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SYNTHESIS AND MECHANISM STUDY OF NEW BIVALENT β-CARBOLINE DERIVATIVES

(Kajian Sintesis dan Mekanisma Derivatif Bivalen β-karbolin Baharu)

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Abstract

This study reports simple and straightforward methods for synthesizing new bivalent β-carboline compounds using L-tryptophan as a starting material with 1,4-dibromobutane as a dimerization linker. The synthetic route began with coupling L-tryptophan with formaldehyde via Pictet-Spengler condensation to afford tetrahydro-β-carboline, **T1** as the key intermediate. The reaction proceeded with decarboxylation of **T1** using potassium dichromate with acetic acid to afford β-carboline, **T2**. Subsequent alkylation of **T2** using 1,4-dibromobutane as the linker yielded intermediate **T3**, followed by dimerization to furnish the new bivalent β-carboline, **T4**. ^{1}H and ^{13}C NMR confirmed all the synthesized compounds. In addition, this study includes the proposed mechanism for the synthesis of a new bivalent β-carboline compound.

Keywords: synthesis, bivalent β-carboline, L-Tryptophan, Pictet-Spengler condensation, dimerization

Abstrak

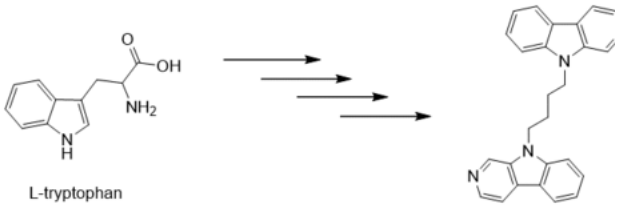
Abstract in Bahasa Malaysia/English Kajian ini melaporkan kaedah mudah dan secara terus untuk mensintesis sebatian baru bivalen β-karbolin menggunakan L-tryptofan sebagai bahan pemulaan dengan 1,4-dibromobutana sebagai penghubung dimerisasi. Laluan sintesis bermula dengan gandingan L-tryptofan dengan formaldehid melalui pemeluwapan Pictet-Spengler untuk mendapatkan tetrahidro-β-karbolin, **T1** sebagai kunci perantaraan. Tindak balas diteruskan dengan pendekarboksilan **T1** menggunakan kalium dikromat dengan asid asetik untuk menghasilkan β-karbolin, **T2**. Seterusnya alkilasi **T2** menggunakan 1,4-dibromobutana sebagai penghubung menghasilkan perantara **T3**, diikuti dengan dimerisasi untuk menghasilkan bivalen β-karbolin baharu, **T4**. Semua sebatian yang disintesis disahkan dengan ^{1}H NMR dan ^{13}C NMR. Sebagai tambahan, kajian ini merangkumi mekanisma yang dicadangkan untuk sintesis sebatian bivalen β-karbolin baharu.

Kata kunci: sintesis, bivalen β-Karbolin, L-Tryptofan, pemeluwapan Pictet-Spengler, dimerisasi

Graphical Abstract

Graphical Abstract

Synthesis of New Bivalent β-Carboline Derivatives



L-tryptophan

Bivalent β-carboline, **T4**

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