SKRIPSI

EVALUASI POTENSI EKSTRAK ETANOL *Spirulina platensis* SEBAGAI BAHAN TABIR SURYA DAN ANTI TIROSINASE SECARA *IN VITRO* DAN *IN SILICO*

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PERNYATAAN

Dengan ini menyatakan bahwa skripsi dengan judul "**Evaluasi Potensi Ekstrak Etanol *Spirulina platensis* Sebagai Bahan Tabir Surya dan Anti Tirosinase secara *In vitro* dan *In silico***" ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung resiko/sanksi apabila dikemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

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ABSTRAK

Penggunaan tabir surya yang mengandung anti tirosinase merupakan salah satu upaya untuk mencegah kerusakan kulit dari radiasi ultraviolet (UV) berlebih yang dapat menyebabkan hiperpigmentasi. Saat ini, penggunaan bahan alami sebagai agen fotoprotektif kulit banyak dikembangkan karena dinilai memiliki efek samping yang relatif rendah. Pada penelitian ini dilakukan analisis potensi ekstrak etanol *Spirulina platensis* sebagai kandidat sediaan bahan tabir surya dan anti tirosinase mengunakan pendekatan *in vitro* dan *in silico*. Karakteristik ekstrak etanol ditentukan menggunakan FTIR, *screening* fitokimia, dan penentuan total senyawa fenolik. Potensi tabir surya ditentukan melalui pengujian aktivitas antioksidan dan penentuan nilai SPF (*Sun Protection Factor*). Potensi anti tirosinase ditentukan melalui uji aktivitas inhibisi tirosinase secara *in vitro* dan *in silico*. Pengujian fitokimia dan FTIR menunjukkan bahwa ekstrak etanol *Spirulina platensis* mengandung senyawa fenolik dengan total kandungan fenolik sebesar 75,99 mg GAE/g ekstrak; IC50 terhadap DPPH sebesar 118,78 mg/L; inhibisi tirosinase 47,68 % (500 mg/L); dan nilai SPF terbaik tabir surya hasil formulasi yaitu 23,34. Pengujian *in silico* menunjukkan bahwa senyawa fenolik berinteraksi dengan tirosinase melalui ikatan hidrogen, ikatan hidrofobik, gaya van der Waals, dan interaksi akseptor logam. Beberapa senyawa fenolik seperti asam galat, asam vanilat, asam siringat, asam protokatekhuat, dan asam kafeat diprediksi memiliki aktivitas inhibisi yang lebih tinggi dibandingkan dengan asam kojat yang biasa digunakan sebagai inhibitor komersial tirosinase. Berdasarkan hasil penelitian dapat disimpulkan bahwa senyawa fenolik dari ekstrak etanol *S. platensis* memiliki potensi sebagai bahan aktif tabir surya yang dapat mencegah efek berbahaya dari radiasi UV dan kandidat anti tirosinase dengan prediksi mekanisme inhibisi kompetitif.

Kata Kunci: anti tirosinase, antioksidan, molekuler *docking*, *Spirulina platensis*, *Sun Protection Factor* (SPF).

ABSTRACT

The use of sunscreen containing anti-tyrosinase is one of the efforts to prevent skin damage from excessive ultraviolet (UV) radiation which can cause hyperpigmentation. Currently, the use of natural ingredients as skin photoprotective agents is widely developed because it is considered to have relatively low side effects. In this study, an analysis of the potential of *Spirulina platensis* ethanol extract as a candidate for sunscreen and anti-tyrosinase preparations were carried out using in vitro and in silico approaches. The characteristics of the ethanol extract were determined using FTIR, phytochemical screening, and determination of total phenolic compounds. The potential of sunscreen is evaluated by measuring an antioxidant activity and the value of the Sun Protection Factor (SPF). Anti-tyrosinase activities was determined by in vitro and in silico tests of tyrosinase inhibitory activity. Phytochemical and FTIR tests showed that the ethanol extract of *Spirulina platensis* contained phenolic compounds with a total phenolic content of 75.99 mg GAE/g extract. The DPPH assay showed an extract IC50 of 118.78 mg/L and tyrosinase inhibition of 47.68 % (500 mg/L). The highest SPF value of formulated sunscreen is 23.34. In silico study showed that phenolic compounds interact with tyrosinase through hydrogen bonds, hydrophobic bonds, van der Waals forces, and metal-acceptor interaction. Several phenolic compounds such as gallic acid, vanillic acid, syringic acid, protocatechuic acid, and caffeic acid are predicted to have higher inhibitory activity than those of kojic acid which is commonly used as a commercial tyrosinase inhibitor. All in all, it can be concluded that the phenolic compounds from the ethanolic extract of *S. platensis* have potential as active sunscreen ingredients that can prevent the harmful effects of UV radiation and anti-tyrosinase candidates by predicting competitive inhibition mechanisms.

Keywords: anti-tyrosinase, antioxidant, molecular docking, *Spirulina platensis*, Sun Protection Factor (SPF).

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