Productivity of Bali Cattle Fed Ration Supplemented by Molasses Containing Several Types of Defaunation Agents

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ABSTRAK

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Kombinasi molases dan agen defaunasi diindikasikan mampu meningkatkan daya cerna pakan. Penelitian ini bertujuan untuk mengkaji kombinasi molases dan agen defaunasi terhadap produktivitas Sapi Bali. Sapi Bali yang digunakan sebanyak 20 ekor dengan rata-rata bobot badan 307±52,46 kg dengan waktu penelitian selama enam bulan. Penelitian ini menggunakan rancangan acak lengkap dengan 4 perlakuan dan 5 ulangan. Perlakuan yang diberikan yaitu P1 : rumput gajah + polard 1,5 kg/ekor/hari, P2 : rumput gajah + polard 1,5 kg/ekor/hari + *Hibiscus tiliaceus moladef* 10 cc/ekor/hari, P3 : rumput gajah + polard 1,5 kg/ekor/hari + *Hibiscus rosasinensis moladef* 10 cc/ekor/hari, P4 : rumput gajah + polard 1,5 kg/ekor/hari + Aloe vera moladef 10 cc/ekor/hari. Parameter yang diamati adalah rata-rata pertambahan bobot badan harian, konsumsi pakan, feed conversion ratio (FCR) dan kecernaan pakan. Hasil penelitian ini menunjukan rata-rata pertambahan bobot badan harian paling baik terdapat pada perlakuan P2 yaitu 543,13 g/ekor/hari. Perlakuan P2 juga menunjukan kecernaan bahan kering dan serat kasar yang tinggi yaitu 81,36% dan 73,58%. Disimpulkan bahwa Sapi Bali yang diberikan rumput gajah + polard 1,5 kg/ekor/hari + *Hibiscus tiliaceus moladef* 10 cc/ekor/hari menghasilkan pertambahan bobot badan harian dan kecernaan serat kasar tertinggi.

Kata Kunci: Kecernaan, Moladef, Produktivitas, Sapi Bali

ABSTRACT

Dinata AANBS, Pujiawati Y, Aurum S. 2019. Productivity of Bali Cattle fed ration supplemented by molasses containing several types of defaunation Agents. JITV 24(2): 49-54. DOI: http://dx.doi.org/10.14334.jitv.v24i2.1958

Defaunation agents and molasses combination indicate able to improve digestibility of feed. This study was conducted to assest productivity of Bali Cattle fed ration supplemented with molasses solution containing several types of defaunation agents (moladef). Twenty Bali Cattle with average body weight of 307.56±52.46 kg were used in this research for six months. This study was arranged in a completely randomized design with four treatments and five replications. The treatments were P1 : Napier grass+pollard 1. 5 kg/head/day, P2 : napier grass + pollard 1. 5 kg/head/day + Hibiscus tiliaceus moladef 10 cc/head/day, P3 : napier grass + pollard 1. 5 kg/head/day + Hibiscus rosasinensis moladef, P4 : napier grass + pollard 1. 5 kg/head/day + Aloe vera moladef 10 cc/head/day . The parameters observed were average daily gain (ADG), feed intake, feed conversion ratio (FCR) and feed digestibility. This study suggest that the best average daily gain (ADG) was found in treatment P2 is 543,13 g/head/day. Treatment P2 also showed highest dry matter digestibility and crude fiber digestibility was 81,36% and 73,85%. It is concluded that Bali Cattle fed on napier grass + pollard 1. 5 kg/head/day + Hibiscus tiliaceus moladef 10 cc/head/day resulted in the highest ADG and CF digestibility.

Key Words: Bali Cattle, Digestibility, Moladef, Productivity

INTRODUCTION

Bali Cattle according to their name are from Bali province, which spread from the 1990s (Talib 2002). Bali Cattle have a several advantages such as having high adaptability and good reproductive performance (Talib 2002). The average body weight gain of Bali Cattle according to Panjaitan et al. (2014) is ranging from 0.23-0.61 kg/day, whereas according to Rauf et al. (2015) Bali cattle which only consumed forage in grazing systems was only able to produce average daily gain 0.15 kg/day.

