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Characterisation Two Types of Feed on Production Performances of Laying Hen in Blitar Regency, East Java

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ABSTRACT

This study was conducted to compare the use of two types of feed on production performances of laying hen (feed consumption, egg production, feed conversion ratio, and population depletion) in Blitar Regency. Data were collected from several laying hen farms in Blitar Regency with survey method. All data were then analyzed both qualitatively and quantitatively. The average feed price of semi self-mixed feed and total self-mixed feeds were Rp 5,031 and Rp 4,752 per kg. Hen received semi self-mixed feed in one period showed 117.5 g/hen/day of feed intake, 70.38% of egg production, 2.62 of feed conversion ratio, and 20.50% of population depletion. Meanwhile, the total self-mixed feed resulted 118.23 g/hen/day of feed consumption, 71.75% of egg production, 2.39 of feed conversion ratio, and 15.94 of population depletion in one period. The proximate analysis showed that the total self-mixed feed had better nutrient balance compared to semi self-mixed feed, based on SNI 01-3929-2006 standard. As conclusion the total self-mixed feed showed more optimal production performances than semi self-mixed feed.

Keywords: Egg production, Feed consumption, Feed conversion ratio, Population depletion, Semi self-mixed feed, Total self-mixed feed

Introduction

There is no denial that feed plays important role in improving animal production in order to meet animal protein demand. A feed formulation that has balance nutrient value will allow laying hen to have maximal production performances. Regarding laying hen, the production performances can be assessed through feed consumption, egg production, feed conversion ratio, and depletion. The total self-mixed feed is widely known by laying hen farmers as one of an alternative type of feed to enhance production performances. The total self-mixed feed has some advantages, such as relatively affordable price, allowing to know the quality of feedstuffs used, and has more various feedstuff options that can be used. Unfortunately, the total self-mixed feed still has some challenges. To provide it, farmers require grinder and mixer. Sometimes, a limited feedstuffs availability also becomes a challenging obstacle. On the other hand, semi self-mixed feed offers easier mixing process since it uses only 3 feedstuffs: corn, rice bran, and concentrate. However, it has more limited feedstuff options that can be used, impossibility to know the quality of some materials especially concentrate, and also has a relatively higher price (Fenita *et al.,* 2015).

An expensive feed does not always lead to better production performance (feed consumption, egg production, feed conversion ratio, and population depletion) and vice versa. According to Alwi *et al*. (2014), good quality of feed ration can be evaluated for its nutrient value and nutrient balance. Abdiguna *et al.* (2013) stated that a good quality feed contains high protein. Higher protein content is positively related to the quality of feed. Each type of feed will result in different production performances of laying hen (feed consumption, egg production, feed conversion ratio, and population depletion). Sultoni *et al*. (2006) explained that the use of different commercial concentrate has a significant difference in feed consumption, but not in hen day production (HDP) and feed conversion ratio.

One of the challenges faced by laying hen farmers is the limited way to evaluate feed quality, that sometimes only referred to its protein content. Protein is a nutrient that plays important roles in the development and metabolism of the body. In some cases, commercial feed often contains high protein content, but it has low protein digestibility. The low protein digestibility will affect production performances of laying hen (feed consumption, egg production, feed conversion ratio, and depletion) negatively. The quality of feed for laying hen also determined by the content of dry matters, ash, crude fiber, extract ether, and gross energy (GE) that will be converted into metabolism energy (ME). The feed quality can be evaluated through

proximate analysis. According to above mean, a study of feed quality is required. Thus, it can be a reference to improve laying hen production.

Materials and Methods

Location and time of study

The study was conducted in Dusun Srengat, Blitar Regency from February 2nd to May 28th, 2016.

Method

The study was conducted with survey method. The survey was conducted in several laying hen farms in Blitar Regency, especially in Srengat District. The survey was conducted to obtain both primary and secondary data. The primary data were collected by giving farmers a questionnaire that contains a list of questions. The secondary data were collected from note, recording or other related documents. The total samples were 100 correspondences.

The 50 farmers of the total sample in Srengat District, Blitar Regency were then grouped based on the type of feed they used. This segregation was intended to facilitate the further production performance analysis. A half of farmers used semi self-mixed feed, while another used total self-mixed feed.

Respondent

Respondent in this study was hen laying farmers in Srengat District, Blitar Regency. The total respondents are 100 farmers that consisted of 50 farmers who used semi self-mixed feed and 50 farmers who used total self-mixed feed.

Data analysis

All collected data are feed formulation, nutrient value, and production performances (feed consumption, egg production or HDP, feed conversion ratio, and depletion). All data were then evaluated based on the standard of feed quality for laying hen SNI 01-3929-2006.

