The Growth of Balinese Cows Which Getting Basic Ration of Spear Grass and Angsana Leaf Supplemented with Silk Tree Leaf

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Abstract

The study had been conducted to find out the growth of Balinese cows which getting basic ration of spear grass (Heteropogoncontortus) and Angsana leaf that had been supplemented with Silk tree leaf (Paraserianthes falcataria L.). The study was using complete randomized block design with 4 ration treatments and 3 times repetition. Each repetition was using three Balinese cows. The weight of cows being used were in the range of: 83-181 kg. Basic ration being given was arranged based on the percentage of dry ingredients namely: 80% of spear grass + 20% of Angsana leaf (A), 80% of spear grass + 20% of Angsana leaf + 10% of silk tree leaf (B), 80% of spear grass + 20% of Angsana leaf + 15% of silk tree leaf (C), and 80% of spear grass + 20% of Angsana leaf + 20% of silk tree leaf (D), The variables being measured were: dry ingredients consumption, nutrients consumption, body weight gain and Feed Conversion Ratio. The result of study showed that with administration of 20% of silk tree leaf in basic ration was significantly improving (P< 0.05) the consumption of dry ingredients and nutrient, and daily weight gain. The result of study concluded that with administration of silk tree leaf in basic ration of spear grass and Angsana leaf increased the growth of Balinese ox.

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1. Introduction

Protein requirement originated from animal for Indonesian people from day to day increasingly growing. This is in line with the increase of population growth, income and awareness of the people. Along with the increase in the

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needs for animal protein, so it demands for the increase in meat production through the effort to improve cattle population. One of Indonesian germplasm which is reliable to increase meat production is Balinese cow. Guntoro (2002) stated that Balinese cow was one of beef cattle which could contribute best for meat by 29% compared to other beef cattle being cultivated in the country.

Cultivation of Balinese cows in an effort to increase productivity, primary attention is directed more to the growth. The growth of Balinese cows is affected by various factor, among others is the availability of animal feed both qualitatively and quantitatively. Oka *et al.,* (2012) stated that cattle productivity, especially for growth and production, 60% was influenced by feed, nutrition content and technology to formulate the ration.

East Nusa Tenggara in general and western Timor island in particular, is potential to develop Balinese cows as beef cattle. It is supported by resource like grazing area: 832,228 ha (Leburaya, 2012), availability of various foragefeeds among others family of grass, leguminosae, trees, appropriate human resource as well as government policy to make NTT as cattle province.

The type of natural grass which dominantly grows and is potential as forage feed in Timor Island among others is spear grass (Heteropogoncontortus), meanwhile the type of tree is angsana. Spear grass and angsana are potential as forage feed, but both materials have low crude protein content in which spear grass has only 5.90% (Sio, 2017) and angsana leaf has crude protein of 11,56 % (Sio, 2017). Spear grass and angsana leaf with low crude protein if given to Balinese cow can obstruct the cattle growth which results in low weigh gain. It is because low crude protein in spear grass and angsana leaf will lead to rumen microbes not able to work optimally to digest food, so that rumen fermentation is not optimal to produce rumen metabolites.

Regarding administration of spear grass and angsana leaf for Balinese cow, in order to get maximum growth then it needs to be supplemented with silk tree leaf. Silk tree is leguminosaeplant, the trees that thrives in both summer and rainy season, the leaves are not falling and have high crude protein content at 20.68% (Sio, 2017). Supplementation of silk tree leaf is intended to cover the lack of crude protein from spear grass and angsana leaf, so that able to improve the activity of rumen microbes to digest food in order to produce rumen metabolites as the source of energy for cattle growth. The utilization of silk tree leaf as forage feed for Balinese cows generally in NTT and particularly in Timor Island is not carried out optimally. In addition, there is no research data regarding the utilization of silk tree leaf as the feed for Balinese cows. In connection with the above mentioned then a research has been conducted with title of "The growth of Balinese cows which getting basic ration of spear grass and angsana leaf supplemented with silk tree leaf (Paraserianthesfalcataria L.).

