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Evaluation of the Utilization of Cocoa Pulp in Feed Concentrate on the Hematological Parameter of Bali Cattle

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Abstract

The cocoa pulp is a by-product of cocoa. Even, its high potentials, the cocoa pulp has not been utilized as feed for ruminants yet. The objective of this study was to evaluate the utilization of cocoa pulp as an alternative feedstuff in feed concentrate on the hematological parameters of Bali cattle. The experimental diet was three levels of cocoa pulp, i.e., 0% (D0), 5% (D1), and 10% (D2), respectively. As a prime source of diet, 60% of forage of dwarf napiergrass (Pennisetum purpureum cv. Mott) and Indigofera (*Indigofera zollingeriana*), while 40% of the feed concentrate, respectively. Other feedstuff was consisting of rice bran, coconut cake meal, shrimp waste meal, corn epidermis, milled corn, molasses, and minerals. Parameters used were hematological status, i.e., red blood cell count, white blood cell count, hemoglobin, and hematocrit. The results revealed that concentrate feed containing cocoa pulp had no significant effect (P>0.05) on the hematological parameters, even the addition of cocoa pulp in the feed concentrate tended to be better compared to without the addition of cocoa pulp. So, in this study, it can be concluded that feed concentrate containing cocoa pulp can be used as an alternative feedstuff for Bali cattle**.**

Keywords: alternative feedstuff; Bali cattle; cocoa pulp; diet; hematological.

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1. Introduction

Reference [1] state that forage is consisting of grass or legume, a by-product of agriculture, and a by-product of agro-industrial. Recently, these by-products are booming as an alternative feedstuff because forage is very limited during the dry season. Besides, due to the influence of global warnings and the conversion of productive land functions, forages are increasingly limited. One of the alternative feedstuffs from the by-product of cocoa (*Theobroma cocoa* L). Cocoa is a fruit that has high economic value and as a raw material for processing chocolate. The seeds are part of which are used as an export commodity while other parts have not been utilized [2]. The cocoa bean plant, which produces cocoa, also produces by-products or waste in the form of cocoa husk or pulp. The cocoa pulp is a soft, slimy tissue that sticks tightly to the cocoa beans. The cocoa pulp contains nutrients, i.e., 7.00% of dry matter; 7.55% of crude protein; 0.49% of crude fat; and 7,71% of calcium (Animal Product Technology, Faculty of Animal Science, University of Hasanuddin, 2018). [3] added that the fresh pulp liquid contains 12–15% sugar; pectin 5–7%; non-volatile acid 0.8–1.5%; and protein 0.1–0.5%. The pulp liquid with a sugar content of 12-15% was used as an energy source. The use of cocoa shells as an alternative feedstuff has been carried out on cows [4; 5]; goat [2]; and sheep [6], while utilization of cocoa pulp as goat feed is also done by [7]. However, information regarding the use of cocoa pulp for cattle is limited. Livestock productivity depends on breeding, feeding, and management. On management, livestock health is one of the keys to increasing livestock productivity. One of the indicators of whether the animal is healthy or not is through hematological parameters. The hematological status in livestock according to [8] functions as a screening test to detect abnormalities in physiological processes, helps determine a diagnosis, does differential diagnosis, disease course, patient management, and determines prognosis. Several hematological parameters are red blood cell (RBC) count, white blood cell (WBC) count, hemoglobin (Hb), and hematocrit, sedimentation rate (ESR), and erythrocyte index. Feed concentrated containing cocoa pulp is not commonly used as feedstuff by the farmers due to the limited information on its utilization, while its potential an average of 7 tons per day (PT. Mars Symbio Science Indonesia). So that the objective of this study was evaluating the utilization cocoa pulp as a feedstuff in feed concentrate on the hematological status of Bali cattle.

2. Methods

2.1. Site Description and Materials of Study

This study was conducted on July–October 2018 at 2 different places. Firstly, the *in vivo* test in Rumah Sapi D'Reppa, Bontolangkasa Selatan Village, Bontonompo District, Gowa Regency. Secondly, the hematology test at the Animal Physiology Laboratory, Faculty of Animal Science, Hasanuddin University, Makassar. This study used a randomized block design with 3 treatments and 3 replications. The diet was fed at 3% dry matter (DM) of body weight of Bali cattle. Drinking water was given ad libitum. The provision of concentrate feed was as follows:

D0 = forage + concentrate without additional of cocoa pulp;

D1 = forage + concentrate with the additional of cocoa pulp as much as 5% DM; and

D2 = forage + concentrate with the addition of cocoa pulp as much as 10% DM.

Other feedstuff was consisting of rice bran, coconut cake meal, shrimp waste meal, corn epidermis, milled corn, molasses, and minerals. The forage feeding was carried out 2 times a day i.e., at 08.00 a.m. and 04.00 p.m., while feed concentrate was fed once a day in the morning before forage-fed. Chemical composition of diet was presented in Table 1 as follows:

Table 1: The feedstuff composition of diets for Bali cattle

Feedstuff (%) DM basis	Diets (% cocoa pulp)[§]		
	D0 (0%)	D1 (5%)	D2 (10%)
Cocoa pulp	0	5	10
Rice bran	20	20	20
Coconut cake meal	20	20	20
Shrimp waste meal	20	21	22
Corn epidermis	17	17	17
Milled corn	20	14	8
Molasses	2	2	2
Mineral	1	1	1
Totally	100	100	100

[§]D0 = forage + concentrate without additional of cocoa pulp; D1 = forage + concentrate with the additional of cocoa pulp as much as 5% DM; and D2 = forage + concentrate with the addition of cocoa pulp as much as 10% DM. Crude protein content of feedstuff was analyzed by the total nitrogen (N) content, of the Kjeldahl procedure [9] the percentage of crude protein, calculated as total N × 6.25. Based on the laboratory results revealed that the average crude protein of diet on D0, D1, and D2 were 12.43%; 12.88%; and 13.76%, respectively.

