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Nutrient content evaluation of dried poultry waste urea-molasses block (DPW-UMB) using proximate analysis

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ABSTRACT: The research evaluated the nutrient content of dried poultry waste urea-molasses block (DPW-UMB). The use of dried poultry waste in the manufacture of the urea-molasses block was as a substitution of urea and could improve the value added in dry season. The treatments used for research were T1 (10% manure of laying chicken and 25% molasses), T2 (15% manure of laying chicken and 30% molasses), and T3 (20% manure of laying chicken and 30% molasses). Chemical analysis: the dried poultry waste were analyzed for dry matter, crude protein, crude fiber, ash, fat, and gross energy. The statically formulation diet composed with Microsoft Excel Ver. 2016. The results showed that the 20% manure layer chicken and 30% molasses T3 were better than T2 and T1 on nutrient content. The study concludes that DPW-UMB T3 are dried poultry waste containing sufficient levels of gross energy, crude protein, crude fiber, ash, and fat it could be used as feedstuff for ruminants for supplementation with the required nutrients.

Keywords: urea, manure, broiler

INTRODUCTION

The number of beef cattle population decreased in the dry season due to the limited supply of feed resources (Andi and Wahdi, 2011). A large quantity of forage is mostly available during the rainy season but scarce in the dry season. Thus, such an imbalance quality and quantity feed among the two seasons do not support the feedlot system. Therefore, smallholder beef cattle fattening apply rice straw for feeding during the dry season.

Rice straw is a by-product of grain production which contains low protein, crude fiber, and nitrogen (Andi and Wahdi, 2011). This low nutrient content can decrease rumen microbial population. Supplementation from the feed which consisted of energy, mineral, vitamin, protein, and non-protein-nitrogen (NPN) was essential in the fattening process (Andi and Wahdi, 2011). Urea molasses block (UMB) is one type of feed supplement which contains microelements. Supplementation from the molasses block containing soluble carbohydrates provides NPN as a source of ammonia and minerals to enhance the formation of microbial protein. Bacteria produce enzymes which digest crude fiber and synthesize protein as a feed source for microbial protein. Siti et al. (2012) stated UMB consisted of rice bran, pollard, salt, lime, and mineral can be used for supplementation.

Andi and Wahdi (2011) stated the nitrogen element on the urea-molasses block is useful in protein synthesis. The first digestion regarding forages is the rumen, where the feed is retained for substantial periods of time and subjected to extensive microbial fermentation. The alternative is using waste combine with the fermentation

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to increase nutrient content in the feedstuff. Waste is derivation by-product of processing that is still containing a lot of nutrients. The urea NPN in layer chicken manure could be used as animal feed (Vatta et al., 2007). Boushy and Poel (2000) stated, however, layer manure chicken consists of a pathogenic microorganism. Therefore past study suggested the utilization of the low content of essential amino acid and metabolic energy from the manure was less than 5% of the total ration (Sinaga and Silalahi, 2012).

The poultry industry produced 22 million tons of manure from over 18 billion population of poultry (FAO, 2010). The high poultry waste production causes an adverse effect of ammonia content on the environment, and thus it needs to be recycled. One method to recover it is by drying the poultry waste and use it as a source of nitrogen in the urea-molasses block. The laying chicken manure has high CF content (14.9% DM). The aim of this research is assessed the nutrient content of dried poultry waste urea-molasses block using proximate analysis.

MATERIAL AND METHODS

Location and time

The research was conducted from 21st January to 4th July 2015 at Janggan Village, Poncol District Magetan, East Java Province. We applied proximate analysis on July-August 2016 at the Nutrition and Animal Feed Laboratory, Animal Science Faculty, Brawijaya University. We selected Janggan village as a study site for some reasons. First, we considered Janggan as a center of beef cattle fattening. Second, we found a sugarcane industry in the study site, and third, the village was one of layer farm centers in Magetan Regency.

Materials

The primary equipment for the manufacture of dried poultry waste urea-molasses block (DPW-UMB) were gloves, bucket capacity 10,000 g, plastic 500 g, UMB-block 500g with shape round and love, pressing tool, and analytic scale. The principal ingredients were molasses, manure layer chicken, rice bran, limestone, cement, brick, salt, water, urea, and mineral mix.

