

Phytochemical Analysis, Antibacterial and Antioxidant Capacity of Acetone and Methanol Pericarp Extract of Mangosteen

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ABSTRACT: *Garciniamangostana*L. (mangosteen) is tropical tree grown in Thailand, Malaysia, Indonesia and other tropical countries. Mangosteenpericarp traditionally known for treatment of abdominal pain, gonorrhea, ulcer, and leucorrhoea. *Garciniamangostana*L. has abundant source of xanthenes, flavonoids and triterpenes. These are showing important pharmacological actions. Aimed to this study evaluate the acetone and methanol extracts of *G.mangostana* pericarp for phytochemicals analysis, anti-bacterial and antioxidant activities. The antibacterial bioassay showed the highest activity. Anti-bacterial effect of mangosteen pericarp done against *Staphylococcus aureus*, *Streptococcus mutans*, *Lactobacillus acidophilus* and *Salmonella typhi*. Anti-bacterial activity against *Staphylococcus aureus* showed highest activity in methanol extract (14mm) and acetone extract (10.5mm). Radical scavenging assays of 2,2-diphenyl-1-picrylhydrazyl (DPPH), ferric ion reducing antioxidant power (FRAP) and 2'-azino-bis-3-ethyl benzthiazoline- 6-sulphonic acid (ABTS) were used for antioxidant activity. In antioxidant activities of *G. mangostana* acetone extract showed comparatively high activities against methanol extract. Acetone extract as the most potent showing IC₅₀2.45 µg/ml in DPPH, 1.52µg/ml in ABTS, and 8631.7 µM TE/g in FRAP assays. Phytochemical screening results of *Garciniamangostana*L. that showed presence of bioactive compounds may responsible for treatment of diseases.

KEYWORDS: *Garciniamangostana*L., Antioxidant, DPPH, Antibacterial.

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I. INTRODUCTION

Medicinal plants visualize numerous different pharmacological active compounds interest in the potential that may act independently, additively or in synergy to improve health. Last two decades improved scientific importance in herbs and herbal products for health care. This modify from synthetic chemical agents to plant-based products is primarily due to more frequent annoying effects seen with the former treatment. (Krishnaveni M et al., 2011) Many components of medicinal or dietary plants have been identified as possessing potential chemo-preventive properties capable of inhibiting as well as reversing the multistage process. (Surh YJ et al., 1998; Surh, YJ et al., 2003; Li YY and Martin CP, 2010) Phytochemicals that present naturally in plants provide them characteristic protection mechanism. Phytochemicals are responsible for the colour, smell, and taste found in fruits, leafs and vegetables. They are also used in the industries for production of medicines and agrochemicals. The antimicrobial characteristics of plants are probably connected to their potential to produce chemical compounds of fairly complicated structures with antimicrobial action, including flavonoids, phenol, alkaloids, tannins, isoflavanoids, saponin, coumarin, terpenoids, glycosides and organic acids. (Al-Daihan S et al., 2013; OmojateGodstime C et al., 2014)

*Garciniamangostana*L., is a universal tropical fruit named as “queen of fruit” and mostly located in Malaysia, India, Myanmar, Philippines, Sri Lanka and Thailand. It is used for treatment of many kinds of diseases such as inflammations, diarrhea and dysentery. *G.mangostana*is a rich source of xanthenes and their derivatives which are important for antioxidant, antimicrobial, cytotoxic, anti-inflammatory and anti- HIV activities which is present on pericarp, whole fruit, stem, leaves, seeds. (O. B. Balemba et al., 2010; J. Pedraza Chaverri et al., 2008; S. X. Chen et al., 1996)

Mangosteen have many bioactive compounds. The major bioactive compounds found are phenolic acids.(Zadernowski R, et al., 2008, 2005, 2002, 2009, 1987) Ten phenolic acids were identified in mangosteen fruit peel and rind. Protocatechuic acid was the major phenolic acid. (Rice-Evans et al., 1996, 1997; Lodoviciet al. 2001; Robbins, 2003 Zadernowskiet al., 2007)Mangosteen peel contains xanthenes, such as mangostin, and other phytochemicals. (Shankaranarayan D et al., 1979; Sampath PD and Vijayaraghavan K, 2007; Obolskiy D et al., 2009)

In addition, screening of phytochemicals present in a medicinal plant or fruits. Which are show beneficial effects and which are controls or cures a disease.

II. MATERIALS AND METHODOLOGY

Sample Collection and Sample Preparation

Fresh Mangosteen fruits *Garciniamangostanawere* purchased from fruit market, Hyderabad, India. The dry peel samples were mashed using mortar and pestle, macerated with methanol, and acetone (1:20) for 24 hours, then filtered using filter paper. The filtrate then macerated with the same solvent to achieve extracts of peel samples. The extracts then concentrated using rotary evaporator at 55⁰C to obtain crude extract.

Phytochemical screening

The phytochemical screening which investigated in this study such as alkaloid test, steroid / triterpenoid test, saponins test, phenolic test, flavonoid test, carbohydrates test, tannins test, anthroquinones test.

Test for Alkaloids

For the Alkaloids screening, 1 ml of the filtrate extract was mixed with 2-3 drops of Wagner's reagent (dissolved 2 g of iodine and 6 g of KI in 100 mL of water). Creamish, brownish red or orange precipitate indicated the presence of Alkaloids. (Mariita RM et al., 2011)

Test for Anthraquinones

For the Anthraquinones screening, 0.5 ml of the extract and 1 mL of H₂SO₄ was heated and filtered while it was still hot about 5 mL of chloroform was added to this filtrate and mixed. The chloroform layer was transferred into another test tube with a pipette and 1 mL of dilute ammonia was added to it. Obtained solution was checked for any change in colour.