2. Materials and Methods

Material

The tools being used were: electronic scale with sonic scala AE12 brand, capacity of 2000 kg x 0.5 kg, hanging scale with capacity of 50 kg, sitting scale, sickle, knife, machete, bucket, clamp cage, shovel, sack. Material being used including: Balinese cow, spear grass, angsana leaf, silk tree leaf and drinking water.

Method

Experimental Design

The study used randomized block design (RAK) consisted of 4 ration treatments and 3 groups of cattle weight as repetition. The cattle being used numbering 12 cows with average weight in group I = 90 kg, in group II = 142 kg and in group III = 171 kg. Those four ration treatments being used were:
a) 80% of spear grass + 20% of angsana leaf
b) 80% of spear grass + 20% of angsana leaf + 10% of silk tree leaf
c) 80% of spear grass + 20% of angsana leaf + 15% of silk tree leaf
d) 80% of spear grass + 20% of angsana leaf + 20% of silk tree leaf

Location and Time of Study

The research was conducted at stock farmer group of Ulnaet Tuan, Village of Letmafo, District of Insana Tengah, Regency of TTU, Province of NTT, for 3 months commenced from May to July 2017.

Cattle Grouping

The cows being studied was first weighed to find out initial body weight. The weighing used electronic scale with sonic scala AE12 brand, capacity of 2000 kg x 0.5 kg. Twelve cows were divided into 3 groups based on body weight. Cows with similar body weight were located into one group and one group consisted of 4 cows. Thus 3 cattle groups were formed with different initial body weight. Each group got treatment, and cow within group was randomized to get treatment.

Administration of Ration and Drinking Water

Ration administration was adjusted with each treatment namely, treatment A was given only spear grass and angsana leaf, treatment B was given treatment A + silk tree leaf by 10%, , treatment C was given treatment A + silk tree leaf by 15% and treatment D was given treatment A + silk tree leaf by 20%. Administration of spear grass and angsana leaf was carried out by adlibitum. Administration of drinking water was carried out after administration of spear grass, angsana leaf and silk tree leaf.

Ration Sampling and Analysis Procedure

Sampling was carried out for 7 days, in the final week of study. The sample taken was: feces, spear grass, silk tree leaf and remains of spear grass and silk tree leaf. Spear grass, silk tree leaf and remains of spear grass and silk tree leaf each was taken 200 g every day. In the end of taking, total material was mixed and composited according to the cattle. After being mixed, 200 g was taken to be analyzed in Laboratory. The taking of feces was as follows: Feces being secreted within 24 hours was collected and weighed to know its weight. Later feces was taken as much as 200 g and dried in sunlight. In the end of taking, total of feces was mixed and composited according to the cattle, later feces of each cow was taken as much as 200 g to be analyzed in laboratory. Sample of ration and feces was analyzed with proximate analysis for namely, dry ingredients (BK), organic material (BO), crude protein (PK), crude fiber (SK) and gross energy content (GE). These data would be used to calculate dry ingredients digestion (KCBK), and nutrition ration digestion (crude protein, organic material, crude fiber, crude fat).

Variables

Variables being observed including:
1) Dry ingredients ration consumption namely consumption of dry ingredients ration being given reduced by remains of dry ingredients ration.
2) Nutrition ration consumption including: Crude protein intake, crude fiber intake, organic material intake and gross energy intake, which was calculated with formula of: Total of consumption multiplied by percentage of dry ingredients ration multiplied by percentage of nutrition ration.
3) Daily cattle weigh gain could be calculated with formula of: Final body weight (kg) reduced by Initial body weight (kg) divided by Duration of research (day).
4) Feed Conversion Ratio was found out by calculating the amount of total dry ingredients ration consumed by cattle (kg) divided by daily cattle weigh gain (kg).

Data Analysis

The data obtained was analyzed with Analysis of Variance. If there was a treatment which markedly different ($P<0.05$), then analysis was continued with Duncan's Multiple Range Test in the level of 5% (Steel & Torrie, 1986).

