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Physiological Status of Fattening Bali Cattle Feeding a Concentrate Containing *Gliricidia sepium* Leaves Meal Fortified with Vitamin B-Complex and Vermicide

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ABSTRACTS

This research has been conducted at Oeletsala village, for 10 weeks from 23 November 2015 to 23 January 2016, comprised of 2 weeks preliminary and 8 weeks for data collection. The aim of the research was to study the effect of feeding a *Gliricidia sepium* leaves meal concentrate fortified with B. complex vitamin and vermicide on rectal temperature, respiratory frequency, and heart rate of fattening Bali cattle. Experimental animals used were nine young male Bali cattle of 1.5-2 years old, with an initial body weight ranging from 82 to 124 kg (KV=15.114%) in average of 98.7±14.93 kg. The experimental design used was Randomized Block Design with three treatments and three replications. Those treatments were R0 = leaves of *Leucaena leucocephala* and *Ceiba pentandra*+ native grass *ad libitum* (as commonly practiced by local farmers), R1 = R0 + 2 kg concentrate, and R2 = R1 + B. complex vitamin, and vermicide. Statistical analysis showed that there was no significant effect of the treatments on rectal temperature, respiratory frequency, and heart rate of the fattening Bali cattle($P \leq 0.05$).In conclusion, there was no significant effect of *Gliricidia sepium* leaves meal concentrate, vitamin B. complex, and vermicide on rectal temperature, respiratory frequency, and heart rate of the fattening Bali cattle.

Keywords: concentrate, B complex vitamin, worm vermicide, rectal temperature, respiratory frequency, and heart rate

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1. Introduction

East Nusa Tenggara (ENT) has been well known as a source of livestock in Indonesia and played an important role in fulfillment of the national meat demand. Although beef cattle's farming was the most leader commodity in ENT, but still facing some handicaps --which cause low productivity of beef cattle especially fattening cattle-- such as not continuity of feed availability, still lay on traditional culture, unused available local feed sources, which in turn impact to the low of animal productivity. One of the factors causes the low productivity of animal in farmer's level was the low quality of feed offered led to increasing of digest tract performance resulted in increasing of stress and in turn disturb thermo regulation process of animal.

Some researcher reported that the stresses on animal were caused by both metrological factors, temperature, humidity, and radiation (Genswein *et al*., 2012) and non metrological factors such as animal density, quantity, and quality of feed offered, and drinking water availability (Aradom, 2013; Bulitta *et al*., 2015). In addition, Ake *et al*. (2013) stated that physiological change was also caused by transportation. Some factors above can stimulate changes in physiology status of animal which bring negative impacts on animal such as the increasing of body temperature, heart rate, and abnormal in respiratory frequency (Eniolorunda *et al*., 2009). It also impacts to the changes of hematological performance (Sporer *et al*., 2014), which cause decrease of body weight and when it happens in long term will cause to decrease immune function which in turn can cause death (Knowles, 1999). Decreasing of immune function up to the death of animal in a relatively large number can cause highly disadvantages to the farmers on village condition that strongly dependence their life upon agriculture and farming. Therefore, strategy to improve feeding management by offering a balance ratio between protein and energy in the diet is needed by feeding on feed that more degradable in the rumen led to which press the activity of microbial rumen and performance of digest tract in digesting low quality feed and press physiological status of animal in order to adapted to feed of low quality and environment by feeding concentrate comprised of protein source feed such as *Gliricidia sepium* leaves

On local farmers kept level, the feeding of this *Gliricidia sepium* resulted in not optimum yet, therefore supplementation of vitamin B-complex and vermicide are needed. Vitamin B-complex is functions to improve body resistant and appetite, meanwhile vermicide is functions to kill internal parasites, so the feed offered could be better digested and in turn, the growth of animal became optimum. This rese-

arch was expected would able to eliminate physiological status disturbance on Bali cattle fattened as commonly practiced by local farmers which in turn could improve animal productivity. The aim of this research was to study the effect of the supplementation of *Gliricidia sepium* leaves meal concentrate, with the addition of vitamin B-complex and vermicide on rectal temperature, respiratory frequency, and heart rate of Bali cattle fattened as commonly practiced by local