The use of natural pasture and crop residues as the main feed is not sufficient to meet nutrient requirements, especially in the growth phase of Bali Cattle. This is indicated by poor feed digestibility so that nutrient intake for growth is not met sufficient. The crude fiber content in forage is more than 20 %, so fiber digestibility plays an important role in supporting the ruminant's performance. Studies to improve forage

digestibility have been widely carried out such as processing physically, chemically and biologically so that forage is easily digested and absorbed by animal body (Wanapat et al. 1996). In addition there are alternative efforts by using several tropical local plants that are known to be able to improve the performance of ruminant's digestive systems (Santra & Karim 2003).

Ruminants are able to degrade and use fibrous feed as a source of energy and nutrients because of the presence of complex anaerobic microbiota in the rumen, composed mainly of bacteria, fungi, and ciliate protozoa (Durand & Ossa 2014). Each rumen microbes has a specific function on feed digestibility. Arora (1995) stated that feed digestibility increase if the rumen microbial population increase, especially the cellulose and hemicellulose digestive bacteria.

Saponin is a natural phytochemical compound that has been widely studied to improve rumen metabolism so that it has a positive impact on increasing the efficiency of ruminant production. The three local plant such as namely *Hibiscus tiliaceus, Hibiscus rosasinensis* and *Aloe vera* are known to have natural phytochemical compounds in the form saponins (Istiqomah et al. 2011; Widiawati et al. 2017; Kusumastuti & Yuniar 2016)**.** A study of utilization *Hibiscus tiliaceus* leaf at 10% level can decrease protozoa population and gas production, and there was no effect on NH3 and VFA concentration also pH value (Istiqomah et al. 2011). Study by McMurphy et al. (2014) showed that use of saponin from extract *Yucca schidigera* as Micro-Aid® in protein supplements increase rumen dry matter and a NDF digestibility in steers fed low quality prairie hay.

Saponin content in *Hibiscus tiliaceus, Hibiscus rosasinensis* and *Aloe vera* is indicated to reduce ration palatibility. According to Santoso & Sartini (2001) the content of saponin in *Sauropus androgynus* leaf can reduce ration palatability because it has a bitter taste and is smooth. To prevent this problem, the combination of the three plants with molasses is an attempt to reduce the chances of decreasing ration palatability. Molasses is suitable for inclusion in the diets of all ruminant livestock and effective to increase the palatability of feeds whilst contributing for increased levels of energy and protein (Senthilkumar et al. 2016). Molasses is a available energy source for microbes and also serves as to protect proteins protection from being entirely degraded in the rumen (Supriyati, Haryanto 2011; Kardaya et al. 2009; Mathius 2009).

Based on briefly literature mentioned above, it is necessary to conduct a study on the addition of molasses solutions containing defaunation agent to increase productivity of Bali cattle. The research was conducted to determine productivity and nutrient digestibility of Bali cattle fed ration supplemented with molasses solution containing several types of defaunation agents (Moladef).

MATERIALS AND METHODS

In vivo research was conducted at "Rare Angon" farmer group in Gel-gel village, Klungkung Sub-district, Klungkung district. Research was conducted six months with preliminary study for one week. For experiment, 20 Bali Cattle was used with mean body weight 307.56 ± 52.46 kg in individual cages. The cage was concrete ground equipped with drinking and feeding facility. Feeding was offered twice a day at 08.00 am and 04.00 pm. Experimental design applied was completely randomized design consisted of 4 feeding treatments with 5 replicates. Feeding treatments were : P1 : napier grass + pollard 1.5 kg/head/day, P2 : napier grass + pollard 1.5 kg/head/day + *Hibiscus tiliaceus* moladef 10 cc/head/day, P3 : napier grass + pollard 1.5 kg/head/day + *Hibiscus rosasinensis* moladef 10 cc/head/day, P4 : napier grass + pollard 1.5 kg/head/day + *Aloe vera* moladef 10 cc/head/day.

This experiment use 4 L of water available for cattle and will be refill once consumed. The diet is given separately between napier grass and pollard.