3. Results and Discussions

3.1 Dry Ingredients Consumption

Consumption of dry ingredients by Balinese cows getting ration A was 3.9 kg/e/h. Cows getting ration B, C and D were 4.2 kg/e/h, 4.8 kg/e/h and 5.1 kg/e/h, respectively. The result of variance analysis showed that supplementation of silk tree leaf for treatment B, C and D significantly (P<0.05) increased the consumption of dry ingredients ration compared to treatment A. The result of Duncan's multiple range test showed the difference on treatment A with treatment B, C and D. Treatment B and C were not markedly different, but B and D were markedly different, meanwhile treatment C and D were not markedly different (Table 1).

Highest consumption of dry ingredients ration was on cows getting ration D by 5.1 kg/e/h. The height of dry ingredients consumption of treatment D, was linked to nutrition ration content which being formulated to fulfill the requirement of rumen microbes so that bacterial activity increased. The increasing of bacterial activity was able to improve food digestion, so that nutrition absorption was high. The higher the nutrition absorption was, it could drive consumption of ration and dry ingredients to become high, which causing weigh gain, in which in treatment D it was significantly higher (p<0.05) compared to treatment A.

Parakkasi (1999) stated that consumption of dry ingredients by ruminant cattle basically was to fulfill the needs for energy, so that cattle would stop feeding if energy requirement had been fulfilled. Dry ingredients consumption in this research was low compared to research result by Mariani (2012) in which highest consumption of dry ingredients was at 5.40 kg/e/h on ration with different protein and energy.

3.2 Consumption of Nutrient Ration

Consumption of crude protein by Balinese cows getting ration A was 0.48 kg/e/h. Cows getting ration B, C and D were: 0.58 kg/e/h, 0.63 kg/e/h and 0.67 kg/e/h, respectively. The result of research showed that treatment B, C and D statistically were significant (P<0.05) improving consumption of crude protein compared to treatment A. The result of Duncan's multiple range test had indicated that there was significant difference of consumption of crude protein on treatment A with consumption of crude protein on treatment B, C and D. Treatment B was not markedly different with C and D, the same was true between C and D. The highest consumption of crude protein was on treatment D by 0.67 kg/e/day. It was influenced by composition and nutrient of ration. Ferguson et al. (1967) stated that improvement of essential amino acid supply in the feeding could influence neuro-endocrine system so that improving consumption of feed. The height of consumption of crude protein on treatment D was due to the increasing of bacterial activity which digesting food. The height of food digestion causing nutrient absorption became high which contributed to the height of growth. Haryanto (1992) in Cakra (1993) stated that high body weight gain would be achieved if protein requirement in feed was fulfilled. The result of this study was lower compared to the result of study by Mariani (2012) in which consumption of crude protein was at the highest: 0.80 kg/e/h in given ration with different protein and energy.

Consumption of organic matter by Balinese cows getting ration A was 4.65 kg/e/h. Cows getting ration B, C and D were: 5.44 kg/e/h, 5.74 kg/e/h and 5.81 kg/e/h, respectively. Result of analysis of variance showed that supplementation of silk tree leaf in treatment B, C and D were markedly (P<0.05) improving the consumption of organic matter compared to treatment A (control). Result of Duncan's multiple range test had indicated that there was significant difference between treatment A and treatment B, C and D. Treatment B and C were not markedly different, but with D it was markedly different, and treatment C and D were not markedly different. The highest consumption of organic matter was on treatment D by 5.81 kg/e/h. The height of organic matter consumption in this study was linked to nutrient of ration being consumed. Nutrient consumption in this study was high, so that it was able to improve the activity of rumen microbes in digesting food. The increase of food digestion would be followed with the increase of organic matter digestion. The higher organic matter digestion was, it was able to produce acetic acid, butyrate acid, propionate acid, which could be used as source of energy to increase growth. The average of organic matter consumption obtained in this research was higher compared to average of organic matter consumption obtained by Mariani (2013) ranging between 4.21 – 4.62 kg//e/h in ration with different protein and energy.

