Abstract

Evaluating Kanchner Guggulu’s Therapeutic Potential in Polycystic Ovary Syndrome: A Comprehensive Approach with Network Pharmacology, Transcriptomics, Docking, and MD Simulation †

Subhajit Ghosh 1, Atanu Maity 2, Bratati Roy 1 and Subarna Thakur 1,∗

1 Department of Bioinformatics, University of North Bengal, Darjeeling 734013, West Bengal, India; rs_subhajitg@nbu.ac.in (S.G.); bratatiroy1999@gmail.com (B.R.)
2 Department of Bioscience and Biotechnology, Indian Institute of Technology, Kharagpur 721302, West Bengal, India; atanuchem48@gmail.com
∗ Correspondence: subarna.thakur@nbu.ac.in
† Presented at the 3rd International Electronic Conference on Biomolecules, 23–25 April 2024; Available online: https://sciforum.net/event/IECBM2024.

Keywords: kanchner guggulu; PCOS; network pharmacology; docking; MD simulation

1. Introduction

Kanchner Guggulu (KG) is a potent Ayurvedic remedy for hormonal imbalances, PCOS, ulcers, cystic swelling, and tumors. PCOS is clinically significant, impacting one in five women during their reproductive years, leading to infertility, hyperandrogenism, and metabolic issues like insulin resistance and obesity. This study aims to explore KG’s mechanism of action and investigate its potential therapeutic targets for PCOS.

2. Methodology

The formulation’s phytochemicals were screened utilizing online databases such as IMPPAT, TCMSP, and literature mining. Subsequently, an ADME analysis was performed to screen the drug potential of the phytochemicals. Targets of the active ingredients were identified using databases like Similarity Ensemble Approach (SEA) and Swiss Target Prediction (STP). A transcriptomics analysis validated therapeutic targets, followed by gene ontology, pathway enrichment analyses, and PPI network establishment. Molecular docking was performed to visualize the interactions between the active molecules and network hub genes. The top three docked complexes were subjected to 250 ns MD simulation and GBMV analysis.

3. Results

The initial database-based screening identified 643 active ingredients, with 413 remaining post ADME analysis. Initially, 171 potential targets were identified from STP and SEA, of which 55 were differentially expressed in PCOS based on the transcriptome analysis. Top enriched pathways encompassed lipid and atherosclerosis, HIF-1 signaling, estrogen signaling, insulin signaling, etc. The toxicology-based screening process efficiently narrowed down a conclusive set of 83 bioactive molecules. These molecules were then subjected to computational docking with eight targets identified as hubs in the PPI analysis. The top three docked complexes identified were retinoic acid receptor (RAR)–curcumene, estrogen receptor (ESR)–shogaol, and platelet-activating factor receptor (PTAFR)–siphonodiol. Finally, the relative stability of the docked complexes was validated using MD simulation.
4. Conclusions

Our results not only validate the clinical efficacy of KG in treating PCOS but also establish a basis for subsequent experimental investigations.

Author Contributions: Conceptualization, S.T. and S.G.; methodology, S.T. and S.G.; formal analysis, S.G., A.M. and B.R.; data curation, S.G., A.M. and B.R.; writing—original draft preparation, S.G.; writing—review and editing, S.T.; visualization, S.G. and A.M.; supervision, S.T. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All data generated or analyzed during this study can be obtained from the corresponding author upon request.

Conflicts of Interest: The authors declare no conflict of interest.

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