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RESEARCH ARTICLE

PERICARP OF MANGOSTEEN CONTROLS CLINICAL MICROBES

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ABSTRACT

In the present study anti microbial activity of *Garcinia mangostana* was examined by determining the minimal inhibitory concentration (MIC) using macro dilution broth technique. The pericarp extract powder of *Garcinia mangostana* at different concentrations were tested against *Staphylococcus aureus*, *Staphylococcus albus*, *Micrococcus luteus*. *Garcinia mangostana* Linn is used as a phytomedicine for the treatment of trauma, diarrhoea and skin infections.

Key words:

Pericarp,
Garcinia,
Mangostana.

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INTRODUCTION

Nowadays attention has been paid to primitive medicinal plants and dietary factors to search for new substances with potentially effective anti-microbial activity. A large number of natural products have been evaluated as potential chemopreventive or therapeutic agents the present study was undertaken to study the anti microbial property of mangosteen pericarp. The pericarps of *G. mangostana* have been widely used as a traditional medicine for the treatment of diarrhea, skin infection and chronic wounds for many years (Mahabusarakam *et al.*, 1987). *Garcinia mangostana* Linn. commonly known as "mangosteen", is a tropical evergreen tree and is an emerging category of novel functional foods sometimes called "superfruits" presumed to have a combination of appealing subjective characteristics, such as taste, fragrance and visual qualities, nutrient richness, antioxidant strength (Primchanien Moongkarndi 2004) and potential impact for lowering risk of human diseases (José Pedraza-Chaverri *et al.*, 2008). Extract from its pericarp has been demonstrated the antimicrobial activity against a wide variety of microorganisms (Inuma *et al.*, 1996., Sundaram *et al.*, 1983., Mahabusarakam *et al.*, 1983., Mahabusarakam 1986., Suksamrarn 2003). The extracts from various parts contain varieties of secondary metabolites such as prenylated and oxygenated xanthenes.

Xanthenes or xanthen-9H-one could be isolated from peel, whole fruit, bark, and leaves of mangosteen (Sakagami 2005). Several studies have shown that xanthenes from mangosteen have remarkable biological activities such as antioxidant, antitumoral, anti-inflammatory, antiallergy, antibacterial, antifungal, and antiviral activities (Suksamrarn 2008; and Pedraza-Chaverri 2008) The subsurface chemistry of the mangosteen pericarp comprises an array of polyphenolic acids including xanthenes and tannins that assure astringency to discourage infestation by insects, fungi, plant viruses, bacteria and animal predation while the fruit is immature. Color changes and softening of the pericarp are natural processes of ripening, which indicates that the fruit can be eaten and the seeds finish developing. Among the constituents of the pericarps, xanthenes are biologically active phenols that naturally occur in a restricted group of plants Jung, *et al* (2006). The strong *in-vitro* antibacterial activity of xanthenes derivatives against both methicillin-resistant and methicillin-sensitive *S. aureus* suggested the compounds might find wide pharmaceutical use Inuma *et al* 2006.

MATERIALS AND METHODS

The fruit of mangosteen is rated one of the most delectable of the tropics and pulp gives the fruit its reputation as one of the finest and most delicious of fruits. Good fruits may attain 6-7 cm in diameter and contain 5-7 seed surrounded by a white, sweet and succulent flesh [Burkill; Quisumbing]. The fruit is a rounded berry 5 to 7 centimeters in diameter, smooth, and dark purple. The rind is firm, spongy, thick, and full of yellow, resinous juice. (Fig1)

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Table I. Pericarp extract on to the sterile discs

Volume	Concentration of extract
5µl	100µg
10 µl	200µg
15 µl	300µg
20 µl	400µg
25 µl	500µg

Table II. The inhibition zone after the incubation period

Strain	Concentration of extract				
	100 µg	200 µg	300 µg	400 µg	500 µg
Staphylococcus Aureus	12mm	15mm	16mm	18mm	22mm
Staphylococcus Albus	8mm	10mm	15mm	17mm	20mm
Micrococci	8mm	9mm	10mm	11mm	14mm

Table III. Minimal inhibitory concentrations of s. aureus, s.albus and micrococci

Strain	Concentration of extract					
	400µg / ml	200 µg / ml	100 µg / ml	50µg / ml	25µg / ml	12.5µg/ml
S. aureus	--	--	Turbidity	Turbidity	Turbidity	Turbidity
S. albus	--	--	--	--	Turbidity	Turbidity
Micrococci	--	--	--	--	Turbidity	Turbidity

