

CHAPTER VI

OVERALL CONCLUSION

The results of this study can be divided into three main parts:

The first part aimed to investigate the potential impact of supplementing different levels of BSF on the growth performance, serum antioxidants, and rumen microbiota of goats. The results indicated that supplementing with BSF did not affect the growth performance and rumen microbiota of goats. However, it is noteworthy that BSF5 and BSF10 were beneficial, as they increased antioxidant levels and the proportion of short-chain fatty acid. In contrast, supplementation with BSF15 resulted in decreased digestibility, antioxidant levels, and VFA parameters. Therefore, we recommend limiting the addition of BSF in goat diets to no more than 10%.

The second part aims to assess the impact of heat treatment on the rumen degradability of BSF and protein digestion in the small intestine using the *in situ* nylon bag method and the three-step *in vitro* method. The results indicate that compared to the BS group, heat-treated BSF showed increased rumen dry matter degradability and effective degradability. The 14BSC group exhibited increased rumen crude protein degradability and degradation kinetic parameters, while the 12BSC group showed a decrease in these parameters. Furthermore, the crude protein degradability of BSF was significantly higher than that of full-fat soybeans. The Idg and IDCP of heat-treated full-fat soybeans were significantly higher than those of other treatment groups. Additionally, heat treatment was beneficial in increasing the Idg and IDCP of BSF, with the 14BSC treatment showing a significantly better effect than the 12BSC group. Therefore, based on the results of this experiment, it is recommended to supplement BSF with cassava and subject them to heat treatment at 140°C.

The third part aims to evaluate the effects of heat treatment on BSF regarding growth performance, serum antioxidants and immunity, rumen microorganisms, meat quality, and related gene expression in goats. The results indicate that the growth

performance of the three groups of goats was not significantly affected. HTBSF increased the digestibility of NDF and rumen pH. Overall, there was no significant effect on rumen VFA levels in the three groups. At 0 h, the activity of immune enzymes in the blood of the FFS and HTBSF groups was higher than that of the BSF group, but at 4 hours, the activity of the BSF group was significantly higher than that of the FFS and HTBSF groups. The serum antioxidant level of the FFS group was significantly higher than that of the BSF and HTBSF groups. The HTBSF group increased the abundance of the phylum *Bacteroidetes* and decreased the abundance of the phylum *Firmicutes*. Both the BSF and HTBSF groups showed a decrease in slaughter rate, carcass weight, and muscle antioxidant capacity. Additionally, the meat quality parameters of the HTBSF group were the poorest, but it improved the composition of beneficial fatty acid in the muscles for human health, such as C18:2n6t, C18:3n6, and UFA. Compared to the FFS group, both the BSF and HTBSF groups showed increased levels of antioxidant and immune mRNA expression, with the HTBSF group having higher mRNA expression levels than the BSF group.

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.