

# Effect of combining known proportions of food waste on growth and nutritional values of black soldier fly larvae

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## Abstract

The rapid growth of the global population presents significant challenges in waste management and food production. Black soldier fly larvae (*Hermetia illucens*, Diptera: Stratiomyidae) offer an effective solution to these dual challenges through organic waste bioconversion and protein production for animal feed. The composition of their feed substrate significantly influences both the quantity and quality of larval production. To determine the impact of organic matter mixtures on larval quality, seven organic substrates were developed using two types of human food waste: fruits/vegetables (A), starchy materials (B), and livestock forage as control (C). The mixture plans were as follows: 100% of each type, 50% of two of the types, or 50% A + 25% B + 25% C. The experiment was conducted under controlled conditions at  $28 \pm 2$  °C and  $60 \pm 5$  % relative humidity. The study measured larval growth performance, mortality rates, waste bioconversion efficiency, and changes in the nutritional profile of the larvae based on their feed substrate. The results indicated that the mixture of 50% A + 25% B + 25% C was the best substrate for larval development and significantly influenced larval performance, leading to the highest larval biomass production ( $0.25 \pm 0.04$  g / larvae), the lowest larval mortality rate ( $5.6 \pm 1.9\%$ ) and the highest bioconversion efficiency ( $9.64 \pm 1.83\%$ ). The nutritional analysis showed that, the larvae fed on this optimal mixture acquired nutrient levels (proteins ( $44.5 \pm 2.1\%$  on dry matter basis), amino acids, and minerals) comparable to conventional protein sources for poultry feed such as fish and soybean meal. Analysis of the fatty acid profile currently ongoing will enable conclusions to be drawn and will complete the nutritional section. Black soldier fly larvae can thus effectively consume and extract valuable nutrients from residual organic matter, producing nutrient-rich larval biomass that can be utilized in animal feed production. By converting waste into valuable protein sources, they offer a promising approach to

meeting future food security and environmental sustainability goals.

**Keywords:** Black soldier fly larvae, organic matter, nutritional values, bioconversion

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