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Non-Carcass Composition of Thin Tail Sheep Fed Indigofera Zollingeriana with Different Maintenance System

Komposisi Non Karkas Domba Ekor Tipis yang Diberi Pakan Indigofera Zollingeriana dengan Pemeliharaan Berbeda

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ABSTRACT

The composition of non-carcass thin-tailed sheep fed *Indigefera zollingeriana* with different rearing systems, was evaluated using twenty sheep with an average initial body weight of 18.3 ± 2.01 kg. The variables observed in this study included the weight of the head, feet, skin, tail, liver, spleen, lungs, heart, kidneys, rumen, reticulum, omasum, abomasum, intestines, empty viscera and omnetal fat. The design used in this study was a factorial completely randomized design (CRD) with five replications. Feed is treatment factor one (P1 = grass + commercial concentrate and P2 = grass + *Indigefera zollingeriana*) and maintenance is treatment factor two (SI = Semi Intensive and I = Intensive). The results of the study were analyzed by analysis of covariance. and the correction factor is the initial weight of the sheep. The results of this study showed that giving P2 to sheep resulted in lower tail weight but higher kidney weight (P<0.05). In addition, there was an interaction effect (P< 0.05) between treatments on the weight of the omasum and abomasum, where the sheep with P1I treatment had the highest omasum and abomasum weights, while the lowest omasum and abomasum weights were in the P2I treatment.

Keywords: thin tailed sheep, *Indigefera zollingeriana*, non carcass, maintenance system

ABSTRAK

Komposisi non karkas domba ekor tipis yang diberi pakan *Indigefera zollingeriana* dengan sistem pemeliharaan yang berbeda, dievaluasi menggunakan dua puluh ekor domba dengan rata-rata bobot badan awal sebesar 18.3 ± 2.01 kg. Peubah yang diamati dalam penelitian ini meliputi bobot kepala, kaki, kulit, ekor, rumen, retikulum, omasum, abomasum, usus, limpa, hati, paru-paru, jantung dan ginjal. Penelitian ini menggunakan rancangan acak lengkap (RAL) faktorial dengan lima kali ulangan. Pakan merupakan Faktor perlakuan satu (P1= rumput + konsentrat komersil dan P2 = rumput + *Indigefera zollingeriana*) dan pemeliharaan adalah faktor perlakuan dua (SI= Semi Intensif dan I = Intensif). Hasil penelitian dianalisis menggunakan analisis kovarians. dan faktor koreksinya adalah bobot awal domba. Hasil penelitian ini menunjukan bahwa pemberian P2 pada domba berdampak pada bobot ekor yang lebih rendah namun meningkatkan bobot ginjal (P<0.05). Selain itu terdapat pengaruh interaksi (P<0.05) antar perlakuan terhadap bobot omasum dan abomasum, dimana domba dengan perlakuan P1I memiliki bobot omasum dan abomasum yang paling tinggi, sedangkan bobot omasum dan abomasum yang paling rendah adalah pada perlakuan P2I.

Kata kunci: domba ekor tipis, *Indigefera zollingeriana*, non karkas, sistem pemeliharaan

INTRODUCTION

Feed is the main thing that must be prepared when raising livestock, because it greatly affects livestock productivity (Soeparno 2005). One type of animal feed that has good quality and quantity is the *Indigofera zollingeriana plant*. This type of legume plant is very easy to cultivate because it can grow in areas with stagnant water or areas that have salinity and can grow in the dry season (Hassen *et al*. 2007). Abdullah *et al.* (2010) explained that this plant is a plant that has high productivity, and has great potential for cultivation because it contains 29.26% protein, 75-78% TDN, 14.02% crude fiber, and 3.62% crude fat. So that it can be used as an alternative feed from concentrate which has a high enough price,

Apart from feed, the rearing system is also very influential in livestock productivity and is related to the quality and quantity of feed to be consumed, so that it can determine the weight of livestock, both from carcass and non-carcass weights (Jatnika *et al.* 2019). Joy *et al.* (2008b) and Diaz *et al.* (2002) stated that sheep which were reared intensively for a maintenance period of 2-4 months by providing concentrate feed could maximize the growth of sheep, but the drawback was that it increased fat deposits in carcasses, and had fatty acids. higher C18:3 unsaturated fat compared to forage (Joy *et al.* 2008a). Whereas in semi-intensive rearing systems or sheep reared in pastures with forage feed has a lower fat composition (Corcoran *et al*. 2001). Carrasco *et al.* (2009) also stated that sheep kept in pastures with supplements in the form of concentrate and sheep kept in pens with only concentrates produced relatively the same fat weight, even producing better quality meat (Baihaqi *et al.* 2013b).

