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Assessing the substrate degradation specificity and life stage performances of black soldier fly larvae (*Hermetia illucens*) in different bio-degradable waste substrates

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Solid waste management has become decisive challenge in Sri Lanka where majority of the generated waste is dumped in an unsystematic way. It is highly encouraged to pursuit more reliable waste management methods in an effective way to mitigate this issue. The black soldier fly (Diptera: *Hermetia illucens*) is a harmless insect proven for its larvae's enormous bio-waste degradable ability and animal feed. This study intends to propose the most suitable substrate to breed the larvae by assessing substrate effect for the larval growth performance and substrate degradable specificity. Specially designed bin which facilitate brooding, aeration, leachate extraction and self-harvesting was used. As three different substrates, 100% swill (T1), 100% fish offal (T2) and rotten fruits and vegetables (T3) were used and maximum allowable height of 20 cm was marked inside the bin. Egg laying lap, eggs volume and length of egg masses, substrate consumption height, pH, average moisture % (wet/dry basis), temperature (inside /outside the substrate), length and width of different larval stages and larval proximate value (crude protein %) were recorded. During the egg laying and colonization period each bin was examined in two hours interval from 8.00 a.m. to 5.00 p.m. for two months. Once brooding initiated, new substrate was refilled by 1 kg in two day intervals. First eggs emergence sequence was recorded as T1, T2 then T3. There was no substrate dependent effect for the mean egg volume (0.97 eggs/mm³) and average egg length (895.389µm) in each bin using three replicates. The highest substrate consumption height was recorded in T1 (10.3 cm). Highest pH drop of the decaying substrates was recorded in T1 (5.82) where T2 (6.17) recorded the least pH drop of the substrate. On wet / dry basis, the highest moisture content was in T3 (20.04% and 25.06% respectively) whereas the lowest moisture level was in T2 (12.06% and 13.71% respectively). The highest inner (37.1°C) and outer (30.9°C) substrate temperature was recorded in T1 and lowest value was recorded in T3. According to the larval growth performances, larval width and length were varying with respect to the larval stage. Larval crude protein % was highest in T3 (48.95%) and lowest in T1 (33.06%). In conclusion, based on the mean comparison study 100% swill indicated the most favorable conditions for the larval growth whereas larvae grew in rotten fruits and vegetables were the most suitable substitute for animal feed as a protein source.

Keywords: Animal feed, Black soldier fly, Degradation, Substrate, Swill

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