THE NUTRITIONAL REQUIREMENTS FOR NATIVE CHICKENS

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ABSTRACT

Two experiments were conducted to evaluate the effects of five dietary levels of metabolizable energy and six dietary levels of lysine and metabolizable energy ratios. These experiments were allocated in a completely randomized design with five treatments and four replications (experiment 1) and six treatments and four replications (experiment 2). In Experiment 1, five levels of metabolizable energy (2,300, 2,450, 2,600, 2,750 and 2,900 kcal/kg of diet) fed to one hundred and twenty native chickens. In Experiment 2, three hundred and sixty native chickens were fed on six levels of lysine and metabolizable energy ratios (2.20 -2.30, 2.40-.50, 2.60-2.70, 2.80-2.90, 3.00-3.10 and 3.20- 3.30 g/ Mcal of diet). In both experiments, feed and water were provided for *ad libitum*. Body weight gain, feed consumption, feed conversion and mortality was measured during the test period (1d-12 weeks). The results showed that increasing dietary metabolizable energy levels of diet had significant effect on body weight gain, feed consumption and feed conversion. There was no effect of dietary lysine and metabolizable energy ratios on feed consumption however significantly affected on body weight gain and feed conversion. It was concluded that nutrient requirements for native chicken at starter period lower than broiler, but higher than layer of NRC (1994) recommendations.

Key words: Nutritional requirements, Native chicken, Performance

INTRODUCTION

The native chicken (*Gallus domesticus*) is one kind of popular breed has been known for centuries in Indonesia. Several constraints in keeping native chickens are poor management, low genetics, low survival rate, low quantity and quality of feed. One of the limiting factors in formulating native chicken diets is the lack of information about nutrient requirements. Some experiments had reported the nutrient requirements for growth egg production and egg quality of native chickens. Wihandoyo *et al.* (1981) reported that the average protein consumption of native chickens under extensive system was 9.71 - 11.38 %. The dietary protein 18 % and metabolizable energy 2,600 kcal/kg of diet significant improvement body weight gain and feed conversion of Nunukan chickens (Resnawati *et al.*, 1991). There were no significant effects of protein levels (14 - 16 %) and metabolizable energy levels (2,400 - 2,700 kcal/kg of diet) on feed consumption, feed conversion, egg production and egg quality of laying native chicken (Gultom *et al.*, 1989). Lysine is the second limiting amino acid and the reference amino acid for ideal protein concept (Austic, 1982). Several authors observed a positive effect of lysine on meat yield in broilers (Sinurat and Balnave, 1985; Moran and Bilgili, 1990; Holsheimer and Veerkamp, 1992; Mendes *et al.*, 1997). The objectives of this study were to examine the response of native chickens to various levels of metabolizable energy and to different Lys: ME ratios during the period of 1d to 12 weeks.

MATERIALS AND METHODS

Two experiments were conducted utilizing day-old mixed sex native chickens. In

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Experiment 1, determining metabolizable energy levels and experiment 2 determining lysine levels. In experiment 1, group of 120 native chickens was reared in 20 colony cages with six birds per cage. Treatments consisted of 5 levels of metabolizable energy (2,300 kcal/kg, 2,450 kcal/kg, 2,600 kcal/kg, 2,700 kcal/kg and 2,900 kcal/kg) and all diets containing 14 % protein. The ingredients and nutrient composition of the diets are given in Table 1. Each diet was fed to 24 birds for 4 replications.

In experiment 2, three- hundred and sixty native chickens were allocated to 24 colony cages, each cage placed of 15 birds as experimental unit. The diets consisted of different levels of lysine: ME ratios (2.20 - 2.30 g / Mcal; 2.40 - 2.50 g/Mcal; 2.60 - 2.70 g/Mcal; 2.80 - 2.90 g/Mcal, 3.00 - 3.10 g/Mcal and 3.20 - 3.30 g/Mcal). The nutrient composition of the treatments is described in Table 2. Each treatment was fed to 60 birds for replications.

