STUDI PENAMBATAN MOLEKUL DAN HUBUNGAN KUANTITATIF STRUKTUR AKTIVITAS TURUNAN SENYAWA EPIGALLOCATHECHIN-3-GALLATE-O-GLUKOPIRANOSIDA (EGCG-O-GLI) TERHADAP ENZIM α-GLUKOSIDASE

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ABSTRAK

Latar belakang: Teh hijau mengandung epigallocatechin-3-gallate (EGCG) yang berpotensi sebagai agen antidiabetes, namun pengembangan turunan glikosidanya masih terbatas.

Tujuan: Penelitian ini bertujuan mengembangkan turunan EGCG-O-glukopiranosida (EGCG-O-Gli) sebagai inhibitor α-glukosidase (AGI), mengevaluasi kemampuan sebagai sediaan oral melalui kaidah Lipinski, serta menentukan strategi optimasi melalui analisis Hubungan Kuantitatif Struktur Aktivitas (HKSA).

Metode: Sebanyak 29 senyawa turunan EGCG-O-Gli ditambatkan pada protein target 2QMJ, kemudian dianalisis skor CHEMPLP dan deskriptornya.

Hasil: 14 senyawa memiliki potensi inhibitor lebih baik dibandingkan acarbose, dengan Senyawa 10 sebagai kandidat utama. Senyawa ini memiliki pelanggaran Lipinski rendah serta membentuk interaksi dengan residu kunci NtMGAM (Asp327, Asp542 dan Arg526). Kajian HKSA mengindikasikan bahwa substitusi gugus gula pada OH R8 dan peningkatan ClogS berperan penting dalam peningkatan aktivitas senyawa.

Kesimpulan: EGCG-O-Gli berpotensi dikembangkan sebagai AGI dengan afinitas tinggi melebihi acarbose dan pelanggaran Lipinski yang rendah. Strategi optimasi berbasis HKSA untuk turunan EGCG-O-Gli dapat melalui modifikasi gugus fungsional direkomendasikan untuk memperkuat aktivitas senyawa sebagai kandidat obat inhibitor α-glukosidase.

Kata Kunci: *EGCG, diabetes, docking, HKSA, PLANTS, NtMGAM (N-terminal maltase-glucoamylase), α-glukosidase inhibitors (AGI)*

MOLECULAR DOCKING AND QUANTITATIVE STRUCTURE ACTIVITY RELATIONSHIP (QSAR) STUDIES OF EPIGALLOCATHECHIN-3-GALLATE-O-GLUCOPYRANOSE (EGCG-O-GLI) AS α-GLUCOSIDASE INHIBITOR

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ABSTRACT

Background: Green tea contains a potential anti-diabetic compound, epigallocathechin-3-gallate (EGCG). However, its glycoside derivates have not been widely developed.

Objective: This research aims to develop EGCG-O-glucopyrannose (EGCG-O-gli) as α-glucosidase inhibitor (AGI), evaluating its property as oral dosage form through Lipinski's rule and further determining its optimization strategy through Quantitative Structure Activity Relationship (QSAR).

Method: 29 EGCG-O-gli derivatives are docked to target protein 2QMJ and further analyze its CHEMPLP score. EGCG-O-gli descriptors are sought with the help of DataWarrior and SwissADME.

Results: Fourteen compounds exhibited stronger inhibitory potential compared to acarbose, with Compound 10 identified as the primary candidate. This compound showed minimal Lipinski's rule violations and established interactions with key NtMGAM residues (Asp327, Asp542, and Arg526). The HKSA analysis indicated that sugar group substitution at OH R8 and increased ClogS played crucial roles in enhancing compound activity.

Conclusion: EGCG-O-Gli demonstrates potential for development as an AGI with higher affinity than acarbose and low violations on Lipinski's rule. An QSAR-based optimization strategy through functional group modifications is recommended to further strengthen the compound's activity as a candidate α-glucosidase inhibitor.

Keywords: *EGCG, diabetes, docking, HKSA, PLANTS, NtMGAM (N-terminal maltase-glucoamylase), α-glucosidase inhibitors (AGI)*