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Ida Ayu Kade Widiani
Magister Program of Animal Science, Faculty of Anim. Sci., Udayana University, Denpasar-Bali, Indonesia

I Gusti Nyoman Gde Bidura
Magister Program of Animal Science, Faculty of Anim. Sci., Udayana University, Denpasar-Bali, Indonesia

BRT Putri
Magister Program of Animal Science, Faculty of Anim. Sci., Udayana University, Denpasar-Bali, Indonesia

Corresponding Author:
I Gusti Nyoman Gde Bidura
Magister Program of Animal Science, Faculty of Anim. Sci., Udayana University, Denpasar-Bali, Indonesia

Performance of fattening bali cattle on feedlot systems which are provided by local grass and concentrate supplementation

Ida Ayu Kade Widiani, I Gusti Nyoman Gde Bidura and BRT Putri

Abstract
The purpose of this study was to determine the performance of Bali cattle fattening in the feedlot system which was fed local grass and concentrate supplementation. A total of 18 fattenening bali cattle with homogeneous body weight (147.29±8.501 kg) were randomly allotted into three feed treatments. The three feed treatments were groups of cattle fed only local grass (Po), local grass+1.5kg of rice bran concentrate (P1); and local grass feed+1.5kg of commercial concentrate (P2), respectively. The results showed that the body final body weight, body weight gains, feed efficiencies, dry matter and organic matter digestibility of cattle in the P1 and P2 treatments were significantly different ($P<0.05$) higher than in the control (P0) treatment. Supplementation of concentrate in native grass basal diets were not significantly different ($P>0.05$) on feed consumption. In conclusion that supplementation of concentrate feed (rice bran and commercial concentrate) in the fattening Bali cattle with a feedlot system based on field grass feed can improve the performance of Bali cattle.

Keywords: Body weight gain, rice bran, digestibility, cattle

Introduction
Bali cattle are local cattle which are expected to be excellent animals in providing meat needs, because Bali cattle have several advantages, namely as beef cattle, the percentage of carcasses is high, ranging between 54-56% and its adaptability is very good for the environment (Bidura, 2019) [2]. Bali cattle are more tolerant of low quality feed, and have better feed use efficiency compared to other local cattle and Bali cattle have good genetic quality (Warmadewi *et al*., 2019) [21]. According Kesuma *et al*. (2019a) [9], Bali Province is believed to be the only region that has pure Balinese cattle, so this germplasm needs to be protected by national policies, so that it can be optimally utilized and preserved.

Productivity of beef cattle during fattening period was influenced by the feed quality and quantity given by farmers. When the adequately of feed covered during the growth phase, the synthesis of body tissue increases (Tahuk *et al*., 2018) [19]. Such conditions have a positive effect on the body weight gain and carcass production of the cattle.

Field grass is the main forage for ruminant animals that are often provided by breeders, because it is easily found around cages and rice fields. Field grass has a high ability to grow, especially in the tropics, although it is often cut, so it is expected to overcome the availability of feed to be available continuously. On the other hand, field grass has a very low nutrient content, which is 6-8% protein; 60% total digestible nutrients; and 28.06% crude fiber (Mathius *et al*., 2006) [11].

Natural grass has a low quality, namely low content of crude protein, gross energy, and total digestible nutrients, with high levels of crude fiber. Field grass contains 8-9% crude protein and 10-54% TDN (Partama *et al.*, 2017) [15]. If cattle are only given field grass, they cannot provide enough nutrients to support their productivity, because the nutrients contained in field grass cannot meet their physiological needs for nutrients, especially protein. Supplementation of rice bran from 75-225 g/head/day can increase nitrogen utilization in etawah crossbreed goats fed native forage grass (Siti *et al.*, 2013) [17].

Concentrate supplemental feed needs to be applied in an effort to meet needs nutrients and to increase cattle productivity. Partama (2017) [15] reports that concentrate is a food ingredient that is easily digested and contains high nutritional value, so that the availability of food substances to synthesize body tissue is increasing and can increase livestock productivity.

