

ABSTRACT

SOFHI NUR AZIZAH. 2026. **IN SILICO ANALYSIS OF THE POTENTIAL OF SECONDARY METABOLITE COMPOUNDS FROM STARFRUIT LEAVES AS ANTI-BREAST CANCER CANDIDATES FOR BIOLOGY TEACHING MATERIAL SUPPLEMENT.** Departement of Biology Education, Faculty of Teacher Training and Education, Siliwangi University, Tasikmalaya.

Breast cancer is the most prevalent cancer among women in Indonesia, with approximately 70% of cases expressing estrogen receptor alpha (ER- α), a major driver of cancer cell proliferation. *Averrhoa bilimbi* leaves contain various secondary metabolites, including flavonoids, terpenoids, and phenolic compounds, which have been reported to exhibit antiproliferative and antioxidant activities. This study aimed to investigate the potential of secondary metabolites from *Averrhoa bilimbi* leaves as breast cancer candidates through in silico approach and to develop the findings into a biology learning supplement. Molecular docking was performed using PyRx against the ER- α receptor (PDB ID: 3ERT), with 4-hydroxytamoxifen (4-OHT) as the reference ligand. Physicochemical and pharmacokinetic properties were evaluated using SwissADME and pkCSM, while toxicity was predicted using ProTox 3.0. Five compounds identified from the literature were analyzed: Squalene, δ -Tocopherol, Cucumerin A, Afzelechin 3-O- α -L-rhamnopyranoside, and Fluorescein Methyl Ester. Molecular docking revealed that Cucumerin A exhibited strongest binding affinity (-9.0 kcal/mol), followed by Afzelechin 3-O- α -L-rhamnopyranoside (-8.6 kcal/mol) and Squalene (-8.3 kcal/mol), all surpassing the reference ligand 4-OHT (-7.9 kcal/mol). Meanwhile, Fluorescein Methyl Ester and δ -Tocopherol showed binding affinity values of -7.9 kcal/mol and -7.8 kcal/mol, respectively. ADMET analysis showed that Squalene, δ -Tocopherol, Afzelechin 3-O- α -L-rhamnopyranoside, and Fluorescein Methyl Ester complied with Lipinski's Rule of Five. Toxicity prediction indicated that Afzelechin 3-O- α -L-rhamnopyranoside was safest compound (toxicity class 6; $LD_{50} = 10,000$ mg/kg). Based on the integrated analysis, Afzelechin 3-O- α -L-rhamnopyranoside was identified as the most promising breast cancer candidate. The research findings were subsequently developed into a booklet as a biology learning supplement for the Bioinformatics course.

Keywords: *Averrhoa bilimbi* L., Anti-Breast Cancer, ER- α , In Silico, Molecular Docking.