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5. STUDIES ON DIFFERENT RESPONSES OF COMMERCIAL AND KAMPONG LAYING HENS ON FORTIFIED LOCAL MINERAL FEED

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ABSTRACT

The present study was aimed to define the beneficial effects of fortification of local mineral feed with micro nutrients as mineral sources in the diets on the laying performances of commercial and Kampongs' laying. Three mineral feed formulas were prepared as treatments: P1: local mineral feed which composed of three locally available feedstuffs of Bukit Kamangs' limestone, fresh water oyster shell and bone meal. P2: local mineral feed fortified with trace minerals of Zn, Cu and I and P3: local mineral feed fortified with trace minerals, vitamins (D3 and B12) and amino acid (DL-methionine). The mineral feeds were mixed into a basal diet in the level of 6% and then fed to 180 laying hens which composed of 90 commercial and Kampongs' hens. They were divided into 3 groups based on body weight; each group was subdivided into 3 replicates groups containing 10 hens. Parameters measured included: feed intake, egg production, FCR, eggshell quality, Ca and P retention, tibia bone weight. Results showed fortification of local mineral feed with micro minerals, vitamins and methionine gave no significant ($P>0.05$) effect on the laying performances of commercial laying hens, while egg production and FCR were significantly ($P<0.05$) improved by Kampongs' hens when mineral feed was fortified with trace minerals. Fortification of local mineral feed with trace minerals of Zn, Cu and I gave also positive effect on P utilization by both laying hens. It was concluded fortification of local mineral feed composed of Bukit Kamangs' limestone, fresh water oyster shell and bone meal gave more beneficial effects on Kampongs' than commercial laying hens. The trace minerals were found more critical micro nutrients than vitamins and amino acid in the local mineral feed.

Key words: mineral feed, limestone, freshwater oyster shell, layer nutrition.

I. INTRODUCTION

The province of West Sumatra strives for a national egg producer in the year 2015 with targeted egg production of about 76,630 tons per year. Total egg production in the year of 2011 was estimated 66,843 tons with total poultry population of about 26.58 millions, including laying and broiler chickens (Hilmi, 2012). Several measures to attain this goal are undertaken such as by boosting poultry population and expanding rearing and marketing areas. Center for intensive rearing of laying hens are located in five districts: Lima Puluh Kota, Payakumbuh, Tanah Datar, Padang Pariaman and Padang. In this area various business activities related to poultry enterprises such as poultry shops, poultry product marketing and processing, transportation services grow up significantly which make positive impact on economy and job opportunities. .

In supporting poultry population growth in the rearing center region, there is a need to serve farmers with feeding guidelines and explore the potential locally available feedstuffs, while feed and feeding practiced by farmers are the most critical aspects determined laying performances and farmers' benefits. Most of laying farmers are depend on commercial feed which are mostly imported from neighbor province of North Sumatera. Farmers' profit margins are scraped due to steady increase of feed prices, while feed are the major cost of layer production.

Laying hens were fed by using self-mixed diet which composed mainly of commercial layer concentrate, ground corn and rice bran. The kinds of feedstuffs offered to commercial and Kampong laying hens were found fast the same, but their composition was difference. Feed for Kampong hens consisted of fewer concentrate and much more rice bran and corn.

Supplementation of diet with mineral and vitamin sources or premix was found not common practiced by farmers. Such feeding practices could be problem less by commercial laying hens due to high portion of concentrate in their diet. Even though Kampong laying hens require lower nutrient than the commercials, the diet was presumable deficient on mineral and trace nutrients, especially vitamin and sulfur-containing essential amino acids. This might be the main factor causing the quality of egg produced from intensive rearing in term of size and shell strength poorer than of egg from free-scavenging Kampong hens. (Anwar and Khalil, 2005).

Inclusion of vitamin-mineral premix in the diet of caged laying hens become indispensable practice because feed ingredients do not contain all essential mineral, vitamin and amino acid at the right amounts needed for chicken. Trace minerals of primary concern in poultry diets and having recommended levels of supplementation by NRC (1994) include Zinc (Zn), Manganese (Mn), Copper (Cu), Iron (Fe), Selenium (Se) and Iodine (I). The vitamin D and B12 which are important in mineralization process are almost completely absent from diet based on corn and soybean meal (Asaduzzaman *et al*., 2005), while methionine is generally the first liming amino acid in corn-soybean diet and adequate sulfur amino acids must be present in the diet for maximum egg size (Miles *et al*., 1986, Abd El-Maksoud *et al.*, 2011).

