Tittle: Substrates most preferred for black soldier fly *Hermetia illucens* (L.) oviposition are not the most suitable for their larval development

Abstract

Larvae of black soldier fly (BSF), *Hermetia illucens* (L.1758) (Diptera: Stratiomyidae), are increasingly being used as animal feed ingredients. Larvae are usually produced by placing eggs, obtained from adult rearing on growing substrates but can also be obtained by exposing substrates to naturally occurring BSF females. In the latter system, the substrate needs not only to be nutritious for the larvae but also attractive to the females for oviposition. The 'preference-performance principle' suggests that female insects prefer to oviposit in substrates that maximise offspring fitness. In this study conducted in Ghana, six organic substrates known to be suitable for BSF production were evaluated for their suitability as oviposition attractants and larval development: pito mash (waste from a locally brewed sorghum drink), millet porridge mash, pig manure, chicken manure, fruit waste, and waste from roots and tubers. These were first exposed outdoors to measure the quantity of eggs laid on them by naturally occurring BSF females. In a second experiment, the quality of the substrates as larval rearing media was tested by placing a standard amount of young larvae to measure the individual and total weights of prepupae obtained, their number, and their development time. The nutritional profiles of both the prepupae and the substrates were determined. The substrate used significantly influenced the quantity of eggs laid and the development of the resulting prepupae, but the substrates most favourable for larval development were not the most favoured by gravid BSF for oviposition. In the oviposition tests, millet porridge mash was the most attractive substrate, whereas only a few eggs were recovered from the other substrates. All substrates allowed the successful development of larvae but pig manure was more productive than the others.