

SHENGYONG LU : APPLICATION RESEARCH OF BLACK SOLDIER FLIES (*HERMETIA ILLUCENS* L.) AS PROTEIN SOURCE IN GOATS. THESIS ADVISOR: ASSOC. PROF. PRAMOTE PAENKOUUM, PH. D., 172 PP.

Keyword: ANTIOXIDANT/BLACK SOLDIER FLY/GOAT/GROWTH PERFORMANCE/MEAT QUALITY

The purpose of this study was to evaluate the effects of different levels of black soldier fly (BSF) supplementation on the growth performance, antioxidant activity, and rumen microbiota of goats, as well as the effects of heat-treated BSF on the growth performance, rumen microbiota, slaughter performance, meat quality, immunity, and antioxidant activity, and related gene expression in goats. This study consists of three parts.

In Experiment I, twenty-four native Anglo-Thai male goats, (body weight  $18.43 \pm 0.76$  kg, Mean  $\pm$  SD), were distributed across four dietary treatments with 6 repetitions in each group. The control treatment (BSF0) did not include BSF, while the treatments (BSF5, BSF10, and BSF15) contained 5%, 10%, and 15% of BSF, respectively. BSF supplementation did not affect ( $P > 0.05$ ) growth performance. High levels of BSF reduced the digestibility of nutrients ( $P < 0.05$ ). Serum MDA levels showed a linear ( $P < 0.05$ ) response at 0 h, while SOD and DPPH exhibited linear responses ( $P < 0.05$ ) at 4 h. Total VFAs were significantly higher ( $P < 0.05$ ) in the BSF5 group, equal in BSF0 and BSF10, and significantly lower ( $P < 0.05$ ) in the BSF15 group. The most abundant phylum was *Bacillota* and *Bacteroidota*, and the most abundant genera were *Xylanibacter*, *Saccharibacteria*, *Butyrivibrio*, and *Ruminococcus*.

In Experiment II, the negative control group includes only full-fat soybeans (FFS) and BSF (FF group and BS group). The positive control groups consist of a 95% BSF or 95% FFS mixed with 5% cassava (FFC and BSC groups). The treatment groups involve adding 75% water to the positive control mixture, followed by vigorous kneading to achieve uniform mixing, and drying for 120 minutes at temperatures of 120°C and 140°C (12FFC, 14FFC, 12BSC, and 14BSC groups). Compared to the BS group, heat-treated BSF showed increased ( $P < 0.05$ ) rumen DM degradability and effective degradability. The 14BSC group increased ( $P < 0.05$ ) rumen CP degradability and degradation kinetic

parameters, while the 12BSC group decreased ( $P < 0.05$ ) these parameters. The CP degradability of BSF was significantly higher ( $P < 0.05$ ) than that of full-fat soybeans. Heat treatment was beneficial to increasing ( $P < 0.05$ ) the Idg and IDCP of BSF, and the 14BSC treatment effect was significantly better ( $P < 0.05$ ) than that of the 12BSC group.

In Experiment III, thirty goats (weighing  $20.30 \pm 1.09$ , Mean  $\pm$  SD) were randomly divided into three groups: the control group (FFS) supplemented with 10% full-fat soybean, treatment 1 (BSF) supplemented with 10% untreated BSF, and treatment 2 (HTBSF) supplemented with 10% heat-treated BSF. The results showed that there were no significant differences in growth performance among the three groups ( $P > 0.05$ ). The serum levels of IgG, IgM, IL-6, IL-8, and IL-10 in the FFS and HTBSF groups were significantly higher than those in the BSF group ( $P < 0.05$ ). The serum levels of CAT, GSH-Px, and T-AOC and muscle antioxidant levels in the FFS group were significantly higher than those in the BSF and HTBSF groups ( $P < 0.05$ ). At the phylum level, the dominant phyla were *Bacteroidetes*, *Firmicutes*, *Proteobacteria*, *Spirochaetes*, and *Fibrobacteres*. At the genus level, dominant genera were identified as *Prevotella*, *Rikenellaceae\_RC9\_gut\_group*, *F082*, *Bacteroidales\_RF16\_group*, and *Prevotellaceae\_UCG\_001*. The slaughter rate, carcass weight, and overall meat quality decreased in the BSF and HTBSF groups ( $P < 0.05$ ). The mRNA expression levels of CAT, SOD, GPX-1, GPX-4, IL-6, IL-8, TNF- $\alpha$ , and IL-1 $\beta$  were significantly higher in the HTBSF group than in the FFS group ( $P < 0.05$ ).

Based on the above, under the conditions of this study, the supplementation level of BSF in goat diets should not exceed 10%, and feeding them after treatment at 140°C yields better results.

School of Animal Technology and Innovation  
Academic Year 2023

Student's Signature Shengyong Lu  
Advisor's Signature Pravita Pasa  
Co-advisor's Signature Shengyong Lu