Conference Paper

# Edible Portion of Carcass and Offal of Indonesian Yearling Kacang Buck Fed Ruminally Undegradable Protein

**Retno Adiwinarti[1,2], I Gede Suparta Budisatria[1], Kustantinah[1], Rusman[1], Edwin Indarto[1], and Agung Purnomoadi[2]**

[1]Faculty of Animal Science, Universitas Gadjah Mada, Jalan Fauna 3, Bulaksumur, Yogyakarta, 55281, Indonesia
[2]Faculty of Animal Agriculture, Universitas Diponegoro, Kompleks drh. R. Soejono Koesoemowardojo, Tembalang, Semarang, 50275, Indonesia

## Abstract

Fish meal and soybean meal are protein source of feeds, and fish meal containing relatively high ruminally undegradable protein that were used in this study to increase the edible portion of Kacang bucks. Twelve of yearling Kacang bucks (17.84 kg ± 1.57 kg) were arranged in Completely Randomized Design with three different treatments: NG (control): natural grass, FM: total mixed ration containing fish meal and SBM: total mixed ration containing soybean meal. The rations contained 15 % of crude protein, except for NG. Parameters observed were edible portion of carcass and offal. Data were analyzed by analysis of variance and Duncan's Multiple Range Test. About 18.82 kg to 26.62 kg of the goats slaughter weight produced 39.17 % to 52.06 % of carcass and 47.94 % to 60.83 % of offal. Total edible portion of SBM carcass (9.67 kg) was higher than those of FM (7.07 kg) and NG carcass (6.56 kg). Total edible portions of offal were relatively similar among the treatments (NG: 3.89 kg, FM: 4.02 kg, SBM: 4.38 kg). It can be concluded that the use of soybean meal in the ration can improve the edible portion of carcass and offal of Kacang Goats better than fish meal did.

**Keywords:** Edible portion, Fish meal, Local goat, Soybean meal, TMR

Corresponding Author:
Retno Adiwinarti
retno_adi@yahoo.co.id

Received: 10 November 2018
Accepted: 6 January 2019
Published: 10 March 2019

Publishing services provided by Knowledge E



Selection and Peer-review under the responsibility of the UASC Life Sciences 2016 Conference Committee.



## 1. Introduction

Kacang Goats are one of local goats in Central Java, Indonesia that is well adapted to the environmental condition, and prolific, therefore mostly reared by farmers in the village [1]. Solanki et al. [2] stated that goat can survive in limited availability of forages and harsh climatic condition. In fact, the price of Kacang Goats is less expensive because they have small in body size and are reared in traditional management system. Many efforts have been done to improve the productivity of Kacang Goats in Indonesia. Fish meal is protein source feeds containing relatively high ruminally undegradable protein.

Crude protein of fish meal has been reported about 59.10 % to 65.40 % [3], 61.20 % to 83.70 % [4]. In addition, Stern et al. stated that fish meal contained 65.00 % ± 4.00 % of ruminally undegradable protein and 80.00 % ± 5.00 % of the ruminally undegradable protein that was digested in the intestine [5]. Soybean meal is also protein source of feed. Barchiesi-Ferrari and Anrique stated that soybean meal contains 58.01 % of crude protein [6]. However, the protein of soybean meal is highly degraded in the rumen, and the content of ruminally undegraded protein is only 25.00 % ± 3.00 % (22 % to 29 %) [5]. In fact, Addulah et al. reported that Kacang Goat preferred soybean meal concentrate compared to fish meal concentrate [3]. The soybean meal concentrate intake was 49.31 % of the total dry matter intake, while the fish meal concentrate intake was 44.52 % to 46.63 %. However, the average daily gain of goat fed concentrate containing fish meal (0.077 kg ± 0.076 kg to 0.102 kg ± 0.068 kg) was higher than those of goat fed soybean meal concentrate (0.070 kg ± 0.047 kg). Therefore, total mixed ration containing fish meal and soybean meal were used in this study to increase the edible portion of Kacang bucks.

