

Development of Omega-3 Enriched Feed Ingredient: Tailoring Fatty Acid Composition of Black Soldier Fly (*Hermetia illucens*) Larvae Using Fish Offal and Seaweeds

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This study aimed to evaluate the potential to enrich black soldier fly larvae (*Hermetia illucens*: BSFL) with omega-3 fatty acids by feeding omega-3 rich ingredients: yellowfin tuna (*Thunnus albacares*) offal and 3 seaweeds (*Kappaphycus alvarezii*, *Gracilaria salicornia* and *Sargassum wightii*). Eight substrates were prepared using poultry manure as basal ingredient: a substrate containing 100% poultry manure (control), 4 substrates supplemented with 12% of one of the 4 omega-3 rich ingredients (fish offal, *K. alvarezii*, *G. salicornia* or *S. wightii*) and 3 substrates supplemented with 6% fish offal and 6% of one of the 3 seaweeds. A total of 5 days-old 3600 BSFL were randomly distributed into 24 plastic containers (150 larvae per container) and fed with one of the 8 substrates for 14 days (n=3). At the end of the experiment, weights of larvae were recorded. Fatty acid compositions of substrates and BSFL were measured. Omega-3 fatty acid (C20:5 EPA and C22:6 DHA) contents were significantly ($P<0.05$) higher in the BSFL fed 12% fish offal. *K. alvarezii* and *G. Salicornia* also showed similar results, but only when fed together with fish offal. Further, the results showed a significant ($P<0.05$) positive correlation between omega-3 contents in the substrate and BSFL. On the other hand, supplementation of *S. wightii* did not enrich BSFL with omega-3 fatty acids. The BSFL fed 12% fish offal had significantly ($P<0.05$) higher growth performance and bioconversion efficiency than the control group. The supplementation of fish offal in combination with *K. alvarezii* or *G. salicornia* did not compromise growth performance and bioconversion efficiency of BSFL. In conclusion, supplementation of poultry manure with fish offal and seaweeds (*K. alverazii* and *G. salicornia*) can enrich BSFL with omega-3 fatty acids without compromising larval performance.

Keywords: Black soldier fly larvae, Fatty acids, Fish offal, Omega-3, Seaweed

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