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IDENTIFICATION OF CONCENTRATE QUALITY FROM LOCAL RAW MATERIALS THROUGH HEMATOLOGY PROFILE ON BALI CATTLE

(Identifikasi Kualitas Konsentrat Berbahan Baku Limbah Berdasarkan Profil Hematologi pada Sapi Bali)

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Abstract

Innovation in the use of local feed is an alternative to reducing production costs in livestock business. However, feeding at different levels will affect physiological conditions such as differences in blood counts This study was conducted to determine the quality of concentrate made from local raw materials toward rice bran through a hematological profile. The observed hematological parameters were total erythrocyte, hemoglobin level, and hematocrit value. The treatment given was P0 = group of cattles that were given green feed plus 1 kg of rice bran/cattle/day; P1 = group of cattles given forage plus 1 kg of concentrate (50% substitution of corn waste and peanut shells); P2 = group of cattles given forage plus 1 kg/cattle/day of concentrate (75% substitution of corn waste and peanut shells). This study used a randomized block design. Blood is drawn through the jugular vein using a venoject. Total erythrocytes, hemoglobin levels and hematocrit values were calculated using the routine hematology examination method with a Hematology Analyzer machine. The results showed that the provision of additional feeds in the form of bran and concentrate made from local raw materials to weaning Bali cattle had no significant effect (P>0.05) on total erythrocytes, hemoglobin levels, and hematocrit values. These results indicate that concentrate made from local raw material has the potential as an alternative feed to replace rice bran without affecting the physiological conditions of the cattle.

Keywords: Bali cattle; feed; erythrocytes; hemoglobin; hematocrit

Abstrak

Inovasi penggunaan pakan lokal merupakan salah satu alternatif untuk menekan biaya produksi dalam usaha peternakan. Namun pemberian pakan pada kadar yang berbeda akan mempengaruhi kondisi fisiologis seperti perbedaan jumlah darah. Penelitian ini dilakukan untuk mengetahui kualitas konsentrat berbahan baku lokal terhadap dedak melalui profil hematologi. Parameter hematologi yang diamati adalah jumlah eritrosit, kadar hemoglobin, dan nilai hematokrit. Perlakuan yang diberikan adalah P0 = kelompok ternak yang diberi pakan hijauan ditambah 1 kg dedak/ekor/hari; P1 = kelompok ternak yang diberi hijauan ditambah 1 kg konsentrat/ekor/hari (substitusi 50% ampas jagung dan kulit kacang tanah); P2 = kelompok ternak yang diberi hijauan ditambah 1 kg/ekor/hari konsentrat (75% substitusi ampas jagung dan kulit kacang tanah). Penelitian ini menggunakan rancangan acak kelompok. Darah diambil melalui vena jugularis menggunakan venoject. Jumlah eritrosit, kadar hemoglobin dan nilai hematokrit dihitung menggunakan metode pemeriksaan hematologi rutin dengan mesin Hematology Analyzer. Hasil penelitian menunjukkan bahwa pemberian pakan tambahan berupa dedak dan konsentrat berbahan baku lokal pada sapi bali sapih tidak berpengaruh nyata (P>0,05) terhadap total eritrosit, kadar hemoglobin, dan nilai hematokrit. Hasil ini menunjukkan bahwa konsentrat berbahan baku lokal berpotensi sebagai pakan alternatif pengganti dedak tanpa mempengaruhi kondisi fisiologis ternak.

Kata kunci: Sapi Bali, pakan, eritrosit, hemoglobin, hematokrit

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INTRODUCTION

Feed has an important role in the success of livestock business, because 60-80% of the total production costs are used for feed costs (Siregar, 2008). To increase efficiency, the development of alternative feeds is a must. Utilization of local resource potential needs to be developed in an effort to provide alternative feed in rural areas. In dry land areas, corn and peanut waste are potentials that can be optimized as feed ingredients combined with several other feed ingredients.