The carcass part is the part of the livestock body that has been separated from the non-carcass part. Non-carcass, consisting of non-carcass outside such as legs, head, skin, and tail, and non-carcass inside, namely heart, kidney, blood, urine bag, lung, intestine, trachea, liver, spleen, and fatty tissue in body parts (Lawrie 2003). In general, there are non-consumable parts of the carcass and not (Baihaqi *et al*. 2013a). In the market, non-carcass is still classified as one of the foods that are in demand by consumers so that the price is relatively high (Herman 2005). This can make cutting costs can be covered.

One type of livestock that is quite widely kept in Indonesia is the thin-tailed sheep (DET) (Zulfahmi *et al.* 2016). According to Jarmuji (2010) DET is a local sheep that can survive with low quality feed and can be developed in the tropics. The percentage of DET carcasses ranged from 40-45% of the 20 kg slaughter weight (Hudallah 2007). Baihaqi and Herman (2012) conducted a study on adult fat tail sheep, in this study the non-carcass component ranged from 44.8 - 46.4%. Research related to DET non-carcass has not been widely carried out, so this study aims to evaluate the composition of DET non-carcass fed *Indigefera zollingeriana* with different rearing systems.

MATERIALS AND METHODS

Materials

This study used 20 female DET under 1 year old with an average initial weight of 18.3 ± 2.01 kg. The feed used is *Brachiaria humidycola grass, Indigofera zollingeriana* and Commercial concentrates. The nutritional content of the feed in this study can be seen in Table 1.

Table 1. The nutritional content of feed in research

Nutritional Content	P1	P2	BH
	---%---	---%---	---%---
Dry Material	84.33	89.92	90.39
Ash	11.61	8.34	5.88
Crude protein	13.03	13.59	5.74
Crude Fat	1.18	0.53	32.65
Coarse Fiber	15.15	22.56	1.20
BETN	42.96	44.90	44.92
TDN	54.76	59.31	56.58

Information: P1 = commercial concentrate, P2 = *Indigofera zollingeriana*, BH = *Brachiaria humidycola* grass

Methods

Sheep are kept for 1 month to adapt to the environment and feed. After adaptation, the research was carried out by treating the feed by giving *Indigofera zollingeriana* and 40% commercial concentrate and 60% *Brachiaria humidycola grass*. This research was carried out for three months during the maintenance period. Provisions for feed treatment and rearing systems are as follows:

P1I: five sheep were fed with *Brachiaria humidycola grass* with the addition of commercial concentrate and reared intensively (24-hour pen)

P2I: five sheep were fed *Brachiaria humidycola grass* with the addition of *Indigofera zollingeriana* and kept intensively (24 hours in pens)

P1SI: five sheep were fed *Brachiaria humidycola grass* with the addition of commercial concentrate and reared in a semi-intensive manner (grazed during the day for 6 hours and penned at night)

P2SI: five sheep were fed with *Brachiaria humidycola grass* with the addition of *Indigofera zollingeriana* and reared in a semi-intensive manner (grazed during the day for 6 hours and penned at night)

Sheep Slaughtering

Cutting DET is guided by MUI rules (2019) and following Herman's (1993) instructions regarding decomposition of carcasses in sheep. Before the cutting process is carried out, DET is fasted and given only drinking water for 16 hours, and the DET weight (cutting weight) is measured. On the first day, 12 DET were slaughtered, each taken from three sheep in each treatment (P1I, P2I, P1SI, and P2SI), and followed by 8 sheep on the second day.

The process of slaughtering the sheep begins with slaughtering the neck by focusing on the jugular vein, carotid artery, oesophagus and trachea, then the head is separated and weighed. then each leg was cut at the carpo

metacarpal and tarso metatarsal joints and then weighed. After that, the sheep is hung by tying or stabbing the tendons of the hind legs, then the sheepskin is wound from the anus, continuing to the abdomen and chest to the neck, to the legs (back and front), and the carcass to the first incision, then the skin is weighed to get the skin weight. After the incision, the internal organs are removed from the abdomen, then tied and separated. Furthermore, the back of the rectum is tied so that feces and omental fat do not come out. Kidneys and tails were weighed to get kidney and tail weights. Then the red innards (heart, spleen, liver, lungs) and green innards (rumen, reticulum, omasum, abomasum and intestine) are separated and weighed to obtain the weight of each component.

Observed Variables

The variables observed in this study were the weight of the external DET non-carcass components, namely the head, legs, skin and tail and the internal parts, namely the rumen, reticulum, omasum, abomasum, intestine, spleen, liver, lungs, heart and kidney.