The present study was aimed to define the beneficial effect of the use of fortified local mineral formula with micro nutrients in the diet on the performances of commercial and Kampong laying hens. Local mineral which composed of limestone originated from Bukit Kamang, fresh water oyster shell were fortified with trace minerals of Cu, Zn and I, vitamins of D and B12 and sulfur-containing amino acid of methionine.

II. MATERIALS AND METHODS

Experimental Diets and Treatments

A basal diet was prepared by using three main component of commercial layer concentrate, corn and rice bran in the level of 30, 40 and 22 % for commercial laying hens and 20, 42 and 32 % for Kampongs' laying hens, respectively. This formula was referred to the diet used by layer farmers in West Sumatra.

Three mineral feeds were formulated which composed mainly of three locally available materials: Bukit Kamangs' limestone, fresh water oyster shell and bone meal. The first formula, called as local formula, composed only of Bukit Kamangs' limestone, fresh water oyster shell and bone meal. The second was the local formula fortified with trace minerals of Zn, Cu and I. The third was the local formula fortified with trace minerals, vitamins of D3 and B12 and amino acid of DL-methionine. The nutrient compositions of the formulas which were calculated based on chemical analysis of feed components were justified to the standard requirements for laying hens recommended by Weinreich *et al.* (1994).

As treatments, each mineral formula was mixed in the level of 6% with basal diet, so that there were in total five experimental diets as treatments:

Treatment 1 (P1): Basal diet + local mineral formula
Treatment 2 (P2): Basal diet + local mineral formula + trace minerals
Treatment 3 (P3): Basal diet + local minerals + micro minerals + vitamins + amino acid.

Table 1 shows the formula of the experimental diets and their nutrient and energy contents. The nutrient and energy compositions which were calculated based on chemical analysis of feed components were justified to the standard requirements of laying hens during production period recommended by NRC (1994) and Scholtyssek (1987) for commercial laying hens and by Mulyono (1999) for Kampongs' laying hens.

Limestone meal used in this study was obtained from a limestone milling company of CV. Bukit Raya, located in Durian village, Kamang Mudik, Kamang Magek subdistrict, Agam district, West Sumatra. Raw fresh water oyster shells were bought from a fisherman near Singkarak Lake,

Tanah Datar district. The oyster shell were then dried and ground by using the same milling machine for limestone.

Table 1. Composition of experimental diets

Feed composition (%):	P1	P2	P3	P1	P2	P3
	Commercial laying hens			Kampong laying hens		
Concentrate	29.9	29.9	29.9	19.9	19.9	19,9
Corn	41.9	41.9	41.9	41.9	41.9	41,9
Rice bran	21.9	21.9	21.9	31,9	31.9	31,9
Local Formula	6.0	-	-	6.0	-	-
Local Formula +Micr Minerals	-	6.0	-	-	6.0	-
Local Formula + Micr Minerals +Vitamins + Amin Acid	-	-	6.0	-	-	6.0
Grit	0.3	0.3	0.3	0.3	0.3	0,3
Grit	100.0	100.0	100.0	100,0	100.0	100,0
Calculated nutrient and energy compositions:						
Crude protein, %	17.7	17.7	17.7	15.4	15.7	15.7
Crude fiber, %	5.3	5.3	5.3	5.3	4.5	4.5
Ca, %	3.7	3.7	3.6	3.8	4.1	4.1
P total, %	0.5	0.5	0.5	0.5	0.5	0.5
ME, kcal/kg	2607	2607	2607	2496	2537	2537

Experimental Animals

The research was conducted at the Poultry Farm of Faculty of Animal Husbandry, Andalas University, located at Limau Manis, Padang, by using each 90 Kampong laying and commercial laying hens of Isa Brown strain, aged 4.5-5.0 months of age. The hens were divided into three groups, each group of 30 birds, based on body weight:

	Commercial hens	*Kampongs' hens*
- light	1200-1399 g/bird	1150-1349 g/bird
- medium	1400-1599 g/bird)	1350-1499 g/bird
- heavy	1600-1769 g/bird	1500-1800 g/bird.