Fresh napier grass was given as much as 10% of body weight. Napier grass was harvested at 40 days of age, and chopped into 5 – 10 cm length. Pollard was fed in the morning prior to Napier grass. Moladef is a solution consisting of molasses with a defaunation agent. Moladef was given by drinking water at the same time as forage feeding. Moladef is given per day as much as 10 cc/head/day diluted in 4 liters of drinking water, drinking water consumed entirely.

Moladef preparation started by dissolving molasses solution with clean water. 700 ml of water was added to 300 ml molasses followed by homogenization. Defaunation agent was mixed in the solution form by initial preparation of 50 g dry of materials (*Hibiscus tiliaceus, Hibiscus rosa-sinensis,* or *Aloe vera)* grinded and milled with mechanical grinder followed by adding 1 L of water then filtered. The filtrate was added to molasses solution at concentration 20% of total volume and then mixed well.

Data recorded were (1) average daily weight, (2) feed intake (3) Feed Conversion Ratio (FCR) and (4) feed digestibility. Weight increase determined by measuring the difference between monthly body weight. Average daily gain quantified by deducting the final body weight with initial body weight devided by the time of research.

Table 1. Nutrient composition of experimental diets in total mix ration

Nutrients	Experimental diets			
	P1	P2	P3	P4
Dry Matters (DM)	28.00	28.27	27.74	28.21
Organic Matters (OM)	88.56	89.24	87.49	87.48
Ash	11.44	10.76	12.51	12.52
Crude Protein (CP)	13.38	13.78	13.53	13.40
Fat	2.12	2.79	2.76	2.75
Crude Fiber (CF)	20.35	17.59	18.62	18.46
Energy (kkal/kg)	2538	2670	2604	2601
Nitrogen Free Extract (NFE)	17.19	16.70	15.96	15.96
Total Digestible Nutrient (TDN)	54.69	54.35	54.32	54.00

P1 = Napier grass + pollard 1.5 kg/head/day;
P2 = Napier grass + pollard 1.5 kg/head/day + *Hibiscus tiliaceus* moladef 10 cc/head/day;
P3 = Napier grass + pollard 1.5 kg/head/day + *Hibiscus rosa-sinensis* moladef 10cc/head/day;
P4 = Napier grass + pollard 1.5 kg/head/day + *Aloe vera* moladef 10 cc/head/day.

Feed intake measured based on dry matters intake (kg/head/day) calculated by finding the difference of feed given with daily residual feed (Parakkasi, 1999). FCR quantification conducted by dividing number of daily ration with weight increase per cow per day during the research. Digestibility is calculated by the formula :

$$\frac{\text{Nutrien intake (kg/DM) - Nutrien in fecal (kg/DM)}}{\text{Nutrien intake (kg/DM)}} \times 100\%$$

The samples of Napier grass and polard offered and refusals samples were collected during the last 7 days of each period by using total collection method. Fecal samples were collected during the last 7 days of each period by using total collection method as animal were moved to the metabolic crates. Feed sample were withdrawn 10% of the given, and fecal withdrawn 5% from the total production. Feed and fecal samples were sun dried followed by composite process and then taken out 200 g from each treatment for laboratory analysis i.e. DM and nutrition content. DM of feed and fecal determined with AOAC method (AOAC 2005). Analysis of crude protein using the Kjedahl method was through the process of destruction, distillation, titration and calculation, while for crude fat the method used included extraction of soxhlet with solvent fat petroleum ether. Analysis of crude fiber using acid solvents and dilute bases was through boiling each of 30 minutes. Energy measurement using the Bomb Calorimeter by measuring changes in temperature due to combustion. NFE value obtained from the calculation of 100% - (Water + Ash + Crude Protein + Crude fat + Crude Fiber %). Total digestible nutrient value was obtained from calculations using formula by Wardeh (1981).

Experemental data obtained were analyzed with one way ANOVA or completely randomized design with four treatment and five replications. Data were analyzed using the model $Yij = \mu + \tau i + eij$. Where Yij is the variable under consideration, μ the overall mean, Ti the ith treatment and eij is the residual error. Differences between treatment means were determined by Duncan's Multiple Range Test, and differences among means with $p < 0.05$ were represented as statistically significant different.

