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DEVELOPMENT OF NOVEL BLACK SOLDIER FLY REARING FACILITIES AS A MEANS TO PROMOTE SUSTAINABLE ORGANIC WASTE MANAGEMENT AT HOUSEHOLD LEVEL

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Abstract

The use of black soldier flies (BSF) to convert municipal organic waste into valuable resources, such as high-protein larvae, offers a sustainable way to promote a circular economy. This approach benefits local communities and industries by reducing waste and producing useful by-products. In this study, a novel household BSF rearing facility with an effective volume of 2,700,000 cm³ was developed for rural areas with limited natural resources like water and forests. The facility has an automated water system and simulated vegetation, reducing manual labor while maximizing BSFL production. It comprises two chambers: a wet chamber for mating and a dry chamber for egg-laying. To initiate the process, 500 g of BSF pupae (approximately 5,996 individuals) were placed in the dry chamber. Of these, 86.67% successfully developed into 5,202 adult BSF, which moved to the wet chamber for mating and then returned to the dry chamber for egg-laying. Upon the completion, a total of 30.31 g of eggs was harvested, yielding approximately 400 eggs produced per female fly. Further experimentation involved rearing a batch of 6-day-old BSFL hatched from 2 g of harvested eggs. These larvae consumed 70.47% of 30 kg of municipal organic waste in 10 days, reaching a total biomass of 5.43 kg. The individual larvae had wet and dry weights of 209.46 mg and 71.30 mg, respectively. This novel BSF rearing facility is particularly advantageous for developing countries, especially in rural areas where access to advanced organic waste treatment technologies and financial resources is limited. By providing an efficient and low-maintenance system, it offers a practical solution for managing organic waste and supporting sustainable development.

Key words: black soldier fly, circular economy, organic waste, source separation

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