# ABSTRAK

**Aditama, Yoga Aria. 2025**. Kajian *in silico* efektivitas antibakteri senyawabioaktif S*trobilanthes crispus* terhadap E*scherichia coli* sebagai bahan belajar asisten teknik laboratorium medik smk kesehatan. Skripsi, Program Studi Pendidikan Biologi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Muhammadiyah Jember.
Pembimbing: (1) Dr.Kukuh Munandar, M.Kes Dan Pembimbing: (2) Indah Rakhmawati Afrida, S.Si. M.Pd

**Kata Kunci:** *Docking Molecul*, aktivitas antibakteri, Senyawa Bioaktif, *Strobilanthes crispus*,*Escherichia coli*, Poster.

Penyakit yang disebabkan oleh infeksi bakteri *Escherichia coli*, seperti Infeksi Saluran Kemih (ISK), merupakan gangguan yang dapat memperburuk sistem imun tubuh karena memicu kerusakan jaringan. Obat yang biasa digunakan sebagai antibakteri umumnya berupa antibiotik, baik dari golongan spektrum luas maupun sempit. Namun, penggunaan jangka panjang dari obat ini dapat menyebabkan efek samping dan resistensi bakteri. Oleh karena itu, diperlukan metode alternatif terapi yang mampu meminimalkan efek samping tersebut, salah satunya melalui pengembangan obat antibakteri berbahan dasar alami, khususnya tanaman herbal seperti Keji Beling (*Strobilanthes crispus*).

Masalah dalam penelitian ini adalah bagaimana aktivitas antibakteri senyawa bioaktif pada Keji Beling (*Strobilanthes crispus*) terhadap infeksi bakteri *Escherichia coli* secara *in silico*, serta pengembangan hasil penelitian sebagai sumber belajar di dasar-dasar teknologi farmasi melalui media poster. Penelitian ini bertujuan untuk mengetahui mekanisme penghambatan senyawa bioaktif dari Keji Beling terhadap *Escherichia coli* secara *in silico*. Kegiatan riset dilakukan melalui pendekatan *in silico* menggunakan teknik *molecular docking* guna mengevaluasi efektivitas interaksi senyawa dengan target protein bakteri.

Berdasarkan penelitian *in silico* yang dikembangkan sebagai sumber belajar biologi pada materi sistem karakteristik bakteri dan infeksi kelas XI, diketahui bahwa Keji Beling mengandung beberapa senyawa bioaktif dengan nilai *Pa* dan *Binding Energy* sebagai berikut: Verbascoside (*Pa* 0,672; *Binding Energy* -9,4 kcal/mol), Apigenin 7-O-beta-D-glucuronide (*Pa* 0,628; *Binding Energy* -9,5 kcal/mol), Quercetin 3-rutinoside (Rutin) (*Pa* 0,677; *Binding Energy* -9,0 kcal/mol), Isoacteoside (*Pa* 0,626; *Binding Energy* -9,2 kcal/mol), dan Calceolarioside E (*Pa* 0,661; *Binding Energy* -8,2 kcal/mol). Hasil pengembangan bahan ajar dari penelitian ini menunjukkan nilai rata-rata kelayakan sebesar 85,97%, yang termasuk dalam kategori "Layak", sehingga bahan ajar tersebut siap digunakan dalam proses pembelajaran.

# ABSTRAK

**Aditama, Yoga Aria. 2025.** *In Silico Study of the Antibacterial Effectiveness of Bioactive Compounds in Strobilanthes crispus Against Escherichia coli as Learning Material for Fundamentals of Pharmaceutical Technology Students in Health Vocational Schools.* Undergraduate Thesis, Biology Education Study Program, Faculty of Teacher Training and Education, Universitas Muhammadiyah Jember. Supervisors: (1) Dr. Kukuh Munandar, M.Kes and (2) Indah Rakhmawati Afrida, S.Si., M.Pd.

**Keywords:** Docking Molecul, aktivitas antibakteri, Senyawa Bioaktif, *Strobilanthes crispus*,*Escherichia coli*, Poster.

Diseases caused by *Escherichia coli* bacterial infections, such as Urinary Tract Infections (UTIs), are conditions that can worsen the immune system by triggering tissue damage. The drugs commonly used as antibacterial agents are generally antibiotics, whether broad-spectrum or narrow-spectrum. However, long-term use of these drugs can lead to side effects and bacterial resistance. Therefore, alternative therapeutic methods are needed to minimize such side effects, one of which is the development of antibacterial agents derived from natural ingredients, especially medicinal plants such as Keji Beling (*Strobilanthes crispus*).

The problem in this study focuses on the antibacterial activity of bioactive compounds from *Strobilanthes crispus* against *Escherichia coli* infection through an *in silico* approach, as well as the development of the research results into educational materials in the form of posters for vocational health school students, particularly in the field of medical laboratory analysis. This study aims to understand the inhibition mechanism of bioactive compounds from *Strobilanthes crispus* against *Escherichia coli* using an *in silico* method. The research was conducted using a molecular docking approach to evaluate the effectiveness of the interaction between the compounds and the bacterial target proteins.

Based on the *in silico* study developed as a learning resource for biology particularly in the topic of bacterial characteristics and infections for grade XI it was found that *Strobilanthes crispus* contains several bioactive compounds with the following Pa scores and *Binding Energy* values: Verbascoside (Pa 0.672; *Binding Energy* -9.4 kcal/mol), Apigenin 7-O-beta-D-glucuronide (Pa 0.628; *Binding Energy* -9.5 kcal/mol), Quercetin 3-rutinoside (Rutin) (Pa 0.677; *Binding Energy* -9.0 kcal/mol), Isoacteoside (Pa 0.626; *Binding Energy* -9.2 kcal/mol), and Calceolarioside E (Pa 0.661; *Binding Energy* -8.2 kcal/mol). The development of teaching materials based on this research yielded an average feasibility score of 85.97%, which falls into the "Feasible" category, indicating that the materials are ready to be implemented in the learning process.