2. Materials and Methods

This experiment was carried out at Oeletsala village, Taebenu sub-district, the regency of Kupang for 10 weeks, from 23 November 2015 up to 29 January 2016, comprised of 2 weeks preliminary and 8 weeks collecting data. Nine young male Bali cattle of 1.5 – 2 years old with an initial body weight ranging from 82 to 124 kg and coefficient variation (CV) 17.10 % were employed in the experiment. Those experimental animals were placed in 9 individual pens of 2.10 m x 1.20 m each, cement floor, roofs from coconut leaves, and equipped with drinking and feeding manger. Feed offered were concentrate and feed ingredients commonly used by local farmers, also 5 cc vitamin B-complex by injected and 20 g vermicide per 100 kg body weight. Drinking water was offered *ad libitum*. Equipment used were: bucket, shovel, electrical scale *Excellent Scale* with a sensitivity of 0.5 kg and capacity of 1000 kg for weighing experimental animal, static balance *Kondo* with a sensitivity of 0.05 kg and capacity of 5 kg, thermometer, stethoscope, and stopwatch. The experimental design used was Randomized Block Design, consisted of 3 treatments and 3 replications. Those three treatments were:

R_0 : Feed commonly used by farmers (*Leucaena leucocephala* leaves, *Ceiba pentandra* leaves, and grass)

R_1 : R_0 + 2 kg concentrate

R_2 : R_1 + vitamin B-complex and vermicide

Variables measured as indicator of the effect of treatment applied in this research were:

1. Rectal temperature (in ^{o}C). By pushing in thermometer as depth as 5 cm in the rectum.
2. Respiratory frequency. By measuring the up-down movement of stomach-rib surface and approaching hand palm on nose of the experimental animal by using stethocope for 1 minute.
3. Heart rate. By measuring the heart beating by using stethoscope for 1 minute on both sides of front left foot of the experimental animal.

Experimental Procedure

1) Preparation phase. Starting with prepare concentrate and nine heads young male Bali cattle of 1.5 – 2 years old. This phase was prior to research conducted.
2) Randomizing of animal experimental:
   a) Before the research carried out, the experimental animals were weighed to know their initial body weight, and they were numbered 1 to 9.
   b) Experimental pens were numbered regularly.
   c) Randomizing experimental animals by using lottery number, to be placed in the pen.
   d) Randomizing feeds to be treated by using lottery number.
3) Experimental phase. This phase was divided into two periods: period-1 the experimental animals were adapted for 14 days to feed treated in the pen environment. Treatment feed was offered little by little to ensure they were familiar.
4) On day-14 the experimental animals were weighed. On period-2 feed intake data was collected and also for the rest feed every day.
5) Feed offering. Feed was offered twice a day, at 7 am and 4 pm, respectively.
6) Feeding. Concentrate was first offered then followed by feeds commonly used by the local farmers. Before offered, feed was weighed first and also for the rest feed on the next morning.
7) Environment temperature. It can be red from dry and wet thermometer which hung on the pen's wall.
8) Procedure of preparing concentrate:
   a) Equipment used in the experiment was: scale with a capacity of 300 kg, bucket, and shovel.
   b) Ingredients for preparing concentrate were: rice-bran, grinding maize, *Gliricidia sepium* leaves meal, fish meal, urea, mineral mix, and *starbio*.
   c) Supplement mixing procedure: ingredients for supplement and feed were homogenized mixed, started with the least part of the ingredients.

Table 1. Concentrate ingredients for fattening male Bali cattle (on dry matter basis)

No.	Ingredients	Percentage (%)
1.	Rice-bran	50
2.	Grinding maize	25
3.	*Gliricidia sepium* leaves meal	16
4.	Fish meal	5
5.	Urea	3
6.	Mineral mix	0.5
7.	*Starbio*	0.5
	Total	100

Table 2. Chemical composition of feed ingredients (based on % DM)

Ingredients	DM	OM	CP	Crude Fat	CF	CHO	NEE	Energy	
								MJ/kg DM	Kcal/kg DM
Grass	16.12	92.48	8.55	1.43	25.34	82.50	57.16	16.83	4,007.85
Leucaena leucoephala	24.23	90.35	23.04	3.33	13.39	63.98	50.59	17.79	4,235.30
Ceiba pentandra	26.11	86.46	16.78	1.95	11.95	67.73	55.78	16.45	3,916.81
Concentrate	90.30	90.22	20.77	6.04	6.30	63.41	57.12	18.07	4,301.25

Table 3. Mean of rectal temperature, heart rate, and respiratory frequency

Parameters	Treatments			*MS*	*P-Value*
	R_0	R_1	R_2		
Rectal temperature (^oC).	38^a±0.20	38^a±0.06	37^a±0.32	0.747	0.530
Heart rate (times/minute)	69^a±1.52	69^a±0.57	66^a±1.02	2.111	0.334
Respiratory frequency (times/minute)	25^a±1.52	25^a±2.3	22^a±1.00	9.333	0.163

Data Analysis

Data collected was tabulated and subjected to Analysis of Variance (ANOVA) to explore effects of treatment on parameters observed. The statistical significant of the data value was considered at $P \leq 0.05$.