Proximate analysis of feed

Proximate analysis was performed according to AOAC (2005) at Laboratory of Animal Feed and Nutrition, Faculty of Animal Science, Universitas Brawijaya. The proximate analysis includes the determination of dry matters, ash, crude protein, crude fiber, extract ether, and gross energy (GE) that converted into metabolism energy (ME). To know the feed quality, the result of the proximate analysis was then compared to SNI 01-3929-2006 standard.

Production performances analysis

The production performances analysis include: feed consumption, egg production or HDP, feed conversion ratio, and depletion).

Feed consumption. The daily feed consumption was obtained by subtracting the amount of feed given with the amount of feed residue in one day. The data were then presented based on this following formula:

$$\text{Feed Consumption} = \frac{\{(\text{the amount of feed given} - \text{the amount of feed residue})\ \text{kg}\}}{\text{the number of hen (hen)}} \times 1.000\ \left(\frac{\text{g}}{\text{hen}}\right)$$

Egg production (HDP). Sudarmono (2003) explained that HDP is a tool to analyze the daily egg production. The purpose of HDP calculation is to determine the number of egg produced by some flocks of laying hen at certain period. The HDP can be calculated according to this following formulation:

$$\text{HDP} = \frac{\text{The number of egg produced (egg)}}{\text{The number of hen (hen)}} \times 100\%$$

Feed conversion ratio. Regarding laying hen, feed conversion ratio (FCR) refers to the ratio of the amount of feed consumed and the number of egg produced at a certain period. The feed conversion ratio can be calculated based on this following formula:

$$\text{Feed Conversion Ratio} = \frac{\text{The amount of feed consumed (kg)}}{\text{The number of egg produced (kg)}}$$

Population depletion. Population depletion can result from mortality and the elimination of unproductive hen (culling). The population depletion can be calculated based on this following formula:

$$\text{Population Depletion} = \frac{\{(\text{the number of died hen} + \text{the number of culled hen})\ \text{hen}\}}{\text{The original hen population (hen)}} \times 100\%$$

Result and Discussion

Table 1 shows that semi self-mixed feed uses a simpler feed stuff combination, only corn, concentrate, and rice bran. On the other hand, the total self-mixed feed has more various feedstuffs combination, and this various option can be adjusted based on their availability and price consideration.

Laying hen that receives adequate nutrient will grow optimally and can produce an egg at the maximal potency. Among of important nutrients, protein is one of the vital nutrients that has to be provided. Providing laying hen with their required protein will positively support their growth and productivity. According to SNI 01-3929-2006 standard, feed for laying hen should contain at least 16% of protein. Protein plays vital roles for development, egg production, and as an energy source as well. However, an excess protein supply can cause unnecessary body weight gain for laying hen that can lead to a further problem, prolapse. Prolapse in laying hen is a condition when reproduction tract does not retract into body cavity after laying an egg. Therefore, a nutrient balance is thought to be necessary to avoid this condition (Fadilah and Fatkhuroji, 2014).

Table 2 shows that semi self-mixed feed has higher protein content by 1.28% compared to total self-mixed feed. The higher protein content in semi self-mixed feed can result from the addition

Table 1. Formulation of semi self-mixed feed and total self-mixed feed

Material or feedstuffs	Types of feed			
	Semi Self-Mixed Feed		Total Self-Mixed Feed	
	Total	%	Total	%
Corn	500	50.00	450	43.02
Concentrate	350	35.00		
Rice bran	150	15.00	150	14.34
Soy bean meal (SBM)			260	24.86
Meat bone meal (MBM)			75	7.17
Poultry meat Meal (PMM)			15	1.43
Grit			90	8.60
Salt			3	0.29
Premix			3	0.29
Total	1000	100,00	1046	100,00

Table 2. Feed quality of semi self-mixed and total self-mixed feed

Types of feed	Dry matter	Ash*	Crude protein*	Crude fiber*	Extract ether*	Gross energy*	Metabolism energy*
	%	%	%	%	%	kcal/kg	kcal/kg
Semi self-mixed	98.78	16.03	21	3.54	6	3189.23	2232.461
Total self-mixed	90.25	15.92	19.72	4.11	5.06	3920.09	2744.063

*Based on 100 g of dry matter.

of fibrous protein such as keratin. Keratin is a fibrous protein that has low digestibility. It can be obtained from some sources, mostly from feather meal. Keratin contains 14-15 cystine. It has been demonstrated that poultry feather meal can be used up to 35% to replace concentrate for laying hen without compromising their growth, feed consumption, and feed conversion ratio (Rahayu *et al*., 2014).