Each group was then subdivided into 3 subgroups, each 10 birds, in accordance with the number of treatments, so that each treatment consisted of 3 groups as replicates. Each replicate consisted of 10 birds. They were randomly placed in individual battery cages. Each cage was equipped with feed and drinking water troughs. The birds were vaccinated for Newcastle (ND) and Pullorum diseases about two weeks after starting of feeding trial.

Parameters Measured

The research was lasted for 24 weeks. Parameters measured included: body weight, feed intake, feed conversion ratio (FCR), hen-day egg production, number and weight of egg

production, eggshell quality (weight, thickness and percentage of eggshell), mineral retention and weight of tibia bone.

Experimental diets were prepared weekly and stored in plastic containers. At the end of each week, the feed rest both in plastic containers and in feed trough were weighed to find out weekly feed intake data. Feed and water offered *ad libitum*. Egg were collected twice daily at 9.30 am and 3.30 pm. The number of eggs laid by birds in each replication were recorded daily and expressed weekly hen day egg production per cent.

Two eggs from each replication or six eggs from each treatment were randomly collected from each 7 days period, so that there were in total 18 sampling eggs per week. They were brought to laboratory for weight and eggshell quality measurements. Each sample egg was weighed and then broken, so that eggshell part was separated with interior content. Shell membrane was removed carefully; egg shell was measured for thickness. After then dried in the air, the dried shell weight was taken by using electric balance. The shell percentage was calculated by using the following formula: Shell percentage = (Weight of eggshell/Egg weight) x 100.

Data on mineral retention were obtained through collection of excreta of the birds for 7 days at the week 19th. One bird was randomly selected in each replication or 3 birds per treatment, so that there were 6 birds used for excreta collection. Collected feces in fresh form were daily weighed and then dried. The dried feces were then ground and chemically analyzed for ash, Ca, P and moisture contents. Mineral retention was calculated by using the following formula: Ca retention = {(Ca intake – Ca excreta)/Ca intake)} x 100. At the end of the experiment, the 9 birds collected their feces were slaughtered and link tibia bone were taken and then weighed.

Statistical Analysis

All data were subjected to statistical analysis using variance analysis in a 2 x 3 x 3 factorial block design with 2 factors, 3 treatments and 3 blocks as replicates. Duncan's Multiple Range (DMRT) was applied to separate means. Differences were considered significant at $P<0.05$ (Steel and Torrie, 1981).

III. RESULTS AND DISCUSSION

Laying Performances

The data presented in Table 2 show that the use diets with different mineral formulas did not significantly influence ($P>0.05$) body weight and feed intake by both commercial and Kampong laying hens. This might be the result of insignificant feed consumption. The commercial laying hens consumed more feed with total feed intake for 24 weeks of 19,857 -20,155 g/bird than that of Kampong laying hens (17,655-18,109 g/bird), but there were no statistically significant differences ($P>0.05$). This might be occurred because supplementation of mineral and vitamin did not have profound influence on feed intake (Asadduzzaman *et al.*, 2005)

As expected, commercial laying hens produced more eggs in terms of number, mass and hen-day than that of Kampong laying hens. They used also much more efficiently feed which were indicated by lower FCR of 2.52-2.57 in compare to FCR of Kampong laying hens with FCR of 6.20 to 8.16. Feeding of diets containing local mineral fortified with different micro nutrients gave no significant effects ($P>0.5$) on laying performances of commercial hens. These might be due to the presence of appropriate level of micro nutrients in the diet, which contained relatively high concentrate (30%) (Table 1).

Table 2. Body weight, feed intake, feed conversion ratio and egg production of laying hens fed diets containing limestone and fresh water oyster shell for 24 weeks

Parameter	P1	P2	P3	P1	P2	P3
	Commercial laying hens			Kampong laying hens		
Initial body weight, g/bird	1,428.7	1,411.0	1,426.3	1,423.3	1,400.0	1,443.3
Final body weight/bird	1,654,(	1,604,0	1,581,3	1,650.0	1,816.7	1,683.3
Total feed intake, g/bird	20,155.11	19,500.2	19,857.4	17,685.1	18,109.0	17,654.6
Daily feed intake, g/bird	120.0	116.1	118.2	105.3	107.8	105.1
Egg production, eggs/bird	136.5 [a]	137.6 [a]	137.0 [a]	47.8 [c]	60.2 [b]	70.8 [b]
Egg mass, g/bird	7,853.0 [a]	7,734.6 [a]	7,774.9 [a]	2,167.8 [c]	2,551.2 [b]	2,846.2 [b]
Hen-day egg production, %	81.3 [a]	81.9 [a]	81.5 [a]	28.0 [c]	35.9 [bc]	42.1 [b]
Feed conversion ratio	2.57 [c]	2.52 [c]	2.55 [c]	8.16 [a]	7.09 [ab]	6.20 [b]

