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Performance of Male Bali Cattle at Different Age By Feed Concentrate Containing Cocoa Pulp

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Abstract

The cocoa pulp is a slimy layer that surrounds the pieces of seeds, consisting of part of water and a layer of nutritional components which is quite high, including sucrose, glucose, and a little starch. The cocoa pulp, the by-product of cocoa production, has been used to avoid environmental pollution as an organic fertilizer. However, for livestock feed, the information is so limited. Therefore, the objective of this study was to determine the performance of male Bali cattle at different ages by feed concentrate containing cocoa pulp. The experiment was carried out in a completely randomized design consisting of 3 treatments and 3 replications so that it needed 9 male Bali cattle. The treatment consisted of A1 = male Bali cattle 2 years; A2 = male Bali cattle age 3 years; and A3 = Bali cattle male age 4 years, respectively. The parameter was feed consumption, performance, daily body weight gain (DWG), and feed consumption rate (FCR). The results showed that the average feed consumption, DWG, and FCR, showed significantly different ($P<0.05$) on feed concentrate containing cocoa pulp. The results indicated that 4 years of male Bali cattle was good growth performance compared to 2 years and 3 years by feed concentrate containing cocoa pulp.

Keywords: Cocoa pulp, feed consumption, DWG, FCR, performance

INTRODUCTION

Bali cattle (*Bos sondaicus*) is the indigenous livestock of Indonesia (Hatta *et al*., 2013; Baco *et al*., 2019; Baco *et al*., 2020). The cattle is one of the sources of livestock protein that produces a variety of needs such as meat, skin, bones, manure, etc (Sudarmono dan Sugeng, 2008). Bali cattle are domesticated of wild cows and have several advantages compared to other cattle such as having fast growth rates, good environmental adaptation, good reproductive appearance, good fertility, and low mortality (Purwantara *et al*, 2012). Furthermore, Williamsom and Payne (1993) revealed that the performance of Bali cattle has a good adaptation to the influence of hot environments, quite tolerant of cold environments, and efficient in the utilize of low-quality feed.

The growth performance of Bali cattle is determined by age which is very closely related to the level of production, production efficiency, and growth rate. The growth process includes changes in body weight, body performance, including changes in body components such as muscles, fat, bones, organs, and chemical components including water, fat, protein, and ash (Soeparno, 1998).

Generally, livestock feed was consisting of forage and concentrate. Forage consists of grass (e.g. dwarf napiergrass, brachiria, Setaria, etc.) and legumes (e.g. Indigofera, Centro, siratro, etc.) (Malaka *et al*., 2019). Forage is containing high crude fiber (>18% of dry matter, DM) (Field, 2007). The DM content for livestock is at least 13% crude fiber in the ration. The forage cannot be replaced fully with feed concentrate which has relatively lower crude fiber content, because of the function of the crude fiber content is keep the digestion tract working properly, cattle become full easily, and affect the digestive glands (Parakkasi, 1999).

Feed concentrate contains crude protein and sufficient energy, relatively low levels of crude fiber, and easily digested. The feedstuff ingredients derived from grains such as ground corn, groats, agricultural or factory by-products such as bran, rice bran, coconut cake meal, molasses, etc. Feed concentrate function is increasing and enrich the nutritional value of other feedstuff ingredients that have low nutritional value. Therefore, livestock that is in the dry lot fattening must be fed sufficient and high nutritional value of feed concentrate (Church, 1991).

Forage and feed concentrate are one of the keys for livestock business. Forage plays an important role to support the performance of male Bali cattle in dry lot fattening systems. However, its availability and sustainability have decreased due to the shift function from native pasture to crop field or the settlements. Therefore, farmers are looking for alternative feeds to maintain and increase the productivity of their livestock. The alternative feed is not only from agricultural, fishery industry waste but also from plantation waste. This feedstuff is formulated into feed concentrate.

In the plantation sector, cocoa (*Theobroma cacao* L.) is one of the non-oil and gas export commodities that have very good potential, because of domestic demand continues to increase with the development of the industrial sector that uses cocoa beans as its main raw material. Cocoa has a strategic role as a source of foreign exchange gain and also as a source of the community's economy (Pairunan, 2009).