RESULTS AND DISCUSSION

Productive Performance and Nutrient Intake

Application of Moladef (molasses containing defaunation agent) has positive effect to average daily gain (ADG) of Bali Cattle. The average daily gain (ADG) increase of Bali Cattle under P2 treatment was 543.13 g/head/day or 30. 53% and 17.28% higher than P1 and P4 (Table 2). Average daily gain in this study was 29% higher than ADG for Bali Cattle as reported by Panjaitan et al. (2014) being 230-610 g/head/day which was fed with *Leucaena leucocephala*. The FCR value is determined based on the amount of ration consumed divided by daily body weight gain. The FCR value was not significantly different between the treatments. The FCR value were not significantly different indicates that the ration used has not been efficient in changing feed consumption into daily body

weight gain, if the highest daily body weight gain is observed in P2, it is supported by a low FCR value.

Feed intake in Table 2 shows no significant different (P>0.05) among treaatments. Feed intake (as fed) ranging from 34,06-34,99 kg/head/day or 11% BB and dry matter intake ranging from 9,59-9,71 kg/head/day. Feed intake was not significantly different between treatments but having different effect on production performance indicates the digestibility of feed form each treatments plays an important role in production performance as indicated by daily weight gain.

These result also showed that supplementation of *Hibiscus tiliaceus* as moladef in P2 had a positive impact on daily body weight gain compared to other type of plants as saponin source. According to Bata et al. (2016) stated that the addition of 0.48% waru leaf meal (*Hibiscus tiliaceus*) on Sumba Ongol Cattle diet did not increase dry matter intake, organic matter digestibility but has a trend to increase daily body weight gain and feed efficiency.

In this study average daily gain in P2 was higher than other diet, this indicated that saponin in *Hibiscus tiliaceus* plant were thought to be more effective than other treatments. Istiqomah et al. (2011) stated that the use of waru leaf (*Hibiscus tiliaceus*) as much as 10% in ration was the most optimal to improve rumen fermentation for propionate synthesis, reduce protozoa population, reduced gas production and did not negatively affect to NH_3 concentration, VFA concentration and pH value. This is also in line with the in vitro study, that use of *Hibiscus tiliaceus* as moladef has increased propionate synthesis, NH_3 concentration, dry matter digestibility and organic matter digestibility (Dinata & Pujiawati 2018).

Table 2. Bali cattle average daily gain suplemented by moladef

Parameter[1)]	Treatments			
	P1	P2	P3	P4
Initial body weight (kg)	307.90 ± 42.03	309.50 ± 45.59	306.70 ± 55.11	306.20 ± 59.79
Final body weight (kg)	382.30 ± 31.13	406.70 ± 40.00	389.70 ± 44.41	383.50 ± 58.53
Average daily gain (g/head/day)*	416.18 ^{a} ± 26.58	543.13 ^{b} ± 24.55	463.25 ^{ab} ± 29.24	432.31 ^{a} ± 27.59
Feed intake (kg/head/day)				
Wet weight	34.24 ± 2.28	34.36 ± 5.60	34.99 ± 6.10	34.06 ± 4.43
Dry mater	9.59 ± 0.64	9.71 ± 1.58	9.71 ± 1.69	9.61 ± 1.25
FCR	24.30 ± 6.53	18.40 ± 4.65	21.11± 4.29	23.68 ± 5.95

[1)] Values with different superscripts on the same rows show a significant difference (P<0.05)

Table 3. Feed intake of Bali cattle suplemented by moladef

Parameter (kg/head/day)[1)]	Treatments			
	P1	P2	P3	P4
DM	9.59 ± 0.64	9.71 ± 1.58	9.71 ± 1.69	9.61 ± 1.25
OM	7.47 ± 0.50	7.63 ± 1.24	7.46 ± 1.30	7.37 ± 0.96
CP	1.28 ± 0.09	1.34 ± 0.23	1.31 ± 0.23	1.29 ± 0.17
Fat	0.20^{a} ± 0.01	0.27 ^{b} ± 0.04	0.27 ^{b} ± 0.05	0.26 ^{b} ± 0.03
CF	1.95 ± 0.13	1.71 ± 0.28	1.81 ± 0.32	1.77 ± 0.23
Energy (kkal/kg)	86.90 ± 5.78	91.73 ± 14.96	91.11 ± 15.89	88.59 ± 11.53
NFE[2)]	1.65 ± 0.11	1.62 ± 0.26	1.55 ± 0.27	1.53 ± 0.20
TDN	5.71± 0.38	5.64 ± 0.92	5.64 ± 0.98	5.55 ± 0.72

