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BIOCONVERSION OF AGRICULTURAL WASTE THROUGH BLACK SOLDIER FLY LARVAE FOR THE PRODUCTION OF FORTIFIED FEED WITH ZINC AND SELENIUM

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SPOKE, WP E TASK DI APPARTENENZA

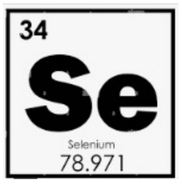
Spoke 8 – Circular economy in agriculture through waste valorization and recycling

Work package 8.1 Producing new products to upgrade waste value

Task 8.1.2 Valorisation of the waste by biotechnology processes to obtain for high value molecules or new products

INTRODUCTION AND AIMS

Black soldier fly larvae (BSF – *Hermetia illucens*) are able to valorise a wide range of wastes and by-products transforming them into biomass rich in proteins and lipids. The exploitation of larvae as feed for animals appears to be of great interest in the context of sustainable feed research.
Zinc (Zn) and selenium (Se) are two essential micronutrients involved in several important biological functions in humans and animals, and an adequate intake must be ensured. Among the various sources of these micronutrients, insects have been proposed, as they are known to be natural bio accumulators of different nutrients.
In this study, the larval growing substrate was supplemented with Zn and Se and the growth parameters of the larvae, the bioconversion capacity and biomass production were observed.



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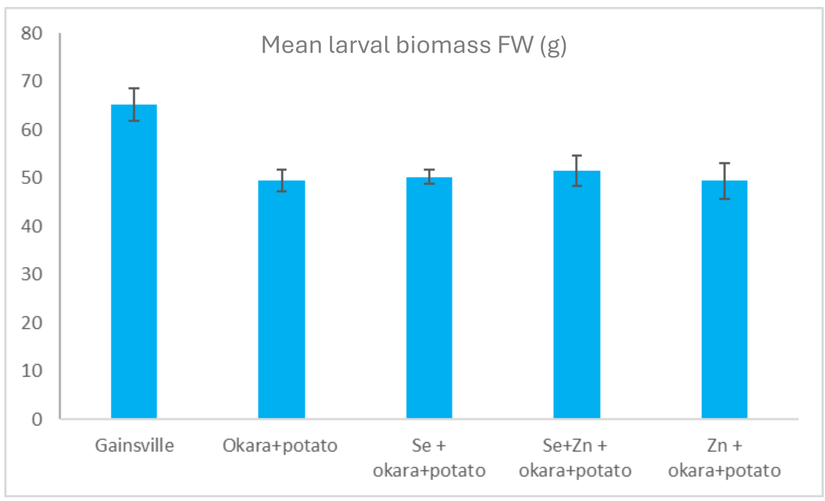
MATERIALS AND METHODS

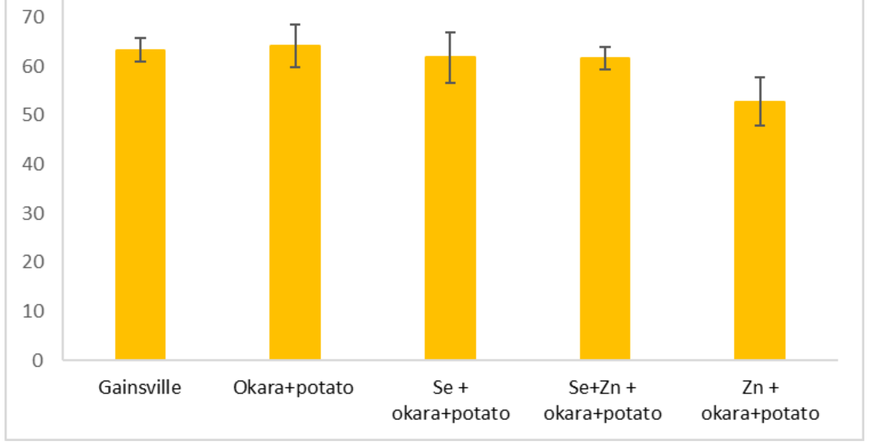
A mixture of two agro-industrial by-products, okara and potato waste (50:50), was selected as rearing substrate, as well as a control diet (Gainsville).
The substrates (okara + potato waste) were fortified as follow:
I) 150 mg/kg of Zn;
II) 0.3 mg/kg of Se;
III) 150 mg/kg of Zn + 0.3 mg/kg of Se.
Doses for both trace-elements have been selected on the base of other farm feed formulations. For each thesis, five replicates were set up (dark conditions, 26°C and 60%RH) containing 500 young larvae. Growth parameters, bioconversion ability and final biomass yield were measured.

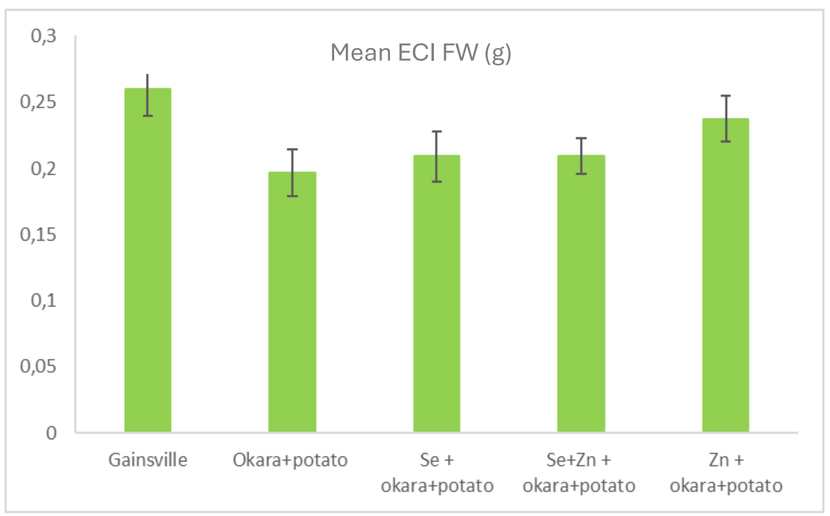
Okara (a residue of soybean processing for the production of tofu and soy milk) and potato waste are characterized by a good nutritional composition (Okara: CP: 28-30%; EE: 8-10%; NSC: 50%. Potato waste: CP:8.11%; EE: 0.95%; NSC: 79,9%), but both have problems of conservation due to the high humidity

RESULTS

BSF larvae grew efficiently on the diets enriched with Zn and Se, without showing significant differences ($p>0.05$) with the control and the unfortified diets in terms of survival (always above 94%), developmental time and mean larval weight (overall mean 0.14 g). Only the total biomass collected at the end of the experiment was higher in the control diet ($p<0.05$). Substrate reduction (SR) and conversion efficiency (ECI) were similar within the experimental thesis ($p>0.05$) .







These first trails indicate that adding Zn and Se in the larval rearing diet does not affect the larval performance, but further studies are necessary to assess the influence of trace elements on adult reproduction and the enrichment of the larval biomass produced as feed for farmed animals.

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