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Body Condition Score (BCS), Body Fat Percentage, and Feed Consumption of Male Sapera Goats on *Indigofera* sp. Based Feeding

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ABSTRACT

The study "Body Condition Score (BCS), Body Fat Percentage, and Feed Consumption of Male Sapera Goats on *Indigofera* sp. Based Feeding" was carried out from May 5, 2021 to July 11, 2021 at the Experimental Farm, Faculty of Animal Science, Jenderal Soedirman University, Purwokerto. The study aimed to examine the effect of feeding based on *Indigofera* sp. on BCS, body fat percentage, and feed consumption of male Sapera goats. The research material used was 18 male Sapera goats aged 8-12 months and body weight of 18-25 kg obtained from the farmer group of the Indonesian Sheep Breeders Association of Banyumas Regency. The feed material used consisted of field grass, commercial concentrate, fresh *indigofera*, and dried *indigofera* (hay). The research method was carried out experimentally using a Completely Randomized Design with 3 treatments and 6 replicates. The treatments studied were 50% Field Grass + 50% Commercial Concentrate (T0), 50% Field Grass + 20% Commercial Concentrate + 30% Fresh *Indigofera* (T1), and 50% Field Grass + 20% Commercial Concentrate + 30 % Dried *Indigofera* (T2). The variables studied were BCS, body fat percentage, and dry matter intake. The results showed that feeding based on *Indigofera* sp. had no significant ($P>0.05$) effect on BCS, body fat percentage, and dry matter consumption of male Sapera goats. The average result BCS of T0, T1, and T2 were 2.67 ± 0.52 ; 2.67 ± 0.52 ; and 2.83 ± 0.61 with a BCS range of 1-5 for each animal. The results of the average body fat percentage of T0, T1, and T2 were 12.25 ± 2.25 ; 12.25 ± 2.25 ; and 12.98 ± 2.64 , respectively. The average dry matter intake (g/head/day) of T0, T1, and T2 were 796.24 ± 27.97 ; 940.98 ± 146.06 ; and 992.46 ± 127.31 , respectively. The average dry matter consumption per Kg body weight (g/kg BW) of T0, T1, and T2 were 31.65 ± 3.94 ; 39.06 ± 1.19 ; and 40.04 ± 0.60 . It could be concluded that feeding based on *Indigofera* sp. can be used to replace concentrate up to 60 percent and does not reduce livestock productivity and has a tendency to increase BCS, body fat percentage, and feed consumption.

Keywords: Male Sapera Goats, *Indigofera* sp., BCS, Body Fat Percentage, and Feed Consumption.

1. INTRODUCTION

Sapera goat is a type of goat resulting from a cross between a male Saanen goat and a female Etawa Crossbreed. This goat is known for its characteristic which is able to produce milk in high quality and quantity. Sapera is a goat that can produce more than 1 liter of milk per day with details reaching 300 liters/lactation with a lactation period of 300 days.

However, several things need to be developed in this type of Sapera goat, one of which is optimizing the male Sapera goat as a meat producer [1].

Sapera goats have a higher birth weight and growth rate than their mothers. The post-weaning growth of male Sapera goats is 77 g/day while the female is 75 g/day. Sapera goats reach puberty at the age of 7-10 months and weigh 23.4 kg. Sapera goats have high growth rates and effective rearing management. Product

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performance of male Sapera goats is a livestock commodity that needs to be improved, considering that in terms of breeding, Sapera goats are more recommended through cross-breeding between male Saanen goats and female Etawa Crossbreed goats. Sapera male goats are considered appropriate to be used as an alternative for producing meat so that livestock productivity is maximized and the use of livestock in the community is not only as dairy goats [2].

Beef goat production has quality supporting factors to be developed and maximized. These factors include maintenance management, feeding and palatability, as well as a review of livestock growth rates. Production performance of beef goats can be measured through BCS, body fat percentage, compatibility index (body proportion), body conformation index and animal feed consumption. The value of body measurements increases with an increasing body weight of livestock [3].

Body Condition Score, body fat percentage, and feed consumption can be optimized through good feeding management, one of which is through feed management based on *Indigofera sp.* as a substitute for commercial concentrates. *Indigofera sp.* is a tropical tree legume plant with good nutritional content for ruminants. The crude protein content of several species of *Indigofera sp.* classified as high ranging from 22-29 percent. A combination of feeding or the optimal nutritional of the feed is able to correlate with the increase and rate of growth of male Sapera goats, in this case the BCS as well as the percentage of body fat and feed consumption [4].