The provision of different levels of feed will affect physiological conditions such as frequency of breathing, pulse rate, body temperature and different amounts of blood due to differences in fermentation or metabolism processes that occur in the body, so that it will affect the production response of an animal (Astuti *et al.,* 2015). Feeding other than forage allows physiological changes of livestock. Therefore, it is necessary to study the physiological changes of cattle by measuring the levels of hemoglobin, erythrocytes and leukocytes as a result of feeding. All of these elements have an important role in the metabolic processes in the body of livestock. If there is a change in the elements in the body, there will be a change in the metabolic process which will have an impact on the performance of the livestock. Hematological status changes in livestock can be used to detect metabolic disorders, diseases, structural damage to organ, and stress (Kubkomawa et al,2015) and (Ihedioha et al,2012). According to Fitria and Sarto (2014), blood is one of the main parameters in preclinical / biomedical research. Hematological values or blood profiles are useful for assessing health conditions and as a reference for baseline or control values in a study. The presence of metabolic disorders, disease, damage to the structure or function of organs, the influence of agents / drugs, and stress can be seen from changes in blood profiles [4]. Hematologic examination may help monitoring livestock metabolism conditions (Lager and Jordan, 2012), which can then determine the physiological and livestock health conditions.

Blood has a very complex role so that physiological processes can run well, so that livestock productivity can be optimal. There are several factors that influence the concentfeed of erythrocytes, hematocrit (PCV) and the concentfeed of constituents of the blood. The feed feed is an essential ingredient for blood metabolism because for the formation of blood, protein, vitamins and minerals are needed. Erythrocyte examination is performed to determine the state of anemia and polycythemia. This research was conducted to see the blood profile of Bali cattles which were given additional feed in the form of rice bran and concentrate feed made from local raw materials. These results are expected to provide an overview of the quality of the feed based on the physiological functions of the body through a hematological profile.

RESEARCH METHODS

Sample

The research was conducted at the Tunas Mekar Livestock Group, Musi village, Gerokgak sub-district, Buleleng district, Bali for seven months from February to August 2019. The cattles used were 30 male Bali cattles aged 12 months with an average weight of 151.11 kg.

Research Design

The design used in this study was a randomized block design (RBD) with 3 (three) feed treatments and 10 replications. The treatments in this study are:

P0: Group of cattle given forage plus rice bran 1 kg/cattle/day (without waste corn and peanuts),

P1: Group of cattle given forage plus 1 kg of concentrate (50% substitution of corn waste and peanut shells),

P2: Group of cattle given forage plus 1 kg/cattle/day of concentrate (75% substitution of corn waste and peanut shells).

Feeding consists of 40% king grass *(Pennisetum purpureum)*, 20% gamelina *(Gmelina arborea Roxb)*, 20% "kayu santen"leave *(Lannea coromandelica Merr)* and 20% gamal *(Gliricidia sepium)*. Concentrate constituents in this study consisted of rice bran, corn waste, peanut shells, mollases and minerals. The feed composition for each treatment group is presented in Table 1.

Feeding is given 3 times a day, in the morning, afternoon and evening, while the concentrate is given once a day, every morning before the livestock is given forage feed. The concentrate is given by mixing it with water (wet). Before being given feed treatment, cattle are given anti-worm drugs and protozoa to anticipate worm infections in the digestive tract.

The materials and equipment used in the research data collection were in the form of weaning cattle blood, syringes, and tubes containing EDTA anticoagulants. Proximate analysis was carried out at Beef Cattle Research Station in Grati, East Java, and hematology profile testing on the Denpasar Veterinary Center Laboratory using a Hematology Analyzer.

Research Variable

The variables observed were proximate analysis of rice bran and concentrate made from local raw materials, blood profiles including: hemoglobin (g%), erythrocytes (million/mm3), and hematocrit (%) (PCV or Packed Cell Volume).

Data Analysis

The data obtained were tested using analysis of variance (ANOVA) use SPSS 22.

