

ABSTRAK

Andicka Dwi Buana Putra. 2026. Analisis Perbedaan Kandungan Metabolit Sekunder pada Bunga Telang (*Clitoria ternatea* L.) dari Tiga Lokasi Tumbuh Berbeda di Jawa. Skripsi. Program Studi Farmasi, Fakultas Ilmu Kesehatan dan Sains, Universitas PGRI Madiun. Pembimbing (I) apt. Weka Sidha Bhagawan, M.Farm., (II) Dr. apt. Vevi Maritha, M.Farm.

Bunga telang (*Clitoria ternatea* L.) dikenal sebagai tanaman herbal yang mengandung beragam senyawa metabolit sekunder, antara lain flavonoid, antosianin, alkaloid, serta senyawa fenolik yang berpotensi memberikan berbagai aktivitas biologis. Variasi kondisi lingkungan pada lokasi tumbuh diperkirakan berpengaruh terhadap proses biosintesis metabolit sehingga dapat menyebabkan perbedaan komposisi metabolit antarwilayah. Penelitian ini bertujuan untuk mengkaji perbedaan profil metabolit sekunder bunga telang yang berasal dari Jawa Timur, Jawa Tengah, dan Jawa Barat menggunakan pendekatan metabolomik **untargeted**. Penelitian ini menggunakan metode deskriptif dengan pendekatan kualitatif. Profil metabolit dianalisis menggunakan instrumen UPLC-QTOF-MS/MS, kemudian data hasil analisis diproses melalui perangkat lunak MetaboAnalyst menggunakan metode Principal Component Analysis (PCA), Heatmap, Hierarchical Cluster Analysis (HCA), dan Partial Least Squares Discriminant Analysis (PLS-DA) untuk mengevaluasi pola perbedaan metabolit berdasarkan lokasi tumbuh. Hasil penelitian menunjukkan bahwa bunga telang dari ketiga wilayah memiliki karakteristik profil metabolit yang berbeda. Sebanyak 69 senyawa berhasil diidentifikasi secara putatif, yang terdiri atas 36 metabolit sekunder, 16 metabolit primer, 12 senyawa hasil *putative identification* yang belum dapat dipastikan identitasnya, serta 5 senyawa sintetik. Analisis kemometrik melalui PCA, Heatmap, HCA, dan PLS-DA memperlihatkan adanya pengelompokan sampel sesuai asal geografis sekaligus mengidentifikasi senyawa-senyawa yang berkontribusi dalam membedakan masing-masing kelompok. Variasi profil metabolit tersebut diduga berkaitan dengan perbedaan karakteristik lingkungan pada setiap lokasi tumbuh.

Kata kunci: *Clitoria ternatea* L., bunga telang, metabolit sekunder, metabolomik, UPLC-QTOF-MS/MS, PCA.

ABSTRACT

Andicka Dwi Buana Putra. 2026. Analysis of Differences in Secondary Metabolite Contents of Butterfly Pea Flower (Clitoria ternatea L.) from Three Different Growing Locations in Indonesia. Undergraduate Thesis. Pharmacy Study Program, Faculty of Health Sciences and Science, Universitas PGRI Madiun. Advisors: (I) apt. Weka Sidha Bhagawan, M.Farm., (II) Dr. apt. Vevi Maritha, M.Farm.

Clitoria ternatea L. is a medicinal plant known to contain a wide range of secondary metabolites, including flavonoids, anthocyanins, alkaloids, and phenolic compounds, which exhibit various biological activities. Differences in environmental conditions across growing locations are presumed to influence the biosynthesis of these metabolites, resulting in variations in their metabolite profiles. Therefore, this study aimed to investigate the differences in the secondary metabolite profiles of Clitoria ternatea L. flowers collected from East Java, Central Java, and West Java using an untargeted metabolomics approach. This study employed a qualitative descriptive research design. Metabolite profiling was performed using Ultra-Performance Liquid Chromatography–Quadrupole Time-of-Flight Tandem Mass Spectrometry (UPLC-QTOF-MS/MS). The acquired data were subsequently processed using MetaboAnalyst and analyzed through Principal Component Analysis (PCA), Heatmap, Hierarchical Cluster Analysis (HCA), and Partial Least Squares Discriminant Analysis (PLS-DA) to evaluate differences in metabolite profiles among the three growing locations. The results demonstrated distinct secondary metabolite profiles among Clitoria ternatea L. flowers collected from the three regions. A total of 69 compounds were putatively identified, consisting of 36 secondary metabolites, 16 primary metabolites, 12 compounds classified as putative identifications with unconfirmed identities, and 5 synthetic compounds. Chemometric analyses using PCA, Heatmap, HCA, and PLS-DA revealed clear clustering of samples according to their geographical origin and identified the metabolites contributing to the discrimination among groups. These differences are presumed to be associated with variations in environmental characteristics at each growing location.

Keywords: *Clitoria ternatea L., butterfly pea, secondary metabolites, metabolomics, UPLC-QTOF-MS/MS, PCA.*