

Short Communication

Antibacterial Potential of Cashew Apple (*Anacardium occidentale* L.) Juice Against Clinical Isolates of *Staphylococcus aureus* and *Streptococcus mutans*

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Abstract

The aim of the present study was to determine antibacterial potential of cashew apple juice against clinical isolates of *Staphylococcus aureus* and *Streptococcus mutans*. Agar well diffusion assay was employed to screen the antibacterial efficacy of the condensed cashew apple juice. Clinical isolates of *S. aureus* were more susceptible than that of *S. mutans* isolates. It is concluded that cashew apple juice contain antibacterial principles having potential to inhibit human pathogens. Further studies are under progress to isolate bioactive components and determine their antibacterial activity.

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INTRODUCTION

Cashew (*Anacardium occidentale* L.) belongs to the family Anacardiaceae and is native to Brazil. It is one of the most important plantation crops in India, Brazil, Nigeria and Vietnam. It is grown for the nuts (true fruit) having an exclusive fine taste and a commercial importance of its own. However, the edible cashew apple (the thick receptacle or 'false fruit' to which the cashew nut or true fruit is attached) has high nutritive values such as high vitamin C content, minerals such as calcium, phosphorus, iron etc. The cashew apple has found several applications in food industries and in breweries. It can be eaten as natural and also as juice, pulp, wine etc (Mohanty *et al.*, 2006; Lowor and Agyente-Badu, 2009; Marc *et al.*, 2011). The cashew apple is reported to possess several biological activities such as antimicrobial (Muroi *et al.*, 1993; Kubo *et al.*, 1999; Gonçalves and Gobbo, 2012), antioxidant (Gordon *et al.*, 2012; Daramola, 2013), antitumor (Kubo *et al.*, 1993), antimutagenic (Cavalcante *et al.*, 2005). In the present study, we investigated inhibitory effect of condensed cashew apple juice against isolates of *Streptococcus mutans* and *Staphylococcus aureus* recovered from dental caries and burn subjects respectively.

MATERIALS AND METHODS

Collection of Cashew Apples

The ripe cashew apples were collected at a place called Maragalale, Thirthahalli (Taluk), Shivamogga (district), Karnataka (State), India. The cashew apples were brought immediately to laboratory and washed well with clean water to remove extraneous matter.

Extraction of Juice

In order to obtain the juice, the cashew apples were cut into small pieces and the juice was extracted in a blender (without using water). The juice was filtered through 4-fold sterile muslin cloth. Further, the juice was condensed to 1/10th of the original volume and used for determining antibacterial activity.

Antibacterial Activity of Cashew Apple Juice

Agar well diffusion assay was employed to determine antibacterial activity of condensed cashew apple juice. A total of 8 clinical strains of bacteria which comprised of 4 isolates of *Streptococcus mutans* (recovered from dental caries subjects) and 4 isolates of *Staphylococcus aureus* (recovered previously from pus samples of burn patients) were screened for their susceptibility to

condensed cashew apple juice. The test bacteria were inoculated into sterile Nutrient broth tubes (in case of *S. aureus* isolates) and sterile Brain heart infusion broth tubes (in case of *S. mutans* isolates) and incubated overnight at 37°C. The broth cultures of *S. aureus* and *S. mutans* were then swabbed aseptically on sterile Nutrient agar plates and Brain heart infusion agar plates respectively. Well of 6mm diameter were punched in inoculated plates with the help of sterile cork borer and cashew apple juice and tetracycline (reference antibiotic) were added into respectively labeled wells. The plates were incubated at 37°C for 24 hours in upright position and the zone of inhibition was measured (Kekuda *et al.*, 2012).

RESULTS

Table 1 depicts antibacterial activity of condensed cashew apple juice against clinical isolates of *Streptococcus mutans*. All the bacterial isolates were found to be susceptible to condensed juice (zone of inhibition 1.4 to 1.7cm). Inhibition of *S. mutans* isolates was higher in case of reference antibiotic than the condensed juice.

Table 1: Inhibitory activity of cashew apple juice against *S. mutans* (Sm) isolates.