RESULTS AND DISCUSSION

Results

Proximate analysis of feeds

To measure the quality of the additional feed given, a test was carried out on bran (group P0) with concentrates made from local raw materials (groups P1 and P2). This test was carried out as a comparison regarding the quality of the feed of each treatment group against the hematological profile. The results of the proximate feed analysis for each treatment are presented in Table 2.

Based on the results of the proximate analysis, it can be seen that the nutritional content of the feed for each treatment is not much different. This shows that concentrate feed made from local raw materials has almost the same quality as rice bran which is sold commercially. This quality indicates that local feed waste has enormous potential to supporting the provision of site-specific quality feed at the field level. The potential use of agricultural waste has an economic function in the development of cattle.

Hematology Profile

The mean results of total erythrocyte examination, hemoglobin levels and hematocrit values of weaning Bali cattles which are given additional feed in the form of bran and concentrate made from local raw materials are presented in Table 3.

Discussion

Erythrocyte and hemoglobin are important components in maintaining the health of ruminants. Erythrocytes and hemoglobin play a role in the transport of nutrients and oxygen for the body's metabolism (Yanti dkk,2013). Erythrocytes have an average diameter of 5-6 μm in cattle, smaller than in other species. The main function of erythrocytes is to transport the oxygen, which is bound to hemoglobin. Erythropoiesis, which takes about 5 days, is stimulated by erythropoietin and occurs in the bone marrow parenchyma. Cattle erythrocytes have a relatively long life span of 130-160 days (Brockus, 2011): (Wood and Quiroz-Rocha,2010).

From table 3, it can be seen that the examination of the total erythrocyte mean, hemoglobin level and hematocrit value of weaning Bali cattle which are given

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additional feed in the form of bran and concentrate made from local raw materials is not statistically significant (P>0.05). This means that the provision of additional feeds in the form of bran and concentrate feed made from local raw materials has no effect on total erythrocytes, hemoglobin levels and the value of hematocrit in Bali cattles. These results indicate that the concentrate made from local raw material has a quality that is not different from rice bran, so it is very feasible to be utilized.

The total erythrocyte of Bali cattle in this study was still in the range of normal values, namely between 6.24 million/mm3 and 6.53 million/mm3. Likewise with hemoglobin levels between 12.10 g/dL to 12.43 g/dL. While the lowest value of hematocrit was 36.77% and the highest was 37.55%. According to Smith and Mangkoewidjojo (1988) total bovine erythrocyte is between 5.8-10.4x106 µl, while the hemoglobin level is between 8.6-14.4 g/dL, and the value of hematocrit is between 33-47%. Dharmawan (2002) reported that the total normal value of erythrocytes, hemoglobin levels and bovine hematocrit values were 5.0-10.0x106 µl, 8.0-15.0 g/dL, and 24-46.0%, respectively. While Roland et al (2014) reported that the normal range of total bovine erythrocyte was 4.9-10x106 µl, hemoglobin levels were 8.4-14 g/dL, and hematocrit values were 21-38%.

Darmawan (2002) states that the factors that affect the number of erythrocyte cells are protein content (amino acids), vitamins B2, B6, B12, folate, thiamin, vitamins C and E, as well as several minerals such as Fe, Cu, Mn, and Co. Measuring the number of erythrocyte cells is an important part of research because erythrocytes are blood cells that have the function of binding and circulating oxygen to all body tissues (Ganong, 2003).

Hemoglobin

Blood hemoglobin concentfeed is measured based on color intensity using a photometer and expressed in grams of hemoglobin per hundred milliliters of blood (g/100 ml) or grams/deciliter (Arifin, 2013). Based on the analysis of variance, it shows that there is no significant difference between treatments (P>0.05). This is influenced by the protein content in the additional feed between rice bran and concentrates made from local raw materials which are not so different. Hemoglobin levels are influenced by the adequacy of feed, especially protein in the feed and digestibility, apart from age, sex, and type of livestock (Schalm, 1965). According to Schalm (2010) and Komalasari (2014), the high and low levels of hemoglobin depend on the number of erythrocytes, and one of the factors that causes high and low levels of hemoglobin depends on the high and low amount of oxygen in the blood. Frandson (1992) explains that low oxygen content causes an increase in hemoglobin production and the number of erythrocytes.