Test for Steroid and Triterpenoid

1 ml of crude extract and 2 ml of sulphuric acid was added. Then ten drops of acetic anhydride was added to the mixture and observed the changes. The colour changed from violet to blue or green indicated the presence of steroids, the colour changed from violet to red indicated the presence of triterpenoids. (POPCiriaco, 1978)

Shinoda's test for Flavonoids

5 mL of ethanol was added to the crude extract and slightly heated. 0,1 g magnesium were added to the mixture along with a few drops of concentrated HCl. The presence of red or orange colour indicated the flavonoid. (Al-Daihan S et al., 2013)

Cardiac glycosides (Keller-Killiani test)

2 mL glacial acetic acid was mixed with 5 mL of extract and few drops of 5% aqueous ferric chloride solution. To this mixture was added 1 mL of concentrated H₂SO₄. A brown ring at the interphase shows the presence of deoxysugar characteristics of cardenolides. A violet ring may appear below the ring while in the acetic acid layer, a greenish ring may form.

Test for Phenolic

2 ml of crude extract was added few drops of ferric chloride solution. Bluish green or red colour shows the presence of phenol. (Khaleel AI et al., 2016)

Test for Tannins

1 ml of extract and few drops of 1% alcoholic ferric chloride solution was added. Presence of green or blue-green precipitate shows the presence of tannins.

Saponins

1 ml of extract mixed with 3 ml of distilled water with and shake. Formation of foam after shaking was presence of saponins.(Bhandary SK et al., 2012)

Antimicrobial Activity

The microorganisms namely *Streptococcus mutans*, *Lactobacillus acidophilus*, *Staphylococcus aureus* and *Salmonella typhi*were procured from Microbial Type Culture Collection (MTCC). Antibacterial effect was performed by agar well diffusion method using de Man, Rogosa and Sharpe (MRS) agar and Trypticase Soy

Agar-Blood Agar (TSA-BA) media. Statistical analysis were done by calculating the mean of the inhibition zones on performed microorganisms. (Sridhar TM et al., 2011)

Antioxidant activity using DPPH and FRAP

Antioxidant activities of the extracts were calculated by free radical scavenging of ABTS, DPPH and ferric ion reducing antioxidant power (FRAP) assays (K. Thaipong et al., 2006). As Standard ascorbic acid, trolox and Gallic acid were used. The scavenging capabilities of the ABTS and DPPH radicals were calculated by the following equation.

$$\% \text{ Scavenging} = [(1 - (\text{Asample}/\text{Acontrol})) \times 100]$$

The results of ABTS and DPPH inhibition were represented by IC₅₀ and μM TE/g of extract while the FRAP assay was represented as μM TE/g.

III. RESULTS

Phytochemical Screening

The qualitative screening of phytochemical compounds in methanol and acetone pericarp extract of Garciniamangostana presented in (Table 1.)

Table: 1 Phytochemical Screening of mangosteen pericarp extract.

S.N.	Phytochemical Test	Methanol Extract (ME)	Acetone Extract (AE)
1.	Alkaloids	+ve	+ve
2.	Anthraquinones	-ve	-ve
3	Triterpenoid	+ve	+ve
4	Flavonoids	+ve	+ve
5	Phenols	+ve	+ve
6	Cardiac glycosides	+ve	+ve
7	Tannins	+ve	+ve
8	Saponins	+ve	+ve

Antimicrobial Activity

Garciniamangostana pericarp extracts presented a zone of inhibition for Staphylococcus aureus, Salmonella typhi, Lactobacillus and Streptococcus mutans (Table- 2).

Table: 2 Zone of Inhibition against different Bacteria.

S.N.	Organism	Methanol Extract (ME)	Acetone Extract (AE)
1.	Streptococcus mutans	10.6mm	9mm
2.	Lactobacillus acidophilus	13.6mm	11.4mm
3.	Staphylococcus aureus	14mm	10.5mm
4.	Salmonella typhi	13mm	9.6mm

Antioxidant Assay

Antioxidant activities results (IC₅₀ and μM TE/g) were shown in Table 3. Acetone extract shown more potent antioxidant capacity as compare to methanol extract.

Table:3 DPPH, FRAP and ABTS Scavenging activity .

Extract Name	DPPH		ABTS		FRAP
	IC ₅₀	μM TE/g	IC ₅₀	μM TE/g	μM TE/g
Methanol Extract	2.71	14042.2±121.2	1.98	253.1±6.95	7495.8±89.8
Acetone Extract	2.45	17832±156.8	1.52	299.8±8.90	8631.7±98.4

The antioxidant activities in DPPH and ABTS are expressed as IC₅₀ in μg/ml and μM TE/g (at 100 μg/ml), at final dilution.

The FRAP values of extracts are expressed as μM TE/g (at 100 μg/ml).

IV. CONCLUSION

We concluded that the crude acetone and methanol extract of mangosteen pericarp shown bioactive compounds positive results such as alkaloids, flavonoids, phenol, saponins. Acetone extract showed an

effective zone of inhibition against *Staphylococcus aureus*, *Salmonella typhi*, *Lactobacillus* and *Streptococcus mutans*. *Garcinia mangostana* L pericarp had potential antioxidant properties.

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