3. Results and Discussion

3.1. Feed and Environment Temperature

In keeping their animals including cattle, the local farmers strongly dependent on forages available surrounding them, without consider on nutritive value of the forages. Although the forages were quiet high protein content, but low energy content. Surroundings temperature has a direct effect on animal physiology which impact to the thermoregulation of animal body. Low quality feed and surroundings temperature was altogether resulted in stress on cattle which affected the animal physiology and in turn decrease animal production. The higher temperature and humidity than comfort zone will cause the higher attempting of the animal to keep normal their body temperature through thermoregulation. The increasing of body heat was caused by the combination of air temperature, air humidity, air movement, and sun radiation. This increasing of body heat and respiratory frequency led to less of feed intake and production (Astuti *et al*.,2015). Physiology status of Bali Cattle Fattened as commonly practiced by Local Farmers are shown on Table 3. The same superscripts in the row indicated no significant difference ($P \leq 0.05$)

3.2. Effect of Treatments on Rectal Temperature

Table 3 showed that the highest mean of rectal temperature was found on treatments R_0 and R_1 38.0 ^{o} C then followed by treatment R_2 (37.8 ^{o} C). Forages offered for each treatment were consisted of *Leucaena leucocephala* leaves, *Ceiba pentandra* leaves, and native grasses, as commonly practiced by the local farmers, and added with 2 kg concentrate, vitamin B-complex and vermicide, was able to decrease rectal temperature of the experimental animals. Based on statistical analysis (ANOVA), there was no significant effect of all of the three treatments on rectal temperature. This was because of the low quality of diet commonly fed by the local farmers, produces metabolism heat although *Gliricidia sepium* leaves meal was added. The high feed digestion activity will increase body heat, therefore the relatively the same quality of feed offered and feed intake resulted in the same body heat produced. This result was in ranging of normal body temperature for mammalian and in accordance with the finding of Astuti *et al*. (2015) by feeding forages and concentrate in different time i.e. 38.57±0.25, 38.89±0.19, and 38.77±0.14, for treatments P_1, P_2, and P_3, respectively. Meanwhile Astuti and Sudarman (2015) found that by adding Ca-saponified lemuru oil coated with herbs on lambs resulted in average of body temperature were 38.90, 38.83, 38.73, 38.73 and 38.83 for R_1, R_2, R_3, R_4, and R_5, respectively. Sporer *et al*. (2014) also reported that cattle transported increased 0.13 ^{o} C their body temperature during the transportation, from 38.73 ± 0.06 ^{0}C to 38.86 ± 0.05 ^{0}C. According to Farooq *et al*. (2010) effort of the animal to keep their body temperature in normal condition, is by increasing the dissipation of their body heat through increasing of their respiratory frequency and heart rate.

The high body temperature on treatment R_0 was caused by low quality of nutrients and high content of crude fiber in that treatment led to increase the activity of animal in masticating feed consumed which in turn released by/through conduction and radiation via respiratory tract which impact to high body temperature. According to Astuti *et al*., (2015[a]), the heat releasing by conduction, radiation, and evaporation was to keep the body temperature in normal range because animal needs a balance between heat production and heat released by their body. Meanwhile, according to Gaughan *et al*.(2004) and Kendall *et al*. (2007) heat releasing by conduction and convection; because when animal body was watered, there will a heat transfer process from animal body to water media which has a cooler temperature on the thin layer around skin.

3.3. Effect of Treatments On heart Rate

Table 3 showed that the highest mean of heart rate was the treatments R_0 and R_1which was 69 times/minute, and the lowest was R_2 (66 times/minute). Forages offered for each treatment were consisted of *Leucaena leucocephala* leaves, *Ceiba pentandra* leaves, and native grasses, as commonly practiced by the local farmers, and added with 2 kg concentrate, vitamin B-complex and vermicide.

