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Abdur Rashid Mia, M.^a, Uddin Ahmed, Q.^b, Ferdosh, S.^c, Bashar Mohammed Helaluddin, A.^b, Najmul Hejaz Azmi, S.^d, Ammar Al-Otaibi, F.^e, Parveen, H.^e, Mukhtar, S.^e, Ahmed, M.Z.^f, Zaidul Islam Sarker, M.^{a,g}

Anti-obesity and antihyperlipidemic effects of Phaleria macrocarpa fruit liquid CO2 extract: In vitro, in silico and in vivo approaches

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^a Department of Pharmaceutical Technology, Faculty of Pharmacy, International Islamic University Malaysia (IIUM), Pahang, Kuantan, 25200, Malaysia

^b Drug Discovery and Synthetic Chemistry Research Group, Department of Pharmaceutical Chemistry, Faculty of Pharmacy, IIUM, Pahang, Kuantan, 25200, Malaysia

^c Western Pacific Tropical Research Centre, College of Natural and Applied Sciences, University of Guam, Mangilao, GU 96923, United States

^d Applied Sciences Department, College of Applied Sciences and Pharmacy, University of Technology and Applied Sciences-Muscat, P. O. Box 74, Al-Khuwair-133, Oman

^e Department of Chemistry, Faculty of Science, University of Tabuk, Tabuk, 71491, Saudi Arabia

^f Department of Pharmacognosy, College of Pharmacy, King Saud University, Riyadh, Saudi Arabia

^g Cooperative Research, Extension, and Education Services (CREES), Northern Marianas College, P.O. Box 501250, Saipan, MP 96950, United States

Abstract

Objective: Phaleria macrocarpa fruit has been reported to be effectively used in Malaysia and neighboring countries to prevent obesity. Despite its anti-obesity potential, no research has ever predicted the compound-lipase, compound-HMG-CoA reductase interactions and in vivo investigations to further confirm its anti-obesity properties. Thus, the purpose of this study was to assess the anti-obesity and antihyperlipidemic effects of P. macrocarpa by in vitro, computational (in silico), and in vivo assays. Method: Initially, fruit was extracted through liquid CO2 and heating under reflux extraction methods to obtain liquid CO2 extracts (LCE-1 and LCE-2) and heating under reflux extract (HRE), respectively. Subsequently, all three extracts were assessed for antioxidant potentials through in vitro bioassays and FTIR analysis to identify different types of functional groups present in the existing bioactive compounds. Successively, the most active fraction (LCE-2) was subjected to GCMS analysis for the identification of lipid lowering and lipase inhibitors through molecular docking approach. Finally, anti-obesity and lipid lowering effects were further confirmed through an in vivo assay using mice. Result: LCE-2 exhibited higher DPPH (IC50 = 0.172 mg/mL) and FRAP (78.98 AAE_{mg/g}) antioxidant activities and showed more potent peaks in FTIR chromatograms than LCE-1 and HRE. Among the identified tentative bioactive compounds viz. methyl palmitate, palmitic acid, ethyl palmitate, methyl oleate, oleic acid, cis-vaccenic acid, 3-deoxyestradiol and phenol, 2,2'-methylenebis[6-(1,1-dimethylethyl)-4-methyl- were found as an anti-obesity and lipid lowering compounds whose protein-ligand interaction was confirmed by binding affinity, amino acid residues and bonding interactions. Similarly, anti-obesity and lipid lowering findings were also found in a mice model after 6 weeks treatment at a dose of 250 mg/kg b.w. Conclusion: Based on the aforementioned in vitro, in silico and in vivo findings, it is concluded that the LCE-2 possesses lipase and HMG-CoA reductase inhibitors that can assist to develop this plant's extract as an alternative safe lipid lowering herbal medicine in future. © 2023 The Author(s)

Author Keywords

Anti-obesity; CO2 extract; In silico; In vitro; In vivo; P. macrocarpa

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Correspondence Address

Uddin Ahmed Q.; Drug Discovery and Synthetic Chemistry Research Group, Pahang, Malaysia; email: quahmed@iium.edu.my

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