Meat is the most valuable product of animals. Dave and Ghaly also stated that meat is preferable animal protein source [7]. In general, the need of meat tended to increase continuously [8]. Therefore, nowadays people has used by-product to make new edible desirable product for consumer [9]. Awan et al. stated that edible offals are included heart, liver, tongue, kidney, tails, tripe/stomach, spleen, Chitterlings, sweetbreads/pancreatic gland/thymus, intestine, rinds, lips, fats, testicles, trimmings, blood and certain bones" [9]. Goat pâté ingredients use blood and liver [10], smoke blood sausage was from blood, heart, kidneys, meat (trimmings), fat, and pig skin [11], goat "sarapatel" was made from blood and viscera [12]. In Indonesia, many kinds of recipes were made from by-products and desirable to consumers, such as: "sambal goreng" (liver), "asem-asem" (kidney, meat trimmings, and testicles), curry and "thengkleng" (viscera and meat trimming), "tongseng" (tongue, eyes, ears, meat trimming from head, cheek), soup, or just fried them after being given seasoning. Therefore, in addition to carcass, edible portion of offal have to be calculated as profitable product. Meat by-products also contain valuable source of nutrients such as: essential amino acids, minerals, and vitamins [13].

In fact, studies about edible portions of goats are still limited. This study has focused on edible portion of carcass and offal of Kacang buck fed total mixed ration containing fish meal and soybean meal.

## 2. Materials and Method

Twelve of yearling Kacang bucks (17.84 kg ± 1.57 kg) were arranged in Completely Randomized Design with three different treatments: NG (control) = natural grass, FM = total mixed ration containing fish meal and SBM = total mixed ration containing soybean meal (Table 1) [14]. The rations contained 15 % of crude protein, except for NG [14]. After being reared for 14 wk, the goats were slaughtered. Before being slaughtered, the goats were provided free access of fresh water and were fasted for 12 h to 15 h [14], and then were weight to get data of slaughter weight. Goats were slaughtered using standard commercial procedures [15], except that kidneys were included in the carcass. The hot carcass was weighed after bleeding, removing skin, head, fore feet (at the carpal-metacarpal joint), hind feet (at the tarsal-metatarsal joint), visceral (gastrointestinal tracts, liver, heart, spleen, pancreas) and abdominal fat, lungs and trachea, diaphragm, penis and testicles and also tail [16]. Non-carcass (offal) components were weighed separately and differentiate between the edible and non-edible offal.

TABLE 1: Ration composition and the nutrients content.

| **Feedstuffs / Nutrients** | **NG** | **FM** | **SBM** |
|---|---|---|---|
| Feed ingredients: | ——————— % ——————— | | |
| Natural grass | 100 | 0 | 0 |
| *Pennisetum purpureum* | 0 | 30 | 30 |
| *Gliricidia* leave | 0 | 30 | 30 |
| Cassava waste product | 0 | 20.10 | 19.20 |
| Wheat bran | 0 | 13.75 | 13.80 |
| Fish meal | 0 | 6.15 | 0 |
| Soybean meal | 0 | 0 | 7.00 |
| Nutrients content in the rations: | | | |
| Dry matter (%) | 18.58 | 91.26 | 91.53 |
| Ash (100 % dry matter) | 12.06 | 10.41 | 10.11 |
| Ether extract (100 % dry matter) | 2.37 | 2.48 | 2.56 |
| Crude Fibre (100 % dry matter) | 34.62 | 29.68 | 29.18 |
| Crude Protein (100 % dry matter) | 10.92 | 15.26 | 15.59 |
| Nitrogen free extract (100 % dry matter) | 40.04 | 43.80 | 42.56 |
| TDN (%) | 63.23 | 56.21 | 57.95 |

Parameters observed were edible portion of carcass and offal. Edible portions of carcass were included meat, fat, and kidneys. Edible portions of offal were consisted of blood, brain, edible meat from head, eyes, ears, tongue, meat fragment and fat from tail, subcutaneous fat, meat fragment from feet, lungs and trachea, heart, weasand (oesophagus without the content), liver, spleen, tripe/stomach without the content, intestine

without the content, pancreatic gland, diaphragm, and testicles. Data were analyzed by a one-way analysis of variance using the SPSS statistics software version 19.

