

## ABSTRAK

### ANALISIS METABOLOMIK VARIETAS TEBU (*Saccharum Officinarum* L.) TERKAIT KETAHANAN TERHADAP PENYAKIT BUSUK MERAH

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Penyakit busuk merah pada tebu disebabkan *Colletotrichum falcatum* menghambat produksi tebu. Penyakit ini mengakibatkan penurunan kandungan nira batang tebu sampai 75% dan kehilangan hasil sampai 10%. Penelitian ini bertujuan untuk membandingkan profil metabolit sekunder varietas tebu tahan dan varietas peka terhadap penyakit busuk merah. Pendekatan kromatografi gas-spektrometri massa (GC-MS) digunakan untuk mengidentifikasi perbedaan metabolit pada varietas tebu peka dan tahan terhadap busuk merah. Dua varietas tebu dengan ketahanan berbeda, GMP5 (tahan busuk merah) dan GMP 7 (rentan busuk merah), diprofilkan metabolitnya. Data profil metabolit dianalisis menggunakan statistik multivariat, yaitu *partial least square-discriminat analysis* (PLS-DA) dan *Hierarchical cluster analysis*. Analisis dilakukan menggunakan *metaboanalyst* 6.0. Analisis GC-MS berhasil mengidentifikasi 74 senyawa metabolit berbeda dengan 20 senyawa yang sama terdapat pada keduanya. Metabolit sekunder tebu Varietas GMP 5 didominasi oleh senyawa golongan alkaloid dan *fatty acid*, sedangkan metabolit sekunder tebu Varietas GMP 7 didominasi oleh senyawa golongan terpenoid dan steroid. Pemisahan metabolit sekunder varietas tahan dan peka dapat dilakukan menggunakan metode PLS-DA dan untuk pengelompokannya dilakukan menggunakan metode *Hierarchical Cluster Analysis*. Hasil analisis *Variable Importance in Projection* (VIP) untuk melihat metabolit yang paling berperan dalam pembedaan antara Varietas GMP 5 dan GMP 7 didapatkan 15 metabolit dengan nilai VIP > 1.

**Kata kunci:** analisis klaster, *Colletotrichum falcatum*, GC-MS, PLS-DA, VIP skor.

## **ABSTRACT**

### **METABOLOMIC ANALYSIS OF SUGARCANE (*Saccharum Officinarum* L.) VARIETIES RELATING TO RESISTANCE TO RED ROT DISEASE**

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*Red rot disease in sugarcane, caused by the *Colletotrichum falcatum*, is a significant limiting factor for sugarcane production in various countries. This disease can lead to a reduction of up to 75% in the sugar content of cane stalks and result in yield losses of about 10%. This study aims to compare the secondary metabolite profiles between resistant and susceptible sugarcane varieties to red rot. In this research, gas chromatography-mass spectrometry (GC-MS) was employed to identify differences in metabolites related to resistance against red rot. Two sugarcane varieties with differing resistance levels were analyzed: GMP5 (resistant to red rot) and GMP7 (susceptible). The metabolite profiles were assessed using multivariate statistical methods, partial least squares discriminant analysis (PLS-DA), and hierarchical cluster analysis. The analysis was conducted using MetaboAnalyst 6.0. The GC-MS results successfully identified 74 metabolite compounds in each variety, with 20 compounds common to both. The secondary metabolites in the GMP5 variety were predominantly alkaloids and fatty acids, while the GMP7 variety was mainly characterized by terpenoids and steroid. The separation of secondary metabolites between resistant and susceptible varieties was effectively achieved using PLS-DA and clustering of these metabolites was performed through hierarchical cluster analysis. The Variable Importance in Projection (VIP) analysis revealed 15 metabolites with VIP values greater than 1 that played significant roles in distinguishing between the both of varieties.*

**Keywords:** *cluster analysis, *Colletotrichum falcatum*, GC-MS, PLS-DA, VIP score.*