2.2. Research Procedure and Parameters

Blood samples from each Bali cattle was taken and then put it into an EDTA tube to measured RBC count, WBC count, Hb, and Ht, respectively. The percentage of RBC count and WBC count was determined by hemocytometry; while Hb and Ht were determined by hemoglobinometer and microhematocrit centrifuge, respectively. All blood samples were analyzed at the Animal Physiology Laboratory (Faculty of Animal Science, University of Hasanuddin, Makassar, South Sulawesi, Indonesia).

2.3. Data Analysis

The data obtained were analyzed using SPSS software for Windows ver. 16.0 (Chicago, IL, USA). The experiment was carried out according to a completely randomized design with three treatments and three replications. Further tests used the least significant difference test at the 5% level.

3. Result and Discussion

Hematological parameters RBC count, WBC count, Hb, and Ht of Bali cattle was feeding by feed concentrate consisting of cocoa pulp was presenting in Table 2, as follows:

Table 2: Hematological parameter of Bali was feeding by feed concentrate at a different level of cocoa pulp

Parameter	Treatment‡			Average	Significance§
	D0	D1	D2		
RBC count ($\times 10^6$)	4.95 ± 6.59	5.18 ± 3.69	4.78 ± 5.24	4.97	ns
WBC count ($\times 10^3$)	9.05 ± 756.63	10.02 ± 1,645.44	10.15 ± 4,750.78	9.74	ns
Hb (g/dl)	9.41 ±0.16	9.56 ±0.86	10.04 ±1.06	9.67	ns
Ht (%)	25.66 ± 1.44	30.22 ± 2.52	29.22 ± 1.83	28.37	ns

Treatments:

‡D0 = forage + concentrate without additional of cocoa pulp; D1 = forage + concentrate with the additional of cocoa pulp as much as 5% DM; and D2 = forage + concentrate with the addition of cocoa pulp as much as 10% DM

§ns = No significant at a level of 5%. Data was presented in average of hematological parameters ± rata-rata standard deviation. The results revealed that the amount of RBC count, WBC count, Hb, and Ht had no significant effect (P>0.05) in all the treatments. WBC count shown that D1 was higher than the other two treatments. The RBC count in the current study ranged from $4.95–5.18 \times 10^6/mm^3$ with an average of $4.97 \times 10^6/mm^3$ (Table 2). This value was in the range of previous study of [10–12]. Even though in the current study was lower than that [13], it's the value of WBC count is the same as at D1 i.e. $5.2 \times 10^6/mm^3$. The RBC count in current study was still in normal range. These phenomena also showed that the nutrition of feed concentrate was high enough to feed sufficient which crude protein level was around 13% and no indication of anemia. Besides, [11] stated that nutritional factors affect the total of RBC count. The more adequate nutrients in the feed, the normal total RBC count in the cattle. The highest value of WBC count was in D2 followed by D0 and D1, respectively (Table 2). The average value WBC count in the diet treatments was in the range of WBC count values in the previously study of [14] i.e., $5,000–12,000/mm^3$. Although in the current study, the WBC count was higher than that [15], this value still within the normal threshold for the cattle. The number of WBC count was generally increased with the increase of body infection by microorganisms. The components of WBC count are very important for the immune response in the immune system of livestock [16]. Furthermore [14] added that the WBC count was influenced by the type of animal, breed, and its condition. The higher of the age of the livestock, the lower of the amount of WBC count produced. The value of WBC count is still within the normal threshold as well, it could be described that the feed concentrates which containing cocoa pulp

feeding to the Bali cattle did not shown an inflammatory effect on the Bali cattle. The Hb value in the current study from lower to higher was D0, D1, and D2, respectively. Although the treatment did not affect on the Hb value, the Hb value at D2 tended to be higher than the other treatments. Also, the Hb value in this study was still within the range of studies conducted of [13,17,19]. Functions of Hb to carry oxygen throughout the body for metabolic processes. The results showed that the treatment did not affect the Ht value ($P>0.05$) (Table 2). The average Ht value in the current study was 28.37% and higher when compared to previous study conducted by [20] which was. 21.46% where Bali cattle was feeding of forage and block urea molasses [10] i.e. 27,4%. In the current study, it showed that Ht levels increased with the increasing levels of RBC count. WBC count and Ht in D1 was higher when compared with D0 and D2 (Table 2). According to [21] the number of RBC count were proportional to the value of the Ht. Hematocrit level is the percentage of RBC count in 100-ml of blood which is strongly influenced by the total RBC count [10,21].

4. Conclusion

Feed concentrate consisting of cocoa pulp did not significantly affect on the hematological parameters, although the additional of feedstuff of cocoa pulp in feed tended to be better compared to without the additional of cocoa pulp. Therefore, cocoa pulp can be used as an alternative feed for Bali cattle.

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