

ABSTRACT

EXPLORATION OF ANTIBACTERIAL ACTIVITY AND ITS CORRELATION WITH TOTAL FLAVONOID AND TOTAL PHENOLIC CONTENT IN THE COMBINATION OF COCOA LEAVES (*Theobroma cacao* L.) AND BILIMBI LEAVES (*Averrhoa bilimbi* L.) EXTRACTS AGAINST *Staphylococcus aureus*

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Background: *Staphylococcus aureus* is a commonly encountered pathogenic bacterium that can cause infections and develop resistance to antibiotics. The combination of cocoa (*Theobroma cacao* L.) leaf extract and bilimbi (*Averrhoa bilimbi* L.) leaf extract is known to contain flavonoids and phenolic compounds with potential antibacterial activity.

Objective: To evaluate the antibacterial activity of a combination of cocoa leaf and bilimbi leaf extracts against *Staphylococcus aureus* and to determine its relationship with total flavonoid and total phenolic contents.

Methods: This experimental study used three extract combination ratios (1:1, 1:3, and 3:1) prepared using the Ultrasound-Assisted Extraction (UAE) method. Antibacterial activity was assessed using the disc diffusion method, while total flavonoid and total phenolic contents were analyzed spectrophotometrically. The relationship between antibacterial activity and bioactive compound levels was analyzed using *Pearson* correlation.

Results: The inhibition zones obtained were 4.83 mm (weak) for the 1:1 ratio, 5.093 mm (moderate) for the 1:3 ratio, and 6.05 mm (moderate) for the 3:1 ratio. Correlation analysis showed no significant relationship between antibacterial activity and total flavonoid content ($p = 0.452$) or total phenolic content ($p = 0.770$).

Conclusion: The combination of cocoa leaf and bilimbi leaf extracts exhibited weak to moderate antibacterial activity against *S. aureus*. Total flavonoid and total phenolic contents were not significantly associated with the inhibition zone.

Keywords: Antibacterial, *Staphylococcus aureus*, flavonoids, phenolics, cocoa leaf, bilimbi leaf.

ABSTRAK

EKSPLORASI AKTIVITAS ANTIBAKTERI DAN HUBUNGANNYA DENGAN KADAR TOTAL FLAVONOID SERTA TOTAL FENOLIK PADA KOMBINASI EKSTRAK DAUN KAKAO (*Theobroma cacao* L.) DAN DAUN BELIMBING WULUH (*Averrhoa bilimbi* L.) TERHADAP *Staphylococcus aureus*

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Latar Belakang: *Staphylococcus aureus* merupakan bakteri penyebab infeksi yang lazim ditemukan dan mampu menimbulkan resistensi antibiotik. Kombinasi ekstrak daun kakao dan daun belimbing wuluh diketahui mengandung flavonoid dan fenolik yang berpotensi sebagai antibakteri.

Tujuan: Menilai aktivitas antibakteri kombinasi ekstrak daun kakao dan daun belimbing wuluh terhadap *S. aureus* serta hubungannya dengan kadar total flavonoid dan total fenolik.

Metode: Penelitian eksperimental menggunakan tiga perbandingan kombinasi ekstrak (1:1, 1:3, dan 3:1) dengan metode *Ultrasound-Assisted Extraction* (UAE). Aktivitas antibakteri diuji dengan metode difusi cakram, sedangkan kadar total flavonoid dan fenolik dianalisis secara spektrofotometri. Hubungan dianalisis menggunakan uji korelasi *Pearson*.

Hasil: Zona hambat yang dihasilkan yaitu 4,83 mm (lemah) pada rasio 1:1, 5,093 mm (sedang) pada 1:3, dan 6,05 mm (sedang) pada 3:1. Hasil korelasi menunjukkan tidak terdapat hubungan signifikan antara aktivitas antibakteri dengan kadar total flavonoid ($p=0,452$) maupun total fenolik ($p=0,770$).

Simpulan: Kombinasi ekstrak daun kakao dan belimbing wuluh menunjukkan aktivitas antibakteri lemah hingga sedang terhadap *S. aureus*. Kadar total flavonoid dan fenolik tidak berhubungan signifikan dengan zona hambat.

Kata Kunci: Antibakteri, *Staphylococcus aureus*, flavonoid, fenolik, daun kakao, daun belimbing wuluh.