Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023 August; 6 (1): 230-236

Response of Male Bali Cattle to Additioning Pineapple Skin Fermented with Lactic Acid Bacteria

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Received: 20- June -2023
Revised: 22- July -2023
Accepted: 16- August -2023

Abstract

Introduction: Bali cattle are large ruminants with unique characteristics, namely they are resistant to heat in the tropics and adapt very quickly. The growth of Bali cattle is influenced by two factors, namely genetic and environmental factors. Bali cattle with good genetics and supporting environmental factors can provide normal growth and produce good quality meat.

Objectives: The research was conducted to determine the response of male Bali cattle to feeding pineapple peels fermented by lactic acid bacteria (LAB).

Methods: The material used in this study was 9 male Bali cattle with an initial weight range of 201.00-215.50 kg which were placed in individual cages randomly based on a Completely Randomized Design into 3 treatments with 3 replications: P0=Balinese cattle ration consisting of 39%+61% ground corn + 0% rice bran + 0% fermented pineapple peel by LAB + native grass (adlibitum); P1 = Bali cattle ration consisting of 15% ground corn + 70% rice bran + 15% fermented pineapple peel by LAB + native grass (adlibitum); and P2 = Bali cattle ration consisting of 5% ground corn + 65% rice bran + 30% fermented pineapple peel LAB + native grass (adlibitum).

Results: One way ANOVA analysis showed that the addition of fermented pineapple peel in Bali cattle rations had a significant effect ($P<0.05$) on body weight gain, final weight, protein consumption, carcass percentage, meat index and rib eye area, whereas on dry matter consumption, FCR and carcass length had no significant effect ($P>0.05$). The results showed that the Bali cattle ration containing fermented LAB 30% of pineapple peel had a body weight gain of 0.62 kg/head/day, carcass percentage (55.08%), carcass length (140.00 cm); meat index (1.05%) and rib eye area (54.00 cm2) were higher with PO and P1 treatment

Conclusions: The addition of LAB fermented pineapple peel 30% in the ration gave a positive response to the production performance of male Bali cattle.

Keywords: Bali cattle, fermentation, lactic acid bacteria

1. Introduction

Bali cattle, native to Indonesia, have their own unique qualities compared to other cattle breeds, namely that they are resistant to heat stress, not selective about feed and have high meat production (Bulkaini et al., 2021[a]). The performance of Balinese cattle is influenced by two factors, namely genetic factors and environmental factors. Cattle with good genetics with a supportive environment, namely available feed and maximum health care, will provide good performance (Marino et al., 2020).

Bali cattle are considered good if they are able to produce carcasses with optimal quantity and quality. Common carcass evaluation parameters are carcass percentage, meat index and rib area (Suryanto et al., 2017). Cattle that have a high live weight do not always show a high carcass percentage. Carcass percentage is affected by slaughter weight and carcass weight at the time of slaughter. The beef index determines the proportion of meat to the length of the beef carcass. Carcasses that have the same carcass length and carcass weight have a trade index of 1 greater than cattle that have a larger carcass length and carcass weight (Wiyatna, 2007). The area of the rib eye area is directly proportional to meat production, that is, the larger the area of the rib eye area, the more meat it will produce (Bulkaini et al., 2021[a]).

Improving feed management must pay attention to quality and continuity of availability by utilizing local sources of ingredients such as pineapple peel. Pineapple skin is a waste of 25-35% of the fruit's weight (Ibrahim et al., 2016). Pineapple peel is available in large quantities and does not know the season, so it has the potential to be used as feed for cattle and other livestock (Bulkaini, 2021[b]). Pineapple production in West Nusa Tenggara reached 24,463.90 tonnes/year so that 7,339 tonnes/year of skin was available (West Nusa Tenggara in figures, 2015). Before use, pineapple skin should be fermented to increase the nutritional value and palatability of the feed using commercial inuculum such as lactic acid bacteria (Nastiti et al., 2013). Fresh pineapple peel is an organic material with crude fiber and crude protein of 33.25% and 4.93% (Setiyanto, 2011); 27.09% and 8.78% (Nurhayati, 2013) and 16.7% and 6.4% (Murni et al., 2008).

