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Black Soldier Fly Larvae as Feline Feed: An Editorial

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Insects such as the black soldier fly larvae (Hermetia illucens (L.), Diptera, Stratiomyidae, BSFL) are emerging as sustainable and high-quality protein sources for pet foods [1,2]. Research in this area is still emerging, with few studies focusing on the nutritional benefits and potential impacts of BSFL meal-based food in feline diets [3,4,2]. Recent studies and industry practices suggest that these larvae could be a sustainable and nutritious alternative to traditional pet food ingredients [5], offering high-quality protein and essential nutrients [1] while also having a lower environmental impact.

Recent studies have shown that insect meals, such as black soldier fly larvae (BSFL) can be safely included in animal diets without negative impacts on growth or nutrient digestibility and may even offer immune benefits due to their chitin content. The utilization of BSFL meal as a protein source in pet food formulations, and its palatability, nutritional value, and health impacts have been researched in cats [3,4,2]. However, little is known about the effects of BSFLM on the growth performance and health of adult cats. Recent studies by, Do et al. [4] found that cats consuming BSFL meal, whole BSFL, and BSFL oil for 70 days showed an increase in feed consumption when compared to a control group. This suggests that BSFL may be more palatable or may stimulate a higher feeding motivation in cats, which could be beneficial in promoting weight gain in underweight animals or those with decreased appetite. In a separate study, Bosch et al. [2] found that adult cats fed a BSFL meal-based diet for 28 days not only had a higher feed intake but also experienced a slight reduction in body weight, although maintaining similar body condition scores relative to the control group. This indicates that while BSFL may encourage feed consumption, it does not necessarily lead to unhealthy weight gain, potentially due to its nutritional composition.

The inclusion of BSFL meals in cat diets appears to offer several nutritional benefits, including increased palatability, potential weight management, reduction in faecal ammonia levels, alteration in the gut microbiome, improved gut health, and enhanced faecal quality. A study with 28 adult cats found that insect-based diets, rich in essential fatty acids and amino acids, were well-digested and led to similar health outcomes as a traditional chicken-based diet. No significant differences were observed in nutrient absorption, faecal quality, or gut microbiota diversity, indicating that insect meals could be a viable alternative protein source for cat food [6]. In terms of digestive health and waste management, both studies by, Do et al. [4] and Bosch et al. [2] reported an increase in faecal output in cats fed with BSFL meal. Additionally, a decrease in faecal dry matter percentage was reported, which could imply a higher moisture content or a change in gut motility and potentially easier defecation. The reduced faecal DM content, as observed by Bosch et al. [2], further supports the hypothesis of improved digestibility of the BSFL diet. These findings are significant as they suggest that BSFL meals can enhance gut health and digestion in cats.

In terms of faecal quality, Bosch et al. [2] found that cats fed BSFL meal-based food for 28 days maintained optimal fresh faecal consistency scores, comparable to those of the control group. This is an important consideration for pet owners and veterinarians as it suggests that despite the dietary changes, faecal quality is not adversely affected. Additionally, the same study reported lower faecal ammonia levels in adult cats fed with BSFL meal, which is a positive outcome as high faecal ammonia can be indicative of protein fermentation in the gut and may contribute to unpleasant odours. This could have positive implications for litter box odour and the overall living environment and health of indoor cats and their owners, as high faecal ammonia can be detrimental to air quality and respiratory health. Moreover, the same study showed that the BSFL diet increased faecal concentrations of short-chain fatty acids and biogenic amines in adult cats.

Short-chain fatty acids are known for their role in colon health, and energy metabolism, and have anti-inflammatory properties. The role of biogenic amines is less clear and may depend on their types and concentrations. However, their presence indicates microbial fermentation and protein metabolism in the gut, which could be influenced by the unique protein composition of BSFL. These findings suggest that BSFL meal may positively alter the gut microbiome and overall health of cats.

Further investigations by, Do et al. [4] found that cats consuming BSFL meal and whole BSFL for 70 days exhibited lower digestibility of organic matter, crude protein, and energy when compared to those fed BSFL oil or a control diet. Similarly, Bosch et al. [2] reported decreased faecal digestibility of dry matter, organic matter, nitrogen, and gross energy in cats fed a BSFL meal-based diet for 28 days, although fat digestibility was unaffected. These findings suggest that while BSFL can be utilized in cat food, its form may significantly influence nutrient absorption. Pezzali and Shoveller [3] found that adult cats on a diet with 4.6% BSFL meal for 21 days had increased levels of alanine aminotransferase, chloride, potassium, sodium, mean corpuscular haemoglobin, and mean corpuscular haemoglobin concentration compared to a control group. Conversely, the same study observed reductions in albumin, amylase, calcium, cholesterol, mean corpuscular haemoglobin concentration and various blood cell counts, raising concerns about the potential impacts of BSFLM on feline oxygen transport and red blood cell function. Despite the alterations in liver function and electrolyte balance, most biochemical values remained within normal ranges. In terms of gut microbiota, a recent study by, Bosch et al. [2] found that BSFL meal-based significantly reduced faecal bacterial species, with numbers dwindling from approximately 600 to 350 when compared to a control group. Furthermore, the study observed a decrease in Shannon's diversity index and Pielou's evenness in cats consuming the BSFL meal, indicating a less evenly distributed microbial community. While diversity is often associated with health, the implications of this reduced diversity are not yet fully understood and warrant further investigation to determine the potential benefits or drawbacks for feline health and nutrition.

In addition, BSFL meals can be incorporated into feline diets without disrupting the existing fungal equilibrium. Interestingly, Bosch et al. [2] found that dietary inclusion of BSFL meal did not seem to influence the faecal fungi population which remained consistent with the control group, suggesting that the effects of BSFL are possibly limited to bacterial communities within the gut. The research also highlighted specific alterations in bacterial populations, with an increase in beneficial bacteria such as Bifidobacterium, Megasphaera, Catenilbacterium, and Megamonas, and a decrease in Prevotella_9 and Peptoclostridium. This shift towards beneficial gut bacteria points towards a potential prebiotic effect of BSFL meal. Additionally, the study reported reductions in the family Lachnospiraceae and genera Lachnoclostridium and Negativibacillus, which could be associated with improved gut health and immune function in felines. Further research is warranted to fully understand the long-term effects of BSFL consumption in cats and its impact on various aspects of feline health and nutrition, as well as its applicability to other pets' food.

Hu et al. [7] found that substitution of chicken meals with three different insect meals in feline diets found no adverse effects on nutrient digestibility, faecal quality, or overall health in cats. This research suggests that insect-based proteins could be a viable alternative to traditional animal proteins in pet food, potentially easing the demand for animal-based sources. Therefore, BSFL can be incorporated into feline diets without major health concerns, but its impact on nutrient digestibility, metabolic processes and fermentation products requires further study to optimize the nutritional viability of BSFL.

Conclusion

The utilization of BSFL meals in cat diets may pave the way for innovative uses of sustainable protein sources in pet food production. As the pet food industry evolves, incorporating environmentally friendly and health-promoting ingredients such as BSFL meal could be pivotal in advancing animal nutrition and welfare. Nonetheless, comprehensive research is essential to fully understand the long-term impacts and optimal inclusion levels of BSFL in feline food. With ongoing evolution in the pet food sector, the incorporation of innovative feed ingredients such as BSFL meal is expected to significantly influence the development of future dietary formulations.

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