The effect of using complete feed containing protected soybean groats on the carcass production of thin tailed lambs

Y N Arif, A Pramono and J Riyanto

Department of Animal Science, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Indonesia

Corresponding author: jokoriyanto@staff.uns.ac.id

Abstract. This study was conducted to determine the effect of using complete feed containing protected soybean groats on fat-tailed lamb carcass production. A total of 9 thin-tailed lambs aged 12 months were divided into 3 groups of ration treatment: the first group only received a 100% complete feed ration (P1), the second group received a 90% complete feed ration, and 10% protected soybean groats (P2), while the third group received 80% complete feed and 20% protected soybean groats (P3). Data were analyzed using a Completely Randomized Design. Differences between treatments were further tested with Duncan's Multiple Range Test. The results showed that complete feeds containing protected soybean groats on fat-tailed lamb carcass production had no significant effect on carcass weight, carcass percentage, carcass size, percentage of carcass size, meat weight, meat weight percentage, fleshing index, but had a significant effect on carcass production. We concluded that the use of complete feeds containing protected soybean groats increased carcass production of male fat-tailed lamb.

1. Introduction
Thin-tailed lambs (TTL) belong to the native sheep breeds in Indonesia that are high in population and commonly reared for meat. The central bureau of statistics reported that the sheep population was approximately 17 million, and meat production reached 70 thousand tons in 2019 [1]. TTL productivity is affected by the quantity and quality of the feeds. So far, TTL has been fed with fresh herbs and concentrates, which are given separately. This caused a lower feed efficiency, and therefore it is necessary to find ways to increase the efficiency of feed nutrients and how they are administered. Herbs and concentrates can be administered in a feed mixture containing complete nutrients capable of meeting TTL production needs, and this mixture is called a complete feed.

The complete feed nutrients were fermented in the rumen and could be optimally degraded by rumen microbes to produce optimal levels of ammonia [2]. One of the feed ingredients with a high potential for protein source is soybean groat [3], with protein content reaching 35%. The protein is protected to escape microbial degradation in the rumen and avoid excessive rumen degradation [3,4]. Protein protection can be performed by adding 37%-formaldehyde solution into dry soybean groats in 1 to 100 ratio to escape the rumen microbial degradation of protein to ensure optimal absorption in the small intestine [5].

Increased protein levels in the feed mixture can increase muscle mass and, therefore, carcass and meat productivity in an optimal number and decrease meat cholesterol level [6]. Carcass weight is determined by its components which include meats, bones, and fats. From the above description, we can
see that further study is needed to determine the effect of complete feed containing protected soybean groats on the carcass production and meat quality of male thin-tailed lambs.

2. Materials and methods

2.1. Sample preparation
The lambs were housed in individual cages with food feeders and water drinkers. The subjects were 15 lambs of 12 months old with 22 kg initial weight. Complete feeds were prepared from a mixture of basal concentrate and protected soybean groats. The lambs were divided into three treatment groups with 5 repetitions each. The percentages of protected soybean groats added to the rations are (P1) 0%, (P2) 10%, and (P3) 20%. The treatments lasted three months before the slaughter for carcass preparation. The front and rear halves of the carcasses were produced by cutting the 12th and 13th ribs. The front half of the carcass includes the neck, Shank, shoulder, rack, and breast, while the rear half includes the loin, flank, and legs [9]. Data on carcass production includes weight and percentage of the carcass, weight and percentage of carcass halves, weight and percentage of commercial cuts, the proportion of fleshing index, and meat weight and percentage.

2.2. Data analysis
The data collected in this study were analyzed using one-way analysis of variance for a completely randomized design. If the analysis of variance results indicated the effect of treatments, a further test is conducted to measure specific differences between pairs of means (Duncan's Multiple Range Test/DMRT).