2. Objectives

The research was conducted to determine the response of male Bali cattle to feeding pineapple peels fermented by lactic acid bacteria (LAB).

3. Methods

The research material consisted of 9 male Bali cattle with body weights ranging from 201-211.50 kg, bran, LAB (*Lactobacillus bulgaricus*), milled corn, fermented pineapple peel and molasses. The research material was placed in individual cages with a size of 1 x 2 m randomly based on a one-way Completely Randomized Design consisting of 3 treatments and 3 replications, namely: P0: Milled corn 39%+61% rice bran + 0% fermented pineapple peel + field grass (adlibitum); P1: Milled corn 15%+70% rice bran + 15% fermented pineapple peel LAB + field grass (adlibitum); and P2: Milled corn 5% + 65% bran + 30% fermented pineapple peel LAB + field grass (adlibitum).The ration formula used in the research is presented in Table 1.

Tabel 1. Composition and Nutritional Content of Research Rations

Ingredients for Rations	Treatment (%)		
	P0 (0%)	P1 (15%)	P2(30%)
Milled Corn	39	15	5
Rice bran	61	70	65
Pineapple peel fermented by LAB	0	15	30
Nutrient content of ingredients			
Crude protein	12.01	12.13	12.03
Crude fiber	4.52	6.15	8.44
Crude fat	9.12	10.27	8.92
Nitrogen Free Extract (NFE)	62.50	61.28	60.73
Total Digestible Nutrients (TDN)	78.76	81.70	85.48
Ca	0.04	0.04	0.05
Pav	0.99	1.13	1.14

The research variables consisted of production performance (body weight gain, dry matter consumption, protein consumption, Feed conversion ratio) and carcass quality (carcass percentage, meat index and rib eye area). Data collection is carried out using the following methods:

a. Body weight gain was obtained by subtracting the final body weight from the initial weight of the study cattle (Budiari et al., 2020). Daily weight gain was obtained by dividing the overall weight gain by the length of the study.

b. Dry matter consumption (kg/head)

Ration dry matter consumption is forage dry matter consumption plus concentrate dry matter consumption (Suryani et al., 2016).

c. Protein Consumption (kg/head)

The level of protein consumption is influenced by the amount of protein content in the ration (Hernaman et al., 2008). Protein and energy are important nutrients that must be considered in formulating rations for ruminants. The protein and energy content of the ration greatly determines the efficiency of nutrient utilization which ultimately affects livestock productivity.

Protein consumption formula: Ration consumption (g DM) × % Ration protein (Mariani et al., 2016)

d. Feed Conversion Ratio (FCR)

Feed conversion ratio is the result of ration consumption divided by body weight gain.

e. Carcass Percentage (%)

Carcass percentage is calculated by dividing carcass weight by empty body weight, then multiplied by.

f. The Meat Index

The meat index is calculated based on the comparison between carcass weight and carcass length.

g. Rib Eye Area

The area of the rib eye is measured at the 13th rib, by means of which the rib is cut beforehand to facilitate the process of making a cross-sectional image of the rib using a marker on transparent plastic. The process of measuring the area of the rib eye area using the plastic grid is carried out by adding up the fields seen on the plastic grid

Data analysis

The research data were analysed using analysis of variance based on a completely randomized design and followed by the Duncan's Multiple Range Test SPSS version 21 program (Azizah et al., 2012).

4. Results

Production Performance of Male Bali Cattle

The average performance of male Bali cattle fed with pineapple peel fermented with LAB is presented in Table 2.

Table 2. Product Performance of Male Bali Cattle by Feeding LAB Fermented Pineapple Peel

Variable	Treatment (%)			Sig
	P0 (Control)	P1 (15%)	P2 (30%)	
Initial weight (kg)	201.00±29.70	206.00±2.12	211.50±4.95	0.076
Final weight (kg)	245.00±9.50^{b}	251.00±7.25^{b}	257.00±14.75^{a}	0.009
Weight gain (kg/head/day)	0.59±0.13^{a}	0.60±0.13^{b}	0.61±0.07^{b}	0.043
Dry matter consumption (kg/ekor/hari)	4.09±0.16	4.16±0.07	4.22±0.04	0.089
Feed conversion ratio	8.31±1.69	6.93±1.98	6.92±0.78	0.077
Protein consumption (g/head/day)	612.54±15.67^{b}	630.77±5.82^{c}	625.19±5.66^{a}	0.025

Description : Different superscripts on the same line show significant difference (P<0.05); Sig= Significant.