Methods

We obtained the poultry waste from a layer farm in Magetan Regency, East Java under the battery cages of laying house accommodating approximately 50,000 hens. The poultry waste collected was fresh and was not subjected to any treatments on the farm. We placed it in clean plastic bags and transported to the Janggan Village. Then we dried it at temperature 1050C. The treatments used for research were T1 (10% manure of laying chicken and 25% molasses), T2 (15% manure of laying chicken and 30% molasses), and T3 (20% manure of laying chicken and 30% molasses). For chemical analysis, we analyzed the dried of poultry waste regarding the dry matter, crude protein, crude fiber, ash, fat, and gross energy according to AOAC (1990). The statically formulation diet composed with Microsoft Excel Ver. 2016.

RESULTS AND DISCUSSION

Dry matter content on dried of poultry waste urea-molasses block

With regards to the dry matter (DM) analysis, the study found that the DM of the dried poultry waste urea-molasses block on T1 (61.42%) was lower than that of T2 (90.92%) and T3 (92.04%). The condition happens from drying method during the manufacturing dried poultry waste urea-molasses block. Dried poultry waste urea-molasses block packaged and sun-dried for seven days. The drying process did not cover the T1 and dry matter only 61.42 % indicated that the manure was still wet. The second factor indicated by the treatment T1 due to the addition of additives (molasses) in each treatment that increasing water content in the DPW-UMB. The higher availability of dissolved carbohydrates during the fermentation activity caused an increased activity of fermentation by bacteria to produce lactic acid (Ghaly and Macdonald, 2012). According to Nurhayu et al., (2010), the decrease of dry matter was affected by respiration and thus broke down a lot of nutrients and reduced the dry matter. The fermentation itself produced lactic acid and water. We found higher water content during the production of DPW-UMB, hence increased the loss of dry matter. Andi and Wahdi (2011) stated that the omasum helped the absorption of water. The dry matter variation in omasum of either dairy or beef cattle were 0.6%, 1.2%, and 3.3% of the body weight respectively.

Crude protein content on dried of poultry waste urea-molasses block

Table 1 presents the results of proximate analysis of the UMB. Several factors that affected the nutrient contents were processing, formulation, and the origin of the material. We found that crude protein (CP) of the DPW-UMB was higher in T3 (13.34%) compared to T1 (10.05%) and T2 (10.33%). These findings were in line with the percentage of formulation ration layer manure in T3 (20%), T1 (15%) and T2 (10%).

Table 1. DPW-UMB nutrient content

Code Name	Feedstuff Content					
	DM	CP	CF	Ash	Fat	GE
	---------------------------%-----------------------------					(Kcal/kg)
T_1	61.42	10.05	17.41	27.26	3.51	3065.82
T_2	90.92	10.33	8.20	31.69	3.95	2949.50
T_3	92.04	13.34	13.39	37.16	3.44	2631.63

Source: Nutrition and Feed Animal Laboratory, Animal Husbandry Faculty, Brawijaya University Malang, (2016)

Our result shows that crude protein on T3 was 13.34%. The result supports the finding of Sinaga and Silalahi (2012) which found that the content of protein in dried layer chicken manure was in the range of 12-31%. Protein is high molecular weight organic compounds which are essential to the structure and formation of all living cells (Ghaly and Macdonald, 2012). Meanwhile, the UMB had 12.76% of the crude protein (Nurhayu et al., 2010).

The sun-dry process of layer chicken manure for three days could reduce heavy metals, pesticide residues, pathogenic bacteria, and fungi from the feed. The formulation that combines 30% of layer manure and 20% of molasses has a dense texture and hence needs a dry treatment before the transformation into the animal feedstuff. We did the drying process manually to reduce the water content of the layer manure chicken, and to reduce the odor from the layer manure chicken. Boushy and Poel (2000) found that a high moisture content on the manure layer (75-80%) was possibly due to the contamination with pathogen microorganism.

Our result was in agreement with Arnita et al., (2010) who stated that non-protein nitrogenous (NPN) in the formulation of beef cattle feedstuff has a specific limitation. The use of urea which is more than 5% can cause poisoning due to its high nitrogen content (45%).