Body fat percentage and BCS are influenced by animal feed consumption. The amount of TDN of a feed ingredient is equal to the amount of digestible organic nutrients such as fat, protein, SK, and BETN. Consumption of male Sapera goat feed consisting of commercial concentrate and *Indigofera sp.* become the basis for the growth of body fat in livestock. Livestock body fat is obtained through energy source feed based on the calculation of TDN with feed based on commercial concentrate and *Indigofera sp.* Total

Digestible Nutrient in commercial concentrate and *Indigofera sp.* relatively the same in the range of 70 percent. This is a reference that underlies the value of body fat percentage and BCS for male Sapera goats.

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2. MATERIALS AND METHODS

2.1. Research Material

The research material used was 18 male Sapera goats aged 8-12 months and body weight of 18-25 kg obtained from the livestock group of the Indonesian Sheep Goat Breeders Association, Banyumas Regency. The feed material used consisted of field grass, commercial concentrate, fresh *indigofera*, and dry *indigofera* (hay) obtained from fresh *indigofera* gardens located in Gunung Tugel, Banyumas Regency and dry *indigofera* obtained from Dawuhan Wetan Farm. The research was carried out using individual cages of the lemprakan type made of wood, located at the Experimental Farm of the Faculty of Animal Science, Jenderal Soedirman University. The tools and materials used are in the form of feed containers (forage and concentrates), drinking water containers, sanitation and health equipment, feed packaging equipment and a set of recording tools such as writing instruments and digital scales.

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2.2. Research Design

The research design used was a Completely Randomized Design (CRD). The study used 3 treatments and repeated 6 times so that there were 18 goats. The treatments in the study were:

- T0 = 50% Field Grass + 50% Commercial Concentrate
- T1 = 50% Field Grass + 20% Commercial Concentrate + 30% Fresh *Indigofera*
- T2 = 50% Field Grass + 20% Commercial Concentrate + 30% Dried *Indigofera*

Table 1. Body Condition Score and Body Fat Percentage of Goat

Score	Body Fat Percentage (%)	Appearance
1	5.0	Very thin, very prominent hip bones, and no fat deposits.
1.5	7.2	Relatively equal to the BCS value of 1
2	9.4	It looks thin and the pelvis is protruding.
2.5	11.5	Relatively equal to the BCS value of 2
3	13.7	Relatively normal, the bones do not look thin, and there is an accumulation of fat.
3.5	15.9	Relatively equal to the BCS value of 3
4	18.1	Looks fat, bones do not look prominent, fat accumulation tends to increase.
4.5	20.3	Relatively equal to the BCS value of 4
5	22.5	Very fat, excess fat accumulated

2.3. Measurement Technique

Body Condition Score (BCS) of male Sapera goats was measured on the last day of the study by observing the physical form through touch and assessment of certain parts of the livestock body based on developments during the research process. The results obtained during the observation of the goat's body were then compared with the standardized BCS from the American Institute for Goat Research to draw conclusions [5].

The percentage of body fat was obtained based on the BCS in livestock whose body condition had been measured. The Body Condition Score (BCS) is able to reflect the condition of the livestock body, one of which is the percentage of body fat. Body condition is reviewed based on the category on the indications and the value of the BCS which then value will describe the percentage of body fat.

Feed consumption of male Sapera goats on *Indigofera sp.* calculated based on the dry matter of the treated feed on average days to weeks 2, 4, 6, 8, and 10 according to the time of weighing body weight. The formula for calculating feed consumption based on dry matter and body weight is as follows:

$$\text{Feed Consumption (g/head/day)} = (\% \text{ BK Feed} \times \text{Total Feed}) - (\% \text{ BK Remaining Feed} \times \text{Total Feed Remaining})$$

$$\text{Feed Consumption (g/kg BW)} = \frac{\text{Feed Consumption (g/head/day)}}{\text{Goat Body Weight}}$$

2.3. Research Methods

The data obtained from the research results have been tabulated and analyzed based on the appropriate calculation method for each research variable. The data were analyzed by Analysis of Variance (ANOVA) using the SPSS version 26 application.

3. RESULTS AND DISCUSSION

3.1 Body Condition Score (BCS)

Feeding based on *Indigofera sp.* in male Sapera

goats did not have a significant effect ($P > 0.05$) on BCS. This means that feeding based on *Indigofera sp.* resulted in the same BCS, both given *indigofera* and not given *indigofera*. The average BCS of the male Sapera goats in this study showed the results were still below the ideal BCS. Male Sapera goats that were not given *indigofera* produced an average BCS of 2.67 ± 0.52 , given fresh *indigofera* produced an average BCS of 2.67 ± 0.52 , and given dry *indigofera* produced an average BCS of 2.83 ± 0.61 with a BCS value range of 1-5. Value of 3 is the BCS which reflects the ideal body condition [6].

