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New life for rice by-products through yellow mealworm bioconversion

A. Resconi¹, S. Bellezza Oddon¹, Z. Loiotine¹, R. L. Passaro¹, K. Y. Mendez Rondo¹, L. Gasco¹, J. Bacenetti², I. Biasato¹

¹ University of Turin, Largo Paolo Braccini 2, 10095 Grugliasco, Italy, ² University of Milan, via Celoria 2, 20133 Milano, Italy

Tenebrio molitor (TM) is commonly reared on substrates with high dry matter (DM) content, thus including rice by-products (i.e., rice hull, rice husk, green grains, broken rice). However, information about the suitability of rice by-products as TM substrate are still limited. This study aims to evaluate the effects of rice by-products-based diets on growth and bioconversion efficiency of TM larvae. Five isonitrogenous (18% crude protein [DM]), isolipidic (3% ether extract [DM]) and isoenergetic (18 MJ/Kg [DM]) diets were tested (5 replicates/diet, 10000 3-week-old larvae/replicate, 0.26g/larva): C (control diet; feed waste, breading waste, dry distillery stillage, coffee silvery film and hazelnut film), WR1 (10.5% of white rice by-products), WR2 (26.5% of white rice by-products), PR1 (17% of parboiled rice by-products), and PR2 (42.5% of parboiled rice by-products). Larval weight was recorded at the beginning of trial and every week. Specific growth rate (SGR), feed conversion ratio (FCR), survival, efficiency of conversion of digested food (ECD), and sieveability percentage (SP) were calculated at the end of larval growth (growth ≤50%). Data were analysed using SPSS software. Diet did not influence survival and development time (P>0.05). However, all the rice by-products-based diets led to higher final larval weights and SGR than C group (P<0.05). The lowest ECD was observed in WR1 and C larvae (P<0.001), but both displayed the highest SP (P<0.001). Lower FCR was also observed in WR2-fed larvae in comparison with C diet (P<0.05). In conclusion, rice by-products are able to improve growth performance and bioconversion efficiency of TM larvae, with white rice being preferable in terms of SP. The research was supported by Fondazione Cariplo (newRIFF project).

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Optimizing the reproduction of Tenebrio molitor D. Deruytter¹, J. Claeys¹, C. L. Coudron¹ ¹ Inagro, Insect Research Centre, Ieperseweg 87, 8800 Rumbeke-Beitem, Belgium

Numerous publications already indicate that Tenebrio molitor can be a great source of sustainable animal protein for both feed and food. However, in general these papers refer to environmental sustainability and not economic sustainability. The latter is often difficult due to a lack of specialized knowledge and equipment resulting in fairly high investment or operational costs. One of the ways to lower the costs is to improve the reproduction ensuring that less space and resources have to be allocated to this part. At the Insect Research Centre several experiments were preformed in order to improve the reproductive output. In a first experiment the particle size of the feed of the adults was assessed. This parameter may affect the density of the feed and therefore the way beetles can borrow in the feed, layer thickness and 'air'gaps. It was observed the particle size of the feed had a major impact on the egg production with smaller particle size resulting in a higher output. In a second trial the effect of the size of the beetles (male and female) on the reproduction was assessed both on the willingness to mate and on the reproductive outcome. In a third trial the sex ratio and the possibility for multiple copulations was assessed. Preliminary results indicate that the beetle size has less of an influence than anticipated, while the sex ratio and multiple copulations did significantly alter the number of offspring. The combined results of these experiments will improve the reproductive output and decrease the space and time allocation.