EFEKTIVITAS IRADIASI UV-C TERHADAP PENURUNAN KADAR PESTISIDA SIPERMETRIN PADA SEDUHAN TEH HIJAU DAN TEH HITAM (*Camellia sinensis)*

SKRIPSI

diajukan untuk memenuhi sebagian syarat dalam memperoleh gelar Sarjana Sains
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Oleh:
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Sebuah skripsi yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Sarjana Sains pada Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam

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PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "EFEKTIVITAS IRADIASI UV-C TERHADAP PENURUNAN KADAR PESTISIDA SIPERMETRIN PADA SEDUHAN TEH HIJAU DAN TEH HITAM (*Camellia sinensis)*" beserta seluruh isinya adalah benar-benar karya 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 atau sanksi apabila di kemudian hari ditemukan adanya pelanggaran etika keilmuan ada ada klaim dari pihak lain terhadap keaslian karya saya ini.

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Yang membuat pernyataan,

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ABSTRAK

Pestisida digunakan pada komoditas pertanian untuk mengendalikan hama yang dapat menyebabkan kerusakan dalam bahan pangan. Pestisida piretroid termasuk sipermetrin sering digunakan pada tanaman teh. Teh (*Camellia sinensis*) dikenal sebagai minuman kaya akan antioksidan yang bermanfaat bagi kesehatan. Kerentanan tanaman teh terhadap hama menyebabkan penggunaan pestisida menghasilkan tingkat residu pestisida yang tinggi pada seduhan teh. Meskipun sipermetrin dikategorikan memiliki tingkat toksisitas rendah, beberapa bukti ilmiah menunjukkan potensi bahaya lebih besar. Metode penurunan residu pestisida seperti fotodegradasi menggunakan iradiasi ultraviolet-C (UV-C) diterapkan karena bersifat ramah lingkungan dan efisien, serta dapat memutus ikatan kimia C=C, C-C, dan C-H pada sipermetrin yang membutuhkan panjang gelombang pada rentang UV-C sehingga lebih efektif dibandingkan UV-A dan UV-B. Beberapa penelitian telah melakukan analisis degradasi sipermetrin pada bubuk cabai dan teh dengan hasil degradasi yang berbeda. Matriks pada bahan pangan dapat mempengaruhi efektivitas penurunan sipermetrin, sehingga digunakan perbandingan teh hijau dan teh hitam. Penelitian ini bertujuan untuk menganalisis efektivitas iradiasi UV-C dengan pengaruh variasi waktu iradiasi dan pengaruh metabolit yang berbeda antara teh hijau dan teh hitam terhadap penurunan pestisida sipermetrin dalam seduhan teh. Penelitian ini dilakukan dengan menambahkan pestisida 100 ppm ke dalam seduhan teh kemudian diiradiasi dengan UV-C pada waktu 15, 30, 45 menit. Hasil iradiasi diekstraksi cair-cair menggunakan pelarut etil asetat, dan dilakukan pemurnian *QuEChERS*, kemudian dikuantifikasi oleh *Gas Chromatography-Flame Ionization Detector* (*GC-FID*). Hasil penelitian membuktikan bahwa iradiasi UV-C secara efektif dapat menurunkan kadar pestisida sipermetrin dengan degradasi tertinggi pada teh hitam 45 menit mencapai 86,99±0,48% dan seduhan teh hijau 45 menit sebesar 63,91±3,96%, dimana semakin lama waktu iradiasi semakin besar penurunan kadar pestisida.

Kata kunci: Teh (*Camellia sinensis*), sipermetrin, fotodegradasi, ultraviolet-C, *GC*-FID

ABSTRACT

Pesticides are used on agricultural commodities to control pests that can cause damage food crops Pyrethroid pesticides, including cypermethrin, are commonly used on tea plants. Tea (Camellia sinensis) is known as a beverage rich in antioxidants with health benefits. The susceptibility of tea plants to pests causes the use of pesticides to produce high levels of pesticide residues in tea brew. Although cypermethrin is classified as having low toxicity, some scientific evidence suggests a higher potential for harm. Pesticide residue reduction methods such as photodegradation using ultraviolet-C (UV-C) irradiation are applied because they are environmentally friendly and efficient, and can break the C=C, C-C, and C-H chemical bonds in cypermethrin which require wavelengths in the UV-C range so that they are more effective than UV-A and UV-B. Several studies have analyzed the degradation of cypermethrin in chili powder and tea with different degradation results. The food matrix can significantly impact the effectiveness of degradation. Therefore, this study compared the effectiveness of UV-C irradiation on green tea and black tea. This study aims to analyze the effectiveness of UV-C irradiation with the influence of variations in irradiation time and the influence of different metabolites between green tea and black tea on the reduction of cypermethrin pesticide in tea brew. The experiment involved adding 100 ppm of cypermethrin to tea brew, followed by UV-C irradiation for 15, 30, and 45 minutes. The irradiated tea was then subjected to liquid-liquid extraction using ethyl acetate solvent, followed by purification using QuEChERS solid-phase extraction. Finally, the remaining cypermethrin was quantified by Gas Chromatography-Flame Ionization Detector (GC-FID). The results confirmed that UV-C irradiation effectively reduces cypermethrin levels. Black tea exhibited the highest degradation (86.99 ± 0.48%) after 45 minutes of irradiation, compared to 63.91 ± 3.96% for green tea irradiated for the same duration. This study suggests that longer irradiation times lead to a greater decrease in pesticide levels.

***Keywords**: Tea (Camellia sinensis), cypermethrin, photodegradation, utltraviolet-C, GC-FID*

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