In the other hand, laying performances of Kampong hens were significantly improved by feeding with diet containing local mineral fortified with trace minerals of Zn, Cu and I (P2). Egg production increased by 12.4 egg/bird, from 47.8 (P1) to 60.2 egg/bird (P2), egg mass 383.4 g/bird, from 2168 (P1) to 2551 g/bird (P2) and hen-day egg production 7.9%, from 28 to 35.9%. There results were undoubtedly a reflection insufficient level of trace minerals in diet of Kampong laying hens due to lower portion of concentrate (20%) (Tabel 1). Moreover, fortification of mineral feed with mixture of micro minerals, vitamins and methionine tend to give positive effect on performances of Kampong laying hens. Kampong hens fed on the diets containing local mineral fortified with trace minerals, vitamin and methionine (P3) showed higher egg production in term of number, mass and hen-day egg production (average: 70.8 eggs/bird; 2846 g/bird; 42.1%, respectively) than those fed on diet containing mineral feed fortified with only trace minerals (P2) (60.2 egg/bird; 2551 g/bird; 35.9%). FCR tended to lower by P3 (6.20) in compare to P2 (7.90). These data, however, did not differ significantly (P>0.05). These results were probably attributed due to disturbance of vitamin function. According to Scheideler (2008) trace minerals should be formulated and supplemented to poultry feeds separates from the vitamins due to potential vitamin oxidation by the trace minerals.

Egg Weight, Eggshell Quality and Mineral Retention

The results of egg weight, quality of eggshell, mineral retention and weight of tibia bone are presented in Table 3. Average egg weight ranged 56.5 to 57.4 g/egg by commercial hens and 38.7-40.5 g/egg by Kampong laying hens. The weight of egg and its shell from commercial hens were higher (P<0.05) than that from egg of Kampong hens, while the percentage and thickness of egg shell were not significant differences (P>0.05).

The data presented in Table 3 also show that fortification of local mineral with micro nutrients did not significantly (P>0.05) influenced egg weight, shell weight, shell thickness,

percentage of shell, retention of Ca and ash. Lack of influence of micro mineral and vitamin on egg weight by commercial laying hens were also reported by some researcher. Mabe *et al.* (2003) reported that the addition of 60, 60 and 10 mg/kg of Zn, Mn and Cu, respectively, to basal diet did not significantly influence egg weight in commercial laying hens. Holoubek *et al*. (2002) reported that the addition of micro minerals of Cu and Fe to feed mixture has not significant impact on the quality of egg shell of commercial layers. Abdallah *et al* (1994) suggested that remove supplemental iron or some other kinds of minerals (Cu, Zn or Mn) from laying hens diets did not affect the egg weight of hens. Kato *et al.* (2003) reported that supplementation of vitamin B12 at 10µg/kg in a corn soy based diet in Lohmann laying hens during the second cycle of production gave no significant effect on egg mass.

Tabel 3. Average egg weight, shell weight, shell thickness, per cent of shell weight, mineral retention and tibia bone weight

Parameter	P1	P2	P3	P1	P2	P3
	Commercial laying hens			Kampong laying hens		
Egg weight, g/egg	57.4 [a]	56.5 [a]	56.7 [a]	40.5 [b]	39.7 [b]	38.7 [b]
Eggshell weight, g/egg	5.8 [a]	5.7 [a]	5.7 [a]	3.8 [b]	4.5 [b]	3.5 [b]
Per cent egg shell, %	9.2	9.2	9.2	8.7	8.6	8.5
Egg shell thickness, mm	0.54	0.53	0.54	0.48	0.50	0.49
Mineral retention and tibia bone weight:						
Ca retention, %	34.0	43.8	50.8	62.8	59.5	62,8
P retention, %	30.7 [c]	71.9 [a]	78.2 [a]	52.9 [b]	72.4 [a]	56,1 [b]
Ash retention, %	33.1	47.3	24.3	37.3	45.1	39.4
Tibia bone weight, g	48.8 [a]	49.3 [a]	56.7 [a]	20.6 [b]	24.4 [b]	19.3 [b]

