

Meat quality of lambs fed BSF larvae as a protein source

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Introduction: Currently, the production of lamb feed has a high environmental impact, together with the higher economic cost, leading to lower sustainability and competitiveness of Australian lamb production. As a novel nutrition source, black soldier fly larvae (BSFL) reared on food waste can be an ideal candidate of soybean substitute in feed which may be potent to improve the efficiencies and sustainability of lamb production. Recently, attempts to substitute soybean meal with BSFL meal as a dietary protein source have been successfully made on pig and poultry production (Cullere et al., 2019; Cullere et al., 2018; Yu et al., 2019). However, studies focusing on the meat quality of ruminants fed BSFL meal are insufficient. Hence, this study aims to investigate the effect of including BSFL as a dietary protein source on the meat quality of lambs.

Methods: Forty 5-month-old merino cross lambs from the Dookie flock in Victoria were randomly allocated to three feeding regimes: control diet (100% soybean meal) and BSFL diets (30% and 50% BSFL meal in replacement of soybean meal). Diets were balanced for energy and protein content between treatments. The fatty acid profiles of soybean meal and BSFL meal were also determined before the experiment started. Lambs were weighed and body condition scored upon entry into the experiment and then once per week for the duration of the experiment. After six weeks of feeding, lambs were slaughtered. Subsequently, the carcass traits including hot carcass weight, fat score and 24 h post-mortem pH decline were measured. Lamb cuts including loin, knuckle, backstrap, leg - chump on, topside were then collected, vacuum packed and stored under refrigerated conditions for 7 days. Meat quality traits including ultimate pH, drip loss (%), colour and lipid oxidation were evaluated after 7-day ageing. The results were analysed by one-way Analysis of Variance (ANOVA) and the Restricted Maximum Likelihood (REML) analysis.

Results: Lambs fed BSFL diets did not show significant differences in live weight, hot carcass weight, fat score and pH-temperature decline. Also, after ageing, feeds had no influence on meat quality traits of five lamb cut types (loin, knuckle, backstrap, leg - chump on, topside) including ultimate pH, drip loss (%), colour and lipid oxidation. Surprisingly, the lower content of PUFA and higher content of SFA in BSFL diets did not affect the resultant colour and lipid oxidation, implying the deposit of antioxidant in lamb muscles might exert antioxidative effect to protect the PUFA within the muscles in the control group (Bekhit et al., 2013; Nute et al., 2007; Wood et al., 2008).

Conclusions: These results indicate that BSFL meal could be used as a substitution of protein source in finishing lamb feed without compromising animal growth and meat quality. Further research is needed to understand the fatty acid profile of meat from BSFL fed lambs, and subsequent sensory flavour and overall acceptability by consumer panels.

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Literature:

Bekhit, A. E.-D. A., Hopkins, D. L., Fahri, F. T., & Ponnampalam, E. N. (2013). Oxidative Processes in Muscle Systems and Fresh Meat: Sources, Markers, and Remedies. *Comprehensive Reviews in Food Science and Food Safety*, 12(5), 565-597. doi:10.1111/1541-4337.12027

Cullere, M., Schiavone, A., Dabbou, S., Gasco, L., & Dalle Zotte, A. (2019). Meat Quality and Sensory Traits of Finisher Broiler Chickens Fed with Black Soldier Fly (*Hermetia Illucens* L.) Larvae Fat as Alternative Fat Source. *Animals (Basel)*, 9(4), 140. doi:10.3390/ani9040140

Cullere, M., Tasoniero, G., Giaccone, V., Acuti, G., Marangon, A., & Dalle Zotte, A. (2018). Black soldier fly as dietary protein source for broiler quails: meat proximate composition, fatty acid and amino acid profile, oxidative status and sensory traits. *Animal*, 12(3), 640-647. doi:10.1017/S1751731117001860

Nute, G. R., Richardson, R. I., Wood, J. D., Hughes, S. I., Wilkinson, R. G., Cooper, S. L., & Sinclair, L. A. (2007). Effect of dietary oil source on the flavour and the colour and lipid stability of lamb meat. *Meat Science*, 77(4), 547-555. doi:10.1016/j.meatsci.2007.05.003

Wood, J. D., Enser, M., Fisher, A. V., Nute, G. R., Sheard, P. R., Richardson, R. I., . . . Whittington, F. M. (2008). Fat deposition, fatty acid composition and meat quality: A review. *Meat Science*, 78(4), 343-358. doi:10.1016/j.meatsci.2007.07.019

Yu, M., Li, Z., Chen, W., Rong, T., Wang, G., Li, J., & Ma, X. (2019). Use of *Hermetia illucens* larvae as a dietary protein source: Effects on growth performance, carcass traits, and meat quality in finishing pigs. *Meat Science*, 158, 107837. doi:10.1016/j.meatsci.2019.05.008