

Influence of the organic fraction of municipal solid waste on black soldier fly larvae growth and bioconversion

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The generation of organic fraction of municipal solid waste (OFMSW) in Italy amounts to approximately 6,071,512 Mg y⁻¹. Due to its composition, it still represents a valuable material and new strategies for its valorization are needed. Bioconversion by insects has been shown to be a new valuable tool for manage and valorize low valuable substrates recycling nutrients in a circular economy perspective. This work considered the suitability of OFMSW as growing substrate for black soldier fly (BSF) larvae assessing the impact of variation of OFMSW on larval growth and bioconversion ability. OFMSW was collected from two plants over four different seasons and tested as it was (Unpulp) or pulped (Pulp). Experimental trials were conducted with groups of 500 larvae and four replicates were set up. The following parameters were observed: larval growth and survival, final larval biomass yielded, substrate reduction (SR), waste reduction index (WRI) and efficiency of conversion of ingested food (ECI). Data were analyzed with a two-way ANOVA. The results confirmed high survival and growth rates of BSF larvae fed with OFMSW. Survival was high in all tested samples (mean >95%), and the larval growth occurred within 12 days (mean of 9.1±0.1 days). Moreover, no significant differences were found between “pulp” and “unpulp” treatment for larval survival and developmental time. Seasonality did not significantly influence larval survival and developmental time, except for one case. The final larval yield (DM) varied from 9.7 to 40.0g, with a mean 24.7±0.9g. In some cases, pulp treatment had a positive effect compared to unpulped for the final larval yield and the ECI values. WRI did not show differences between pulp and unpulp but some seasonal variabilities were registered. SR presented a mean of 55.5±1.5 %. OFMSW is a suitable substrate for BSF larvae and no clear effects due to season, waste plant or texture were found, although a certain variability was observed.

Keywords: *Hermetia illucens*, larval biomass, OFMSW, seasonality, OFMSW texture