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## Comparative Evaluation of Antimicrobial Properties of Red and Yellow Rambutan Fruit Peel Extracts

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### Authors' contributions

This work was carried out in collaboration between all authors. Author MS designed the study, wrote the protocol, and wrote the first draft of the manuscript. Authors FNAJ, NHZ, NM, NAZ, RAK and SA managed the analyses of the data. All authors read and approved the final manuscript.

Short Research Article

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### ABSTRACT

**Background and Aims:** Rambutan fruits are native to the humid tropical regions of the Peninsular Malaysia in Southeast Asia. Its antimicrobial properties are well known. There are two varieties of rambutan fruits available in Malaysian market i.e. red and yellow rambutan.

**Methodology:** In the present study, a qualitative phytochemical analysis along with antibacterial properties of methanolic extract of both the varieties of rambutan peels were carried out by disc diffusion method against *Streptococcus pyogenes*, *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*.

**Results:** The methanolic extract of yellow rambutan peels showed more potency than red rambutan peels against *Streptococcus pyogenes* and *Staphylococcus aureus* ranged from 7-10mm and 5-12mm, respectively in different concentrations. At the same time both the extracts do not showed zone of inhibition against *Escherichia coli* and *Pseudomonas aeruginosa*.

**Conclusion:** These results showed that methanolic extract of yellow rambutan peels are good candidate for further investigation against gram positive bacteria.

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**Keywords:** *Nephelium lappaceum*; red and yellow rambutan; antimicrobial.

## 1. INTRODUCTION

*Nephelium lappaceum* Linn., commonly known as rambutan which belongs to the family of Sapindaceae, is an attractive tropical fruit widely distributed in South-East Asia, especially in Malaysia and Indonesia [1]. It is a potential fruit to be commercialized since it is widely planted all over Malaysia. Rambutan has been used as traditional medicine for centuries especially as a remedy for diabetes and high blood pressure [2,3].

Rambutan contains a large variety of substances possessing antioxidant activity, such as vitamin C, vitamin E, carotenes, xanthophylls, tannins and phenolics [4]. They also exhibit a wide range of biological activities including antimicrobial, anticarcinogenic as well as antiproliferative, and many other biological activities have been attributed to their antioxidant properties [5].

Medicinal plants represent a rich source of antimicrobial agents. There is also an urgent need to search for new antimicrobial compounds with novel mechanisms of action because there has been an alarming increase in the incidence of new and re-emerging infectious diseases [6]. A numeral commercial variety of rambutan (*Nephelium lappaceum* Linn.) exists. In Malaysia, red and yellow rambutan fruits are available in the market. The fruits are ovoid, with a red or yellow pericarp covered with soft spines that vary in colouring from yellow and red. They are different in taste. However, so far there is no comparative study have been reported in rambutan varieties, though various extracts of *Nephelium lappaceum* have been reported for antibacterial activity [5,7]. Hence, in the present study, we aimed to carry out a comparative investigation of antimicrobial properties of different varieties of rambutan fruits using standard methods.

## 2. MATERIALS AND METHODS

### 2.1 Chemicals and Reagents

All the chemicals and reagents used were analytical grade.

### 2.2 Collection and Authentication of Plant Materials

The fruits of red and yellow rambutan (Fig.1, *Nephelium lappaceum* Linn.) were collected from local market, Ipoh District, Perak, Malaysia and authenticated by botanist.

### 2.3 Extraction of Red and Yellow Rambutan Peels

The peels of red and yellow rambutan were removed from the fruit and washed thoroughly in distilled water to remove contaminants; it was chopped into small pieces and dried under shade, coarsely powdered and separately subjected to extraction by maceration in double distilled methanol at room temperature with occasional shaking for seven days [8]. The macerate extracts were filtered and the filtrate was dried at low temperature (40-50°C) under vacuum. The extracts were stored in air-tight containers in a refrigerator at 4°C until further use.



Fig. 1. Red and yellow rambutan fruits (*Nephelium lappaceum* Linn)

## 2.4 Qualitative Phytochemical Analysis

Qualitative phytochemical analysis of all the extracts were carried out by using various chemical tests [9] to identify the phytoconstituents present in it

**Tests for carbohydrates:** Molisch's test, Fehling's test, Benedict's test.

**Tests for alkaloids:** Mayer's test, Dragendorff's test, Wagner's test.

**Tests for steroids and sterols:** Liebermann Burchard's and Salkowski test.

**Tests for glycosides:** Baljet's test, Borntrager's test and Keller-Kiliani test.

**Tests for saponins:** Foam test and hemolysis test.

**Test for flavonoids:** Shinoda test.

**Tests for tannins:** Lead acetate test and gelatin test.

**Test for triterpenoids:** Tin and thionyl chloride test.

**Tests for proteins and amino acids:** Biuret test and Ninhydrin.

## 2.5 Antimicrobial Screening

### 2.5.1 Test microorganisms

A panel of four common pathogenic microorganisms were used in the study, which includes gram-positive bacteria (*Streptococcus pyogenes* and *Staphylococcus aureus*), gram-negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*).

