

Introducing the special issue 'Insects on the monogastric menu'

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EDITORIAL

Interest in insects as feed ingredients in poultry, swine and rabbit is growing rapidly. The protein fraction has been studied most, but research on other nutrients from insects and a deeper understanding of beneficial aspects of the use of insects is gaining traction. Since September 2021 it is legally allowed to include insect proteins in feed for poultry and pigs and the number of publications on applications of insect products in these livestock animals is increasing. Publishing open access ensures the engagement of all stakeholders in the insect chain and parties involved in using the end products in animal feed. For this reason, the Journal of Insects as Food and Feed has composed an open access special issue focussing on applications of insect products in monogastric animal nutrition. The special issue touches on aspects related to nutrition, health, welfare, safety, socio-economic and consumer issues.

A call for papers was published via the website of the Journal of Insects as Food and Feed and authors were selected *a priori* based on their expertise related to the topic of this special issue. Manuscripts were assigned among the guest editors of this special issue and they were asked to identify reviewers as well as manage the review process. In some instances, guest editors were also authors or co-authors. However, they did not manage their own manuscripts to guarantee the integrity of the process.

Novel feed ingredients can only be included in feed if the chemical nutrient composition and the digestibility of the respective feed ingredient is known to include these parameters in the matrix for feed formulation. Nutrient digestibility can be assessed *in vitro* as well as *in vivo*. The *in vitro* digestibility can be assessed without animals and is less time consuming and cheaper compared to the *in vivo* digestibility assessment. One prerequisite is that the *in vitro* digestion assay simulates the digestive system of animals. Optimal experimental variables to assess the digestibility of proteins, the solubility of amino acids and minerals in black soldier fly (BSF) larvae meals were determined, and these experimental variables were evaluated on three different batches of BSF meals (Silva *et al.*, 2022) for monogastric animals. Once the nutrient digestibility has been determined and the feeding value of the novel protein has been evaluated, the feed ingredient can be included in animal feed formulation. Fungal contamination of crops and stored

cereals can, however, result in the production of secondary toxic metabolites usually referred to as mycotoxins, which are a main concern for food safety issues due to their implications for human and animal health. The effects of inclusion of yellow mealworm larvae (*Tenebrio molitor*) fed low or high deoxynivalenol-contaminated wheat in broiler diets were evaluated for broiler production performance, survival, and retention of dry matter and crude protein (Duhra *et al.*, 2022). In two papers in this special issue the feeding value of BSF larvae products is evaluated in broiler chickens (Kim *et al.*, 2022) and in laying hens (Heuel *et al.*, 2022). Kim *et al.* (2022) evaluated the apparent ileal nutrient digestibility of diets supplemented with different inclusion levels of BSF meal. Subsequently, the authors evaluated different inclusion levels of microwave-dried BSF larvae meal as replacement for soybean meal in broiler chicken diets on growth performance, intestinal length and weight, volatile fatty acids in caecal digesta and serum parameters and haematological traits as indicators for animal health. Heuel *et al.* (2022) evaluated the difference in feeding value between soybean protein and BSF larvae protein in a lysine-deficient diet in laying hens at the start of the laying period, and the source of BSF larvae was also studied. Next to production performance parameters, egg quality and a sensory evaluation of the odour of eggs were also assessed. Sensory and physicochemical properties of broiler chicken meat were evaluated in an experiment in which broilers were fed with different combinations of inclusion levels of

Desmodium intortum and BSF larvae meal (Mutisya *et al.*, 2022). *D. intortum* is widely recommended to smallholder farmers as a companion plant to manage weed, stemborers, and fall armyworm, which affect cereal production in Africa. Previously, a combination of *D. intortum* and BSF larvae meal as feed ingredients were evaluated positively in broilers. The inclusion of insect products in animal feed is important not only for the purposes of balancing the nutrients for optimal performance but also from an economic perspective. Tavares *et al.* (2022) evaluated the economic aspects of the inclusion of *T. molitor* meal in broilers. Gross margins of broilers fed different inclusion levels of insect meal were determined, and different scenarios were simulated considering different soybean meal and/or insect meal costs to evaluate the economic viability of the cost of insect meal in the diets of broilers. Insect production is viable not only because of the feeding value of insect meal but also due to the potential application of insect meal as a nutritional additive with beneficial bioactive properties. Veldkamp *et al.* (2022) reviewed the bioactive properties of insect products for monogastric animals focusing on different categories of bioactivity. In the review, bioactive activity of antimicrobial peptides (such as α -helical peptides, cysteine-rich peptides, proline-rich peptides, glycine-rich peptides), fatty acids (especially lauric acid), and polysaccharides (especially chitin and chitosan), and effects of insect proteins on antioxidant capacity were evaluated, which may create added value for insect products in animal feed. This special issue contributes knowledge on the inclusion of insect products in feed for monogastric animals, considering it is now legally approved to include insect protein in feed for poultry and swine.

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