In both experiments, Newcastle vaccinations were administered to all birds at 4 d of age and revaccinated at 4 weeks and 8 weeks of age by eye drop. To prepare feed samples for nutrient analyses, composite samples were analyzed for Kjeldahl nitrogen and DM (AOAC, 1984). Metabolizable energy were analyzed using Farrel Method (1978) by the following model:

$$ME = \frac{(GE_R \times R) - (GE_E \times E)}{R} \text{ cal/ g.}$$

Feed and water were provided for *ad libitum* consumption. Feed consumption, body weight gain and feed conversion were determined during the test period. The data were analyzed as Completely Randomized Design. When significant differences among or between treatment means were found, means were separated using Duncan Test (Steel and Torrie, 1981).

Table 1. Ingredients and nutrient composition of the experimental diets with increasing levels of metabolizable energy

Ingredients	Metabolizable Energy levels (kcal/kg)				
	2,300	2,450	2,600	2,750	2,900
Corn (%)	35.98	41.03	48.82	56.07	63.58
Rice bran (%)	45.18	42.20	30.89	21.30	14.55
Coconut meal (%)	8.89	8.88	12.84	14.61	12.96
Soybean meal (%)	6.95	6.91	6.88	6.85	6.82
$CaCO_3$ (%)	2.56	0.52	0.22	0.58	1.49
Premix-A (%)	0.22	0.20	0.18	0.22	0.22
Salt (%)	0.18	0.17	0.14	0.28	0.20
Lysine (%)	0.04	0.08	0.03	0.18	0.18
Total	100	100	100	100	100
Nutrient contents :					
ME (kcal/kg)	2,338	2,446	2,620	2,771	2,896
Crude protein (%)	14.71	14.04	14.80	15.45	14.95
Crude fibre (%)	7.43	7.14	7.83	7.73	9.46
Fat (%)	6.83	8.03	7.03	5.98	6.46
Ca (%)	2.45	2.45	2.32	2.04	1.16
P (%)	0.95	1.04	1.12	2.04	1.13
Methionine (%)	0.23	0.24	0.24	0.25	0.26
Lysine (%)	0.63	0.67	0.71	0.76	0.80
Tryptophan (%)	0.13	0.13	0.14	0.14	0.14
CP : ME ratio	158.97	174.22	177.06	179.41	189.76

Table 2. Ingredients and nutrient composition of the experimental diets with increasing levels of lysine

Ingredients	Lysine levels (g/Mcal)					
	2.30	2.50	2.70	2.90	3.10	3.30
Corn (%)	39.80	39.50	41.10	41.04	41.26	41.46
Rice bran (%)	39.80	39.70	32.10	32.04	32.12	32.19
Coconut meal (%)	9.54	9.54	9.56	9.56	9.56	9.56
Fish meal (%)	0.86	0.95	0.96	0.96	0.96	0.96
Soybean meal (%)	6.60	7.15	12.96	13.10	12.71	12.35
Bone meal (%)	1.77	1.08	1.24	1.25	1.25	1.25
Salt (%)	0.20	0.20	0.20	0.20	0.20	0.20
Premix-A (%)	0.25	0.25	0.25	0.25	0.25	0.25
L-Lysine (%)	0.05	0.09	0.03	0.09	0.15	0.22
Methionine (%)	--	0.02	0.02	0.05	0.08	0.10
$CaCO_3$ (%)	1.13	1.52	1.58	1.46	1.46	1.46
Total	100	100	100	100	100	100
Nutrient Contents						
ME (kcal/kg)	2,559	2,563	2,603	2,603	2,602	2,601
Crude protein (%)	12.95	13.26	15.08	15.20	15.14	15.08
Cruse fibre (%)	8.46	8.48	7.88	7.88	7.87	7.86
Fat (%)	8.78	8.79	8.10	8.10	8.10	8.10
Ca (%)	0.97	0.43	1.01	0.98	0.97	0.97
P (%)	1.10	1.02	0.95	0.95	0.95	0.95
Lysine (%)	0.59	0.64	0.71	0.76	0.80	0.86
Methionine (%)	0.24	0.26	0.28	0.31	0.34	0.36
Lys : ME ratio	2.31	2.50	2.73	2.92	3.07	3.31

RESULTS AND DISCUSSION

Experiment 1

The average weekly body weight gain, feed consumption and feed conversion of the birds fed diets with increasing levels of metabolizable energy is shown in Table 3. Dietary metabolizable energy levels significantly ($P<.01$) affected feed consumption, body weight gain and feed conversion.

