

## Antibacterial activity of ten medicinal plants obtained from some selected villages in the states of Kedah and Penang, Malaysia

### Aktivitas anti bakteri dari sepuluh tanaman obat yang diperoleh dari beberapa daerah di Kedah dan Penang, Malaysia

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#### Abstract

The antimicrobial activities of ten plant extracts showed some degree of variation among Gram positive and Gram negative bacteria. Nineteen crude plant extracts were active against Gram positive bacteria as compared to only 9 against Gram negative bacteria. The most resistant bacteria was *K. pneumoniae* K6 which showed no sign of susceptibility towards any of the plant extracts. This might be due to the presence of  $\beta$ -lactamase, which had been reported recently. *S. epidermidis*\* showed susceptibility towards all plants except for *M. citrifolia* L. The highest zone of inhibition was 14.67 mm which was found in *P. guajava* extracts against *S. epidermidis* and this is closely followed by *M. indica* (at 13.67 mm) against the same bacteria. Among all the plants which have been studied only *M. citrifolia* L. extract did not show any sign of antimicrobial activity. The result showed that means of inhibition zones between each plant extract were significantly different.

**Key words:** Antibacterial; Gram positive; Gram negative; medicinal plants.

#### Abstrak

Aktivitas anti microbial dari sepuluh ekstrak tanaman memperlihatkan beberapa derajat perbedaan pada bakteri Gram positif dan Gram negatif. Sembilan belas ekstrak gobl tanaman mempunyai aktivitas terhadap bakteri Gram positif dan hanya sembilan ekstrak yang aktif terhadap bakteri Gram negatif. Bakteri yang paling resisten adalah *K. pneumoniae* K6 yang memperlihatkan tidak adanya efek oleh setiap ekstrak tanaman. Ini mungkin karena adanya  $\beta$ -lactamase, seperti yang telah dilaporkan akhir-akhir ini. *S. epidermidis*\* terlihat mudah dipengaruhi oleh seluruh ekstrak tanaman kecuali pada *M. citrifolia* L. Zona hambatan paling tinggi terhadap *S. epidermidis* adalah ekstrak *P. guajava* (14,67 mm) dan diikuti oleh *M. indica* (13,67 mm). Diantara seluruh tanaman yang telah diuji, hanya ekstrak *M. citrifolia* L. yang tidak menunjukkan aktifitas sebagai anti microbial. Hasil penelitian menunjukkan bahwa zona rata-rata hambatan diantara masing-masing ekstrak tanaman berbeda secara signifikan.

**Kata kunci :** Anti bakteri, Gram positif, Gram negative, tanaman obat.

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#### Introduction

In recent years the search for drug and dietary supplement derived from plants have greatly increased. This is because some human

pathogens are becoming more resistance towards certain type of antibiotics. Since ancient time, herbal plants have been used for curing many diseases. More than 25 % of all

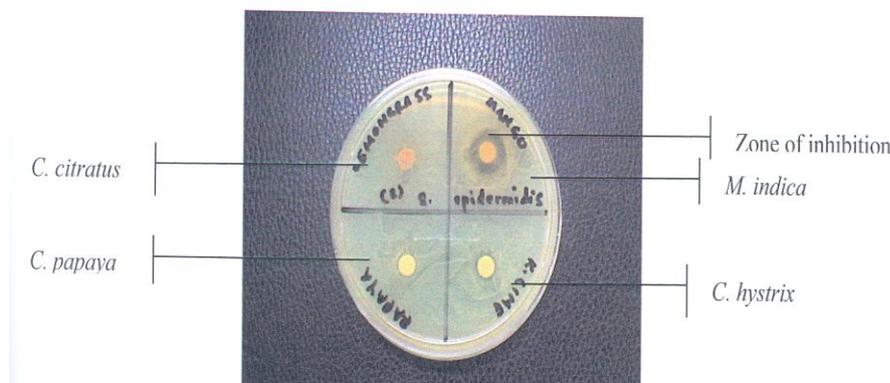


Figure 1. Antibacterial activity of plant crude extract samples against *S. epidermidis*\* on an agar plate (a) showing zone of inhibition.

medical prescriptions come from plants (Cowan, 1999). They have also been used as food preservatives, food flavouring and cosmetics (Lipp, 1996), treatment of bacterial infection (Doughari *et al.*, 2007), providing antioxidant activity (Ojokoh, 2007), controlling bad breath (Nalina and Rahim, 2007) and many other forms of uses. In developing countries many people rely on medicinal plants for their health care especially those living in isolated areas for example in certain remote districts of west and east Malaysia. The screening of medicinal plants found in these areas to study their antimicrobial activities and phytochemicals is important in understanding the therapeutic use of drug.