The results of the One way ANOVA analysis showed that the addition of fermented pineapple peel to the Bali cattle ration had a significant effect (P<0.05) on final weight gain, daily body weight gain and protein consumption, while on initial weight, dry matter consumption and feed conversion ratio had no significant effect (P>0.05).

Carcass Quality of Male Bali Cattle

The results of research on the carcass quality of male Bali cattle fed with fermented pineapple peel are presented in Table 3.

Table 3. Carcass Quality of Male Bali Cattle with Fermented Pineapple Peel Feeding

Variable	Treatment (%)			Sig.
	P0 (Control)	P1 (15%)	P2 (30%)	
Slaughter Weight (kg)	245.00±9.50	251.00±7.25	257.00±14.75	0.115
Carcass weight (kg)	133.00±5.50	132.00±3.25	147.00±10.00	0.063
Percentage Carcasses (%)	54.32±0.00^{b}	52.44±0.22^{a}	55.08±0.01^{b}	0.001
Carcass Length (cm)	143.00±3.00	133.00±2.50	140.00±10.00	0.183
Meat index	0.93±0.06^{a}	0.99±0.01^{a}	1.05±0.00^{b}	0.016
Rib eye area (cm2)	49.00±1.00^{a}	53.00±1.00^{b}	54.00±1.00^{b}	0.002

Description: Different superscripts on the same line indicate a very significant difference (P<0.01); Sig= Significant.

The results of the One way ANOVA analysis showed that the addition of fermented pineapple peels to the ration of Bali cattle had no significant effect (P>0.05) on slaughter weight, carcass weight and carcass length. while the carcass percentage, meat index and rib eye area had a significant effect (P<0.05).

5. Discussion

Increase in body weight

The production performance of Bali cattle can be seen from body weight gain. Body weight gain is one parameter that can be used as a benchmark for livestock productivity, especially beef livestock.

The results showed that Bali cattle with rations containing 30% pineapple peel fermented by LAB had a body weight gain of 0.61 kg/head/day, higher than the control (0.59kg/head/day) and 15% treatment (0.60 kg/head/day). The results of this study were lower than the results of research on Bali cattle which were reared for 4 months using feed consisting of king grass + 1.5% concentrate of body weight and 1 kg of corn flour resulting in an increase in body weight of 0.89 kg/head/day (Suryani et al., 2019).

The results of this research prove that nutritional balance in the ration makes a significant contribution to the performance of Bali cattle production (Karda et al., 2014). The achievement of higher growth in the livestock group that received rations containing 30% fermented pineapple peels of LAB solution (P2) was due to achieving a balance of the ecosystem in the rumen, namely the occurrence of a synergistic relationship between microbes in the rumen. This has implications for higher feed digestibility so that livestock receive a greater supply of nutrients which causes livestock to grow more perfectly.

Feed Consumption

Giving fermented pineapple skin in the ration had no significant effect (P>0.05) on the consumption of ration dry matter. This reflects that the fermentation of pineapple peel using LAB in the ration is not to a level that interferes with the appetite of Bali cattle, so that feed consumption based on dry matter is relatively the same among all treatments. Ration consumption is basically aimed at meeting the energy needs of livestock, so livestock will stop eating when livestock feel their energy needs are fulfilled. If the ration is not energy dense (high in fiber), the capacity of the digestive organs, especially the fermentative digestive organs, will be the main limiting factor in ration consumption, even though additional energy is still required.

The results of the study (Table 2) showed that the addition of lactic acid bacteria fermented pineapple peels 15% in the ration provided a higher protein consumption (630.77 ± 5.82 g/head/day) compared to the treatment with the addition of LAB fermented pineapple peels 30 % (625.19±5.66 g/head/day) and control (612.54±15.67 g/head/day). This is probably due to the ration of Bali cattle with the addition of fermented pineapple skin 15% LAB can increase the palatability value of the ration.