Consumption of crude fiber on cows getting ration A was 0.90 kg/e/h, and cows getting ration B, C and D were: 1.03 kg/e/h, 1.07 kg/e/h and 1.11 kg/e/h, respectively. Result of analysis of variance showed that consumption of crude fiber on cows getting silk tree leaf was significantly (P<0.05) increasing compared to cows getting ration without getting silk tree leaf. The result of Duncan's multiple range test showed that there was significant difference between treatment A and treatment B, C and D. Treatment B with C and D, and treatment C and D were not markedly different. Highest consumption of crude fiber in treatment D was 1.11 kg/e/h, followed by treatment C (1.07 kg/e/h) and B (1.03 kg/e/h).

Consumption of crude fiber on treatment getting supplementation of silk tree leaf was higher compared to treatment without getting silk tree leaf. The height of crude fiber consumption on treatment D was linked to ration which being formulated having appropriate nutrient content so that it was able to increase population of rumen microbes. The increasing number of bacterial could also increase its activities to digest food, so that fermentation product by rumen being produced was increasing. The increase of fermentation product by rumen could be utilized as source of energy for growth process. The higher energy absorption for growth, causing gastric to emptied so that requiring food addition. This was causing ration consumption to increase which was followed by the increase of crude fiber consumption.

Energy consumption by Balinese cows getting ration A was: 21,756.5 kcal/e/h. Energy consumption on cows getting ration B, C and D were; 25,380.3 kcal/e/h, 26,742,6 kcal/e/h and 27,069.6 kcal/e/h, respectively. Result of analysis of variance showed that treatment getting silk tree leaf was significantly ($P<0.05$) increasing the consumption of energy compared to the treatment without getting silk tree leaf. Result of Duncan's multiple range test showed that on treatment getting silk tree leaf (B, C and D) was markedly different ($P<0.05$) compared to treatment without getting silk tree leaf. The highest energy consumption was in treatment D by 27,069.6 kg/e/h. The height of energy consumption was influenced by the height of feed consumption. It was because ration being formulated had high nutrient which was the food for rumen microbes. The increase of energy consumption by feed could contribute to the height of digested energy, so that causing increasing growth followed by the increase of daily weigh gain.

Table 1
Nutrient consumption of Balinese cow

Variable	Treatment				SEM
	A	B	C	D	
Consumption of Dry Ingredients (kg/e/h)	3.9	4.2	4.8	5.1	0.2
Consumption of Crude Protein (kg/e/h)	0.48	0.58	0.63	0.67	0.01
Consumption of Organic Matter (kg/e/h)	4.65	5.44	5.74	5.81	0.10
Consumption of Energy (kg/e/h)	21756.5	25380.3	26742.6	27069.6	459.07
Consumption of Crude Fiber (kg/e/h)	0.90	1.03	1.07	1.11	0.03

Notes:
- Value with different superscript in the same row is markedly different ($P<0.05$)
- A = ration without silk tree leaf
- B = ration with silk tree leaf of 10%
- C = ration with silk tree leaf of 15%
- D = ration with silk tree leaf of 20%

3.3 Appearance of Balinese Cow

Initial weight of Balinese cows getting ration A was: 128.6 kg. Cows which getting ration B, C and D were: 128.3 kg, 129 kg and 129 kg, respectively. Result of analysis of variance showed that there was not any significant difference ($P>0.05$) between all treatments.

Final weight of Balinese cows getting ration A was: 153.7 kg. Cows which getting ration B, C and D were: 161.3 kg, 171.3 kg and 181 kg, respectively. Result of analysis of variance showed that there was not any significant difference ($P>0.05$) between all treatments, although in treatment B, C and D final weight of the cows were higher than cows getting treatment A.

Weight gain by cows getting treatment A was: 25 kg. Cows getting ration B, C and D were: 33 kg, 42.3 kg and 52 kg, respectively. Result of analysis of variance showed that cows getting ration B, C and D statistically significant ($P<0.05$) increasing weight gain compared to cows getting ration A. Result of Duncan's multiple range test had indicated that cows getting ration B, C and D had its weight gain markedly different ($P<0.05$) to increase compared to cows getting control ration. Treatment B with C and D was significant, meanwhile treatment C and D was not significant statistically (Table 2).