### 2.5.2 Disc-diffusion method

A suspension of the tested microorganisms was uniformly swabbed on agar. Sterile blank discs were individually impregnated with different concentration of extracts (1000, 500, 250µg/ml) and placed onto the inoculated agar plates [6]. The plates were inverted and incubated at 37°C for 24h. The antimicrobial activity was measured by measuring diameter of the resulting zone of inhibition against the tested organisms. The test for positive control (Bacitracin, penicillin, ceftriaxone and ciprofloxacin) and negative control (Methanol) were performed in duplicate.

### 3. RESULTS AND DISCUSSION

#### 3.1 Nature and Yield of the Extracts

The nature of two varieties of rambutan peels extracts and yields are mentioned in Table 1. The percentage yield of red rambutan peels extract (6.18%) was more than yellow rambutan extract (4.72%).

**Table 1. Yields and nature of methanolic extract of red and yellow rambutan peels**

Plant source	Quantity used for methanol extraction		Nature of the extracts	Yield (%)
	Powder (g)	Solvent (ml)		
Red Rambutan	50	300	Brownish semisolid	6.18
Yellow Rambutan	50	300	Yellowish semisolid	4.72

#### 3.2 Qualitative Phytochemical Analysis

Phytochemical analysis (Table 2) of crude methanolic extracts of red and yellow rambutan peels showed the presence of carbohydrates, proteins, aminoacids, steroids, flavonoids, tannins, triterpenoids and fixed oils. Both the extracts showed the presence of same constituents qualitatively and this may be different from quantitatively.

#### 3.3 Antimicrobial Activity

In the present study we have been used methanol for extraction of rambutan peels which may contain higher amount of polar and phenolic compounds. The antibacterial activity of crude methanolic extract of red and yellow rambutan peels against *Streptococcus pyogenes*, *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* were presented in Table 3. The zone of inhibition produced by the crude methanolic extract of red rambutan peels against *Streptococcus pyogenes* and *Staphylococcus aureus* were 7mm and 5-10mm, respectively in different concentrations.

The methanolic extract of yellow rambutan peels showed more potency than red rambutan peels against *Streptococcus pyogenes* and *Staphylococcus aureus* ranged from 7-10mm and 5-12mm, respectively in different concentrations. At the same time both the extracts do not showed zone of inhibition against *Escherichia coli* and *Pseudomonas aeruginosa*. However, the standards showed better activity with lower concentration when compared to both the extracts against the tested organisms.

The results indicate that the methanolic extract of red and yellow rambutan peels showed antibacterial activity toward only in gram positive (*Streptococcus pyogenes* and *Staphylococcus aureus*) not in gram negative bacteria (*Escherichia coli* and *Pseudomonas aeruginosa*). The methanolic extracts of yellow rambutan peels showed more effective result than red rambutan peels extract against gram positive bacterial strains. The highest antibacterial activity was recorded in both the extracts against *Staphylococcus aureus*.

**Table 2. Qualitative phytochemical analysis of methanolic extract of red and yellow rambutan peels**

Phytoconstituents	Methanolic extract of red rambutan peels	Methanolic extract of yellow rambutan peels
Alkaloids	-	-
Carbohydrates	+	+
Proteins	+	+
Aminoacids	+	+
Steroids and sterols	+	+
Glycosides	-	-
Flavonoids	+	+
Tannins	+	+
Triterpenoids	+	+
Fixed oils	+	+

+ Present, - Absent

**Table 3. Antimicrobial activity of methanolic extract of red and yellow rambutan peels**

S. No.	Organism used	Concentration in µg/ml						Control	Standard
		Methanolic extract of Red rambutan peels			Methanolic extract of Yellow rambutan peels				
		1000	500	250	1000	500	250		
<b>Gram positive bacteria</b>									
1	<i>Streptococcus pyogenes</i>	7 mm	-	-	10 mm	7 mm	-	-	Bacitracin (4µg/ml, 25 mm)
2	<i>Staphylococcus aureus</i>	10 mm	8 mm	5 mm	12 mm	10 mm	5 mm	-	Penicillin (10µg/ml, 28 mm)
<b>Gram negative bacteria</b>									
3	<i>Escherichia coli</i>	-	-	-	-	-	-	-	Ceftriaxone (30µg/ml, 26 mm)
4	<i>Pseudomonas aeruginosa</i>	-	-	-	-	-	-	-	Ciprofloxacin (5µg/ml, 21 mm)

- No inhibition

These findings are supported by the reported results of earlier study [3,5]. The results of this study reflect that potent phytochemicals are present in the methanolic extract of yellow rambutan peels than red rambutan peels quantitatively and not in qualitatively. The crude methanolic extract of yellow rambutan peels was biologically active when compared to red rambutan peels.

#### 4. CONCLUSION

In conclusion, the above results showed that methanolic extract of yellow rambutan peels are good candidate for further investigation against gram positive bacteria. Furthermore, the isolation of active constituents which are responsible for the activity is necessary for broad investigation.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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