## 3. Results and Discussions

About 18.82 kg to 26.62 kg of the goat slaughter weights produced 39.17 % to 52.06 % of carcasses (kidneys included in the carcass) and 47.94 % to 60.83 % of offal. The slaughter weight of SBM goats was the highest and produced the highest carcass weight and dressing percentage; while the slaughter weight, carcass weight, and dressing percentage of NG goats was similar to those of FM goats, but the dressing percentage and offal percent of FM goats were similar to those of SBM goats [14].

Carcass percentage of goat was varied depended on the body components of the carcass [17]. Pinkerton reported higher dressing percentages of slaughter goats (in the range of 45.00 % to 52.00 %) than in this study, because liver, heart, and kidney were included in the carcasses [17]. Yusuf et al. also reported that the dressing percentage of Boer goats were in the range of 43.90 % to 55.70 % because heart, liver, kidney, and lungs were included in the carcasses [18]. Das and Rajkumar stated relatively lower dressing percentage in Indian goat breeds (40.66 % to 45.14 %) than in this research, because the carcass was without kidneys [19]. Hutama reported that the dressing percentage of Kacang Goat (46.67 %) was relatively the same as this study [20].

### 3.1. Edible portion of carcass

Edible portion total of SBM carcass (9.67 kg) was higher ($P < 0.01$) than those of FM (7.07 kg) and NG carcass (6.56 kg). However, edible portion of the carcass (% of carcass weight) was similar among the treatments (Table 2). This indicated that heavier carcass produced more edible carcass. Edible carcass (% of slaughter weight) in the Table 2 shows that NG goat produced edible carcass (% of slaughter weight) lower ($P < 0.05$) than SBM goat did, but similar to FM goat, and those of FM goat did relatively the same as SBM goat. It can be concluded that SBM goat have produced the highest edible carcass (37.92 % of slaughter weight).

Meat is the most valuable product of the carcass. Meat production of Kacang Goat in this study (Table 2) was higher than those reported by Sumardianto et al. was 3.34 kg (60.00 %) and Adiwinarti et al. was 3.57 kg (62.69 %) [21, 22]. However, the fat component in this study (7.73 %) was lower than those in Sumardianto et al. research (9.70 %) [21]. The

Table 2: Edible carcass.

| Edible carcass | NG | FM | SBM |
|---|---|---|---|
| Meat (kg) | $5.71^{A} \pm 0.56$ | $6.40^{A} \pm 1.07$ | $8.41^{B} \pm 0.74$ |
| Fat (kg) | $0.68^{Aa} \pm 0.20$ | $0.54^{A} \pm 0.04$ | $1.02^{Bb} \pm 0.23$ |
| Kidneys (kg) | $0.17^{a} \pm 0.04$ | $0.14^{Aa} \pm 0.04$ | $0.25^{Bb} \pm 0.03$ |
| Edible carcass total (kg) | $6.56^{A} \pm 0.71$ | $7.07^{A} \pm 1.09$ | $9.67^{B} \pm 0.74$ |
| % of carcass weight | $77.72 \pm 2.75$ | $79.55 \pm 1.88$ | $80.94 \pm 1.83$ |
| % of slaughter weight | $31.71^{a} \pm 1.86$ | $34.19^{ab} \pm 2.48$ | $37.92^{b} \pm 3.76$ |
| A, B Means in the same row without common letter are different at $P < 0.01$ | | | |
| a, b Means in the same row without common letter are different at $P < 0.05$ | | | |

Table 3: Edible offal.