3. Results and discussion
The carcass production of male, thin-tailed lamb (TTL) is provided in Table 1. The results of the ANOVA indicate that the use of complete feed containing protected soybean groats had no significant effect (P>0.05) on carcass production.

| Parameter                  | Treatments | P-Value |
|----------------------------|------------|---------|
|                            | P1         | P2      | P3      |         |
| Carcass weight (kg)        | 17.26±0.65 | 16.75±0.24 | 18.14±1.09 | 0.150   |
| Carcass percentage (%)     | 47.39±1.19 | 48.86±1.11 | 48.69±0.46 | 0.212   |
| Front cut of carcass (%)   | 55.15±0.68 | 54.77±1.92 | 55.30±1.81 | 0.915   |
| Rear cut of carcass (%)    | 44.85±0.68 | 45.23±1.92 | 44.70±1.81 | 0.915   |
| Neck (%)                   | 10.30±0.10 | 10.58±1.46 | 11.73±0.96 | 0.656   |
| Shank (%)                  | 10.55±0.89 | 10.55±1.27 | 11.06±0.57 | 0.759   |
| Shoulder (%)               | 19.84±1.15 | 18.64±1.44 | 17.86±1.36 | 0.244   |
| Loin (%)                   | 14.83±1.60 | 16.16±5.45 | 13.50±0.90 | 0.634   |
| Leg (%)                    | 27.20±0.50 | 26.08±3.66 | 27.64±1.58 | 0.698   |
| Fleshing index (%)         | 25.14±0.03 | 26.01±0.02 | 25.80±0.01 | 0.783   |
| Meat percentage (%)        | 58.12±1.87 | 57.18±0.49 | 59.98±0.81 | 0.464   |

Complete feed containing protected soybean groats (PSG) provides no significant difference (P>0.05) in carcass percentage between treatments. This is because the differences in the protein level of the feed remain relatively similar: P1 15.12%, P2 15.72%, and P3 16.53%. The present study is in line with previous researches indicating no differences between treatments because the total consumption of crude protein, crude fiber, and total digestible nutrients are relatively the same [7]. However, feeding with 20% PSGs provides a higher percentage of carcass's main components (bone, muscle, and fat) than those without PSGs. Increased protein and energy concentration in the diet can increase the percentage of the carcass. The dressing percentage also indicates similar results because the carcass percentages are obtained from comparing weights before and after slaughter. The average
dressing percentage is 48.31%. This figure is higher than previous research on complete feed containing
sunflower seeds, i.e., 43-45% [8].

Complete feed containing protected soybean grout provides no significant (P>0.05) difference in
front-half carcass percentage. This is because the weight and percentage of the carcass are relatively the
same. The average weights of carcass front- and rear-halves are 9.18-10.04 kg and 7.74-8.10 kg,
respectively. The feeding of Complete Feed (CF) containing protected soybean grout (PSG) provides
no significant difference (P>0.05) in the percentage of commercial cuts between treatments. The reason
for no differences between treatments is the relatively similar weight and percentage of the carcass. This
is in line with previous research indicating that the carcass weight determines the weight of commercial
cuts [10]. We can see from Table 1 that the feeding of the diet with 20% PSG provides a higher
percentage of commercial cuts. The growth rates are significantly interrelated and affect the carcass
proportions [11]. The quality standards of carcass cuts can be divided into three classes: 1) tenderloin,
loin; 2) leg, shoulder, rack; 3) breast, flank, and shank [9]. The weight of leg cuts in this study ranges
from 4.37 to 5.01 kg or 26.08 to 27.64%, indicating that the leg represents the dominant portion of the
carcass. Legs are the early-maturing portions of the carcass because they serve the functions of walking
and moving [12]. The growth rate is slower at an early age, faster during puberty, and decreases when
physical maturity is reached [6].

Feeding of complete feed containing protected soybean grout provides no significant difference
(P>0.05) in the values of flashing index (FI) between treatments. The reason for no differences between
treatments is the relatively similar weights of carcasses. This has been confirmed by a previous study
indicating that FI is affected by the carcass weight and length. The heavier and longer the carcass, the
higher the value of FI [6].

Complete feed containing protected soybean grout provides no significant difference (P>0.05) in
meat percentage between treatments. The reason for this is the relatively similar weights and percentages
of the carcasses that, in turn, affect the proportion of meat. It had been confirmed in the previous study
indicating that carcass tissue composition of lambs fed with herbs has no significant effect on meats,
bones, and fats because of similar weight of the carcasses [7]. The higher the weight of the carcass, the
higher the weight of the meat [6]. The meat bone ratio is generally related to better flesh. However, this
does not necessarily reflect muscle tissue variance because higher meat weight can be attributed to lower
bone and fat weights.

4. Conclusion
Complete feeds containing protected soybean grouts increased the production and quality of carcass
with similar percentages of carcass, major carcass cuts, meat weight, and fleshing index.

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