J. Pharm. Sci. Res. 3: 4151-4157.
2. Anjali, S. and Rao, AR. (1995). Modulatory influence of *Areca* nut on antioxidant 2(3)-tert-butyl-4-hydroxy anisole-induced hepatic detoxification system and antioxidant defense mechanism in mice. Cancer Letters. 91:107-114.
3. Anthikat, RRN. and Michael, A. (2009). Study on areca nut for its antimicrobial properties. J.Young. Pharm. 1: 42-46.
4. Bauer, AW., Kirby, WMM., Sherris, JS. and Turk, M. (1966). Antibiotic susceptibility by standardized single disc method, American. J. Clin. Pathol. 45: 493-496.
5. Cyriac, MB., Pai, V, Varghese, I, Shantaram, M. and Jose, M. (2012). Antimicrobial properties of *Areca catechu* (Areca nut) husk extract against common oral pathogens. International J. Res. Ayur. Pharm. 3: 81-84.
6. IARC. (2004). Betel-quid and areca-nut chewing. IARC Monographs Volume. 85: 41-278.
7. Jaiswal, P., Kumar, P, Singh, VK. and Singh, DK. 2011. *Areca catechu* L.: A valuable herbal medicine against different health problems. Res. J. Med. Plant. 5: 145-152.
8. Lalitha, P., Arathi, KA, Sripathi, SK, Hemalatha, S. and Jayanthi, P. (2010). Antimicrobial activity and phytochemical screening of an ornamental foliage plant, *Pothos aurea* (Linden ex Andre). Alfa Universal, an Int. J. Chem.1: 63-71.
9. Lee, C-H, Ko, AM, Warnakulasuriya, S, Yin, BL, Sunarjo, Zain, RB, Ibrahim, SO, Liu ZW, Li, WH, Zhang, SS, Kuntoro, Utomo B, Rajapakse PS, Warusavithana SA, Razak IA, Abdullah N, Shrestha P, Kwan AL, Shieh TY, Chen MK. and Ko YC. (2011). Intercountry prevalence and practices of betel-quid use in south, southeast and eastern Asia regions and associated oral preneoplastic disorders: an international collaborative study by Asian betel-quid consortium of south and east Asia. Int. J. Cancer. 129: 1741-1751.
10. Marsh, PD. (2000). Role of the Oral Microflora in Health. J. Microb. Ecol. Health and Dis. 12: 130-137.
11. Pithayanukul, P., Nithitanakool, S. and Bavovada, R. (2009). Hepatoprotective potential of extracts from seeds of *Areca catechu* and nutgalls of *Quercus infectoria*. Molecules. 14: 4987-5000.
12. Sharan, RN., Mehrotra, R, Choudhury, Y. and Asotra, K. (2012). Association of betel nut with carcinogenesis: revisit with a clinical perspective. PLoS ONE. 7: e42759.
13. Staples, GW. and Bevacqua, RF. (2006). *Areca catechu* (betel nut palm), ver. 1.3. In: Elevitch, C.R. (ed.). Species Profiles for Pacific Island Agroforestry. Permanent Agriculture Resources (PAR), Hōlualoa, Hawai‘i.<http://www.traditional-tree.org>.

14. Trivedy, CR., Craig, G. and Warnakulasuriya, S. (2002). The oral health consequences of chewing areca nut. Addict. Biol. 7: 115 -125.
15. Tsai, CC., Kao, CT, Hsu, CT, Lin, CC. and Lin, JG. (1997). Evaluation of four prescriptions of traditional Chinese medicine: Syh-mo-yiin, guizhi-fuling-wan, shieh-qing-wan and syh-nih-sann on experimental acute liver damage in rats. J. Ethnopharmacol. 55: 213-222.
16. Verma, DK., Bharat, M, Nayak, D, Shanbhag, T, Shanbhag, V. and Rajput, RS. (2012). *Areca catechu*: Effect of topical ethanolic extract on burn wound healing in albino rats. Int. J. Pharmacol. Clin. Sci. 1: 74-78.
17. Zhang, W., Wei, J, Chen, W. and Zhang, H. (2011). The chemical composition and phenolic antioxidants of areca (*Areca catechu* L) seeds. ICABE Adva. Biomed. Eng. 1(2): 16-22.