## Methodology

Ten medicinal plants which were obtained in some selected villages in the states of Kedah and Penang are as follow: *Psidium guajava*, *Citrus hystrix*, *Carica papaya* L., *Mangifera indica*, *Cymbopogon citratus*, *Capsicum frutescens*, *Curcuma longa*, *Zingiber officinale*, *Piper betle* L., and *Morinda citrifolia* L. These plants were identified by local residents who were very familiar with these medicinal plants in their homelands. Whereas 6 clinical isolates of bacterial species namely *Bacillus subtilis* B132, *Staphylococcus aureus* S277, *Staphylococcus epidermidis*\*, *Escherichia coli* E94, *Pseudomonas aeruginosa* P84 and *Klebsiella pneumoniae* K6 were obtained from The Institute of Medical Research Malaysia, Kuala Lumpur.

## Preparation of plant materials and extraction

All plant leaves were dried at room temperature for about 4 days before being grinded to powdery form using an electrical grinder. Samples were kept at room temperature in an airtight container until used. The extraction of plant extracts with ethanol were carried out in accordance to Basri and Fan (2005) using soxhlet apparatus for 24 h. Samples were filtered using Whatman filter paper No.1 and the filtrates were then concentrated using rotary evaporator (Buchi evaporator R-200) at 40 °C. The extracts were poured into 250 mL beakers and left frozen at -80° C. All the frozen samples were finally lyophilized for a week.

## Disc diffusion assay

Mueller Hinton agar and broth were prepared for culturing bacteria. For negative and positive control, discs impregnated with 70% DMSO and 30 µg tetracycline were used, respectively. All agar plates were incubated for 48 h at 37 °C and zone of inhibitions were measured in triplicates (mm).

## Result and Discussion

All negative controls showed no inhibition zone for all species bacteria tested.. However, when testing these bacteria against tetracycline disc, large inhibition zones were observed. The highest zone of inhibition was 14.67 mm which was found in *P. guajava* extracts inoculated with *S. epidermidis*\* and this

