EVALUASI POTENSI ANTIKANKER EKSTRAK DAUN *Averrhoa bilimbi* L. DAN *Averrhoa carambola* L. TERHADAP SEL KANKER PAYUDARA T47D

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INTISARI

Kanker payudara merupakan salah satu penyebab utama kematian pada perempuan di seluruh dunia, dengan lebih dari 2,3 juta kasus baru dan 667.000 kematian berdasarkan data tahun 2022. Angka kejadian dan kematian akibat kanker diprediksi akan terus meningkat hingga tahun 2030 apabila tidak dicegah dan ditangani dengan tepat. Pengobatan kanker dapat dilakukan melalui pembedahan, radiasi, dan kemoterapi, bergantung pada tingkat keparahan penyakit. Meskipun pengobatan tersebut relatif efektif, metode tersebut juga dapat merusak sel sehat dan meningkatkan risiko resistansi obat. Oleh karena itu, penemuan terapi berbasis tanaman perlu terus dikembangkan. *Averrhoa bilimbi* L. dan *Averrhoa carambola* L. telah diteliti karena memiliki potensi antikanker yang terkait dengan kandungan tanin, alkaloid, saponin, fenol, flavonoid, dan antioksidan. Penelitian ini bertujuan untuk menganalisis potensi *A. bilimbi* dan *A. carambola* terhadap sel kanker payudara T47D. Analisis *in silico* digunakan untuk memprediksi tumpang tindih gen target menggunakan diagram Venn, kemudian dilakukan pengelompokan kategori fungsional melalui Gene Ontology dan jalur KEGG. Prediksi aktivitas antikanker dilakukan menggunakan PASS Online dan CLC-Pred. Setelah analisis *in silico*, uji *in vitro* berupa MTT dan uji apoptosis dengan flow cytometry digunakan untuk memvalidasi hasil prediksi tersebut. Hasil penelitian menunjukkan bahwa 133 gen pada *A. bilimbi* dan 147 gen pada *A. carambola* memiliki keterkaitan dalam regulasi miRNA, respons terhadap karsinogen, dan regulasi apoptosis di dalam inti sel, namun berbeda pada fungsi molekuler, di mana *A. bilimbi* berkaitan dengan aktivitas protein lysine delactylase, sedangkan *A. carambola* berhubungan dengan pengikatan IGF-II. Secara konsisten, sebagian besar senyawa yang teridentifikasi pada kedua spesies diprediksi berperan dalam jalur regulasi terkait TP53. Selain itu, validasi *in vitro* menunjukkan bahwa *A. bilimbi* memiliki potensi paling kuat (IC_{50} 214,7 µg/mL) dengan 57,25% sel mengalami nekrosis dan 42,8% apoptosis, diikuti oleh *A. carambola* dengan IC_{50} 319,5 µg/mL, 8,45% sel nekrosis, dan 11,8% apoptosis. Penelitian ini menyimpulkan bahwa *A. bilimbi* dan *A. carambola* sama-sama memiliki efek antikanker, meskipun tingkat efektivitas di antara kedua spesies tersebut berbeda

Kata kunci: antikanker, herbal, kanker payudara, MTT, viabilitas sel,

EVALUATION OF THE ANTICANCER PROPERTIES OF *Averrhoa bilimbi* L. AND *Averrhoa carambola* L. LEAF EXTRACTS AGAINST BREAST CANCER CELL T47D

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ABSTRACT

Breast cancer continues to be one of the leading cause of deaths among women around the world with new incidence over 2.3 million and death cause of 667,000 people based on 2022 data. The incidence of cancer and deaths will rise continuously by 2030 not prevented and treated properly. Cancer can be treated with surgery, radiation and chemotherapy each depending on the degree of severity of the cancer. Even though those treatments are relatively effective in treating cancer, they exhibit damage in healthy cells and increase drug resistance. Hence, new discoveries of plant-based remedies are needed to be studied. *Averrhoa bilimbi* L. and *Averrhoa carambola* L. have been studied for their anticancer properties due to the properties of tannins, alkaloids, saponins, phenols, flavonoids, and antioxidants. Aims of this study is to analyze the potency of *A. bilimbi* and *A. carambola* on breast cancer cell T47D. *In silico* analysis was used to predict overlapping target genes using Venn diagram, followed by grouping of their functional categories with Gene Ontology and KEGG pathway, and prediction of anticancer activities was done with PASS Online and CLC-Pred. Following the in silico analysis, in vitro test with MTT and flow cytometry-apoptosis test were used to validate the predicted in silico results. The results revealed that 133 genes in *A. bilimbi* and 147 genes in *A. carambola* were similarly associated with miRNA regulation, carcinogen response, and apoptosis regulated within the nucleus, however differs in molecular function since *A. bilimbi* is associated with protein lysine delactylase activity whereas *A. carambola* is linked to IGF-II binding. Consistently, the majority of compounds identified in *A. bilimbi* and *A. carambola* were predicted to act on TP53-related regulatory pathways. Furthermore, *in vitro* validation demonstrated that A. *bilimbi* exhibited the strongest potency (IC_{50} 214.7 µg/mL) with 57.25% necrotic cells and 42.8% apoptotic cells, followed by *A. carambola* with IC_{50} 319.5 µg/mL with 8.45% necrotic cells and 11.8% apoptotic cells. This study suggests that both of *A. bilimbi* and *A. carambola* have effects in becoming anticancer although the effectivity between these two species differs.

Keywords: anticancer, breast cancer, cell viability, natural medicine, MTT assay