

## Improved Chemical and Structural Properties of Black Soldier Fly Larva Protein Isolate Conjugated with Glucose Through Maillard Reaction

Bongisiwe Zozo, Merrill Wicht, Vusi Mshayisa, Jessy Van Wyk

Cape Peninsula University of Technology, Cape Town, South Africa

### Abstract

The increasing global population and consumer demand for protein will render the provision of protein a serious future challenge, thus placing substantial pressure on the food industry to provide for the human population. The lower environmental impact of insect farming makes the consumption of insects such as Black soldier fly larvae an appealing solution, although consumers in developed countries often respond to the idea of eating insects with disgust. One approach to adapt consumers to insects as part of their diet is through application of making insect-based products in an unrecognised form. Black soldier fly has been proposed as an alternative protein source sustainable for both food and feed due to its nutritional composition. This study focused on the structural analysis of black soldier fly larvae protein and conjugates. The protein was extracted using the alkaline-acid extraction technique. The protein extract was then conjugated with glucose by Maillard reaction. The protein and glucose were mixed at (2:1 w/w, pH 9), incubated for 30, 60, 90, and 120 at 90 °C. The products obtained were then characterised and compared. The changes were confirmed by universal attenuated total reflectance Fourier-transform infrared spectroscopy (UATR-FTIR), scanning electron microscopy, thermal gravimetric analysis, and differential scanning calorimetry. UATR-FTIR combined with principal component analysis monitored the protein-sugar conjugates, to show the structural difference among heated proteins and conjugates. The heating treatments resulted in the unfolding and reduction of the protein molecule aggregation. The conjugates showed a significant decrease in the lysine content as the heating time increased to 120 min. FTIR indicated that the amide I and II bands of the protein were altered by the MR. The increased T max (the temperature at which decomposition is completed) demonstrated that the conjugation of the protein with glucose improved the thermal stability, remarkably. These results suggested that Maillard reaction with glucose can be a promising way to improve the thermal properties of Black soldier fly larvae protein.