The Body Condition Score value that does not reach the ideal BCS is not only caused by the initial body weight being varied and even tends to below, but also because feed consumption is not always optimal during growth. This resulted in an unstable increase in Daily Body Weight Gain in goat livestock; even some livestock experienced a decrease in body weight and Daily Body Weight. Stated that Daily Body Weight Gain is a simple indicator of muscle growth or available fat reserves and can be used by livestock. This is in line with the decrease in the level of feed consumption; the body weight of the livestock also decreases so that it is directly proportional to the stunted growth rate and BCS of livestock [7].

The male Sapera goat is a male type of dairy goat, which is identical with high milk productivity, both genetically and metabolically. These factors have resulted in male Sapera goats not achieving the ideal BCS as goats that require a compact body shape, even though their feed consumption is fairly good. Dairy goats type distribute feed nutrients more to milk productivity and tend to have a lean body condition and prioritize nutritional stability or health (not necessarily very fat or very thin) [8].

Body Condition Score in male Sapera goats fed dry *indigofera* tended to be higher than male Sapera goats fed fresh *indigofera* and without *indigofera*. This was because the male Sapera goats on the control diet were only given field grass and commercial concentrates, while the second and third treatment male Sapera goats were given additional feed based on *Indigofera sp.* (fresh and dry). Feed treatment based on *Indigofera sp.* containing Crude Protein (CP) composition of 25.68

Table 2. Average Research Results of Body Condition Score, Body Fat Percentage, and Feed Consumption

Treatment	Body Condition Score	Body Fat Percentage (%)	Dry Matter Consumption (g/head/day)	Dry Matter Consumption (g/kg BW)
T0	2.67 ± 0.52	12.25 ± 2.25	796.24 ± 27.97	31.65 ± 3.94
T1	2.67 ± 0.52	12.25 ± 2.25	940.98 ± 146.06	39.06 ± 1.19
T2	2.83 ± 0.61	12.98 ± 2.64	992.46 ± 127.37	40.04 ± 0.60
Probability	$P > 0.05$	$P > 0.05$	$P > 0.05$	$P > 0.05$

Information: T0 without *indigofera*, T1 given fresh *indigofera*, and T2 given dried *indigofera*. Probability of $P > 0.05$ means that the results have not significant effect.

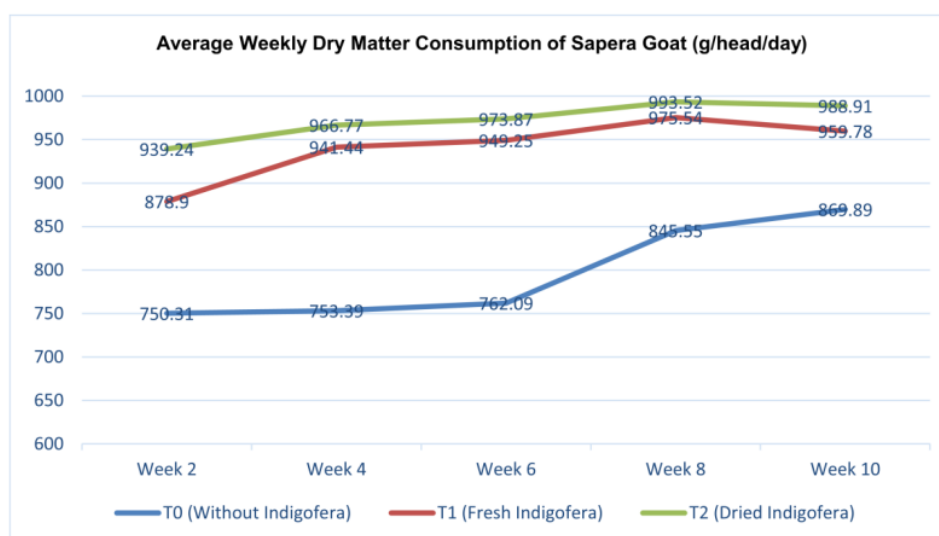


Figure 1. Average Weekly Dry Matter Consumption of Sapera Goat (g/head/day)

percent and 23.25 percent, respectively, the content is higher than the Crude Protein (CP) content in field grass which is 11.45 percent. The higher protein content of the feed resulted in greater Daily Body Weight Gain in goats. This is because protein is a food substance that functions for efficient use of energy into a muscle or meat [9]. Consumption of high protein feed in male Sapera goats fed fresh and dry *indigofera* made Daily Body Weight higher than without *indigofera* so that it was in line with the BCS value.

3.2. Body Fat Percentage

Feeding based on *Indigofera sp.* in male Sapera goats did not have a significant effect ($P>0.05$) on body fat percentage. This means that feeding based on *Indigofera sp.* resulted in the same percentage of body fat, both given *indigofera* and not given *indigofera*. Body fat percentage values from the three treatments in this study showed results that were still below the ideal body fat percentage value based on the BCS. Male Sapera goats that were not fed an *indigofera*-based diet produced an average body fat percentage of 12.25 \pm 2.25 percent, that given fresh *indigofera* produced an average body fat percentage of 12.75 \pm 2.25 percent, and given dry *indigofera* produced an average body fat percentage of 12.98 \pm 2.64 percent. The ideal or normal goat body fat percentage value based on the BCS was at a value of 3 with a body fat percentage of 13.7 percent [10].

