Influence of grit on performance of local chicken under intensive management system

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ABSTRACT: A study was designed to evaluate the influence of grit on performance of local chicken under intensive management condition for 8 weeks. Eighty unsexed local chickens obtained from local farmers were randomly placed into 16 battery cages in which the chickens were fed a standard local chicken ration. Grits were added 0%; 0.25%; 0.50%; 0.75% of body weight respectively to basal diet in a Completely Randomized Block Design consisting of four blocks. Grits were given in separate trough. The results showed that daily feed intake, daily body weight gain and feed conversion ratio of local chicken fed grit were significantly higher and better ($P<0.05$) than those without fed grit.

Key words: grit, local chicken, intensive management system

INTRODUCTION

Grits are hard bits of stones, sand and small particles utilized by birds to assist gizzard in grinding food into smaller particles. Grits can be classified into soluble and insoluble grits. Soluble grit include limestone and oyster shell, which are easily dissolved in the gizzard, they also serve as source of calcium. The insoluble grits include silica, mica and sand, they are non digestible and are retained in the gizzard (Adeniji and Oyeleke, 2008). It was also reported that grit can improve the efficiency of feed utilization by the birds and increase average feed intake (Atteh, 2003 and Waugh *et al.*, 2006). Local chickens have been raised using traditional extensive production system by most of the rural population of Indonesia and they represent an important source of meat an eggs (Diwiyanto and Iskandar, 2010). Under the traditional extensive production system the productivity of local chickens appear to be extremely low but with better management, productivity can be improved. One feeding characteristic of the local chickens in that system is the deliberate swallowing of stones and sand or grit. The chicken also show a strong appetite for the grit. In contrast, under intensive management systems, the use of grit is commonly abandoned. Waugh *et al* .(2007) stated that in domesticated rearing situations where the bird has no access to grit, it must be fed to the bird.
This experiment was conducted with the assumption that under intensive management system, grit would help to improve performance of local chicken.

MATERIALS AND METHODS

Before conducting this experiment, a previous study on local chicken had been done to have some data base in support of the experiment. The data about body weight of local chicken of 1-10 weeks of age, weight of gizzard, type and weight of grits in gizzard and chemical composition of grit were collected.

A base population of about 100 local chickens with 5-7 days of age was obtained from local farmers in Kupang. Before using as materials in this experiment, the chickens had been environmentally conditioned for about one week. Eighty unsexed local chickens two weeks of age were allocated into four treatment groups. The chicken were placed in 16 battery system cages of five chickens each and reared intensively in a building for 8 weeks. This study was conducted from August to October 2009 at the Poultry Station, Department of Animal Production, Agriculture Polytechnic Kupang.

An experimental basal diet was formulated to consist of yellow corn, rice bran, soybean meal, small green peas meal, fish meal, tapioca, top mix and contained 16% crude protein with 2750 kcal/kg of metabolizable energy as shown in Table 1.

Table 1. Composition and nutrient content of the experimental basal diet

Ingredients	Composition/100 kg
Yellow corn	41
Rice bran	28
Small green peas meal	14
Soybean meal	4.7
Fish meal	6.0
Tapioca	5.8
Top mix	0.5
Calculated nutrients composition	
Crude protein, %	16.01
Fat, %	2.44
Crude fiber, %	5.26
Calcium, %	0.61
Phosphorus, %	0.59
Metabolizable energy, kcal/kg	2765

The chickens were fed basal diet and added four levels of grit. The grits sources consisted of limestone, oyster shells and sandstone at a ratio of 30:30:40. Grits were prepared in several particle sizes namely 0.5 mm ; 1.0 mm; 1.5 mm and 2.0 mm as they were needed in this experiment to supply the chickens of 2-4 weeks; 4-6 weeks; 6-8 weeks and 8-10 weeks of age respectively. The mineral composition of the grit is presented in Table 2. The diet and grit were given separately. Water was provided *ad libitum.* The chicken were weighed every week and the remaining feed was weighed every day.

Table 2. Mineral composition of the grit

Grit	Mineral composition*		Solubility of the grit
	Calcium (%)	Phosphorus (%)	
Limestone	37.15	0.09	Soluble
Oyster shell	40.32	0.16	Soluble
Sandstone	0.06	0.09	Insoluble

*Analyzed by: Laboratory of Almira Kupang, 2009.