Data Analysis

This study used a completely randomized design (CRD) with a 2×2 factorial pattern. Treatment factor 1 was feeding (commercial concentrate and *Indigofera zollingeriana*) and factor 2 was the maintenance system (intensive and semi-intensive). This study used five replications for each treatment. The results of this study were tested by covariance analysis and the correction factor was the initial weight of the sheep. Then proceed with the *least square means* test if there is a treatment effect on the observed variables.

RESULTS AND DISCUSSION

Non-carcass livestock is a component of the livestock body consisting of head, blood, legs, skin, digestive tract, urine bag, intenstine, *trachea*, heart, lungs, kidneys, spleen, liver and omnetal fat (Lawrie 2003). The non-carcass parts in this study were classified into external (external) and internal (internal) non-carcass parts. the external part consists of the head, legs, skin and tail, while the internal part consists of the rumen, reticulum, omasum, abomasum, intestine, spleen, liver, lung, heart and kidney. The results of the analysis of the weight variance of the non-carcass DET components between treatments can be seen in Table 2.

Based on the results of the analysis of variance in Table 2 showed that there was no interaction effect (P>0.05) between treatments on head, leg and skin weight. This is possible because the head and legs are body components of cattle which are classified as early ripe. Hatta (2009) states that the head and legs are the body parts of livestock which are classified as early ripe which are composed of bones and a little meat. In addition, the sheep in this study were ewe without horns, so the level of diversity was low. The results of this study were similar to a study conducted by Baihaqi *et al.* (2013a) on fat-tailed sheep by administering tofu dregs and wool shearing in that there was no treatment effect and treatment interaction on blood, head, leg and skin weight. Furthermore, Sriyani *et al.* (2016) and Soeparno (1994) stated that the feed treatment given had no effect on the weight of the head, legs, skin and blood.

data in Table 2 shows that the weight of the non-carcass component of DET which was reared intensively was not different (P>0.05) from DET which was reared semi-intensively. This shows that the different maintenance systems have no significant effect on non-DET carcass components. This is presumably because the movement or *exercise size* does not really have an impact on the non-carcass components of the sheep. These results are in line with Jatnika's research (2019) on DET which were reared intensively and semi-intensively which showed no significant differences in slaughter weight, carcass weight, carcass percentage, carcass conformation and rib eye vein area (udamaru).

Table 2. Average weight of non-carcass components outside (external)

Variable	Maintenance system	Feeding		
		P1	P2	Average
Head	SI	1437.04±45.63	1423.40±44.41	1430.22±31.68
	I	1408.77±44.93	1394.97±44.40	1401.87±31.68
	Average	1422.90±31.42	1409.19±31.42	
Foot	SI	538.34±48.86	560.23±47.55	549.29±33.92
	I	450.03±48.12	493.78±47.54	471.90±33.92
	Average	494.19±33.65	527.00±33.65	
Skin	SI	1555.56±198.55	1694.07±193.24	1624.82±137.84
	I	1836.48±195.52	1596.66±193.20	1716.57±137.84
	Average	1696.02±136.74	1645.37±136.74	
Tail	SI	53.10±5.64	36.16±5.49	44.63±3.92
	I	50.26±5.56	35.66±5.49	42.96±3.92
	Average	51.68±3.88b	35.91±3.88a	

Different lowercase letters in the same row or column indicate significantly different (P<0.05). The outer carcass weight was corrected based on the average initial weight at 18,320 grams. SI = semi-intensive, I = intensive, P1 = commercial concentrate, P2 = *Indigofera zollingeriana*

When viewed from the results of the analysis of variance with the initial weight covariable, it was shown that, in the tail section, it was seen that the sheep with P1 administration had a tail weight of 51.68 grams higher (P<0.05) than the tail weight of sheep with P2 administration, namely 35.91 grams. This is presumably because in the tail section there is no separation between tissues (muscle, fat and bone), so it is possible that the treatment given can affect one of these tissues. The high tail weight of the sheep fed P1 was probably related to the nutrients contained in the feed. When seen in Table 1, the crude fat contained in P1 looks higher than P2. Baihaqi *et al.* (2013a) stated that differences in the nutritional content of the feed given can affect livestock productivity. This allows the proportion of muscle, fat and bone in the tail to have an impact on the weight of the tail. Soeparno (2005) states that non-carcass composition can be affected by the energy content of the feed, so that it also affects productivity.

