



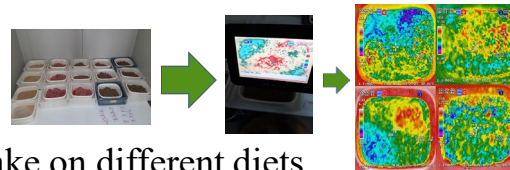
EFFECT OF DIET COMPOSITION ON TEMPERATURE DEVELOPMENT IN BLACK SOLDIER FLY (*Hermetia illucens*) LARVAE REARING

Introduction:

Black soldier fly (BSF) larvae are voracious feeders of organic material and they can utilize food waste and residues as a substrate for growth. Environmental conditions (such as temperature, humidity, light, and aeration) are important to guarantee the welfare of larvae and the efficiency of their bioconversion. Diets (i.e., substrates) should be formulated carefully since they have a direct effect on microclimatic conditions and larval development.

Materials and Methods

BSF Larvae (6-day-old) were randomly chosen and allocated to the 4 diets. Environmental conditions were kept at $27 \pm 1^\circ\text{C}$ and $65 \pm 5\%$ RH, with photoperiod of 12L:12D. The temperature of each container was measured twice daily (morning and afternoon) for the entire experimental period (7 days) using a thermal imaging camera. Each container was aerated daily to ensure that the substrate was thoroughly moisturized, and rotated.



Future Proposal:

Evaluate the performance of adults when they take on different diets.

Period Abroad/at Company

The study was conducted in the laboratories of BEF Biosystem.



References:

[1] Surendra et al. Rethinking organic wastes bioconversion: Evaluating the potential of the black soldier fly (*Hermetia illucens* (L.)), in *Waste Management*, 58–80, 2020.
 [2] Tomberlin et al. Black soldier fly from pest to “crown jewel” of the insects as feed industry: An historical perspective, *Journal of Insects as Food and Feed*, 1–4, 2020.
 [3] Barragan-Fonseca et al. Influence of larval density and dietary nutrient concentration on performance, body protein, and fat contents of black soldier fly larvae (*Hermetia illucens*), *Entomol Exp Appl*, 761–770, 2018.

Objective:

This trial tested four different diets: control, vegetable, carnivorous and omnivorous with the following aims:

- To assess larval growth;
- To analyze the chemical composition of larvae and substrates;
- To identify the temperature of each of the substrates and its variation during the rearing cycle.

Results

TRIALS	LARVAE BIOMASS (gr)	DRY MATTER %	Larvae meal yield (gr)
control	376,94 ^b	37,05 ^{ab}	138,55 ^b
vegetable	278,04 ^a	26,81 ^a	76,31 ^a
omnivorous	335,10 ^{ab}	35,10 ^{ab}	117,52 ^{ab}
carnivorous	305,93 ^{ab}	44,43 ^b	135,40 ^b

Figure 1: Growth performance

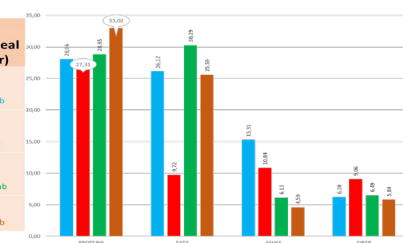


Figure 2: Chemical composition of larvae

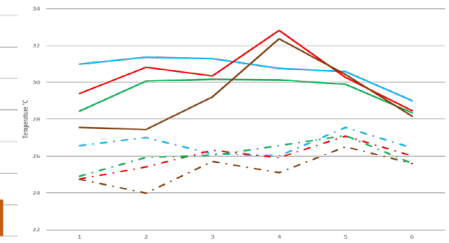


Figure 3: Temperature of the substrate during the study

Conclusions

This study showed the vegetarian diet has lower dry matter, larvae meal yield and crude proteins. In terms of substrate temperatures, since the vegetable diet produced significantly higher temperatures than the control and carnivorous diets, it appears that this diet is the one that results in the poorest growth performances. These findings showed an effect of the diets on substrate temperature and larvae growth.

[4] Singh et al. Black Soldier Fly *Hermetia illucens* (L.): Ideal Environmental Conditions and Rearing Strategies, *Indian Journal of Entomology*, 1–11, 2022.
 [5] Chia et al., Threshold temperatures and thermal requirements of black soldier fly *Hermetia illucens*: Implications for mass production, *PLoS One*, 1–26, 2018.
 [6] Barrett et al. Welfare considerations for farming black soldier flies, *Hermetia illucens* (Diptera: Stratiomyidae): a model for the insects as food and feed industry, *J Insects Food Feed*, 1–30, 2022.