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Changes in Body Length, Hips Height and Shoulder Height in Male Bean Goats Experienced Different Levels of Feed Limitation

Gregory Renerius Nahak, Paul Klau Tahuk*, Gerson Frans Bira
Animal Husbandry study program, Faculty of Agriculture, University of Timor
Corresponding author : Paul Klau Tahuk
Email : paulklau@yahoo.co.id

Abstract

This study aims to determine the increase in body length, hip height and shoulder height of male peanut goats at different levels of feed restriction. The research was carried out in the livestock goat pen of the Faculty of Agriculture, University of Timor in June-September 2022. The livestock used were 15 male peanut goats with an average body weight of 10-15 kilograms (kg). The research used a Completely Randomized Design (CRD) experimental method consisting of 3 treatments and 5 replications. The treatments used in this research are: T0=Livestock without limited feed, T1=Livestock limited to feed (100%) of the main life, T2=Livestock limited to food (50%) of the main life. The variables observed in this study were body length, hip height and shoulder height. Data analysis used analysis of variance and Duncan's multiple range test. The results showed that the average change in body length of male peanut goats in treatments T0, T1, T2 was 0.040; -0.050; and -0.060 cm/head/day. shoulder height of 0.060; -0.080; and -0.083 cm/head/day. Hip height of 0.087; -0.090; and -0.107. Statistical analysis showed that this treatment had a significant effect at the level ($P<0.05$). It was concluded that T0 treatment without limited feed gave the best results for changes in body length, shoulder height and hip height of male peanut goats.

Keywords : Kmale Peanut udders; feed restrictions; body length; shoulder height; hip height.

Introduction

Goats are small ruminants that are widely known in society. One of the native Indonesian goats that is much sought after by the public is the Peanut Goat. According to Mahmilia & Tarigan (2004), the characteristics of peanut goats include a small, short body, flat nose, erect and small ears, and short fur of various colors. Peanut goats are agile and have high adaptability to low quality feed and extreme environments, are productive and easy to handle both feed and disease (Sarwono, 2008; Yunus et al., 2016).Potential for developing Kacang goats on Timor Island to meet animal protein needs and traditional traditions. Peanut goats are able to breed in environments with barren, rocky land and low quality feed. Feed is a contributing factorimportant in increasing livestock growth and productivity.

North Central Timor Regency (TTU) has two seasons, namely the dry season and the rainy season. In the rainy season, food is available in abundance, but in the dry season, food is very reduced. This causes livestock growth to fluctuate.In order to increase the efficiency of goat farming businesses, the application of feed management (restriction-refeeding) and feed restriction treatment (feed restriction) have begun to be developed. During a certain period followed by full feeding (refeeding). Full feeding can cause compensatory growth in goats (Dashtizadeh et al., 2008). Excess energy consumed is stored as fat in adipose tissue. On the other hand, in conditions of food shortage (dry season) where food availability is limited, energy will be prioritized for survival rather than for the growth process (Schneider, 2004). LackFood availability can reduce linear body increases such as body length, hip height and

shoulder height. Linear increase in the body according to the availability of food. If sufficient feed is available, it can increase changes in body dimensions in livestock.

Changes in body dimensions of livestock when growing rapidly follow an exponential function with growth rates varying between one body dimension and other body dimensions such as body length, hip height and shoulder height which are used to determine the growth rate on the effect of body weight on livestock. Livestock that experience a phase of food deficiency (lack of energy, protein, minerals and carbohydrates) will have a negative effect on linear body growth, changes in body weight and body condition score (Haryanto 2012). The feed restriction phase can reduce the growth process of livestock, but until now body length, hip height and shoulder height are not clearly known. Therefore, it is necessary to carry out research with the title "Changes in body length, hip height and shoulder height of male peanut goats experiencing different levels of feed restriction.

Materials and Methods

Time and Place of Research

This research was carried out in a goat pen belonging to the Animal Husbandry Study Program, Faculty of Agriculture, University of Timor, for 3 months from June to September 2022.