Treatments R_0 and R_1 have the same effect on heart rate, therefore animal would always try to keep normal their heart rate through physiological, metabolic, and thermoregulation activities. Based on statistical analysis, there was no significant effect of treatments on heart rate. This was analog with the result on respiratory frequency of this experiment. According to Astuti *et al*. (2015), that the increasing of respiratory frequency in ruminant was related to heart rate and rectal temperature due to daily activity and surroundings temperature stress. Results of this experiment was lower than finding of Astuti et al. (2015) who feeding forages and concentrate in different time, found that the heart rate were 87.06±2.17, 90.69±2.18, and 88.13±2.17, for treatments P_1, P_2, and P_3, respectively. Meanwhile, Astuti and Sudarman (2015) found that by adding Ca-saponified lemuru oil coated with herbs on lambs resulted in average of heart rate were 104.6, 99.6, 93.6,

102.6 and 98.3 for R_1, R_2, R_3, R_4, and R_5, respectively. According to Eniolorunda *et al*. (2009) that the increasing of heart rate was physiologically related to the increasing of respiratory frequency which cause increasing of respiratory muscles activity resulted in fasting heat distribution to the periphery skin to be released to surrounding to keep balance of body heat.

The high heart rate on treatments R_0 and R_1 was suspected due to increasing of muscles activity as the resulted of high cell wall content of forages of diet commonly practiced by local farmers and also high level of concentrate offered which cause difficult to be consumed and digested in term of took long time to be masticated by animal and needed more energy. According to West (2003) that the higher level of feed offered the higher energy consumed, and this led to increasing of heat produced from the body as the result of metabolic process. Heat produced by animal body was derived from metabolic activity and heat from the surroundings, would be released by conduction, radiation, and evaporation via skin and respiratory tract (Ewing dan Borell, 1999).

3.5. Effect of Treatments On respiratory Frequency

Table 3 showed that the highest mean of respiratory frequency were the treatments R_0 and R_1 25 times/minute, and the lowest was R_2 (22 times/minute). Forages offered for each treatment were consisted of *Leucaena leucocephala* leaves, *Ceiba pentandra* leaves, and native grasses, as commonly practiced by the local farmers, and added with 2 kg concentrate, vitamin B-complex and vermicide. Both treatments R_0 and R_1 indicated to have the same effect on respiratory frequency. Based on statistical analysis, there was no significant effect of treatments on respiratory frequency. This no significant difference among the treatments was suspected due to low quality of feed and/or high content of crude fiber, resulted in disturbing of physiology condition of animal and impact to increasing of respiratory frequency. This was because of high crude fiber consumed could produce a high metabolic heat. The high feed digestion activity lead to high body heat, therefore the relatively the same feed quality and feed consumed of all the three treatments resulted in also the same on body heat produced. High crude fiber of feed affected the physiologic condition of animal and also respiratory frequency, where high quality of feed will increase respiratory frequency as the result of feed metabolic activity.

The respiratory frequency found in this experiment were far lower than the findings of Astuti *et al*. (2015) who feeding forages and concentrate in different time, found that the respiratory frequency were 22.66±2.27,26.81±2.21, and 25.00±0.94, for treatments P_1, P_2, and P_3, respectively. Meanwhile, Astuti and Sudarman (2015) found that by adding Ca-saponified lemuru oil coated with herbs on lambs resulted in average of respiratory frequency were 43.33, 48.66, 49.00, 44.33, 45.66, for treatments R_1, R_2, R_3, R_4, and R_5, respectively. The high respiratory frequency on treatments R_0 and R_1 was suspected due to high animal activity in masticating low quality feed which in turn digestion in rumen need longer time and this will push the diaphragm and also the lung, resulted in short in respiration lead to decreasing of tidal volume or inward air (inspiration) and outward air (expiration) in respiratory tract. According to Swenson dan Reece (1993), factors that affected there spiratory frequency were body size, age, muscle activity, surroundings temperature, pregnancy, and fully of digestive tract. The high surroundings temperature will also determine the high and the low of respiratory frequency (Ambius *et al*., 2016).

4. Conclusions

Based on the results, it is concluded that the fedding of supplement contained *Gliricidiasepium* leaves meal with the addition of vitamin B-complex and vermicide was not affected significantly ($P \leq 0.05$) the rectal temperature, respiratory frequency, and heart rate of Bali cattle fattened as commonly practiced by local farmers in the Oeletsala village.

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