

Bioprospeksi Metabolit Sekunder Daun Sirih Merah (*Piper crocatum* Ruiz & Pav.) Berpotensi Insektisida Alami Melalui Perlakuan Pupuk, Cekaman Air dan Cahaya

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Intisari

Walang sangit (*Leptocorisa oratorius* (F.)), merupakan hama utama tanaman padi yang dapat menurunkan produktivitas padi secara signifikan. Penanggulangan hama ini sering dilakukan dengan penggunaan insektisida sintetik secara intensif yang berpotensi memacu resistensi dan masalah keamanan lingkungan. Oleh karena itu, diperlukan alternatif untuk mengurangi serangan hama ini melalui bioprospeksi tanaman. Salah satunya dengan insektisida alami yang berasal dari senyawa ekstrak tanaman sirih merah (*Piper crocatum* Ruiz & Pav.). Tujuan penelitian ini adalah mempelajari pengaruh kombinasi cekaman abiotik terhadap pertumbuhan tanaman serta kandungan metabolit sekunder daun *P. crocatum*. Penelitian ini juga bertujuan untuk mengetahui kombinasi cekaman abiotik yang berpotensi meningkatkan jumlah jenis dan kadar senyawa anti walang sangit. Desain penelitian menggunakan rancangan petak terbagi (*split plot design*) dengan tiga faktor, yaitu cekaman air (100%, 50%, dan 25% kapasitas lapang), cahaya (tanpa paranet, paranet 65%, dan paranet 75%), serta pemupukan (pupuk organik guano dan pupuk anorganik NPK). Parameter yang diamati meliputi pertumbuhan tanaman, parameter lingkungan pendukung, dan analisis profil metabolit sekunder ekstrak daun *P. crocatum* dengan berbagai perlakuan. Analisis data pertumbuhan tanaman dan parameter lingkungan menggunakan ANOVA dan DMRT (*Duncan Multiple Range Test*), sedangkan analisis metabolit sekunder menggunakan GC-MS. Hasil penelitian menunjukkan bahwa kombinasi cekaman abiotik berupa cahaya, air dan pupuk berpengaruh terhadap pertumbuhan tanaman sirih merah, terlihat dari morfologi dan biomassa tanaman. Kombinasi perlakuan 100% kapasitas lapang (KL), pupuk guano dan tanpa paranet (W1F1L1) menghasilkan pertumbuhan tanaman yang paling baik, serta peningkatan jumlah jenis dan kadar senyawa bioaktif yang lebih tinggi dibandingkan kontrol. Kombinasi perlakuan 50% KL, pupuk NPK, dan tanpa naungan (W2F2L1) menghasilkan jumlah senyawa anti walang sangit yang paling banyak dibandingkan perlakuan lain. Sementara itu, perlakuan W1F2L3 (100% KL, pupuk NPK, dan paranet 75%) menghasilkan total kadar senyawa insektisida yang paling tinggi. Terdapat 32 jenis senyawa yang berpotensi sebagai insektisida dari ekstrak kloroform daun sirih merah, terdiri dari golongan terpenoid, monoterpenoid, seskuiterpenoid, diterpenoid, dan lain-lain.

Kata kunci: Bioprospeksi, cekaman abiotik, insektisida alami, *Leptocorisa oratorius* (F.), *Piper crocatum* Ruiz & Pav.

***Bioprospection of Secondary Metabolites of Red Betel Leaves (Piper crocatum
Ruiz & Pav.) as Potential Natural Insecticide trough Fertilizer Application,
Drought Stress and Light Treatments***

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Abstract

*Rice bug (Leptocorisa oratorius (F.)) is the main pest of rice plants which can reduce rice productivity significantly. Pest control is often carried out using synthetic insecticides which has the potential to spur resistance and environmental safety issues. The alternatives are needed to reduce the attack of these pests through plant bioprospection. Natural insecticides could be derived from plant extract compounds, such as Red Betel (Piper crocatum Ruiz & Pav.). This research aimed to study the effect of abiotic stress on plant growth and secondary metabolites profiles of *P. crocatum* leaves that have potential compounds as an insecticide. The research design used a split plot design with three factors, namely water stress (100%, 50%, and 25% field capacity), light treatment (without shade, shade net 65%, and shade net 75%), and fertilizer application (guano organic fertilizer and NPK inorganic fertilizer). The parameters observed included plant growth and profile metabolites analysis of *P. crocatum* leaf extract produce by those treatments. Data analysis used ANOVA and DMRT (Duncan Multiple Range Test) for growth data, also GC-MS test for profile metabolites analysis. The result showed that the combination of abiotic stress in the form of light, water, and fertilizer affected the growth of *P. crocatum* in terms of plant morphology and biomass. The combination of 100% field capacity, guano fertilizer and without shade (W1F1L1) treatment produced the best plant growth, as well as increased the type and content of bioactive compounds in leaves compared to those of control treatments. The combination of 50% abiotic stress in the field capacity, NPK fertilizer, and without shade (W2F2L1) had the highest potential to increase the type of insecticide compounds, while the treatment of 100% field capacity, NPK fertilizer, and shade net 75% (W1F2L3) produced the highest insecticide total compounds. There were 32 types of compounds potentially acted as an insecticide in the red betel leaf chloroform extract. The compound groups covered terpene, monoterpene, sesquiterpene, diterpene and others.*

Keywords: *Abiotic stress, bioinsecticide, bioprospection, Leptocorisa oratorius (F.), Piper crocatum Ruiz & Pav*