Mangostin is obtained by boiling the rind in water, and tannin is removed by exhausting by boiling in alcohol and evaporating; resulting product is mangostin and resin; resin is precipitated by redissolving it in alcohol and water, and evaporating the water. It occurs in small yellow scales, tasteless neutral, insoluble in water, but readily soluble in alcohol and ether (Nadkarni and Nadkarni 1999). *G. mangostana* pericarp extract powder was obtained from Avasthagen Company, Thailand as a compliment and used for the present investigation. All other chemicals used were of analytical grade.

**Fig. 1.**

Antimicrobial activity

6 mg of the extract was mixed with 300 micro lit of DMSO so as to get a concentration of 20 micro gm in 1 micro lit of the suspension. 5ul, 10ul, 15ul, 20ul and 25ul volume of extract was loaded on to sterile discs corresponding to the concentrations. The herbal extract in different concentration was tested against *Staphylococcus aureus*, *S. albus* and *Micrococci* for antibacterial activity separately. After 24 hours incubation period the plates were observed and the inhibition-zone was recorded.

Minimal Inhibitory Concentration (MIC)

A serial 2-fold broth dilution method was performed to determine the MICs of herbal extracts against bacterial strains.

Stationary-phase cultures of all strains were prepared by inoculating fresh broth tubes and incubating at 37°C till 0.5 Mc Farlands standard was achieved. Serial 2-fold dilutions were prepared from extract stock solutions and 1.0 mL of each standardized bacterial suspension was added to an equal volume of each extract dilution. After incubation for 24 h ± 1 h at 37 ° C, turbidity of the cultures was assessed visually by comparison to uninoculated controls. The MIC was defined as the lowest concentration of extract where bacterial growth was not detected. The MICs were determined from independent triplicate assays and were based on a serial 2-fold dilution starting with the initial concentration of 400 µg / ml. The MIC for *S. aureus* 200 µg / ml and *S. albus* and *Micrococci* is 50µg/ml.

RESULTS

Results obtained in our present study revealed the anti bacterial activity of Pericarp extract of *Garcinia mangostana* against *Staphylococcus aureus*, *Staphylococcus albus*, *Micrococcus luteus* (Table - II and Table - III). Microbial susceptibility assays using the disc diffusion method and the Minimal Inhibitory Concentration (MIC) were carried out for *Staphylococcus aureus*, *Staphylococcus albus*, *Micrococcus luteus*. When tested by the disc diffusion method, the Pericarp extract of *Garcinia mangostana* showed significant activity against *Staphylococcus aureus*, *Micrococcus luteus* and *Staphylococcus albus* at 22 mm, 14mm and 20mm respectively. The anti bacterial activity of the extract was especially notable. The Minimum Inhibitory Concentration (MIC) for *Staphylococcus aureus*, is 100 µg / ml while *Micrococcus luteus* and *Staphylococcus albus* at 25 µg/ml and 12.5 µg/ml respectively.

DISCUSSION

The extract from mangosteen pericarp has been known for its broad-spectrum antibacterial activity against several Gram-positive and Gram-negative bacteria, especially those associated with skin infection, diarrhea, tuberculosis or acne

(Iinuma *et al* 1996., Sundaram *et al* 1983., Mahabusarakum *et al.*, 1983., Mahabusarakum *et al.*, 1986., Suksamrarn *et al.*, 2003., Sakagami *et al.*, 2005.). The active chemical components that are present in medicinal plants like *Garcinia mangostana* were responsible for its anti microbial activity (Priscila Ikeda Ushimaru *et al.*, 20007). Among xanthone derivatives from mangosteen extract, α -mangostin has been known to exert the most potent antimicrobial activity (Chomnawang *et al.*, 2005). Kitti Torrungruang *et al.* (2007) showed the antibacterial activity of mangosteen Pericarp extract against cariogenic *Streptococcus mutans*. Pedraza-Chaverri *et al.*, 2008 indicates that the extract from mangosteen pericarp was effective against *Staphylococcus aureus*, *Staphylococcus albus*, *Micrococcus lutus*. The strong anti bacterial activity of the extract suggests that it is a good drug of choice for which might be helpful in preventing the progress of various diseases and it can be used in alternative system of medicine, Al-Massarani *et al.* (2013).

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