Crude fiber content on dried of poultry waste-urea molasses block

We found that crude fiber (CF) of dried poultry waste UMB on the T1 (18.41%) was higher than T2 (8.20%) and T3 (13.39%) (Table 1). Wayne et al. (2003) stated that crude fiber would stimulate the process of rumination and rumen contractions, which in turn would improve the fermentation process of the fiber. The main result of the fermentation of fibrous carbohydrates was acetic acid (Boushy and Poel, 2000). However, the crude fiber content can be a limiting factor for feed consumption. Crude fiber will stay longer in the rumen and can suppress the feed consumption (Mubi et al., 2013).

Boushy and Poel (2000) stated crude fiber was also an indicator of the low digestibility of feed material. The digestibility of crude fiber depends on its content in the formulations. Our result matches with Wayne et al., (2003) mentioning that supplementation in the substantial form had the same effect with the concentrate because both have a function to increase growth and number of rumen microbes.

Ash content on dried of poultry waste-urea molasses block

Our finding showed the content of ash in T_3 (37.16%) was higher than that in T_2 (31.69%) and T_1 (27.26%). Ash was residues remaining after all the combustible material has been turned off. The nutritional values of ash have little importance on DPW-UMB. In this component salt and limestone gave the content of ash. The function of cement in the DPW-UMB was for silica source (micro-mineral) and hardener. The ash content has a positive correlation with crude protein (CP) content in the dry poultry waste urea-molasses block.

Nurhayu *et al*., (2010) stated urea-molasses block (UMB) consisted of urea and molasses contains 14.04% ash. We could determine total ash for many purposes. In this case, we used it in the dried poultry waste urea-molasses block (Boushy and Poel, 2000). The total ash knew the type of material composed and as a determinant of the nutritional value parameters of a feedstuff AOAC (1990).

Fats content on dried of poultry waste-urea molasses block

Lipids or fats were a heterogeneous group of organic compounds found in living microorganism (Boushy and Poel, 2000). Lipid was soluble in the organic solvents like ether or chloroform. We required fats for long-term storage of metabolic energy to supply essential fatty acids and to carry fat vitamin. The fat in the dried poultry waste urea-molasses block on the T3 (3.44%) was lower than T2 (3.95%) and T1 (3.51%).

Urea molasses block (UMB) consisted of urea and molasses which contained 2.51% of fat (Nurhayu *et al.*, 2010). The rice bran provided some key nutrients including fat and phosphorus (Nurhayu *et al.*, 2010). Rice bran helped the absorption of the moisture in molasses and gave the structure of the block. The fats were highly digestible and reduced dustiness (Nurhayu *et al.*, 2010).

Gross energy content on dried of poultry waste-urea molasses block

The energy was defined as the ability or capacity to work in a living organism (AOAC, 1990). Arnita *et al*., (2010) argued energy was essential for the maintenance of life processes including cellular metabolism, growth, reproduction, and physical activity. Gross energy (GE) was the quantity of heat resulting from the complete oxidation of food, feed, or other substances (Boushy and Poel, 2000). The result showed that GE on T_1 (3065.82 kcal/kg) was higher than in T_2 (2949.50 kcal/kg) and T_3 (2631.63 kcal/kg) (Table 1). The proximate analysis result affected from the molasses. The molasses collected from Rejosari sugarcane industry was a residual liquid of sugarcane which provided energy and as a source of carbohydrate.

The result of T_1 was higher because molasses mixed with other feedstuff could absorb well into the dried poultry waste urea-molasses block. The method of DPW-UMB production was the factor that affected the content of DPW-UMB. Our result was in line with Mubi *et al*., (2013) who stated molasses and sugar were sources of energy for ruminants. The molasses used in the formulation formula was less than 8% of dry matter and could increase microbial growth in the rumen.

The main use of molasses was as a binding agent or binder in feedstuff (Bata, 2008). The molasses acted granules to improve palatability in feedstuff ration. Wayne *et al*., (2003) stated microbial production was high-quality by-pass protein and drastically altered rumen VFA.

CONCLUSION

Our findings suggest that T3 of the DPW-UMB which contains sufficient levels of gross energy, crude protein, crude fiber, ash, and fat can be used as feedstuff for ruminants together with the required nutrients as supplementation.

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