Feed Conversion Ratio (FCR)

The efficiency value of ration use is indicated by the size of the FCR value and is often used as a basis for making decisions. The Feed Conversion Ratio obtained respectively was 8.31 ± 1.69; 6.93 ± 1.98, and 6.92 ± 0.78 for treatments P0, P1, and P2, and not significantly different (P> 0.05) between treatments. The results of this research indicate that the addition of 30% LAB fermented pineapple peel (P2) in the ration can provide a higher feed efficiency value compared to P0 and P1. This is because the P2 treatment has a body weight gain that is proportional to the increase in feed dry matter consumption so that it can provide a smaller FCR value (6.92 ± 0.78) compared to the FCR at P0 (8.31 ± 1.69) or with FCR at P2(7.15±0.78). The FRC value obtained in this study is relatively the same as the FRC value for Bali cattle fed king grass + 1.5% concentrate of body weight and 1 kg of corn flour, which is equal to (Suryani et al., 2019).

Carcass Quality of Male Bali Cattle

Duncan's test results showed that the addition of 30% fermented pineapple peel from LAB in the ration resulted in a carcass percentage of Bali cattle of 55.08%, significantly (P>0.05) higher than the carcass percentage at P0 (54.32%) and P1(52.44%). The percentage of Bali cattle carcasses fed feed containing 30% fermented pineapple shells from LAB in this study was higher than the percentage of male Bali cattle carcasses fed fermented cocoa shells, namely 54.76%, also higher than the percentage of male Bali cattle carcasses. which is reared extensively in the East West region of East Nusa Tenggara with a slaughter weight of 190-220 kg has a carcass percentage of 53.38% (Suryanto et al., 2017; Niru, 2017). Male Bali cattle slaughtered at the Manado Slaughterhouse, North Sulawesi, had a carcass percentage of 50.168% lower than the carcass percentage of male Bali cattle treated with pineapple peel fermented with yeast or LAB (Marino et al., 2020).

The carcass length obtained in this study (Table 3) ranged from 133.00 ± 2.50 to 143.00 ± 3.00 cm. The results of this study were higher with the carcass length of male Bali cattle with a slaughter weight of 300-400 kg which had a carcass length of 125 cm (Yosita et al., 2011). Furthermore, it is said that carcass length is determined more by the length of the permanent bones, while carcass width is determined by the growth of tendons in the area around the chest.

Male Bali cattle with an age range of 3 to 3.5 years and a fat body condition have a carcass length of 148.20 cm (Wiyatna, 2007). The results of Duncan's test showed that the trade index for male Bali cattle in the control treatment (P0) was 0.93 ± 0.06 lower than the trade index at P1 (0.99 ± 0.01) and was significantly different (P <0.05). with the Bali cattle beef index in treatment P2 (1.05 ± 0.00). This was because the treatment of rations containing fermented pineapple peels with 30% LAB had a higher carcass weight compared to other treatments. The size of the trade index is very dependent on carcass weight, the higher the carcass weight per unit length, the higher the index of meat (Bulkaini et al., 2021[a]). The index of meat obtained in this study ranged from 0.93 to 1.05, lower than the index of male Bali cattle reported by Wiyatna, 2007) which was 1.23. This is because the male Bali cattle used as research material are still relatively young, namely 1.5-2 years, so they have not given maximum growth in the carcass components. The rib eye area of male Bali cattle obtained in this study ranged from 49.00-54.00 cm2, lower than the rib eye area of male Bali cattle fed fermented cocoa shells which was 61.79 cm2 (Suryanto et al., 2017). Duncan's test results showed that the rib eye area of male Bali cattle at P0 (49.00 ± 1.00 cm2) was lower and significantly different (P < 0.05) to the rib eye area of male Bali cattle in treatment P1 (53, 00 ± 1.00) and treatment P2 (54.00 ± 1.00). The results of this study indicate that there is a positive correlation between the rib eye area and carcass weight. The results of this research are strengthened by the opinion which states that the factors that influence the area of the rib eye are live weight and carcass weight (Suryanto et al., 2017).

6. Conclusion

The addition of 30% LAB fermented pineapple peel in the ration gave a positive response to the production performance of male Bali cattle.

7. Acknowledgment

The researcher would like to express his gratitude to the Ministry of Education and Culture, Research and Technology for providing research funding through the Institute for Research and Community Service at Mataram University.

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