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Daily weight gain by Balinese cows getting ration A was: 0.31 kg/e/h, cows getting ration B, C and D were: 0.41 kg/e/h, 0.53 kg/e/h and 0.65 kg/e/h, respectively (Table 2). Result of analysis of variance showed that daily weight gain of Balinese cows getting ration with silk tree leaf statistically markedly different (P<0.05) to increase compared to treatment without getting silk tree leaf. Result of Duncan's multiple range test showed that treatment getting silk tree leaf was statistically significant (P<0.05) increasing daily weight gain compared to cows getting ration without silk tree leaf. Treatment B and C were not markedly different but with D it was markedly different, meanwhile treatment C and D were not markedly different.

Lowest daily weight gain was on Balinese cows getting ration A with 0.31 kg/e/h and highest daily weight gain was on cows getting ration D with 0.65 kg/e/h, followed by cows getting ration C: 0.53 kg/e/h and cows getting ration B: 0.41 kg/e/h.

Balinese cows getting ration D produced highest weight gain with 0.65 kg/e/h. It had indicated that ration which being formulated had appropriate nutrient content and suitable for the needs of cattle's physiologic. Ration with high crude protein content was able to improve bacterial activity so that it was able to increase food digestion which capable to produce rumen metabolites that being utilized to increase the growth followed by the height of daily weight gain of cows getting silk tree leaf of 20%.

Cows getting treatment D were most efficient in changing ration consumed to be converted into weight gain. It was seen in FCR score of treatment D, the lowest meant the most efficient. In addition, consumption of dry ingredients, crude protein, organic matter, crude fiber, showed significant difference, so that producing high daily weight gain.

Weight gain of Balinese cows obtained from this study was higher compared to weight gain of Balinese cows which getting fermented unconventional ration by 0.22 – 0.44 kg/e/h (Putri *et al.,* 2010). Suryani (2012) was getting weight gain of Balinese ox higher than the result of this study which of 0.88 kg/e/h with feeding being given consisted of forage feed with different type and composition.

3.4 Feed Conversion Ratio

The average of feed conversion ratio of Balinese cows getting ration without silk tree leaf was 12.6. Feed conversion ratio of cows getting ration with silk tree leaf (B, C and D) was: 10.3, 9 and 7.9, respectively (Table 2). Result of analysis of variance showed that FCR score in treatment B, C and D were markedly different compared to treatment A.

Duncan's multiple range test showed that FCR score on cows getting ration B, C and D statistically markedly different compared to cows getting ration A. Treatment B with C and D differed markedly statistically. But treatment C and D were not differed markedly (Table 2). The lowest feed conversion ratio score in this study was on Balinese cows getting treatment D with 7.9. Cows getting basic ration of spear grass, angsana leaf and addition of silk tree leaf by 20% became efficient in converting ration to increase weight gain. It was seen on cows getting treatment D, its weight gain was greater of 0.65 kg/e/h with lower FCR score of 7.9 (Table 2).

Table 2
Appearance of Balinese cows

Variables	Treatment				SEM
	A	B	C	D	
Initial Body Weight (kg)	128.6	128.3	129	129	1.44
Final Body Weight (kg)	153.7	161.3	171.3	181	23.14
PBB (kg)	25	33	42.3	52	0.99
PBBH (kg/e/h)	0.31	0.41	0.53	0.65	0.01
FCR	12.6	10.3	9	7.9	0.6

Notes:
- Value with different superscript in the same row is markedly different (P<0.05)
- A = ration without silk tree leaf
- B = ration with silk tree leaf of 10%
- C = ration with silk tree leaf of 15%

D = ration with silk tree leaf of 20%

4. Conclusion

Based on the result and discussion above it can be concluded that administration of basic ration consisted of spear grass and angsana leaf supplemented with silk tree leaf, is able to increase the consumption of dry ingredients, nutrient and growth of Balinese cows.

Statement of authorship
The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

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