A Completely Randomized Block Design consisting of four treatments and four blocks was used in this experiment. The four treatments were: diet without grit (T0); diet added 0.25% grit of body weight (T1); diet added 0.50% grit of body weight (T2); diet added 0.75% grit of body weight (T3). The variable measured were daily feed intake, daily body weight gain and feed conversion ratio.
Average values for the traits measured were analyzed using Analysis of Variance and the significance of that analysis was then analyzed by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

Mean Daily Feed Intake

The treatment had a significant effect (P<0.01) on the mean daily feed intake of local chicken. T3 had significantly higher (P<0.05) mean daily feed intake than T2, T1 and T0. No significant differences were found between T1 and T2, T0. The gradual increase in feed intake with increase in the level of grit fed to the chicken as shown in Table 3. This might have been due to the fact that the grit had physiological effect on the digestive system and increased metabolism of the chicken. The high metabolism required that food constantly be available and far more than just the stomach and gizzard can hold. So the crop was just a way to gather and hold more food than was needed at the time. Similar research were found by Guinotte and Nys (1990) who reported that significant increases occurred in feed intake in Leghorns, when hens were fed particulate limestone were supplemented with coarse particles of limestone. Limestone and oyster shell or grit, which are good sources of calcium, can be fed to the chicken separately or as mixture (Buitomelo, 2004). According to Sreenivas (1997), feeding of calcium improved feed consumption on hen in high climates. Another study by El-Agguory *et al*. (1989) also revealed that adding oyster shell to limestone at a ratio of 1:2 increased the palatability of feed. Waugh *et al.* (2006) reported that feed palatability was important in stimulating feed ingestion by the birds.

Table 3. Average daily feed intake, daily body weight gain and feed conversion ratio of local chicken fed with and without grit

Treatments	Parameters		
	Mean daily feed intake, g/chicken	Mean daily body weight gain, g/chicken)	Feed conversion ratio
T0	38.58^{cd}	5.37^{c}	7.29^{bc}
T1	41.54^{bc}	6.84^{bc}	6.16^{ab}
T2	42.12^{b}	7.67^{ab}	5.54^{a}
T3	45.45^{a}	9.14^{a}	5.01^{a}

Means with different superscript in the same group with in a column are different (P<0.05)

Mean Daily Body Weight Gain

The diets added with grit had a significant effect (P<0.01) on the mean daily body weight gain of local chicken. T3 had significantly higher (P<0.05) mean daily body weight gain than T1,T0, but no significant differences were found between T3 and T2 , T1 and T2, T0 as presented in Table 3. The difference could be due to improved digestibility of ingesta as a result of improved grinding capability enhanced by the presence of grit. The increase of daily feed intake of the chicken fed grit in this study could be attributed to the effect of grit on growth rate of local chicken which meant that the more feed was digested efficiently, the increase of daily body weight gain the better. The results were in agreement with that Gionfriddo and Best (1995) who found that grit improved the digestive efficiency of ostriches and an efficient digestive system means a good growth rate. It also reported that the bird fed with grit, the grit stimulated the secretion of digestive enzyme and added the mixing of the enzyme with the ingesta. This meant that ingested feeds were efficiently digested.

Feed Conversion Ratio

This study found that the grit supplied to the local chicken had a significant effect (P<0.05) on the feed conversion ratio. T3 had significantly better (P<0.05) feed conversion ratio than T0. No significant differences were found between T1 and T0,T2 ; T3 and T2. as seen in Table 3. This study showed that base on the comparable feed intake to body weight gain of local chicken fed grit, resulted a better profitability. In a previous study Cooper (2005) found that young ostrich chicks less than two months old had high feed conversion to body mass ratio of 2:1. Waugh (2006) also stated that young ostriches that had access to grit obtained higher feed conversion efficiency than those that had no

access to grit. Majewska *et al.* (2009), reported that diet were supplemented with silica grit, charcoal and hardwood ash in the amount of 0.3 % of administered feed mix improved the feed conversion ratio of turkeys, but the resulting differences were not statistically verified.

CONCLUSION

This study found that grits had a positive effect on the average daily feed intake, average daily body weight gain and feed conversion ratio of local chicken. It should be added to the diet of local chickens under intensive management system as they have no access to them.

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