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Black-soldier-fly larvae in Kenya: Evaluating waste-based production systems for safe and climate-resilient protein value chains

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Abstract

The escalating global population and increasing demand for protein have placed immense pressure on conventional food and feed sources. This challenge is exacerbated by environmental concerns associated with traditional livestock farming, including greenhouse gas emissions and land degradation. In this context, insect farming, particularly the rearing of Black Soldier Fly Larvae (BSFL), *Hermetia illucens*, has the potential to convert various organic waste streams into high-quality protein and fat. Despite significant global interest in adoption, substantial knowledge gaps and ongoing challenges exist regarding how different waste streams and manufacturing processes ultimately affect the nutritional content and safety of BSFL products, especially in practical situations in Africa. This study describes and assesses the performance and safety of BSFL reared on two waste streams in Kenya from December 2025 to March 2026. The study adopts an experimental design that integrates production system-level data with laboratory analyses of BSFL and its derived products. For this, the BSFL were produced in two systems, namely local (uncontrolled temperature and humidity, UC) and industrial (controlled temperature and humidity, CC). Parameters assessed were growth performance (gram per day), feed conversion efficiency (FC, %), proximate and amino acid composition, as well as microbiological hazards, mainly Enterobacteriaceae and *Salmonella* spp, which are prominent in local feeds. Preliminary results show that BSFL effectively transforms organic waste into useful biomass. However, marked variability in nutritional composition and safety parameters was observed between the systems. The UC provided 8.2±0.75 % ash, 13.05±0.82 % fat and 19.34±1.48 % moisture content compared to 17.84±0.26 %, 6.31±1.39 % and 8.6.3±0.1 % in the CC, respectively. Similarly, FC varied between the two systems, 3.51 % for UC and 3.06 % for CC. These preliminary findings highlight the need for standardised production systems to ensure consistent productivity, quality and safety in emerging BSFL value chains. Our ongoing analysis will provide further insights into the effect of genetic variation, feed ingredients, and processing methods on the efficiency, quality and safety of the BSFL.

Keywords: Alternative protein, black soldier fly, feed conversion efficiency, food safety, food systems, Kenya

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