Yellow mealworm composition after convection and freeze drying – preliminary results

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Abstract

The research hypothesis assumed that different drying methods would change the physico-chemical composition of the mealworm larvae. Therefore, the aim of this study was to determine whether blanching, different temperatures, drying times and drying technologies will affect selected physical and chemical parameters of the mealworm larvae of yellow mealworm (*Tenebrio molitor* L.).

The experiment involved blanching insects and then drying them by convection or freeze-drying. Two blanching times were adopted: 60 and 180 s. Convection drying temperatures were 60 and 80°C, and drying times 12 and 16 hours. The main freeze-drying temperature was -30°C for 16 or 24 hours, followed final drying at -40°C for 2 hours. After drying, the insects were packed into string bags and then subjected to laboratory analyses, i.e., contents of moisture, fat, protein, ash, crude fiber and water activity.

The insects blanched for 60 seconds and then freeze-dried for 16 and 24 hours had the highest moisture content (5.47% and 4.79%, respectively) and water activity (0.55 and 0.49, respectively), among all the tested samples. On the other hand, the larvae blanched for 120 s and dried for 16 h at 80°C had the significantly lowest moisture (3.15%) and low water activity (0.06). The highest protein, fiber and ash content was determined for larvae blanched for 60 s and dried by hot air at 60°C and freeze-dried for 16 h. The larvae dried in this way also had the least fat. Its high amounts were assayed in samples from blanching for 120 s and dried by convection at both temperatures and times.

These were first analyses carried out in our laboratory in the field of various methods of drying insects and it is not yet possible to unequivocally determine the influence of individual drying methods on the quality of processed larvae and should be treated as preliminary. In addition to the above-mentioned methods, the quality of the larvae could be influenced by the age and weight of individual insects, as well as other factors not examined in this experiment.

Competitive Insect Products
Feedstock suitability assessment for Hermetia rearing and waste treatment of insect farming residues by anaerobic digestion

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Abstract

In the research project “Competitive Insect Products (CIP)”, the suitability of various organic feed materials for larval rearing of the black soldier fly has been tested in laboratory- and pilot-scale feed tests. Larval growth and weight gain were investigated under controlled conditions over a period of 2-3 weeks in batch operation. In addition to numerous raw materials of feed quality such as brewer's grains, residues from bioethanol production, maize silage, agricultural residues such as fermentation residues from agricultural biogas plants, dry chicken manure as well as residues from watercourse management were investigated. Based on the results of the feeding trials, an initial estimate of the required feed input quantities and the substrate-side production costs has been made. Depending on the feed material used and the feeding rate selected, a conversion of the organic dry matter (oTS) contained in the feed material into insect biomass (oTS) of between 4...29 % could be achieved. Depending on the process control, the residues of larvae fattening are comparatively dry (70...85 % dry matter).

A further aim of the CIP project was to determine the biogas potential and the fermentation properties of residues from insect farming (insect frass). For this purpose, discontinuous fermentation tests and quasi-continuous fermentation tests were carried out in lab scale. The specific gas potential of the insect frass samples from lab feeding trials was in the range of 168...288 mL CH_4 / g organic total solids (oTS) and was thus comparable to other animal residues such as cattle, pig and chicken manure with 210, 250 and 280 mL / g oTS, respectively. Insect frass from Hermetia rearing in pilot scale achieved methane potentials of approx. 168 mL CH_4 / goTS or 118 m^3 CH_4 / t residue in long-term fermentation tests on a laboratory scale, which corresponds to the typical methane potential of maize silage with approx. 110 m^3 / t fresh mass. Accordingly, one tonne of maize silage could be replaced by the use of one tonne of insect frass from insect farming.

The poster or presentation will summarize the main project results and will give an outlook towards the current research work on insect farming.