Concentration supplementation in grass-based feed is carried out with a view to providing microbial protein-forming materials such as ammonia (NH_3), sufficient folatile fatty acids (VFA) on the rumen, so that rumen microbial growth becomes rapid Kim *et al*. (2018) [7]. The rapid growth of rumen microbes will increase the population and activity in digesting crude fiber.

The ratio of different consumption patterns in cattle fattening, can affect rumen microbes, thus affecting fermentation in the rumen, which can affect the performance of cattle. Thus, limited information is available on the effects of different concentrated ratios, so research is conducted aimed at evaluating the effect of supplementing different concentrates in local grass-based feed on the performance of fattening cattle.

Material And Methods

Experimental design, animals, housing and diets

A total of 18 male Bali cattle aged 1.5 years with initial body weight (BW) of 147.29±8.501 kg were prepared in this study. The young male Bali cattle (calves) referred to are calves that will be fattened (calves) maintained by the "Amerta Sari" Livestock Farmers Group, in Kesiut Village, Kerambitan Sub-District, Tabanan Regency, Bali, Indonesia. Cattle were randomized and placed in individual stall equipped with different eating and drinking places. All calves used were kept in one colony enclosure and grouped into 6 groups with homogeneous body weights. The cages used in this study are individual cages. The roof of the cage uses asbestos. Each enclosure was equipped with a feed capacity of 30 kg with a size of 50x40x50 cm and a manual drinking water container made of a plastic bucket with a capacity of ± 10 liters. Feedlot was made of permanent cement, so it cannot be moved by cattle. Drinking places were placed in the feed, so it is easy to clean every day. The feed used in this study consisted of two types of feed, namely: forage as a basic feed and two types of concentrate. Forage in the form of field grass was given *ad libitum* and concentrate as much as 1.5 kg per head per day. Fattening was done for 90 days, including the adaptation period for 14 days. Feeding was done two times a day at 7:00 am, and 17:00 pm. Drinking water was available ad libitum. Feeding of forage and concentrates were carried out separately. Forage give first, while concentrate was given 60 minutes later after the cattle get forages. Field grass used was grass that grows around the study area (rice fields and dry fields).

There were two types of concentrates used in this study, namely rice bran concentrate and factory concentrate (MegaPro). All concentrates were made in the form of flour. Feed were given twice, namely in the morning and evening. Food and drinking water containers were cleaned every morning. Drinking water provided for livestock was taken from spring sources (bore wells). The composition of ingredients and nutrient content of the ration is presented in Tables 1 and 2.

Retention and excretion of nutrients

To determine nutrient digestibility values (dry matter and organic matter digestibility): Feces collection for determining feed digestibility was conducted over 5 days by using the technique of the total collection (Harris, 1970)[6]. Feces were collected daily, weighed, and sprayed with a solution of 10% formalin to avoid decomposition of feces and lost of N feces. The sample was dried until the weight constant; furthermore the samples collected during 5 days was mixed thoroughly, then 10% of the samples were milled with willey mill of 1 mm diameter for laboratory analysis. Identification of chemical feed composition was carried out by proximat analysis according to the AOAC procedure (2005) [1].

Table 1: Composition of feed in rice bran concentrate

Composition of feed	(%)
Rice bran	23
Yellow corn	40
Soy bean	34
Gritz	3
Total	100

Table 2: Nutrient content in research feed

Nutrient	Native Grass (P0)	Rice bran concentrate (P2)
Dry matter (%)	20,79	89,38
Organic matter (%)	72,69	77,27
Crude protein (%)	12,5	21,05
Ether extract (%)	3,89	2,03
Crude fibre (%)	23,71	12,67
Total digestible nutrient (Kg)	31,24	52,06

Note:

1. Analysis Results at the Animal Nutrition Laboratory, Faculty of Animal Husbandry, Udayana University

Statistical analysis

Data obtained from the results of this study were analyzed using one-way analysis of variance, if there were significant differences between treatments ($P<0.05$), then followed by Duncan's multiple range test.