Tools and materials

Tools and materials used in the research include feed milling machines, grass cutting machines, scales, measuring sticks, drums, water hoses, buckets, machetes, hammers, crowbars, nails, bamboo, wire, sacks, tarpaulins, thermohygrometers, plastic, nets. , aqua bottles, jerry cans and stationery.

Cattle

The livestock used in this research were 15 male peanut goats which were grouped into 3 groups, each treatment consisting of 5 individuals with an average body weight of 9-15 kilograms (kg).

Feed

The feed needed in this research is dried greens and concentrates in the form of ground corn, pollard bran, fish meal and rice bran.

Research methods

The method used in this research is the experimental method according to the completely randomized design (RAL) procedure. There were 15 peanut goats used and grouped into 3 groups with 5 animals each treated in the restriction phase. Each of the three livestock groups is treated T0: goat group without feed restrictions (control). Treatment T1: livestock are limited to 100% of their basic living needs, and treatment T2: livestock is limited to 50% of their basic living needs.

Research procedure

Preparationpen

The preparation period included preparation of 15 cages made from simple materials with leather boards, while the partitions between all the cages were made using bamboo with the size of each plot being 140x69 cm. Each cage plot is equipped with a separate feeder and drinker.

Complete feed creation

The feed ingredients used in making Complete Feed are natural grass collected from the environmental area around the research location. Natural grass is cut fresh and dried in the sun for 7 days and then ground using a grinding machine. The concentrate consists of ground corn, fish meal, rice bran and pollard bran mixed until evenly distributed, then the concentrate and forage that have been provided are put into sacks and ready to be given to livestock.

Livestock Adaptation (Preliminary)

Livestock adaptation is the process of adjusting livestock to a new environment. The aim of livestock adaptation is for the livestock to adapt to the research location or pen and rations. The Peanut goats that had been purchased and brought to the cage and weighed initially were put into individual cages to be adapted to the rations and research cages. Adaptation lasts for 14 days or when the livestock have adapted to the feed that has been provided by consuming this type of feed in large quantities. The aim of livestock adaptation is the process of adapting livestock to changes in the environment and the feed they will consume.

Providing Feed and Drinking Water

Feed and drinking water are provided to all livestock. Animal feed is given according to body weight requirements. With the process of feeding twice a day, namely: 08.00 in the morning and 16.00 in the afternoon, and providing unlimited drinking water (ad libitum). The remaining feed is calculated the next day by weighing the feed that has been consumed by the livestock.

Research variable

The variables measured in this study were body length, hip height and shoulder height.

1. Body length measurement.

   Body length is measured from the distance in a straight line from the edge of the pinous process bone to the ossium. Measurements are made using a measuring stick in cm.
2. Shoulder height measurement

   Shoulder height is measured from the highest distance between the shoulders and the ground level. Measurements are made using a measuring stick in cm.
3. Hip height measurement

   Hip height is measured from a standing position from the ground to the tip of the goat's hips

Data analysis

The data obtained during this research was tabulated and analyzed according to the analysis of variance (ANOVA) procedure. If there is a significant effect ($P<0.05$) between treatments, then the analysis continues with the Duncan distance test (Mahfutz et al., 2009).

Formula used:

$Yij = \mu + \tau i + \varepsilon ij$

information:

Yij: value of treatment observation results i and j

μ : average response across treatments and replications

τi: effect of the ith treatment

εij: deviation in the experiment from the treatment ith and repetition

Results and Discussion

Effect of Treatment on Changes in Body Length of Male Peanut Goats

Body length is one of the linear body measurements that can be used to determine the increase in body weight of livestock. The length of the livestock's body can be seen from the distance between the front edge of the shoulder and the back edge of the sieve bone, which is measured from the base of the tail to the back of the neck, measured using a measuring stick. Changes in body length can be determined by subtracting the final body length from the initial body length divided by the measurement time (Gunawan, 2008). The average daily increase in length (PB) of male peanut goats during the feed restriction phase during the study can be seen in Table 1.

Table 1. Average increase in body length of male peanut goats at different feed restriction phases (cm/head/day).

