

ABSTRACT

PROFILE OF METABOLITE AND ANTI-DIABETIC ACTIVITY OF COCOA (*Theobroma cacao*) EXTRACT USING LC-MS/MS

By

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Cocoa pod shell (*Theobroma cacao L.*) or commonly called Cocoa Pod Husk (CPH) is the main by-product of the cacao industry. The antidiabetic properties of CPH have been extensively studied, but studies on the identification of the active compound responsible are scarce. Information about the active compounds is very important for the quality of herbal medicinal use. The purpose of this study was to identify inhibitors of α -amylase metabolites in CPH at various solubilities through the LC-MS/MS correlation and antidiabetic activity using a metabolomics approach. In the α -amylase test on *n*-hexane, ethyl acetate, ethanol, and acetone extracts. It was found that ethanol extract ($296.47 \pm 26.98 \mu\text{g/mL}$) and acetone ($362.90 \pm 45.20 \mu\text{g/mL}$) had the most active antidiabetic bioactivity. From the results of the LC-MS/MS analysis, 225 known compounds and 94 unknown compounds were obtained. In grouping variations of cocoa extract with PCA with 110 ionic mass variables, it was found that grouping with the main component (PC) was 75%. The results of the PLS analysis showed the presence of choline compounds, *n*-methylethanolamine phosphate, Phaseollidin hydrate, 2-Amino-1,3,4-octadecanetriol, Matairesinol, Altenuene, and Amorphigenin which are thought to contribute actively to anti-diabetic bioactivity with the most contributing compound being altenuene. The altenuene compound was strengthened by the results of the OPLSDA which found that altenuene is a characteristic compound in the active extract of cocoa pod shell with a VIP value of 1.497. It can be concluded that the ethanol extract of cocoa shell has potential as an antidiabetic drug and altenuene compounds are thought to have the most active role in the antidiabetic bioactivity of cocoa shell.

Keywords: *Theobroma cacao*, metabolomic, antidiabetic, LC-MS/MS, PLS, PCA, OPLSDA

ABSTRAK

PEMPROFILAN METABOLIT DAN AKTIVITAS ANTIDIABETES EKSTRAK KULIT BUAH KAKAO (*Theobroma cacao*) MENGUNAKAN LC-MS/MS

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Kulit buah kakao (*Theobroma cacao* L.) atau biasa disebut *Cocoa Pod Husk* (CPH) merupakan hasil samping utama dari industri kakao. Sifat antidiabetes CPH telah diteliti secara ekstensif, tetapi studi tentang identifikasi senyawa aktif yang bertanggung jawab masih langka. Informasi tentang senyawa aktif sangat penting untuk kualitas penggunaan obat herbal. Tujuan dari penelitian ini adalah untuk mengidentifikasi metabolit penghambat α -amilase pada CPH dengan variasi pelarut melalui korelasi LC-MS/MS dan aktivitas antidiabetes menggunakan pendekatan metabolomik. Pada uji penghambatan terhadap ekstrak *n*-heksana, etil asetat, etanol, dan aseton terhadap enzim α -amilase. Didapatkan hasil ekstrak etanol (296.47 ± 26.98 $\mu\text{g/mL}$) dan aseton (362.90 ± 45.20 $\mu\text{g/mL}$) mempunyai bioaktivitas antidiabetes yang paling aktif. Dari hasil analisis LC-MS/MS didapatkan 225 senyawa *known* dan 94 senyawa *unknown*. Pada pengelompokan variasi ekstrak kakao dengan PCA dengan 110 variabel massa ion didapatkan pengelompokan dengan komponen utama (PC) 75%. Hasil analisis PLS menunjukkan adanya senyawa *choline*, *n-methylethanolamine phosphate*, *Phaseollidin hydrate*, *2-Amino-1,3,4-octadecanetriol*, *Matairesinol*, *Altenuene*, dan *Amorphigenin* yang diduga berkontribusi aktif pada bioaktivitas antidiabetes dengan senyawa yang paling berkontribusi yaitu *altenuene*. Senyawa *altenuene* diperkuat dengan hasil OPLSDA yang didapat bahwa *altenuene* sebagai senyawa pencari pada ekstrak aktif kulit buah kakao dengan nilai VIP 1.497. Dapat disimpulkan bahwa ekstrak etanol pada kulit kakao mempunyai potensi sebagai obat antidiabetes dan senyawa *altenuene* diduga mempunyai peran paling aktif pada bioaktivitas antidiabetes kulit kakao.

Kata kunci :*Theobroma cacao*, metabolomic, antidiabetes, LC-MS/MS, PLS, PCA, OPLSDA