In Indonesia, cocoa production is 661,243 tons (Directorate General of Plantation Production Development, 2015). However, the production was also followed by by-products. The cocoa pods, only the cocoa beans are used by farmers or plantation companies to processed into dried cocoa beans, while the cocoa pulp is not utilized yet.

The cocoa pulp is a slimy layer that surrounds the pieces of seeds, consisting in part of water and a layer of nutritional components which is quite high, including sucrose, glucose, and a little of starch (Sulistyowati *et al*, 1998), and it has a DM content (7.00%); crude protein (7.55%), crude fat (0.49%); and crude fiber (7.71%) (Laboratory of Animal Feed Chemistry, University of Hasanuddin, 2018). The cocoa pulp is one of the raw materials that can be processed further as an alternative energy source. Its availability is quite abundant and not used as food so that its use as an energy source will not disrupt food supply (Kristiani, 2006). Therefore, the objective of this study was to determine the performance of male Bali cattle at different ages by feed concentrate containing cocoa pulp.

MATERIALS AND METHODS

The site, Materials, and In vivo Experiment

The research was conducted at Bontolangkasa Selatan Village, Bontonompo Sub-district, Gowa District from July to October 2019. This study used a completely randomized design with 3 treatments and 3 replications for dry lot fattening. The treatment for was male Bali cattle at 2 years old, 3 years old, and 4 years old as A1, A2, and A3, respectively, with a total of 9 head of male Bali cattle. The feed provided of 2 types of forage i.e. dwarf napier grass (*Pennisetum purpureum* cv. Mott) with Indigofera (*Indigofera zollingeriana*) and feed concentrated consisting of cocoa pulp, bran, coconut cake meal, shrimp waste meal, cornstarch, milled corn, molasses, and minerals.

The research cattle were placed in individual cages side by side with the size of each 2 × 1 m. The forage feeding was carried out 2 times a day i.e. at 08.00 a.m. and 04.00 p.m. Feed concentrate was fed once a day in the morning before forage-fed. Feeding system are according to 3% of DM of body weight cattle with a comparison of 60% of forage and 40% of feed concentrate. Water was given ad libitum. Before the feeding for the next day, the remaining feed was weighed firstly.

Parameters

The parameters in this study were:

1. Daily body weight gain ($kg^{-1}head^{-1}day^{-1}$)
   Daily gain = [Finished weight (kg) – Initial weight (kg)]/period of feed (day)
2. Body performance of the male Bali cattle:
   a. Chest depth; measured circularly on a round chest thoroughly the back shoulder of scapula by a measuring tape (cm);
   b. Body length; measured from the scapula to the pelvis by a measuring tape (cm); and
   c. Withers height; looked for a level place on solid ground for where the cattle standing up. Put themeasuring stick on the back of front leg and then slide down to the shoulders.
3. Feed Conversion Ratio

$$FCR = \frac{\text{amount of feed fed (kg day}^{-1})}{\text{body weight gain (kg day}^{-1})}$$

RESULTS AND DISCUSSION

Feed Consumption

The results revealed that the treatment of A3 was significantly ($P<0.05$) higher than A1 and A2 treatments, however, A2 tended to be higher compared to A1 ($P>0.05$) (Table 1). The higher feed consumption of male Bali cattle in A3 due to its body condition and body weight was higher also. This revealed was following the opinion of Sumarsono (2001) that the higher livestock body weight, the higher amount of feed consumption. Sugeng (2003) added that the rate of body weight gain is influenced by the age of livestock, the environment, and genetics. Furthermore, Maynard and Loosli (1969) stated that the higher the bodyweight of livestock, the higher the amount of feed consumption and also resulted in a faster growth rate.

The results of research related to feeding consumption, DWG, and FCR during dry lot fattening were presented in Table 1.

Table 1. Feed consumption, daily body weight gain,and feed conversion ratio of male Bali cattle

Parameter†	Treatments‡		
	A1	A2	A3
Feed consumption (kg head^{-1}day^{-1})	2.88 ± 0.10^{a}	3.18 ± 0.20^{a}	4.23 ± 0.17^{b}
DWG (kg head^{-1}day^{-1})	0.17 ± 0.06^{a}	0.15 ± 0.07^{a}	0.37 ± 0.08^{b}
FCR	18.82 ± 7.60	23.96 ± 10.30	11.74 ± 2.07

Description:Data were presented as means ± standard deviation.†DWG= daily body weight gain; FCR = feed consumption rate. ‡A1 = male Bali cattle at 2 yearsold, A2 = male Bali cattle at 3 yearsold, A3 = male Bali cattle at 4 yearsold. Superscript with different letters in the same line showed significantly different (P<0.05).

