BIOMASS RESIDUE UTILSATION IN INSECT REARING

Summary

Biomass of agricultural origin is an important source of nutrients. According to scientific sources and organizations such as FAO, about a third of this biomass is lost due to inefficient storage or technical limitations. The recovery of nutrients from it can be done with the help of its use as feed for the growth of insects. This theme is very current in Europe, because it allows an efficient bioconversion of nutrients by insects. The latter become the source of nutritional fodder for other animals, allowing to replace fish meal, currently used as a rich source of nutrients in animal breeding. The use of insects as a tool to recover valuable nutrients, but also as a feed source for animals, reduces the pressure on the environment in terms of the need in increasing the production of animal protein sources for growing global population. Recently in 2021, insects are an already accepted source of protein for human consumption. Yellow mealworm larvae (*Tenebrio molitor* L.) flour was the first that has been allowed on the European market. Yellow mealworm is a beetle from Coleoptera: Tenebrionidae. Research was conducted at the Department of Genetics, Plant Breeding and Bioresource Engineering, University of Warmia and Mazury in Olsztyn, Poland. The aim of the research was to analyse the progress and directions of research on yellow mealworm, as well to investigate the growth performance, survival, feed conversion ratio (FCR), efficiency of ingested feed (ECI), etc. on larvae grown on 13 different diets containing agro-industrial byproducts. In addition, influence of different drying methods on chemical and physical mealworm larvae nutritional features was evaluated.

Based on investigated literature from 2012-2020 (**P1**) it was concluded that yellow mealworm is widely bread insect species in Europe, being tested as feed for different livestock (poultry, fish, small birds, and pets). Western European researchers and research facilities are investigating the mealworm larvae on a small and large scale. Many studies are carried out on the influence of different feed and byproducts on the nutritional quality of the mealworm and its development.

Moreover, result on feeding experiment of mealworm larvae on various tested diets showed that the highest final fresh weight of larvae was on those reared on WB diets. Individual larval weight gain almost doubled weekly, excepting the larva fed on WS 100 diet (**P2**). The survival

of mealworms on tested diets was high, between 92.2% and 97.7% for larvae grown on WB 100 and WS 25/CF 75, respectively (**P3**). However, the longest larval period (115 days) was recorded for mealworms fed on the WS 100 diet, compared to those fed on WB 25/FC 75 (73 days). The final results revealed the lowest FCR (1.53 to 1.59) were found on larvae fed on RM mixed with CF diets (**P3**). Adding CF into the diets significantly improved the ECI (**P2&P3**).

Mealworm larvae were also analysed for their physical and chemical composition after being subjected to a drying process (**P4**). Insects were blanched and dried with the use of two methods: convective drying and freeze-drying, at different drying temperatures and times. Dried insects were characterized by low moisture content in the range of 3.15% to 5.47%, and they differed considerably in water activity (0.06–0.55). Moisture content and water activity were substantially higher in larvae blanched for 60 s and freeze-dried than in larvae dried with the use of the remaining methods. It was shown that the shorter freeze-drying time resulted in a high value of water activity (a_w) (0.49–0.55), but still sufficient to inhibit the growth of microorganisms but insufficient to inhibit enzymatic reactions. In the case of extending the freeze-drying time during the main drying a_w values dropped significantly, especially in the larvae blanched for 60 s. The study of the proximate composition of larvae, however, did not show any significant changes in the crude content of protein, fiber or fat in insects after using various methods and drying parameters. However, it was noticed that the age of insects significantly influenced the features of the examined larvae, e.g. crude fat and protein content.