Results and Discussion

The results were presented that the final body weight, body weight gains, feed conversion ratio (feed consumption:body weight gains), dry matter and organic matter digestibility, in groups fed the experimental diets are shown in Table 3. Supplementation of commercial concentrates (Group P1) and rice bran concentrates (Group P2) in the local grass basal rations in fattening cattle, significantly different ($P<0.05$) increases the final body weight of cattle, respectively: 10% and 20% more higher than control group cattle (without concentrate). Supplementation of 1.5 kg of concentrate per day to cattle in Groups P1 and P2, significantly ($P<0.05$) can increase weight gain, namely: 12% and 13% higher than controls (P0). Supplementation of 1.5 kg of concentrate per day to cattle in Groups P1 and P2, apparently had no significant effect ($P>0.05$) on feed consumption (grass and concentrate). The mean FCR in fattening cattle treatment P1 and P2 was significantly different ($P<0.05$) 12% and 13% lower than the control treatment (Table 3).

The results showed that supplementation of concentrate in native grass base feed, significantly ($P<0.05$) increased the digestibility of dry matter by 10% (Group P1) and 12% (Group P2) higher than controls (Group P0). While the digestibility of organic matter significantly ($P<0.05$) increased by 12% and 13% higher than the control (P0).

Table 3: Supplementation of concentrate feed (rice bran and commercial concentrate) in fattening Bali cattle with a feed lot system based on field grass feed on the performance and feed digestibility

Variables	Treatment Group[1)]			SEM[2)]
	P0	P1	P2	
Final body weight (kg)	167.37[a3)]	207.48[b]	198.67[b]	15.095
Body weight gains (kg/ head/85day)	18.70[a]	58.65[b]	51.00[b]	11.184
Feed consumption (kg DM/head/85day)	400.35[a]	422.45[a]	423.30[a]	21.852
• Native grass (kg DM/head/85day)	288.15[a]	310.27[a]	311.11[a]	8.063
• Concentrate (kg DM/head/85day)	112.20[a]	112.18[a]	112.19[a]	0.037
Feed Convertion Ratio (FCR)	21.4[b]	7.20[a]	8.30[a]	3.196
Dry matter digestibility (%)	65.26[b]	73,72[a]	72,95[a]	2.018
Organic matter digestibility (%)	68.04[b]	77.27[a]	76.89[a]	2.714

Note:
1. Bali cattle fed with native grass field *ad libitum* (P0); plus 1.5 kg of commercial concentrate (P1); and 1.5 kg of rice bran concentrate (P2).
2. SEM: standard error of treatment means
3. Means with different superscripts within raw values are significantly different ($P<0.05$)

Supplementation of concentrates in grass-based feed turned out to be able to increase final body weight and weight gain in treated cattles. This is due to the concentrate is a nutrient rich food and easy to digest. As reported by Partama (2017) [15] that the concentrate will accelerate the body weight gain of cattle and increase feed efficiency better. One optimization to get better feed utilization efficiency is to determine the right amount of concentrate. In Group P1 cattle use commercial concentrates, so that the content of gums or supplements in this concentrate is easier to digest cows.

The average daily body weight gain of local beef cattle in Indonesia is only 0.37 kg, whereas the ideal condition is 0.8-0.9 kg (Soedjana *et al.*, 2012) [18]. Due to low productivity, local cattle in Indonesia are more often slaughtered when they reach 60-80% of their genetic and economic potential (Diwyanto and Saptati, 2010) [5]. Genetically, according to Diwyanto and Priyanti (2008) [4], the ideal final weight of male Bali cattle can reach 300-400 kg. The appearance of Bali cows (growth, meat quality, child production and milk) can be improved by increasing the quality of feed supply (Mastika and Puger, 2009) [12].