Daily Body Weight Gain

The results of research related to DWG showed that the male Bali cattle in A3 treatment (0.37 kg^{-1}head^{-1}day^{-1}) was significantly (P<0.05) higher than A1(0.17kg^{-1}head^{-1}day^{-1}) and A2 (0.15 kg^{-1}head^{-1}day^{-1}), while A1 and A2 were not significantly different (P>0.05) (Table 1). This happened was due to getting older of the cattle, the higher the body weight. Hafid and Priyanto (2006) showing that the average body weight of cattle tended increased with the getting older of the cattle. The difference in body weight is due to getting older, organs, growth, fat deposits, increased percentage of muscle, and bone. Besides the age factor, DWG Bali cattle are also influenced by the feed digestibility. As expressed by Werner and Peter (2001) that low-quality feed includes its digestibility, the microbes in the rumen need more time to destroy it so that the livestock feed consumption is reducing.

Feed Conversion Ratio

The results revealed that there was no difference in FCR (P>0.05) between ages of male Bali cattle which the FCR value of A3 (11.74) tended to be lower than A1 (18.82) and A2 (23.96) (Table 1). This showed that the FCR was influenced by the condition, digestibility, and age of livestock. Campbell *et al*., (2006) states that feed efficiency is influenced by several factors including the ability of livestock to digest feed, the adequacy of feed ingredients for basic life, growth rates, and type of feed.

FCR on A3 treatment had a feed conversion of 11.74 which means that the efficiency of feed was classified as good and converted in livestock growth. Siregar (2008), states that the FCR for good livestock is 8.56-13.29. Suherman *et al*., (2018) stated that a high body weight gain had a low FCR value. The low FCR value could be stated that feeds were converted into livestock growth.

Growth of Body Dimension

The performance of Bali cattle is closely related to the measurement of body dimensions i.e. chest depth; body length; and withers height. The results of the measurement of body dimension growth were presented in Table 2.

Table 2.Growth of body dimension

Parameter	Treatment†		
	A1	A2	A3
Chest depth (cm)	0.07 ± 0.01^{a}	0.05 ± 0.02^{a}	0.11 ± 0.02^{b}
Body length (cm)	0.05 ± 0.01^{a}	0.04 ± 0.01^{a}	0.13 ± 0.03^{b}
Withers height (cm)	0.04 ± 0.01	0.04 ± 0.03	0.07 ± 0.02

Description:Data were presented as means ± standard deviation. For the treatment, A1 = male Bali cattle at 2 years old, A2 = male Bali cattle at 3 years old, A3 = male Bali cattle at 4 years old. Superscript with different letters in the same line showed significantly different ($P<0.05$)

The results showed that the chest depth of male Bali cattle in the A3 (0.11) was significantly ($P<0.05$) higher than A1 (0.07) and A2 (0.05), while A1 and A2 were not significantly different ($P>0.05$). The body length of A3 (0.13) was significantly ($P<0.05$) higher compared to A1 (0.05) and A2 (0.04), whereas A1 and A2 were not significantly different ($P>0.05$). Furthermore, withers height was not significantly different ($P>0.05$) in all the treatments with the value of A1 (0.04), A2 (0.04), and A3 (0.07), respectively. One of the differences in livestock body dimensions growth is the age factor, as said by Sugeng (2003) that the differences in the body dimensions of livestock are influenced by several factors such as the age of the livestock, gender of livestock, feed consumption, and climate.

The growth of body dimensions is obtained as a result of getting older of the cattle, which the more getting older of the cattle the more increasing the growth body dimension. It was further stated by Anggorodi (1979) who stated that all parts of the of livestock grew in an orderly manner, but it did not grow with a unity because of various tissues grew at different rates from calf to bull.

CONCLUSION

The results indicated that 4 years of male Bali cattle was good growth performance compared to 2 years and 3 years by feed concentrate containing cocoa pulp.

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