The average body fat percentage value that does not reach the ideal body fat percentage average as a goat that require a compact body shape is because the male Sapera goats that are kept have varied initial body weights. The initial body weight of male Sapera goats

that are kept ranges from 18-25 kg with a body fat percentage value based on the BCS which is still low, which is 7.2 percent to 9.4 percent (based on a low BCS value of 1-2). The Body Condition Score value can be an indication of good fat in the animal's body [11].

The percentage of body fat in male Sapera goats given dry *indigofera* was different from that given fresh *indigofera* and without *indigofera*. This was because the dry matter feed consumption of male Sapera goats fed dry *indigofera* was higher than that given fresh *indigofera* and without *indigofera* with an average feed consumption which was 992.46 ± 127.31 g/head/day and 40.04 ± 0.60 g/kg BW. The increase in dry matter consumption is directly proportional to the efficiency of feed use, namely Daily Body Weight Gain, BCS, body fat percentage, and feed digestibility as well as the body's metabolic system [12].

3.3. Feed Consumption

Feeding based on *Indigofera sp.* in male Sapera goats did not have a significant effect ($P>0.05$) on feed consumption (based on dry matter and body weight). This means that feeding based on *Indigofera sp.* resulted in the same feed consumption value from the three treatments, both those given *indigofera* and those not given *indigofera*. The average value of feed consumption for male Sapera goats fed fresh and dry *indigofera* tended to be higher than male Sapera goats without *indigofera*. This was because the feeding of Sapera goats varied, according to the dose of feed in each treatment, then the composition of the treatment feed showed different dose content and nutrient values. The quantity and quality of feed provided affected feed consumption and feed nutrition [13].

Male Sapera goats that were not given *indigofera* produced an average feed consumption based on dry matter of 796.24 ± 27.97 g/head/day and an average feed consumption based on body weight of 31.65 ± 3.94 g/kg BW. Male Sapera goats fed fresh *indigofera* produced an average feed consumption based on dry matter of 940.68 ± 140.06 g/head/day and feed consumption based on body weight of 39.06 ± 1.19 g/kg BW. Male Sapera goats fed dry *indigofera* produced an average dry matter intake of 992.46 ± 127.31 g/head/day and 40.04 ± 0.60 g/kg body weight based on body weight. Male Sapera goats fed dry *indigofera* had a higher average dry matter feed consumption than those fed fresh *indigofera* and without *indigofera*. This was because dry *indigofera* had a higher digestibility level than the digestibility of field grass and fresh *indigofera*. Dried *indigofera* had a digestibility rate of 77 percent [14] while the digestibility rate of fresh *indigofera* was 75.53 percent and the digestibility rate of field grass was 56.2 percent [15].

Digestibility of feed can affect the consumption of dry matter which can be seen from the results of the rest of the feed in the form of faeces. The higher the digestibility of the feed is in line with the level of dry matter consumption of the feed. Digestibility of feed is the number of feed nutrients consumed by the body. Nutrient digestibility is the number of nutrients that are digested or absorbed in the digestive tract which includes dry matter and organic matter [16].

Consumption of dry matter feed with high digestibility will be in line with livestock production. Male Sapera goats fed dry *indigofera* had the highest level of dry matter consumption as well as treatment feed with the highest digestibility and optimal composition of treatment feed. High dry matter digestibility in ruminants indicates high digested nutrients, especially those digested by rumen microbes [17].

Dried *Indigofera* became the treatment feed with the highest average dry matter feed consumption. This was due to the higher dry matter content of dry *indigofera* by 63.91 percent compared to fresh *indigofera* at 43.57 percent and field grass at 53.12 percent. Dried *Indigofera* is a feed that has good palatability of the three treatment feeds based on the presentation of dry feed and high feed consumption. Dry feed had a higher dry matter content than fresh feed because of the reduction in water content during the drying process of feed [18].

4. CONCLUSION

Based on the results of the study on Body Condition Score (BCS), body fat percentage, and feed consumption of male Sapera goats on *Indigofera sp.* it can be concluded that feeding based on *Indigofera sp.* can be used to replace concentrate up to 60 percent. Feeding based on *Indigofera sp.* in male Sapera goats

did not reduce livestock productivity and tended to increase BCS, body fat percentage, and feed consumption.

AUTHORS' CONTRIBUTIONS

The author contributes during the research process to produce research that can be used as a scientific reference and application to the wider community, especially in the field of beef goat production. Authors also understand each other in compiling scientific papers so that they are easily accessible and understood.

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