1) Values with different superscript in the same rows show a significant difference (P<0.05)
2) Values with different letters on the same rows show a highly significant difference

Dry matter (DM) intake in cattle treated with moladef was not significantly different (P>0.05) among treatment (Table 2). Moladef supplementation in drinking water does not affect dry matter intake indicating that saponin content in moladef does not reduce ration palatability. Suharti et al. (2009) stated that the saponin in the diet can decrease palatability because it has a bitter taste. This is indicated that molasses content in moladef can overcome the bitter taste of saponin. Senthilkumar et al. (2016) stated that the provision of molasses in diet increased the palatability of feed, thus increasing feed intake.

Suplementation moladef did not affect to nutrient consumption (Table 3) except crude fat consumption (P<0.05). This is because the crude fat contained in P1 treatment lower than other treatments. Crude fat intake in this study did not affect to average daily gain (ADG) Bali cattle (Table 2). Suplementation moladef did not affect to nutrient consumption because nutrient in experiment diets designed to be iso-energy and iso-protein. TDN and protein consumption is relatively similar in all treatments.

TDN consumption (Table 3) is still within the standard range of Kearl (1982) which states that TDN consumption for cattle with body weight 300 kg and daily body weight gain 0.5 kg is 3.8 kg, while for crude protein consumption also still within the standard range crude protein consumption is 604 gram or 0.6 kg. Crude fiber consumption in this study ranged from 1.71-1.95 kg/head/day (P>0.05). This is because the crude fiber content in ration is not too different between diets, but the crude fiber digestibility is more optimal with moladef treatment (Table 4).

Nutrient Digestibility

The addition of moladef was not significant effect on nutrient digestibility such as dry matter, organic matter, crude protein, crude fat and TDN (P>0.05; Table 4). The addition of moladef has an influence on the NFE digestibility and crude fiber digestibility (P<0.05; Table 4). This is indicated that 10 cc/head/day moladef in diets did not have negative effect on nutrient digestibility. In vitro studies, dry matter digestibility for moladef treatment was higher 18.33-26.55 % compared without moladef treatment, whereas for organic matter digestibility was higher at moladef treatment ie 22.76 – 33.61% compared to control (Dinata & Pujiawati 2018). These results are inversely proportional to digestibility of dry matter and organic matter in the in-vivo study, for which further studies are needed regarding the effectiveness of moladef in the in-vivo study.

CONCLUSION

The Suplementation of *Hibiscus tiliaceus* moladef 10 cc/head/day particularly in Bali cattle fed Napier grass + pollard 1.5 kg/head/day has the highest productivity and can increase crude fiber digestibility.

Table 4. Nutrient digestibility of Bali cattle Supplemented by Moladef

Digestibility (%) [1)]	Treatments			
	P1	P2	P3	P4
DM	79.07 ± 3.95	81.36 ± 2.91	79.93 ± 3.97	78.31 ± 3.06
OM	79.96 ± 3.78	82.39 ± 2.75	81.04 ± 3.75	79.15 ± 2.95
CP	87.07 ± 2.44	87.73 ± 1.92	87.67 ± 2.44	86.87 ± 1.86
Fat	84.23 ± 2.98	86.26 ± 2.15	90.75 ± 1.83	88.23 ± 1.66
CF	52.52 [a] ± 8.96	73.58 [b] ± 4.13	63.58 [ab] ± 7.20	61.11 [ab] ± 5.49
Energy (kkal/kg)	92.00 ± 1.51	93.35 ± 1.04	92.92 ± 1.40	92.20 ± 1.10
NFE [2)]	78.52 [b] ± 4.05	59.50 [a] ± 6.33	65.83 [a] ± 6.75	59.20 [a] ± 5.76
TDN	89.62 ± 1.96	88.97 ± 1.72	87.99 ± 2.37	86.19 ± 1.95

[1)] Values with different letters on the same line show a significant difference
[2)] Values with different letters on the same line show a highly significant difference

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