

**STUDI PENDAHULUAN PENGGUNAAN MELATONIN DALAM MITIGASI
EFEK PAPARAN ULTRAVIOLET-B TERHADAP PERTUMBUHAN DAN
METABOLIT SEKUNDER TUNAS TANAMAN STEVIA SECARA *IN VITRO***

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ABSTRAK

Stevia rebaudiana merupakan tanaman penghasil steviol glikosida (SG) yang terakumulasi pada daun. Paparan UV-B diketahui meningkatkan akumulasi SG dan senyawa fenolik, tetapi menurunkan ukuran daun. Salah satu upaya mengurangi efek tersebut adalah penggunaan melatonin. Penelitian ini bertujuan mengetahui respons morfofisiologis tunas stevia pada media diperkaya melatonin dalam memitigasi efek paparan UV-B secara *in vitro*, serta perubahan profil senyawa turunan fenolik dan aktivitas antioksidan. Penelitian dilakukan dalam dua tahap: (1) respons morfofisiologis tunas terhadap UV-B (0; 3 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 4 jam/hari) dan melatonin (0; 12,5; 25; 50 μM) menggunakan rancangan acak kelompok faktorial; serta (2) akumulasi metabolit sekunder dan aktivitas antioksidan tunas pada media dengan konsentrasi melatonin terbaik dari tahap sebelumnya di bawah paparan UV-B, masing-masing selama 42 hari (28 hari paparan UV-B). Hasil menunjukkan pertumbuhan tunas tidak dipengaruhi paparan UV-B ($P > 0,05$), tetapi dipengaruhi melatonin. Melatonin mempercepat munculnya daun (1,42–1,71 hari) dan akar (0,62–0,81 hari) baru, tetapi menurunkan jumlah daun (20,92–22,17) dan nodus (6,67–7,67) dibanding kontrol. Interaksi kedua faktor berpengaruh nyata terhadap jumlah nodus, penambahan melatonin 50 μM tanpa paparan UV-B (8,67) dan 25 μM dengan paparan UV-B (8,54) setara kontrol (8,38 dan 8,13). Melatonin 25 μM meningkatkan akumulasi flavonoid lebih tinggi di bawah UV-B, sedangkan fenolik relatif setara. Aktivitas antioksidan DPPH menurun drastis akibat UV-B. Penambahan 25 μM melatonin berpotensi memitigasi dampak paparan UV-B pada pemeliharaan tunas stevia, terutama dalam pengayaan metabolit.

Kata kunci: Antioksidan, *in vitro*, melatonin, metabolit sekunder, *Stevia rebaudiana*, UV-B.

ABSTRACT

Stevia rebaudiana is a plant that produces steviol glycosides (SG), which accumulate in the leaves. UV-B exposure is known to increase the accumulation of SG and phenolic compounds, but reduces leaf size. One approach to mitigating this effect is the application of melatonin. This study aimed to determine the morphophysiological responses of stevia shoots cultured on melatonin-enriched media in mitigating the effects of UV-B exposure *in vitro*, as well as the resulting changes in the profile of phenolic-derived compounds and antioxidant activity. The study was conducted in two stages: (1) the morphophysiological response of shoots to UV-B (0 and 3 $\mu\text{mol m}^{-2} \text{s}^{-1}$, 4 hours/day) and melatonin (0; 12,5; 25; 50 μM) using a factorial randomized block design; and (2) the accumulation of secondary metabolites and antioxidant activity of shoots on media containing the optimal melatonin concentration identified in the previous stage, under UV-B exposure, each for 42 days (28 days of UV-B exposure). The results showed that shoot growth was not significantly affected by UV-B exposure ($P > 0,05$), but was affected by melatonin. Melatonin accelerated the emergence of new leaves (1,42–1,71 days) and roots (by 0,62–0,81 days), but reduced leaf number (20,92–22,17) and node number (6,67–7,67) compared to the control. The interaction between the two factors significantly affected node number, with 50 μM melatonin without UV-B (8,67) and 25 μM melatonin with UV-B (8,54) producing values comparable to the control (8,38 and 8,13, respectively). Melatonin at 25 μM increased flavonoid accumulation to a greater extent under UV-B exposure, while phenolic content remained relatively similar. DPPH antioxidant activity decreased markedly as a result of UV-B exposure. The addition of 25 μM melatonin shows potential for mitigating the impact of UV-B exposure on stevia shoot, particularly in enhancing metabolite enrichment.

Keywords: Antioxidant, *in vitro*, melatonin, secondary metabolites, *Stevia rebaudiana*, UV-B.