Test Bacteria	Zone of inhibition in cm	
	Cashew Apple Juice	Tetracycline
Sm-01	1.6±0.03	2.9±0.07
Sm-02	1.7±0.10	2.7±0.04
Sm-03	1.4±0.05	2.6±0.11
Sm-04	1.5±0.04	3.1±0.09

The result of inhibitory efficacy of cashew apple juice against clinical isolates of *Staphylococcus aureus* is shown in Table 2. All isolates have shown susceptibility to condensed juice (zone of inhibition ranging 2.6 to 3.6cm). Three out of four isolates of *S. aureus* were inhibited to high extent by condensed juice when compared to reference antibiotic.

Table 2: Inhibitory activity of cashew apple juice against *S. aureus* (Sa) isolates.

Test bacteria	Zone of inhibition in cm	
	Cashew Apple Juice	Tetracycline
Sa-01	3.6±0.20	3.1±0.12
Sa-02	3.5±0.09	2.7±0.17
Sa-03	2.8±0.12	2.4±0.08
Sa-04	2.6±0.15	3.3±0.22

DISCUSSION

Dental caries is an infectious, transmissible disease of oral cavity affecting people of all age group. Mutans group of *Streptococci* in particular *S.*

mutans are considered as principal agents causing the disease (Chaiya *et al.*, 2013). Various parts such as nut shell, stem bark of *A. occidentale* have shown to possess inhibitory activity against *S. mutans*. The phenolic compounds isolated from the nut shell oil of *A. occidentale* showed inhibition of *S. mutans* (Himejima and Kubo, 1991). Muroi and Kubo (1993) showed the bactericidal activity of anacardic acids from *A. occidentale* against *S. mutans*. Pereira *et al.* (2006) showed *in vitro* inhibition of clinical isolates viz., *Streptococcus mitis*, *Streptococcus mutans* and *Streptococcus sanguis* by stem extract of *A. occidentale*. Melo *et al.* (2006) showed the efficacy of stem bark extract of *A. occidentale* extract against *S. mutans*. Akinjogunla *et al.* (2012) showed the efficacy of ethanolic stem extracts of *A. occidentale* against *S. mutans* associated with dental caries. In the present study, the condensed juice of cashew apple demonstrated inhibitory activity against clinical isolates of *S. mutans* recovered previously from dental caries subjects.

S. aureus is a Gram positive opportunistic human pathogen. It is one of the most important bacteria isolated from Burn patients and is a common cause of community and hospital acquired infections involving skin infections and septicemia (Revazishvili *et al.*, 2006; Hoerle and Brandelli, 2009; Chakraborty *et al.*, 2011). Multidrug resistant strains of *S. aureus* are being reported frequently from burn patients (Beheshti and Zia, 2011; Rajput *et al.*, 2008; Chakraborty *et al.*, 2011). It has been found that *A. occidentale* possess inhibitory efficacy against *S. aureus*. Aqueous extract of leaf of *A. occidentale* showed inhibitory activity against *S. aureus* (Satish *et al.*, 2008). Jayalakshmi *et al.* (2011) found higher inhibitory activity of methanol extract of *A. occidentale* leaf than ethyl acetate. Petroleum ether and chloroform extracts were not effective. Nut shell liquid of *A. occidentale* was shown to possess inhibitory activity against Methicillin resistant *S. aureus* (Parasa *et al.*, 2011). In another study, ethanolic extract of leaf and bark of *A. occidentale* were more inhibitory against *S. aureus* than that of aqueous extract of leaf and bark (Arekemase *et al.*, 2011). In our study, the condensed juice of cashew apple was found to possess marked inhibitory activity against *S. aureus* isolates recovered from pus samples of burn subjects.

CONCLUSION

In the present work, the condensed Cashew apple juice showed antibacterial activity against the clinical isolates of *S. aureus* and *S. mutans*. The inhibition of *S. aureus* isolates was marked when compared with inhibition of *S. mutans* isolates. The cashew apple can be utilized in the development of new antibacterial agents.

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