The data on P retention and weight of tibia bones of the three treatments varied significantly ($P<0.05$). Retention of P and tibia bone weight were significantly improved by both animals, when local mineral were fortified with trace minerals of Cu, Zn and I, while fortification with mixture of micro mineral, vitamins and methionine depressed P retention ($P<0.05$). These might be a factor which caused insignificant positive effect on egg production (Table 2). On the contrary, Swiatkiewics and Koreleski (2005 reported the positive influence of vitamin on bone properties. They found that simultaneous addition of grind particle limestone and active form of vitamin D3 (25-OH-D3) to the diet significantly improved biomechanical, geometrical and chemical parameters of tibia bone in laying hens at 70 weeks of age.

IV. CONCLUSION

Considering the above results it may be concluded that fortification of local mineral feed composed of Bukit Kamangs' limestone, fresh water oyster shell and bone meal gave more beneficial effects on Kampongs' than commercial laying hens. The trace minerals were found more critical micro nutrients than vitamins and amino acid in the local mineral feed.

REFERENCES

Abdallah, A.G., O.M.El-Husseiny and K.O. Abdel-Latief. 2009. Influence of some dietary organic mineral supplementations on broiler performance. Int. J. of Poult. Sci., 8(3):291-298.

Abd El-Maksoud, A., S.E.M. El-Sheikh, A.A. Salaman & R.E. Khidr, 2011. Performance of local laying hens as affected by low protein diets and amino acids supplementation. Egypt Poult. Sci. 31(11):249-258.

Anwar, S. and Khalil. 2005. Pemanfaatkan pakan lokal untuk industri pakan. Laporan Hasil Riset Andalan Perguruan Tinggi dan Industri. Universitas Andalas

Assaduzzaman, M., M.S. Jahan, M.R. Mondol, M.A. Islam and A.K. Sarkar, 2005. Efficacy of different commercial vitamin-mineral premixes in productive performance of caged laying pullets. Int. J. of Poult. Sci., 4(8):589-595.

Hilmi, M.Y., 2012. Sumbar bersiap jadi sumber telur ayam. Bisnis Indonesia, Bisnis.com, Januari 2012

Holoubek, J., M.L. Jankovsky, M. Staszkova & D. Hreadecka, 2002. Impact of copper and iron additives in feed on productivity of layers and technological characteristics of eggs. Czech J. Anim. Sci., 47(4):146-154.

Kato, R. K., A. G. Bertechini, E. J. Fassani, C. D. Santos, M. A. Dionizio & E. T. Fialho, 2003. Cobalt and vitamin B12 in diets for commercial laying hens on the second cycle of production. Brazilian J. Poultry Sci., 5(1): 45-50.

Mabe, I., C. Rapp, M.M. Bain & Y.Nys. 2003. Supplementation of corn-soybean meal diet with manganese, copper and zinc from organic and inorganic sources improves eggshell quality in caged laying hens. Poult. Sci. 82:1903-1913.

Miles, R.D., N. Ruiz & R.H. Harms, 1986. Response of laying hens to choline when fed practical diets devoid of supplemental sulfur amino acids. Poult. Sci. 32: 322-332.

Mulyono, S., 1999. Memelihara ayam buras berorientasi agribisnis. Penebar Swadaya, Jakarta.

NRC. 1994. Nutrient Requirement of Poultry. National Academic Press, Washington, DC.

Scheideler, S.E., 2008. Trace mineral balance in poultry. Proceeding of the "Midwest Poultry Federation Convention". St. Paul, Minnesota, USA.

Scholtyssek, S. 1987. Gefluegel. Eugen Ulmer Verlag, Ulm, Germany.

Steel, R.G.D. and J.H. Torrrie. 1981. Principles and Procedures of Statistics. McGraw-Hill International Book Company, Auckland.

Swiatkiewicz, S. and J. Koreleski. 2008. The effect of zinc and manganese source in the diet for laying hens on eggshell and bone quality. Veterinarni Medicina. 53(10):555-563.

Weinrech, O., V. Koch und J. Knippel, 1994. Futtermittelrechtliche Vorschriften, AgriMedia, Frankfurt.

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