| Edible offal | NG | | | FM | | | SBM | | |
|---|---|---|---|---|---|---|---|---|---|
| | ———————— kg ———————— | | | | | | | | |
| Blood | 0.984 | ± | 0.129 | 1.012 | ± | 0.228 | 1.053 | ± | 0.076 |
| Brain | 0.083 | ± | 0.015 | 0.090 | ± | 0.008 | 0.089 | ± | 0.011 |
| Head & cheek meat | 0.335 | ± | 0.074 | 0.362 | ± | 0.069 | 0.362 | ± | 0.105 |
| Eyes | 0.043 | ± | 0.013 | 0.044 | ± | 0.011 | 0.044 | ± | 0.012 |
| Ears | 0.092 | ± | 0.017 | 0.094 | ± | 0.019 | 0.127 | ± | 0.023 |
| Tongue | 0.073 | ± | 0.012 | 0.067 | ± | 0.020 | 0.090 | ± | 0.045 |
| Tail fat and meat | $0.009^{A}$ | ± | 0.005 | $0.007^{A}$ | ± | 0.001 | $0.020^{B}$ | ± | 0.003 |
| Subcutaneous fat | 0.031 | ± | 0.010 | 0.021 | ± | 0.003 | 0.036 | ± | 0.019 |
| Meat fragment from feets | $0.068^{a}$ | ± | 0.014 | $0.071^{ab}$ | ± | 0.014 | $0.097^{b}$ | ± | 0.010 |
| Lungs & trachea | 0.195 | ± | 0.029 | 0.206 | ± | 0.009 | 0.228 | ± | 0.031 |
| Heart | 0.117 | ± | 0.030 | 0.120 | ± | 0.002 | 0.147 | ± | 0.018 |
| Weasand/esophagus netto | 0.034 | ± | 0.005 | 0.038 | ± | 0.003 | 0.039 | ± | 0.002 |
| Liver | $0.283^{a}$ | ± | 0.020 | $0.337^{ab}$ | ± | 0.067 | $0.387^{b}$ | ± | 0.037 |
| Spleen | 0.026 | ± | 0.007 | 0.033 | ± | 0.010 | 0.030 | ± | 0.005 |
| Tripe/stomach netto | 0.700 | ± | 0.084 | 0.703 | ± | 0.178 | 0.801 | ± | 0.104 |
| Intestine netto | 0.559 | ± | 0.124 | 0.534 | ± | 0.120 | 0.516 | ± | 0.057 |
| Pancreatic gland | 0.028 | ± | 0.007 | 0.034 | ± | 0.005 | 0.027 | ± | 0.016 |
| Diaphragm | 0.065 | ± | 0.007 | 0.071 | ± | 0.011 | 0.082 | ± | 0.011 |
| Testicles | 0.167 | ± | 0.041 | 0.178 | ± | 0.029 | 0.206 | ± | 0.033 |
| Edible offal total : | 3.894 | ± | 0.348 | 4.022 | ± | 0.564 | 4.381 | ± | 0.306 |
| (% of offal) | 31.88 | ± | 2.74 | 34.23 | ± | 3.47 | 32.54 | ± | 5.25 |
| (% of slaughter weight) | 18.86 | ± | 1.31 | 19.48 | ± | 1.35 | 17.16 | ± | 1.44 |
| $^{A,B}$Means in the same row without common letter are different at $P < 0.01$ | | | | | | | | | |
| $^{a,b}$Means in the same row without common letter are different at $P < 0.05$ | | | | | | | | | |

differences of carcass composition were influenced by the carcass weight [23], slaughter weight, and the feed nutrition [24].

## 3.2. Edible portion of offal

Edible portions total of offal was relatively similar among the treatments (NG: 3.89 kg, FM: 4.02 kg, SBM: 4.38 kg). Edible offal total, both in % of offal and % of slaughter weight was also no significant difference ($P > 0.05$) among the treatments (Table 3). Some edible offal (fat and meat from tail, liver, and meat fragments from feet) were significantly different among the treatments. Edible portion from tail of SBM goat was higher ($P < 0.01$) than those of NG and FM goat, but those of NG goat was the same as FM goat ($P > 0.05$). Liver and meat trimming from feet of NG goats was similar to FM goat, but lower ($P < 0.05$) than SBM goat; while those of FM goat was not different from SBM goat.