Hemoglobin levels in this study ranged from 12.10 + 2.17 g/dl to 12.43 + 1.30 g/dl and were still in the normal range of bovine hemoglobin values between 8-16 g/dl (Banks,1993).Given the very important function of hemoglobin in the body of livestock, the use of concentrate feed made from local raw materials is still very suitable for use as an alternative feed.

Lack of hemoglobin will lead to reduced oxygenation (oxygen transfer) in the tissue resulting in cyanosis (Duncan and Prase 2011), and hemoglobin is the most important part of erythrocytes which fill one-third of the erythrocyte components after water and stroma (Reece, 2006). The presence of hemoglobin is important in regulating oxygen to body tissues (Jain,1993)and the ability of blood to carry oxygen is produced by hemoglobin levels and the chemical characteristics of hemoglobin (Cunningham, 2002).

Hematokrit (PCV/ *Packed CellVolume*)

Hematocrit is the percentage of red blood cells in 100 ml of blood. According

to Rosadi (2013) in normal animals, the hematocrit is proportional to the number of erythrocytes and hemoglobin levels. The hematocrit value in this study was still below normal. The average hematocrit value in this study ranged from 21.30% - 30.03%. However, seen from the results of statistical analysis, the concentfeed of hematocrit showed no significant difference (P>0.05) with the number of hematocrit. According to Guyton and Hall (2006), the normal value of bovine hematocrit is 28% - 32%. Hematocrit values that are far from normal can cause anemia due to the amount of fluid in the total blood. It is further explained that a decrease in the value of the hematocrit can occur due to a decrease in the degree of body activity.

CONCLUSIONS AND SUGGESTION

Conclusion

Concentrate made from local raw material has the same quality as rice bran based on the hematological profile. These results indicate that concentrate made from local raw material has the potential as an alternative feed to replace rice bran without affecting the physiological conditions of the cattles.

Suggestion

The use of local raw materials as feed should pay attention to the quality of the ration. Minimum levels of feed rations should contain 12% crude protein.

DECLAFEED OF CONFLICTING INTERESTS

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Table 1. Feed composition in the treatment group

Composition of feeds	Treatments		
	P0	P1	P2
Rice Bran (%)	100,00	50,00	25,00
Corn Waste (%)	0,00	24,90	37,00
Peanut Skin Waste (%)	0,00	24,00	36,90
Molases (%)	0,00	1,00	1,00
Mineral (%)	0,00	0,10	0,10
Total	100,00	100,00	100,00

Table 2. Nutritional content of feeds based on proximate analysis in the treatment group

Nutritional Content	Treatments		
	P0	P1	P2
Dry Material (BK) %	93,88	94,96	89,25
Crude protein (PK) %	8,63	8,15	8,39
Crude Fat (LK) %	7,02	4,11	1,08
Crude Fiber (SK) %	20,87	25,61	38,09
Total Digestible Nutrient (TDN) %	58,30	53,87	48,00

Note: Results of Proximate Analysis of Animal Feed Nutrition, Beef Cattle Research Station in Grati, East Java.

Table 3 Hematological Profile of Bali cattle given additional feed feeds in the form of bran and concentrate made from local raw materials.

Parameter	Treatments		
	P0	P1	P2
Eritrosit (juta/ mm3)	6.53 ± 1.00^{a}	6.24 ± 0.78^{a}	6.48 ± 0.88^{a}
Hemoglobin (g/ dl)	12.43 ± 1.30^{a}	12.17 ± 1.50^{a}	12.10 ± 2.17^{a}
PCV (%)	37.55 ± 3.84^{a}	36.88 ± 3.65^{a}	36.77 ± 4.35^{a}

Note: Numbers on the same line followed by the same letter (a) indicate in non significant differences ($P>0.05$).