Test	Treatment		
	T0 (0%)	**T1 (100%)**	**T2 (50%)**
1	0.100	-0.033	-0.067
2	0.033	-0.050	-0.033
3	0.033	-0.067	-0.067
4	0.033	-0.050	-0.033
5	0.033	-0.050	-0.100
Total	0.233	-0.250	-0.300
Average	0.047^{a}	-0.050b	-0.060^{b}

$^{(a,b)}$ Different superscripts in the mean row indicate significant differences (P<0.05).

Based on Table 1, it can be seen that the highest average body length of male peanut goats was in the T0 treatment at 0.047 cm/head/day. The body length of T1 treated livestock decreased (negatively) by -0.050 cm/head/day. The greatest decrease in body length was found in the T2 treatment, amounting to -0.060 cm/head/day. Analysis of variance showed that the treatment had a significant effect at the level (P<0.05). Duncan's further test showed that T0 treated cattle experienced a higher increase in body length than T1 and T2 body length. Livestock without limited feed (T0) experience a linear increase in body length (PB) because the availability of feed is sufficient for basic living needs, so the excess is used to meet production needs such as increasing muscle and bone tissue.

According to Williamson and Payne (2006), generally the nutrient content of forage is higher in the rainy season than in the dry season. In the rainy season, the relatively cooler temperatures greatly affect the digestive capacity of goats to meet their needs and also the forage vegetation that grows in the rainy season is of better quality. The higher the quality of forage consumed by an animal, the more optimal the linear growth of the ruminant's body will be.Meanwhile, during the dry season there is a shortage of feed, farmers only depend on types of feed from nature without supplementation and only a small amount of commercial feed is applied to the feed system. The amount of feed that is often used mostly comes from field grass available around agricultural land (Gamoyo et al., 2015). Siregar (2008) states that body length increases in accordance with the growth and increase in body weight of livestock that receive good treatment and maintenance management, so changes or increases in body dimensions will be good.

Livestock that are limited to 100% of their basic living needs (T1) experience a linear decrease in body length (PB) because the feed given is only enough for their basic living needs, so the livestock experience depletion of muscle and fat tissue. Based on the opinion of Sudarmono and Bambang (2008) who state that lack of feed is the biggest obstacle in the process of livestock growth, if the feed contains very few feed substances for growth, such as protein, vitamins and minerals, it can cause livestock growth to not be optimal.

Livestock that are limited to 50% of their basic living needs or (T2) experience a decrease in body length, because the availability of feed is less than their basic living needs, resulting in a mechanism for breaking down muscle and fat tissue to meet their basic living needs. As a result, livestock become thinner. Wahyono et al. (2013) stated that different environmental conditions, livestock health and different feeding causes differences in livestock growth. This decrease in livestock growth is caused by a decrease in nutritional intake. This is in line with the opinion of Parakasi (1999) who states that feed factors are very important in meeting growth needs. Lack of feed is a big obstacle in the growth process. What's worse, this feed doesn't contain many of the substances needed for growth such as vitamins, protein and fat. The body length (PB) treatment in this study was lower than the report by Bria et al. (2021) who reported

that the body length growth of castrated male peanut goats increased by 0.053cm. The same thing from the research of Naitili et al. (2020) which stated that the increase in body length of male peanut goats given complete forage-based silage increased by 0.28 cm/head/day. This difference is caused by different feeding factors and different feed quality. Research by Naitili et al. (2020) the feed was given in the form of complete silage, whereas in this study the feed given was dried field grass with limited concentrate.

Effect of treatment on changes in shoulder height of male peanut goats

Shoulder height is the distance obtained from the highest point of the shoulders perpendicularly to the ground. The shoulder is the highest point on a four-legged animal and is used as a standard for measuring animal height (Soenarjo, 2006). The average daily increase in shoulder height of male peanut goats during the study can be seen in Table .

Table 2. Average increase in shoulder height of male peanut goats at different feed restriction phases (cm/head/day).