Spleen and liver of Kacang Goat in this study were lower than those of Indian goat breeds (Barbari, Marwari, and Jamunapari) as reported by Das and Rajkumar [19] that spleen was about 0.043 kg to 0.052 kg and liver was around 0.401 kg to 0.456 kg. However, spleen and liver weight of Ethiopian goat breeds (Afar, Long-eared Somali, the Central Highland goat) as reported by Sebsibe et al. [16] that were about 0.021 kg to 0.034 kg of spleen and 0.279 kg to 0.342 kg of liver were similar to this study. Gafar et al. [25] reported the spleen weights of Kacang Goat were 0.042 kg to 0.056 kg and the liver weights were 0.251 kg to 0.364 kg. Solanki et al. [2] reported that the weight of liver was influenced by management system. Testicles/genital organs of Kacang Goat in this study were bigger than Gafar et al. research (0.128 kg to 0.194 kg) [25] and the Indian goat breeds (0.143 kg to 0.149 kg) [19], but smaller than Ethiopian goats fed 50 % to 80 % of concentrate (0.144 kg to 0.230 kg) [16].

Edible offal total in this study was about 17.16 % to 19.48 % (Table 3). This result is higher than research reported Awan et al. that stated edible offal of ruminants around 12 % [9].

## 3.3. Edible portion total

Edible portion total of SBM goats was higher than those of FM ($P < 0.05$) and NG ($P < 0.01$) goats (Table 4). However, the percentage of edible portion total was similar among the treatments ($P > 0.05$). It means that the higher was the body weight, the more the edible portion total was. The percentage of edible carcass total was higher than those of edible offal total in all of the treatments. It can be concluded that the highest edible portion total was produced by SBM goat. It has been reported that SBM goat had the highest slaughter weight [14].

It can be concluded that the use of soybean meal in the ration can improve the edible portion of Kacang Goat's carcass better than fish meal did.

TABLE 4: Edible portion total.

| | NG | FM | SBM |
|---|---|---|---|
| Edible carcass total (kg) | $6.56^{A} \pm 0.71$ | $7.07^{A} \pm 1.09$ | $9.67^{B} \pm 0.74$ |
| % of slaughter weight (%) | $31.71^{a} \pm 1.86$ | $34.19^{ab} \pm 2.48$ | $37.92^{b} \pm 3.76$ |
| Edible offal total (kg) | $3.89 \pm 0.35$ | $4.02 \pm 0.56$ | $4.38 \pm 0.31$ |
| % of slaughter weight (%) | $18.86 \pm 1.31$ | $19.48 \pm 1.35$ | $17.16 \pm 1.44$ |
| Edible portion total (kg) | $10.46^{Aa} \pm 0.96$ | $11.09^{a} \pm 1.63$ | $14.05^{Bb} \pm 1.03$ |
| % of slaughter weight (%) | $50.57 \pm 2.24$ | $53.67 \pm 3.65$ | $55.08 \pm 5.16$ |
| $^{A,B}$Means in the same row without common letter are different at $P < 0.01$ | | | |
| $^{a,b}$Means in the same row without common letter are different at $P < 0.05$ | | | |

## 4. Conclusion

Total edible portion of carcass and offal with soybean meal was higher than fish meal and natural grass. Soybean meal in the ration can improve the edible portion of carcass and offal of Kacang Goats better than fish meal.

## Acknowledgements

The authors gratefully appreciate to the Directorate of Higher Education, Ministry of Education, and the Republic of Indonesia for Research Grant "*Penelitian Unggulan Perguruan Tinggi*" [Honorable University Research] Universitas Gadjah Mada No. 693/UN-P III/LT/DIT-LIT/2016, March 1, 2016. Appreciation is also expressed to "Kacang Goats Research Team" that has assisted for data collection.

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