Body weight gain increased with

Tabel 3. Growth, feed consumption, feed conversion and mortality as influenced by dietary metabolizable energy levels, experiment 1

Dietary treatments/ Metabolizable energy (kcal/kg)	Weight gain (g/bird)	Feed consumption (g/bird)	Feed conversion (g/g)	Mortality (%)
A (2,300)	35.93 ^{a}	235.56 ^{c}	6.56 ^{c}	2.08
B (2,450)	40.54 ^{ab}	229.34 ^{cb}	5.66 ^{cb}	0
C (2,600)	43.06 ^{b}	208.38 ^{ba}	4.84 ^{ba}	4.17
D (2,750)	43.65 ^{b}	196.55 ^{a}	4.50 ^{a}	0
E (2,900)	45.51 ^{b}	183.23 ^{a}	4.03 ^{a}	0

increasing dietary metabolizable energy ranged from 2,300 - 2,900 kcal/kg. The dietary protein 14 % and metabolizable energy 2,900 kcal/kg ratio had highest body weight gain. These results are in disagreement with Suryono (1983) that reported that the protein energy requirements of native chickens at starter period were 18 % and 2450 kcal/kg. Kurtini (1995) reported that protein and energy requirements for native chickens at starter period (3d - 8 weeks) and growing period (12 - 20 weeks) were 20 %, 2,800 kcal/kg and 15 %, 2,700 kcal/kg, with protein energy ratios 134.5 and 181 respectively.

Increasing dietary metabolizable energy from 2,300 to 2,600 kcal/kg had similar feed consumption and feed conversion. However, there were differences of feed consumption and feed conversion between 2,300, 2,750 and 2,900 kcal/kg. The feed consumption and feed conversion of native chickens decreased with fed the diets containing metabolizable energy 2,750 and 2,900 kcal/kg.

Different dietary protein and metabolizable energy ratios caused the differences of feed consumption and feed conversion between treatments. These results agrees with Anggorodi (1985) and Olomu *et al* (1980) reported that protein and metabolizable energy ratio in the diet affected feed consumption and feed conversion. The result showed that optimum protein and metabolizable energy requirement were 14 % : 2,900 kcal/kg . NRC (1994) recommended that protein and metabolizable energy requirements for broiler were 23 % : 3,200 kcal/kg at starter, 20 % : 2,900 kcal/kg at finisher and 18 % : 2,900 kcal/kg at starter , 15 % : 2,900 kcal/kg at growing period for layer.

Subiharta *et al.* (1995) reported that commercial broiler diets containing protein 20 % and metabolizable energy 3,100 kcal/kg better than the diets containing protein 14 % and metabolizable energy ranged from 2,833 - 2,561 kcal /kg improved body weight gain and feed conversion of native chickens at 6 - 14 weeks of age . Iskandar *et al.* (1996) has studied that base on body weight gain, the optimum level of dietary protein was 19 % and metabolizable energy 2,900 kcal/kg, whilst feed consumption was not affected by dietary protein. However, feed conversion ratio increased with increasing dietary protein.

Experiment 2

The average body weight gain, feed consumption and feed conversion are presented in Table 4.. Native chickens fed dietary lysine level 3.30 g/ Mcal had significantly ($P<.01$) increased weight gains compared to those grown with fed 2.30 and 2.50 g/ Mcal. However, body weight gains were not significantly ($P<.05$) influenced by dietary lysine levels between 2.30 and 2.50 g/ Mcal, also from 2.70 to 3.30 g/Mcal. The highest weight gains occurred to native chickens fed dietary lysine level 3.30 g/ Mcal.

