

STUDIES ON THE BIOACTIVE PROPERTIES
OF SELECTED PLANT AND FERMENTED
EXTRACTS

SARAVANA KUMAR SINNIAH

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Name of candidate: Saravana kumar Sinniah

Matric No: SGR070059

I/C: 820212-08-5039

Name of Degree: Master of Science

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extracts

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Studies on the bioactive properties of selected plant and fermented extracts

ABSTRACT

The aim of this study was to isolate protein/peptide and secondary metabolites from plant and fermented sources. The extracts were used to test for antimicrobial and antioxidant properties. In the current study protein/peptide extracts of *Allium sativum* showed promising results with a 15mm inhibition zone against *Escherichia coli*, 28mm against *Staphylococcus aureus*, 16.3mm against *Bacillus cereus* and 9mm against *Pseudomonas aeruginosa*. The minimum bacteriocidal concentration (MBC) results showed that *Allium sativum* protein/peptide extract is only bacteriostatic and not bacteriocidal. *Andrographis paniculata* showed the most promising result for the ethanolic extracts with an inhibition zone of 14mm against *B. cereus*, 11.5mm against *P. aeruginosa*, and 11mm against *S. aureus*. Ethanolic extract of *Andrographis paniculata* showed minimum inhibitory concentration (MIC) and MBC values below 10mg/ml for both *B. cereus* and *S. aureus*. This result proves that *Andrographis paniculata* extract at a concentration of 10mg/ml is both bacteriostatic and bacteriocidal. Ethanolic extract of *Cymbopogon citratus* exhibited high antioxidant properties. Toxicity studies on all four plant extracts namely *Andrographis paniculata*, *Curcuma mangga*, *Cymbopogon citratus* and *Allium sativum* did not reveal any toxic symptoms or mortality at 2500mg/kg doses. The selected plant extracts were fractionated with HPLC on a C-18 reverse phase column. The fractions collected were used for matrix-assisted laser desorption/ionization (MALDI) Time of Flight TOF/TOF analysis.

Kajian mengenai sifat-sifat bioaktif ekstrak tumbuhan dan hasil penapaian yang dipilih

ABSTRAK

Tujuan kajian ini adalah untuk mengasingkan protein/peptida dan metabolit sekunder dari tumbuhan dan sumber penapaian. Ekstrak digunakan untuk menguji sifat antimikrob dan antioksidan. Dalam kajian ini ekstrak protein/peptida dari *Allium sativum* menunjukkan keputusan yang berpotensi dengan zon perencatan terhadap *E. coli* 15mm, 28mm terhadap *S. aureus*, 16.3mm terhadap *B. cereus* dan 9mm terhadap *P. aeruginosa*. Keputusan kajian menunjukkan bahawa ekstrak *Allium sativum* hanya bakteriostatik dan tidak bakteriosidal. *Andrographis paniculata* menunjukkan keputusan yang paling berpotensi untuk ekstrak etanol dengan zon perencatan terhadap *B. cereus* 14mm, 11.5mm terhadap *P. aeruginosa*, dan 11mm terhadap *S. aureus*. Ekstrak etanol untuk *Andrographis paniculata* menunjukkan nilai-nilai MIC dan MBC di bawah 10mg/ml untuk kedua dua *B. cereus* dan *S. aureus*. Keputusan ini membuktikan bahawa ekstrak *Andrographis paniculata* pada kepekatan 10mg/ml bersifat bakteriostatik dan bakteriosidal. Ekstrak etanol *Cymbopogon citratus* menunjukkan sifat antioksidan yang tinggi. Kajian keracunan yang dijalankan pada keempat-empat ekstrak iaitu *Andrographis paniculata*, *Curcuma mangga*, *Cymbopogon citratus* dan *Allium sativum* menunjukkan tiada gejala beracun atau kematian pada dos 2500mg/kg. Ekstrak tumbuhan terpilih difraksinaskan dengan HPLC menggunakan “C-18 reverse phase column”. Hasil keputusan HPLC digunakan untuk analisis MALDI TOF / TOF.

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List of Symbols and Abbreviations

°C	:	Degree Celsius
µg/ml	:	Microgram per milliliter
mg/ml	:	Miligram per milliliter
g/mg	:	Gram/milligram
mM	:	Millimolar
%	:	Percentage
<	:	Less than
>	:	More than
g	:	Gram
µl	:	Microliter
ml	:	Milliliter
O ₂ ⁻	:	Superoxide anion
IPB	:	Isotonic phosphate buffer
PBS	:	Phosphate buffer saline
l	:	Liter
UV	:	Ultraviolet
RPM	:	Rotation per minute
OD	:	Optical Density
M	:	Male
F	:	Female
TFA	:	Trifluoroacetic acid
EDTA	:	Ethylenediaminetetraacetic acid
NaOH	:	Sodium hydroxide
KPO ₄	:	Potassium phosphate
K ₂ HPO ₄	:	Dipotassium phosphate
CFU	:	Colony forming units
ACHCA	:	α-cyano-4-hydroxycinnamic acid
TBE	:	Tris-borate-EDTA
DPPH	:	2,2-Diphenyl-1-picrylhydrazyl
BSA	:	Bovine serum albumin
DTT	:	Dithiothreitol
ACN	:	Acetonitrile
ddH ₂ O	:	Double distilled water

SOD	:	Superoxide dismutase
ROS	:	Reactive oxygen species
RNS	:	Reactive nitrogen species
MIC	:	Minimum inhibitory concentration
MBC	:	Minimum bactericidal concentration
BLAST	:	Basic local alignment search tool
ANOVA	:	One-way analysis of variance
LPS	:	Lipopolysaccharide
LTA	:	Lipoteichoic acid
LAB	:	Lactic acid bacteria
PCR	:	Polymerase chain reaction
DNA	:	Deoxyribonucleic acid
ICR mice	:	Institute of Cancer Research mice
HPLC	:	High performance liquid chromatography
RP-HPLC	:	Reversed-phase high performance liquid chromatography
MALDI	:	Matrix assisted laser desorption/ionization
TOF	:	Time of flight
NCCLS	:	National Committee on Clinical Laboratory Standards
OECD	:	Organisation for Economic Co-operation and Development
WHO	:	World Health Organisation