Test	Treatment		
	T0 (0%)	**T1 (100%)**	**T2 (50%)**
1	0.033	-0.100	-0.100
2	0.033	-0.100	-0.050
3	0.067	-0.067	-0.067
4	0.067	-0.033	-0.033
5	0.133	-0.100	-0.100
Total	0.333	-0.400	-0.417
Average	0.067^{a}	-0.080^{b}	-0.083^{b}

$^{(a,b)}$ Different superscripts in the mean row indicate significant differences (P<0.05).

The research results in Table 2 show that the highest average shoulder height of male Kacang goats was in the T0 treatment at 0.067 cm/head/day. Meanwhile, livestock in the T1 treatment received a negative value of -0.080 cm/head/day, and the lowest was in the T2 treatment at -0.083 cm/head/day. Analysis of variance showed that the treatment had a significant effect at the level (P<0.05). Duncan's further test showed that the T0 treatment had a positive appearance of shoulder height compared to T1 and T2 which had negative and relatively similar values because giving feed equivalent to staple life (100%) and (50%) had the same effect on livestock growth including decreasing shoulder height as a linear body. This shows that feeding (100%) of the main life or 50% of the main life has a negative impact on livestock as seen from the negative shoulder height

Positive growth in the T0 treatment was caused by the availability of sufficient feed which resulted in an increase in muscle and fat tissue with an increase in shoulder height. Factors that influence the speed of increase in shoulder height of livestock are the physiological characteristics of livestock in relation to livestock growth and development, where the initial phase of growth speed is the formation of bone structure, following the formation of muscle structure and ending in the formation of fat deposits. This is in line with the opinion of Sampurna and Suatha (2010) who state that differences in the development of livestock body parts are caused by the function and differences in components that make up these body parts. The parts of the body that function earlier will develop first, namely the parts of the body whose main components consist of bones.

Livestock treated with T1 (100% feed restriction according to basic living needs) experienced a decrease in linear shoulder height because the feed given was only enough for basic living needs.As a result, bone and muscle growth in T1 treated livestock will not increase. This is in accordance with the opinion of Beyleto et al. (2010) who stated that basically the

factors that influence body tissue are age, race, gender and food. Male animals tend to form the largest muscle tissue, have a large proportion of bones and larger head and neck sizes than female animals.

Animals treated with T2 were limited to feed at 50% of their basic life, experiencing a linear decrease in body height at the shoulder, causing a decrease in muscle mass and fat tissue, because the synthesis of muscle tissue in the animal's body did not increase. As a result, muscle tissue is broken down to meet basic living needs. Muscle, protein and fat deposits will increase if livestock consume enough feed. Lake (2016) states that food is needed to produce body tissue and increase body weight. The feed factor is very important to meet growth needs, so that lack of feed is a big obstacle in the livestock growth process.

Pamungkas et al. (2009) stated that the low average shoulder height is thought to be caused by environmental differences including maintenance management. Relatively fast bone growth occurs in the growth of the head bones, thigh bones, front leg bones and hind leg bones. Relatively moderate bone growth occurs in the thoracic cavity and shoulder bones, while relatively slow bone growth occurs in the waist, chest and hips (Sutiono et al., 2006). Research by Bria et al. (2021) that the increase in shoulder height of castrated male peanut goats was 0.05 cm/head/day.Meanwhile, in the research of Nailiti et al. (2020) who reported that the increase in shoulder height of male peanut goats given complete forage-based silage was 0.32 cm/head/day. The T0 treatment in this study was higher than the report by Bria et al. (2021) and lower than the report by Naitili et al. (2020). However, the T1 and T2 treatments from this study were lower than those reported by Bria et al. (2021) and Naitili et al. (2020) due to feed restrictions so that livestock growth, especially shoulder height, has a negative value.

Effect of Treatment on Changes in Hip Height of Male Peanut Goats.

Hip height is measured from the standing position of the livestock starting from the ground level to the tip of the goat's hips. Sampurna and Suhata (2010) stated that differences in the development of livestock body parts are caused by the function and differences in components that make up these body parts, the developing body parts increase the volume of the livestock's body. This has a close relationship with the increase in body weight of livestock, a high level of closeness to body weight of livestock can be seen in the development of hip height. The average daily increase in hip height (TPG) of male peanut goats during the study can be seen in Table 3.