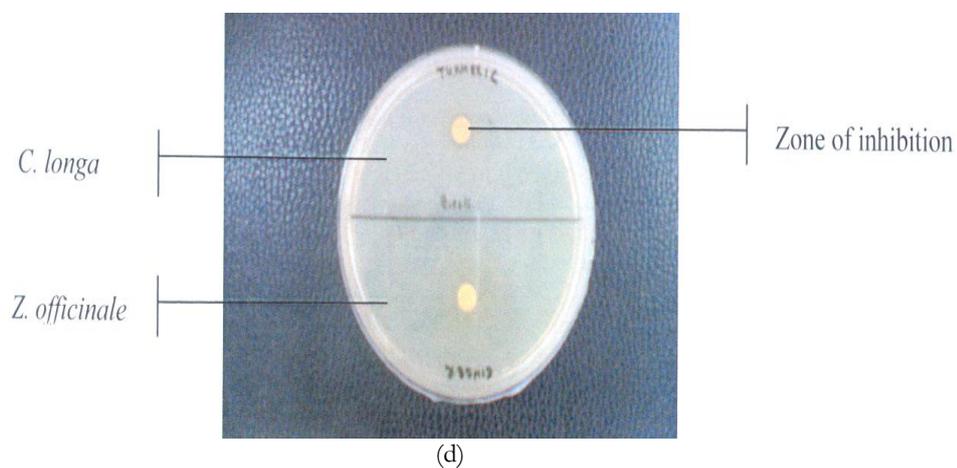
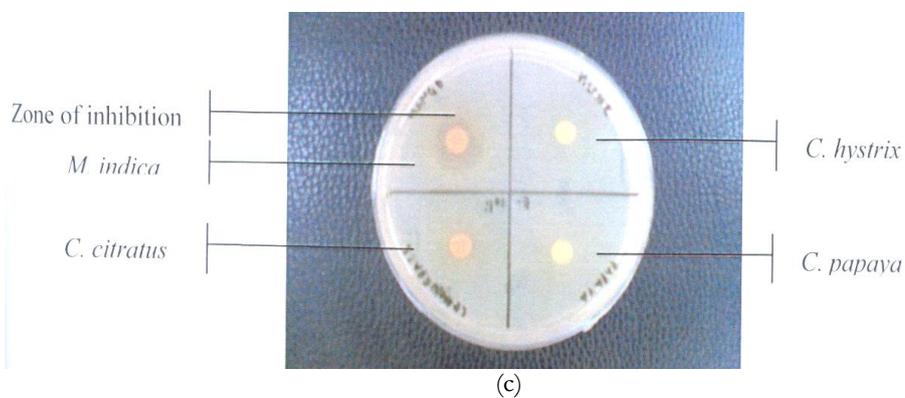
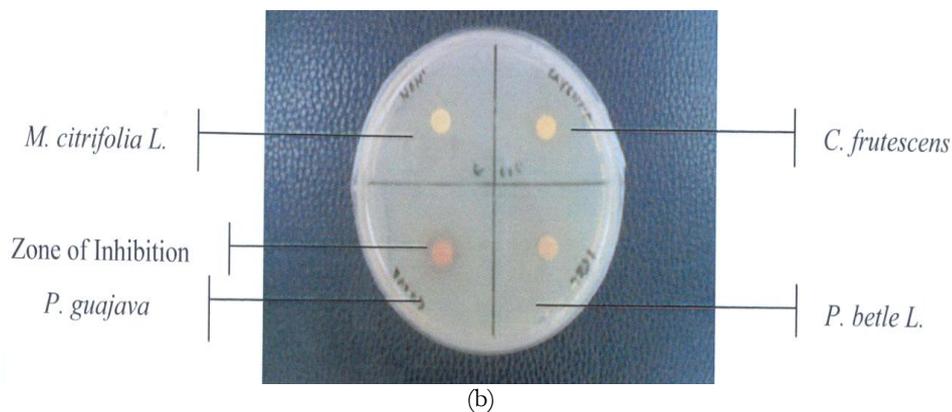


Figure 2. Antibacterial activity of various plant crude extracts against *E. coli* E94 on agar plates (b), (c) and (d) showing zones of inhibition.

was closely followed by *M. indica* (at 13.67 mm) with the same bacterial species. Among all the plants which have been studied only *M. citrifolia* L. extract did not show any sign of bacterial activity. Subsequently, the mean of inhibition

zone for each plant was calculated and analyzed statistically by analysis of variance. Significant difference between the mean of each plant was considered to exist when  $p < 0.05$ . The ANOVA shows that the mean of each plant was

Table I. Antibacterial activity in crude plant extracts against Gram positive and Gram negative bacteria.

No.	Plant	Gram positive			Gram negative			Total
		B.s	S. a	S. e	E. c	P. a	K. p	
1	<i>C. frutescens</i>			√	√			2
2	<i>P. betle L.</i>	√	√	√				3
3	<i>P. guajava</i>	√	√	√	√	√		5
4	<i>M. citrifolia L.</i>							0
5	<i>C. longa</i>	√	√	√	√			4
6	<i>Z. officinale</i>			√	√			2
7	<i>C. citratus</i>	√	√	√	√			4
8	<i>M. indica</i>	√	√	√	√	√		5
9	<i>C. papaya L.</i>			√	√			2
10	<i>C. hystrix</i>			√				1

Note:

B.s = *Bacillus subtilis* B132,

significantly different from one another for all bacteria tested except for *K. pneumoniae* K6.

## Conclusion

It was observed that Gram positive bacteria are more susceptible to the crude plant extracts than the Gram negative bacteria. Crude extracts of *P. guajava* and *M. indica* inhibited all species bacteria except *K. pneumoniae* K6. These two plants exhibited significant antibacterial activity which may be

suitable in treating infection caused by Gram positive bacteria.. Crude extracts from some of these plants may have the potency to become novel antibiotics which could help in overcoming drug resistance bacteria, hopefully.

## Acknowledgement

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