Feed provides energy for laying hen. Table 2 shows that the gross energy value of total self-mixed feed is higher than semi self-mixed feed. The energy from the feed can be gross energy and metabolism energy. Some of the gross energy will be excreted in feces and urine. Meanwhile, metabolism energy is available energy that can be used for maintenance, growth, and egg production (Haryono and Ujinto, 2000). According to SNI 01-3929-2006 standard, the metabolism energy requirement for laying hen is at least 2,650 kcal/kg. Determining the metabolism energy value is important in the process of feed formulation. The metabolism energy value of a feed can be affected by the nutrient value and nutrient balance of feedstuffs, especially crude fiber. Crude fiber is a limiting factor of metabolism energy value. Prawitasari *et al*. (2012) explained that crude fiber content could reduce the feed digestibility.

Table 3 shows that laying hen that received total self-mixed feed consumed 118.23 g/hen/day of feed, while the feed consumption of semi self-mixed feed laying hen is 117.55 g/hen/day. Those values are still in normal range of feed consumption for laying hen. The feed consumption of laying hen that produces egg can range from 100 to 120 g/hen/day. The feed consumption can be altered by various factors, such as body size, breed, environment temperature, production phase, housing, feeder space per hen, debeaking, stocking density, drinking water availability, health, and energy content in the feed (Nurcholis *et al*., 2009).

Hen day production (HDP) can be used to assess the daily egg production. It can be acquired by dividing the total egg produced by the number of hens, then multiple it by 100%. The average HDP (shown in Table 3) in one period of laying hen that received total self-mixed feed is 71.75%. The average HDP can range from 70 to 75% (Fadilah and Fatkhuroji, 2014). The HDP may vary due to some factors. North and Bell (1990) explained that all treatments including when the laying hen was in starter and grower phase, especially the nutrient balance of feed given can affect the number of egg produced. The decreased egg production can result from environment factors, feed quality, feed supply, breed, and rearing management.

The nutrient values (i.e., digestible protein, amino acid content, and metabolism energy) of total self-mixed feed may contribute on the high HDP. Along with that, the health status and stress level exposed by laying hen may also affect HDP. Some health challenges and stress exposure faced by laying hen can lead to reduced egg production (Sultoni *et al.,* 2006). Anang *et al*. (2007) explained that HDP value of favorable egg production is 80% per year.

Feed conversion ratio (FCR) is a ratio of the amount of feed consumed and the number of egg produced at the certain period. The feed conversion ratio can be used to evaluate both

Table 3. Production performances (feed consumption, *HDP,* feed conversion ratio and population depletion) of laying hen received semi self-mixed feed and total self-mixed feed

Types of feed	Feed consumption (g/hen/day)	Hen day production (HDP) (%)	Feed conversion ratio	Population depletion (%)
Semi self-mixed	117.55	70.28	2.62	21.75
Total self-mixed	118.23	71.75	2.39	21.58

quality and quantity of feed that eventually can be expressed in egg production per 1 kg of the egg.

The laying hen that received total self-mixed feed has lower feed conversion ratio by 0.0124 compared to laying hen that received semi self-mixed feed. It indicates that total self-mixed feed has better efficiency than semi self-mixed feed. Feed conversion ratio can be altered by some factors, such as energy value contained in feed, the nutrient balance of feed, environment temperature, and health status of the animal (Allama *et al*., 2012). The physical form of feed, laying hen breed, nutrient value, sexes, and temperature may also be factors of different feed conversion ratio.

The population depletion can be used to evaluate the success of the animal production. Population depletion is the reduction of hen number that can be resulted from mortality and eliminating unproductive hen (culling). A low population depletion indicates the successful animal farming practices, including animal selection, feeding management, and also rearing management (Yunus, 2009). The average population depletion of laying hen that received total self-mixed feed is 15.94% compared to 20.50% of population depletion of laying hen that received semi self-mixed feed (shown in table 3). Those values are still out of normal range which is 10% (Banong, 2012).

A low population depletion can be achieved by ensuring 3 important factors: good selection of chicken, providing required nutrient both quantitatively and qualitatively, and also good rearing management practice.

Some bad rearing management practices, such as bad housing system, high stocking density, bad sanitation, unbalance nutrient supply, and the potency of pathogen infection can lead to mortality (Risnadjati, 2014). Therefore, it is necessary to avoid those above factors to prevent mortality. High mortality will result in high population depletion.

Conclusion

According to the variety of raw materials or feedstuffs used, semi self-mixed feed is a lot simpler since it only consists of corn, concentrate, and rice bran. Meanwhile, the total self-mixed feed has more components such as SBM, MBM, PMM, grit, salt, and premix along with corn and rice bran. The proximate analysis shows that total self-mixed feed has better nutrient balance compared to semi self-mixed feed (referred to SNI 01-3929-2006). Moreover, total self-mixed feed also leads to better production performance than semi self-mixed feed.

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