**An *In Silico* Study for Mechanism of Actions of Peptides in *Salvia hispanica* L. Seed in Skin Aging Treatment**

**Binh Thi Ngoc Khac1**, Phuong Thuy Viet Nguyen1, Thuan Thi Nam Le1, **Long Hung Tran1**.

Department of Pharmaceutical Information Technology, School of Pharmacy – University of Medicine and Pharmacy at Ho chi Minh City1, Ho Chi Minh City, Vietnam.

**Background and aims.** Aging is a complex process involving genetic and physiological changes in cells and tissues, increasing the risk of developing serious diseases such as neurodegeneration, cardiovascular disorders, and cancer. Peptides derived from *Salvia hispanica* L. (chia seed) have shown potential anti-aging and antioxidant properties on the skin. However, their molecular mechanisms remain poorly understood, especially due to the synergistic effects of natural compounds. This study aimed to elucidate the anti-aging effects of chia seed peptides on skin using *in silico* methods.

**Methods.** 126 amino acid sequences of chia seed-derived peptides were analyzed. Target prediction was conducted via SEA, TargetNet, SwissTargetPrediction, and PharmMapper, while skin aging-associated targets were retrieved from GeneCards, OMIM, NCBI, and OpenTargets. The methodology included: (i) pharmacological network construction using Cytoscape 3.9.0 to elucidate potential signaling pathways and targets; (ii) peptide–protein molecular docking using AutoDock CrankPep; and (iii) molecular dynamics simulations of key complexes using GROMACS to explore anti-aging mechanisms.

**Results.** The study identified neutrophil extracellular trap formation as the primary mechanism of chia seed peptides in skin aging treatment, with 77 peptides and 16 potential targets revealed via network pharmacology. Molecular docking highlighted AKT1, AKT2, MAPK1, and KRAS as key targets, and three promising peptides—C2 (NGFEWITF), N14 (SDKNGYFF), and P14 (GFEWITFK)—with favorable pharmacokinetics and skin permeability. Molecular dynamics simulations confirmed the stability of complexes: AKT1–P14, MAPK1–N14, and AKT2–C2 over 50 ns.

**Conclusion/Discussion.** Based on cross-referencing with previously published studies, the peptides GFEWITFK, SDKNGYFF, and NGFEWITF derived from chia seeds were identified as promising candidates for anti-skin-aging therapy, exerting their effects through three key molecular targets: AKT1, MAPK1, and AKT2, respectively.

**Acknowledgements.**

We would like to thank the University of Medicine and Pharmacy at Ho Chi Minh City, Vietnam, for supporting this research.

**References:**

(1) Fang J, Gao L, Ma H, et al. Quantitative and Systems Pharmacology 3.Network-Based Identification of New Targets for Natural Products Enables Potential Uses in Aging-Associated Disorders. Original Research. Frontiers in Pharmacology. 2017;8:747. doi:10.3389/fphar.2017.00747.

(2) Aguilar-Toalá JE, Liceaga AM. Identification of chia seed (Salvia hispanica L.) peptides with enzyme inhibition activity towards skin-aging enzymes. Amino Acids. 2020;52(8):1149-1159.doi:10.1007/s00726-020-02879-4.