

PEMANFAATAN LARVA LALAT TENTARA HITAM (*Hermetia illucens* L.) UNTUK BIOKONVERSI SAMPAH BIOMASSA GULMA HUTAN

Galuh Anggara¹, Musyafa², Daryono Prehaten²

¹Mahasiswa Fakultas Kehutanan UGM, ²Pengajar Fakultas Kehutanan UGM

INTISARI

Sampah biomassa gulma hutan hasil tebasan mekanis berpotensi menjadi menimbulkan kebakaran lahan. Sampah biomassa gulma berpotensi sebagai materi penambah kesuburan tanah salah satunya melalui biokonversi menggunakan larva lalat tentara hitam (*Hermetia illucens* L.). Penelitian ini bertujuan untuk mengevaluasi efektivitas kinerja biokonversi larva *black soldier fly* (BSF) pada biomassa gulma hutan yang dimodifikasi secara fisik, mengkaji dinamika lignoselulosa dan rasio C/N, serta menganalisis profil protein kasar larva dan tingkat fitotoksisitas *frass*. Eksperimen menggunakan Rancangan Acak Lengkap (RAL) dengan lima perlakuan pakan: P0 (ampas tahu sebagai kontrol positif), P1 (ekor naga), P2 (alang-alang), P3 (kerinyuh), dan P4 (campuran ketiga gulma). Hasil penelitian menunjukkan bahwa *survival rate* (SR) larva BSF mencapai 100% pada seluruh perlakuan. P3 menghasilkan pertumbuhan bobot larva dan *waste reduction rate* (WRR) paling tinggi, yakni sebesar 52,09%. Sementara itu, tingkat asimilasi nutrisi paling efisien ditunjukkan oleh P1 dengan nilai *bioconversion efficiency corrected for residue* (BER) mencapai 29,38% dan *bioconversion efficiency* (BE) mencapai 12,23%. Sebaliknya, performa biologis dan kinerja biokonversi terendah terdapat pada P2 akibat tingginya hambatan struktural dari lignoselulosa dan kandungan silika, meskipun biomassa larva BSF memiliki kandungan protein kasar tertinggi (41,33%). Proses biokonversi oleh larva BSF belum dapat menurunkan rasio C/N pada *frass* pada seluruh perlakuan berdasarkan standar mutu kematangan kompos SNI 19-7030-2004. Selain itu, uji *in vitro* menggunakan parameter *germination index* (GI) pada benih selada (*Lactuca sativa* L.) mengindikasikan bahwa *frass* gulma hutan masih menyisakan efek fitotoksik diduga akibat belum terombaknya senyawa alelokimia secara sempurna. P1 dan P2 menunjukkan fitotoksisitas sedang (GI 45-60%), sedangkan P3 dan P4 menunjukkan fitotoksisitas tinggi (GI < 20%). Berdasarkan hasil tersebut, dapat disimpulkan bahwa biomassa gulma hutan dapat dikonversi dengan baik oleh larva BSF untuk mereduksi volume limbah, namun *frass* yang dihasilkan harus melalui tahap pengomposan lanjutan sebelum diaplikasikan di lapangan.

Kata Kunci: Biokonversi, *Hermetia illucens*, Gulma Hutan, Lignoselulosa, Fitotoksisitas, *Frass*.

UTILIZATION OF BLACK SOLDIER FLY LARVAE (*Hermetia illucens* L.) FOR THE BIOCONVERSION OF FOREST WEED BIOMASS WASTE

Galuh Anggara¹, Musyafa², Daryono Prehaten²

¹Student of Faculty of Forestry UGM, ²Lecturer of Faculty of Forestry UGM

ABSTRACT

Forest weed biomass waste generated from mechanical clearing has the potential to increase the risk of land fires. Weed biomass waste can potentially be utilized as a material to improve soil fertility, one approach being through bioconversion using black soldier fly larvae (*Hermetia illucens* L.). This study aims to evaluate the bioconversion performance effectiveness of BSF larvae on physically modified forest weed biomass, examine the dynamics of lignocellulose dynamics and C/N ratio, and analyze the larval crude protein profile and frass phytotoxicity levels. The experiment used a Completely Randomized Design (CRD) with five feed treatments: P0 (tofu dregs as a positive control), P1 (*Epipremnum pinnatum*), P2 (*Imperata cylindrica*), P3 (*Eupatorium odoratum*), and P4 (a mixture of the three weeds). The results showed that the survival rate (SR) of black soldier fly (BSF) larvae reached 100% across all treatments. P3 produced the highest larval weight growth and waste reduction rate (WRR) at 52.09%. Meanwhile, the most efficient nutrient assimilation rate was demonstrated by P1, achieving a bioconversion efficiency corrected for residue (BER) of 29.38% and a bioconversion efficiency (BE) of 12.23%. Conversely, the lowest biological performance and bioconversion efficiency were found in P2 due to high structural barriers from lignocellulose and silica content, although its BSF larval biomass had the highest crude protein content (41.33%). The bioconversion process by BSF larvae unable in reducing the frass C/N ratio across all treatments to meet the SNI 19-7030-2004 compost maturity quality standard. Moreover, in vitro tests using the germination index (GI) parameter on lettuce (*Lactuca sativa* L.) seeds indicated that the forest weed frass still retained phytotoxic effects, presumably due to the incomplete degradation of allelochemical compounds. P1 and P2 showed moderate phytotoxicity (GI 45-60%), while P3 and P4 showed high phytotoxicity (GI < 20%). Based on these results, it can be concluded that forest weed biomass can be effectively converted by BSF larvae to reduce waste volume, but the resulting frass must undergo a further composting stage before being applied in the field.

Keywords: Bioconversion, *Hermetia illucens*, Forest Weeds, Lignocellulose, Phytotoxicity, Frass.