The results of tail weight in this study appear to have a correlation with slaughter weight obtained in Jatnika's research (2019) on DET fed *Indigofera zollingeriana* rations and commercial concentrates which were reared in stables and pastures, where the highest slaughter weight was in sheep fed commercial concentrates which intensively maintained. Feed differences also had a significant (P<0.05) effect on the kidneys. Where sheep with P2 administration had a kidney weight of 28.31 grams higher (P<0.05) compared to P1 administration, which was 25.08 grams. This result is suspected because the high content of crude fiber in the P2 ration can increase the weight of the sheep kidneys. This is in line with Dianti's research (2012) on broiler chickens that high crude fiber content in feed can result in increased work of physiological organs in digestion, thereby increasing non-carcass weight in such as the heart, liver and kidneys.

When seen from the results of the analysis in Table 3, it shows that there was an interaction effect (P<0.05) between treatments on the weight of the omasum and abomasum, where the highest weight of omasum and abomasum was in the P1I treatment, namely 343.92 grams which was significantly different (P<0.05) with P1SI (267.10 grams)

Table 3. Average weight of non-carcass components inside (internal)

Variable	Maintenance system	Feeding		
		P1	P2	Average
Heart	SI	352.96±22.71	383.48±22.10	368.22±15.76
	I	362.75±22.36	336.99±22.10	349.87±15.76
	Average	357.86±15.64	360.23±15.64	
Limpa	SI	59.77±9.17	63.12±8.92	61.45±6.36
	I	66.08±9.03	39.61±8.92	52.84±6.36
	Average	62.92±6.31	51.37±6.31	
Couple by couple	SI	303.42±22.50	318.55±21.90	310.98±15.62
	I	354.91±22.16	303.70±21.89	329.31±15.62
	Average	329.17±15.49	311.12±15.49	
heart	SI	87.11±8.79	99.25±8.55	93.18±6.10
	I	90.85±8.66	94.97±8.55	92.91±6.10
	Average	88.98±6.05	97.11±6.05	
kidney	SI	24.29±1.24	29.52±1.21	26.91±0.86
	I	25.86±1.22	27.10±1.21	26.48±0.86
	Average	25.08±0.85a	28.31±0.85b	
Rumen	SI	504.74±28.32	562.95±27.56	533.85±19.66
	I	519.83±27.89	526.46±27.56	523.14±19.66
	Average	512.29±19.50	544.70±19.50	
Reticulum	SI	92.39±7.19	102.91±7.00	97.65±4.99
	I	89.26±7.09	89.22±7.00	89.24±4.99
	Average	90.83±4.95	96.06±4.95	
Omasum+abomasum	SI	267.10±29.37ab	337.28±28.59bc	302.19±20.39
	I	343.92± 28.92c	258.67±28.58a	301.30±20.39
	Average	305.51±20.23	297.98±20.23	
Intestines	SI	1187.50±173.39	1181.02±168.75	1184.26±120.37
	I	1275.19±170.74	1341.27±168.72	1308.23±120.37
	Average	1231.35±119.4	1261.14±119.41	

Different lowercase letters in the same row or column indicate significantly different (P<0.05). The internal non-carcass weight was corrected based on the average initial weight at 18,320 grams. SI = semi-intensive, I = intensive, P1 = commercial concentrate, P2 = *Indigofera zollingeriana*

and P2I (258.67 grams), but not significantly different from P2SI (337.28 grams). This explains that sheep with intensive maintenance by giving P1 feed will increase the weight of the sheep's omasum and abomasum, but in sheep that are fed P2 it will have an impact on the low weight of the omasum and abomasum. Whereas sheep reared in a semi-intensive manner would produce no different weights of omasum and abomasum (P>0.05) even with different feeding. The high weight of omasum and abomasum in P1I is thought to be due to the sheep treated with P1I having a high level of energy consumption when viewed from the nutritional content of feed P1 and P2 (Table 1). Soeparno (2005) explained that rations with high energy content can cause an increase in the weight of the lungs, heart and kidneys. In addition, high nutrient consumption will increase the weight of the rumen, reticulum, omasum, abomasum, small intestine, large intestine, liver and total digestive system.

The low weight of omasum and abomasum in the P2I treatment was thought to be caused by the high SK content in the P2 ration so that the other nutritional contents could not be digested optimally. Pangestu *et al.* (2018) explained that the high crude fiber content in feed can cause a decrease in the digestibility of livestock for other nutrients. this is because the nutrient content that was previously digestible will be bound by SK, namely cellulose and wasted together with the excreta.

CONCLUSION

Giving *Indigofera zollingeriana* to sheep reared intensively and semi-intensively did not generally affect the weight of the non-carcass components of DET. Feeding *Indigofera zollingeriana* resulted in lower tail weights compared to commercial concentrate feeds, but had higher kidney weights. In addition, the omasum and abomasum weights of sheep with intensive rearing and feeding with commercial concentrates had the highest omasum and abomasum weights.

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