The same thing was reported by Yogyantara *et al*. (2014) [22], increased administration of concentrate levels in forage-based rations can increase body composition and 60% concentrate levels in rations produce optimal body composition in etawah crossbreed goats.

Supplementation of concentrate in fattening cattle is expected to increase the concentration of propionic acid in the rumen, so that the growth of cattle can be optimal. It was reported by Kim *et al*. (2018) [7] that the highest propionate concentration was found in the rumen if cattle were given a high proportion of concentrate feed, while the highest butyrate concentration was in the proportion of moderate concentrate. It was also reported that the high proportion of concentrate produced the highest total gas in all incubation periods while the highest methane (CH_4) concentration was at the proportion of low and lowest concentrations in the proportion of moderate concentrate. In addition, lower feed digestibility is generally accompanied by a reduction in forage intake and an increase in the balance between acetate: propionate, which supports the production of CH_4 per unit of forage consumed (McAllister *et al.* 1996) [13].

The effect of nutrition will be greater if the treatment begins at the beginning of the growth period. So growth can be manipulated by different nutritional treatments (Partama, 2017) [15]. Average daily body weight gain in local cattle according to Soedjana *et al*. (2012) [18] were 0.30-0.75 kg/day for Ongole cross breed or Ongole cattle of; 0.35-0.66 kg/day for Bali cattle; and 0.25-0.60 kg/day for Madura cattle. This means that the daily body weight gain of cattle in the study tends to exceed the average daily body weight gain of local cattle in general. In Figure 1, the performance of bali bulls given grass and additional concentrate.

Fig 1: Performance of Balinese cattle fed local grass (left), supplemented with rice bran concentrate (right)

The FCR average is strongly influenced by the quality or nutritional content of the feed, as well as the ability of the cow to use nutrients in the feed for body growth (Kesuma *et al*., 2019b) [10]. The average FCR value is obtained from a comparison of the amount of feed consumed with beef body weight gain. The higher the FCR value, the lower the effectiveness of the feed to produce cattle body weight gain. The average conversion of feed costs to body weight gain is an economical measure of feed costs that must be incurred to produce weight gain.

Increasing microbial protein synthesis in the rumen of fattening cattle is important, because it contributes greatly to increasing livestock productivity. According to Mullik (2006) [14], around 60-80% of the total protein needed by sapi is derived from rumen microbial protein. On the other hand, the maximum potential of rumen microbes to produce microbial proteins and degraded nutrients in the rumen can be explored only by providing high-quality feed, namely concentrates (Verbic, 2002) [20].

In particular, this might cause increased forage consumption, result in slower digestion and increased rumination (Kim *et al.*, 2018) [7]. Russell and Wilson (1996) [16] explain that the main consequence, if the rumen pH<6 is a dramatic decrease in digestion of crude fiber. This can happen for two reasons; enzymes needed for the breakdown of crude fiber do not function effectively at pH<6.0, and the rate of growth of fibrolytic bacterial activity decreases markedly at low pH.

Concentrate digestion is faster than forage digestibility, which explains the higher total gas production observed in the high proportion of concentrate. The linear significance of total gas production shows a direct proportional relationship between total gas production and the amount of concentrate provided (Kim *et al*., 2018) [7]. Concentrated feed has a lower cell wall component than forage. Therefore, an increase in concentrate feed has been proposed for CH_4 mitigation. However, commercially produced concentrates vary in nutritional composition and therefore differ in CH_4 production (Kim *et al*. 2013) [8]. Cakra *et al*. (2014) [3] reported that supplementation of 10% concentrate in 90% forage significantly increased digestibility of dry matter, organic matter, crude protein, and crude fiber.

Conclusion

We conclude that supplementation of concentrate feed (rice bran and commercial concentrate) in fattening Bali cattle with a feedlot system based on field grass feed can improve the performance of Bali cattle.

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