Kajian Metabolomik dan Penambatan Molekuler Berbasis KCKST SM/SM Tanaman Rhinacanthus nasutus (L.) Kurz dengan Aktivitas Antioksidan dan Penghambatan Alfa-Glukosidase = Metabolomic and Moleculer Docking Studies Based on UHPLC MS/MS in Rhinacanthus nasutus (L.) Kurz Plants with Antioxidant Activity and Inhibition of Alpha-Glucosidase

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Abstrak

Research through a metabolomics approach is carried out withoutisolating a single active compound responsible for an activity. Empirically the root, stem, and leaf preparations of Rhinachantus nasutus (L.) Kurz have long been used in traditional medicine such as the treatment of diabetes, eczema, pulmonary tuberculosis, herpes, hepatitis, and hypertension. This dissertation aims to evaluate compounds that have antioxidant and antidiabetic activity through inhibition of alpha-glucosidase activity of plant R. Nasutus metabolomics and molecular tethering based liquid chromatography very high performance mass spectrometry/mass spectrometry (KCKST SM/SM). The stages of research carried out include: (1) Extraction of leaves, flowers, and bark using 70% ethanol with ultrasonic wave-assisted extraction method. (2) Fractionation of selected extracts using centrifugation partition chromatography (PPP). (3) Testing of antidiabetic activity through the mechanism of alpha-glucosidase inhibition of selected extracts and their PPP fractions in vitro. (4) Testing of antioxidant activity by 1,1-diphenyl-2-picrylhydrazil (DPPH) method; ferric reducing antioxidant power (FRAP); cupric ion reducing antioxidant capacity (CUPRAC) in vitro against extracts and PPP fractions whose alpha-glucosidase inhibitory activity is very active and/or active. (5) Determination of metabolite profiles using KCKST SM/SM Q-Orbitrap on PPP fractions whose alpha-glucosidase inhibitory activity is very active and/or active. (6) Chemometric analysis with multivariate data analysis using SIMCA software against metabolite area area data and bioactivity data. (7) Verification of compounds that contribute significantly as inhibitors of alpha-glucosidase activity resulting from metabolomics by molecular tethering. This study obtained 10 active compounds in the inhibition of alpha-glucosidase in the KPS fraction of R. nasutus, namely compounds (5) bis(2-ethylhexyl) amines, (6) choline, (7) leu gly, (8) N-methyltanolamine phosphate, (11) N-methyldioctylamine, (14) dodesiltrimethethlammonium, (15) austalida J, (17) DL--leucine, (22) cemilicoisoflavone B, and (26) licoflavone B. In addition, 6 compounds (compounds 5, 8, 11, 14, 15, and 22) contributed significantly as alpha-glucosidase inhibitors as well as very strong antioxidants with the FRAP method and 3 compounds (compounds 5, 11, and 15) with the CRAPC method.

.....In the metabolomics approach, research is done without isolating any active compounds that cause activity. Empirically, preparations of the roots, stems, and leaves of Rhinachantus nasutus (L.) Kurz have long been used in traditional medicine for such purposes as the treatment of diabetes, eczema, pulmonary tuberculosis, herpes, hepatitis, and hypertension. This dissertation aims to evaluate compounds with antioxidant and anti-diabetic activity by inhibiting the alpha-glucosidase activity of the plant R. nasutus using a metabolomics approach and molecular docking based on ultra-high performance liquid chromatography mass spectrometry/mass spectrometry (UHPL MS/MS). The stages of the research

included: (1) extraction of leaves, flowers, and stem bark using 70% ethanol using an ultrasound-assisted extraction (UAE) method. (2) Fractionation of selected extracts using centrifugation partition chromatography (CPC). (3) In vitro testing of antidiabetic activity through the mechanism of alpha-glucosidase inhibition of selected extracts and their CPC fractions. (4) Testing the antioxidant activity with the 1,1-diphenyl-2-picrylhydrazyl (DPPH) method, ferric reducing antioxidant power (FRAP), and cupric ion reducing antioxidant capacity (CUPRAC) in vitro against extracts and CPC fractions with highly active, active, or slightly active alpha-glucosidase inhibitory activity. (5) Determination of metabolite profiles using KCKST SM/SM Q-Orbitrap on CPC fractions with highly active or slightly active alpha-glucosidase inhibitory activity. (6) Chemometric analysis in the form of multivariate data analysis using SIMCA software on metabolite area data and bioactivity data. (7) Verification of compounds that contribute significantly as inhibitors of alpha-glucosidase activity in metabolomics by molecular docking.This study obtained 10 active compounds in alpha-glucosidase inhibition in the R. nasutus CPC fraction, namely compounds (5) bis(2-ethylhexyl) amine, (6) choline, (7) leugly, (8) N-methylethanolamine phosphate, (11) N-methyldioctylamine, (14) dodecyltrimethylammonium, (15) austalide J, (17) DL--Leucine, (22) semilicoisoflavone B, and (26) licoflavone B. In addition, it was also found that six compounds (compounds 5, 8, 11, 14, 15, and 22) significantly contributed as alpha-glucosidase inhibitors as well as very strong antioxidants with the FRAP method and three compounds (compounds 5, 11, and 15) with the CUPRAC method.