79. Black Soldier Fly process performance via urine diverting dry toilet-container based Sanitation Technology

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Abstract

This study sought to evaluate the treatment performance efficiency of Black Soldier Fly process on the fecal waste via SCBS-UDDT model. In SCBS-UDDT model, the feces container was seeded with actively feeding BSF larvae before being introduced for fecal sludge (FS) collection, allowing for FS conversion on-site.The experiment investigated on-site and offsite treatment of UDDT-CBS generated feces using the BSF larvae by installing six UDDT-CBS systems within six households at Nchiru where for onsite treatment it was pre-seeded with 5-day-old BSF larvae which fed on the fecal matter in the containers and were left at the site for 14 days. For offsite treatment 3 UDDT-CBS were installed in households where, the used containers were collected and swapped with clean ones daily and fed to 5-day-old larvae in batch feeding as a control experiment. The treatment performance of Black Soldier Fly larvae in converting waste to larval biomass was estimated by calculating the Waste Reduction (WR), Waste Reduction Index (WRI), and Bioconversion on a wet mass basis. The study used statistical analysis IBM SPSS software from the sets of experiments. Findings from this study showed that there was a significant difference in the waste reduction rates across all the treatments after the treatment process between SH and NH ($p<0.05$). In Seeded households, SH3 recorded the highest waste reduction of 67.78±1.10 while in Non-Seeded Households NH3 recorded 67.80±1.17. Similarly, waste reduction index also varied significantly ($p<0.05$) with SH3 recording 5.63±0.15 and NH3 recording 6.23±0.33 and Bioconversion rate obtained varied significantly across the treatment between SH and NH at ($p<0.05$) and lowest Bioconversion rate was recorded by SH3 at 20.09±1.53 while a high bioconversion rate was recorded by NH3 at 24.15±0.93. Efficient waste reduction and bioconversion underscore the potential of black soldier fly larvae in converting fecal waste into valuable resources. Black soldier fly larvae demonstrate effective waste reduction and bioconversion capabilities in both seeded and non-seeded households, highlighting their role in sustainable fecal waste management. This has implications for sustainable sanitation practices and resource recovery. Incorporating Black Soldier Fly larvae into fecal waste management systems offers a potential remedy to the issues of organic waste treatment while also reducing environmental contamination.

Key words: *Offsite, Onsite, Bioconversion, Container based Sanitation, Waste reduction, Fecal*