

Solvent Effect on the Phenolic Compounds and Biological Activity of Difference *Morinda citrifolia* Root Extract

(Kesan Pelarut pada Sebatian Fenol dan Perbezaan Aktiviti Biologi Ekstrak Akar *Morinda citrifolia*)

IDRIS ADEWALE AHMED¹, FASIHUDDIN BADRUDDIN AHMAD², GWENDOLINE CHENG LIAN EE³, SIAU HUI MAH⁴ &
NOR HISAM ZAMAKSHSHARI^{2,*}

¹Centre for Natural Products Research and Drug Discovery (CENAR), Universiti Malaya, 50603 Kuala Lumpur, Malaysia

²Department of Chemistry, Faculty of Resource Science and Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia

³Department of Chemistry, Faculty of Science, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

⁴School of Biosciences, Taylor's University, Lakeside Campus, 47500 Subang Jaya, Selangor, Malaysia

Received: 3 February 2023/Accepted: 26 July 2023

ABSTRACT

Cancer and antimicrobial resistance have become a threat to global health and development. This work aimed to identify the biological activities and phenolic compounds content of different *Morinda citrifolia* L. root extracts. The relationship between biological activities and phenolic content was also discussed. All extracts were screened for antioxidant activity using anti-oxidant assays (FRAP, DPPH, TAOC, ABTS, and BCB) and quantitative phytochemical analyses (TPC). Antimicrobial activity against four bacterial and two fungal strains as well as cytotoxic activities on stomach cancer (SNU-1), colon cancer (LS-174T and HT29), leukemia (K562), and breast cancer (MDA-MB-361) cell lines were also performed. With a value of 122.789 g of gallic acid equivalent/mg extract, the dichloromethane extract had the highest total phenolic content (TPC). The extract also showed high antioxidant activities in all the antioxidant assays and antimicrobial activity. The FRAP ($r_2 = 0.962$) as well as antimicrobial activities against *Staphylococcus aureus* ($r_2 = 0.708$), *Bacillus subtilis* ($r_2 = 0.890$) and *Pseudomonas aeruginosa* ($r_2 = 0.870$) were strongly correlated with the total phenolic content. The LS-174T, K562, HT-29, and MDA-MB-361 cytotoxic activities were also strongly correlated with the total phenolic content with $r_2 = -0.899$, -0.845 , -0.981 , and -0.978 , respectively. The results obtained suggested that the dichloromethane extract of *Morinda citrifolia* has high biological activity compared to other extracts.

Keywords: Antimicrobial; antioxidant; cytotoxic activity; *Morinda citrifolia*; root

ABSTRAK

Kanser dan perintang antibiotik telah menjadi ancaman kepada kesihatan manusia dan pembangunan global. Penyelidikan ini dilakukan adalah bertujuan untuk mengenal pasti aktiviti biologi dan kuantiti kandungan sebatian fenol pada ekstrak akar kayu *Morinda citrifolia* L. yang berbeza. Hubungan antara aktiviti biologi dan kandungan fenol turut dibincangkan dalam kajian ini. Kesemua ekstrak akan disaring untuk aktiviti anti-oksidan menggunakan asai anti-oksidan (FRAP, DPPH, TAOC, ABTS dan BCB) dan analisis fitokimia kuantitatif (TPC). Penyaringan aktiviti antimikrob terhadap empat strain bakteria dan dua strain kulat serta aktiviti sitotoksik pada sel kanser perut (SNU-1), sel kanser kolon (LS-174T dan HT29), leukemia (K562) dan karsinoma payudara (MDA-MB-361) juga turut di jalankan. Ekstrak diklorometana menunjukkan jumlah kandungan fenol (TPC) yang tinggi iaitu 122.789 g asid galik setara/ekstrak mg. Ekstrak diklorometana juga menunjukkan aktiviti antioksidan yang tinggi dalam semua asai antioksidan dan juga perencatan antimikrob aktiviti yang tinggi. Jumlah kandungan fenol menunjukkan korelasi yang tinggi dengan FRAP ($r_2 = 0.962$) serta aktiviti antimikrob terhadap *Staphylococcus aureus* ($r_2 = 0.708$), *Bacillus subtilis* ($r_2 = 0.890$) dan *Pseudomonas aeruginosa* ($r_2 = 0.870$). Aktiviti sitotoksik, LS-174T ($r_2 = -0.899$), K562 ($r_2 = -0.845$), HT-29 ($r_2 = -0.981$) dan MDA-MB-361 ($r_2 = -0.978$) juga menunjukkan korelasi yang tinggi dengan jumlah kandungan fenol. Hasil uji kaji yang diperolehi menunjukkan ekstrak diklorometana *Morinda citrifolia* mempunyai aktiviti biologi yang tinggi berbanding dengan ekstrak lain.

Kata kunci: Akar kayu; antimikrob; anti-oksidan; *Morinda citrifolia*; sitotoksik