Table 3. Average increase in hip height of male peanut goats at different feed restriction phases (cm/head/day).

Test	Treatment		
	T0 (0%)	**T1 (100%)**	**T2 (50%)**
1	0.167	-0.050	-0.100
2	0.033	-0.133	-0.133
3	0.167	-0.067	-0.067
4	0.033	-0.100	-0.167
5	0.033	-0.100	-0.167
Total	0.433	-0.450	-0.533
Average	0.087^{a}	-0.090^{b}	-0.107^{b}

$^{(ab)}$ Different superscripts in the mean row indicate significant differences ($P<0.05$).

The results of the research in Table 3 show that the highest average hip height for male peanut goats was found in the T0 treatment of male peanut goats at 0.087 cm/head/day, the T1 treatment cattle had a negative value of -0.090 cm/head/day, and the lowest found in T2 treatment livestock was -0.107 cm/head/day. The Anova test showed that the treatment had a

significant effect at the level (P<0.05). Duncan's further test showed that the appearance of the T0 treatment was much better than the T1 and T2 treatments because the T0 livestock treatment experienced a positive increase in hip height compared to the T1 and T2 treatments which had relatively the same reduction in hip height. This is caused by feed consumption which is only sufficient for basic living needs (T1) and less than basic living needs (T2).

The increase in hip height of male Kacang goats in this study obtained good results in the T0 treatment. Animals without limited feed (control) experienced an increase in linear body measurements, due to factorsConsuming enough feed for basic living needs and more for basic needsDuring production, livestock experience increased bone and muscle tissue. Same thing from researchTehupuring (2011) reported that the skeleton of the hind legs is formed by a group of bones, including the thigh (os femuris). The os femuris has a function not only as a support but as part of the movement and its position functions to transmit the body's load to the bones where it is located.

The increase in hip height in treatment T1 decreased when linear body measurements were taken, because feed consumption was only sufficient for basic living needs. As a result, livestock experienced a decrease in bone and muscle in T1 treatment livestock because the livestock were limited in feed (100% of basic living requirements). This is in line with opinionMurtidjo (2005) states that food is needed to produce body tissue and increase body weight. The feed factor is very important in meeting growth needs, because lack of feed is a major obstacle in the growth process.

The T2 treatment received a negative value when measuring the linear body, due to insufficient feed availability for basic living needs. As a result, there is a breakdown of muscle and fat tissue to meet basic living needs.Growth in hip height and body length is closely related to bone growth. The growth rate of the tubular bones is the increase in height such as body height, flank height and parts of the back and front legs, the growth rate is very fast (Sampurna, 2013). According to Semakula et al. (2010) stated that differences in body dimensions are influenced by different fat and muscle deposition in these body dimension areas, such as circumference, thickness and body weight. Hip height has a very strong correlation, causing the size of hip height to be greatly influenced by the size of the hind leg bones. The hind leg bones have a function as body support, so growth is faster from the start (Basbeth et al., 2015). Putri et al. (2016) stated that the increase in hip height in female peanut goats aged >3-6 months to >6-12 months (for 6 months) increased by 0.027 cm/head/day. In the research of Asmidaryanti et al. (2017) that the growth of hip height in peanut goats reared semi-intensively was 0.07 cm/head/day. The T0 treatment in this study was higher than the research report of Asmidaryanti et al. (2017) but the T1 and T2 treatments were lower than the research of Asmidaryanti et al (2017) because the T1 and T2 livestock were limited in feed so that livestock growth was negative, while the T0 treatment exceeded the results reported by Asmidaryanti et al. (2017) because sufficient feed is provided according to basic living needs and more for production needs.

Conclusion

Based on the results of this research, it can be concluded thatTreatment T0 which received normal feed experienced an increase in body length, shoulder height and hip height, whereas in treatments T1 and T2 which received restricted feed experienced a linear decrease in body length, shoulder height and shoulder height.

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