Table 4. Growth, feed consumption, feed conversion and mortality as influenced by dietary lysine levels, experiment 2

Dietary treatments/ Lysine/ME (g/Mcal)	Weight gain (g/bird)	Feed consumption (g/bird)	Feed conversion (g/g)	Mortality (%)
A (2.20 - 2.30)	41.39 [a]	235.07 [a]	5.68 [b]	0.28
B (2.40 - 2.50)	41.03 [a]	266.26 [a]	6.49 [c]	0.83
C (2.60 - 2.70)	55.95 [b]	285.50 [a]	5.10 [ab]	1.11
D (2.80 - 2.90)	50.61 [b]	225.56 [a]	4.46 [a]	0.56
E (3.00 - 3.10)	56.03 [b]	238.14 [a]	4.25 [a]	0.83
F (3.20 - 3.30)	56.48 [b]	265.77 [a]	4.71 [a]	0

Body weight gain increased with increasing lysine and metabolizable energy ratios of the diets. These results agrees with other studies (Gous and Morris, 1985; Morris *et al.*, 1987; Bilgili *et al.*, 1992).

Feed consumption was not significantly (P<.05) influenced by lysine levels. The absence of feed consumption response to dietary lysine levels agrees with Holsheimer and Verkamp (1992), who reported that feed consumption were not influenced by protein levels (21.0 - 33.6 %) and lysine levels (1.08 - 1.39 %) in the diets of broiler. Mendes *et al.* (1997) reported that there were no significant effects of lysine levels (1.0, 1.1, 1.2 %) and Arg : Lys ratios (1.1: 1, 1.2 : 1, 1.3 : 1, 1.4 :1), or any interaction among temperature, Lys level, or Arg:Lys ratio on feed consumption Feed consumption and growth rate were depressed when dietary lysine level was suboptimal and the metabolizable energy of the diet was increased (March and Biely 1972).

Feed conversion was significantly (P<.01) higher in dietary lysine levels 2.30 and 2.50 g/Mcal than in 3.00 g/Mcal. However, there were no significant (P<.05) effect of dietary lysine from 2.70 to 3.30 g/Mcal. The lowest feed conversion was in dietary level 3.0 g/Mcal. The National Research Council (NRC, 1994) recommended that lysine requirements in the diets were (2.66 - 3.75 g/Mcal) for broiler at 9 weeks of age and (2.07 - 2.93 g/ Mcal) for layer at 0 - 14 weeks of age.

It appears from the results of this study that lysine requirements for native chickens were lower than broiler but higher than layer. Several studies have reported that the reduction in feed consumption and improvement in feed conversion associated with increasing lysine levels of the broiler diets (Latshaw *et al.*, 1993; Han and Baker, 1994).

Mortality

The mortality percentage of native chickens in both experiments is described in Table 3 and 4. There were no indications that dietary metabolizable energy or lysine levels in the diets influenced mortality during the study.

CONCLUSION

The nutrient requirements for native chickens at starter period (1d - 12 weeks) based on metabolizable energy or lysine levels were lower than broiler but higher than layer. It is suggested that a further study on other nutrient requirements is necessary.

REFERENCES

Anggorodi, R. 1985. *Kemajuan Mutakhir dalam Ilmu Makanan Ternak Unggas*. UI Press, Jakarta.

Association of Official Analytical Chemists. 1984. *Official Methods of Analysis*. 14th ed. Association of Official Analytical Chemists, Washington, DC.

Austic, R.E. 1982. *Lysine in Poultry Nutrition*. Ajinomoto, Co. Inc.

Bilgili, S.F., E.T. Moran, JR., and N.Acar. 1992. Strain-cross responses of heavy male broilers to dietary lysine in the finisher feed : live performance and further - processing yields. *Poultry Sci.*, 71:850-858.

Gous, R.M., and T.R. Morris. 1985. Evaluation of a diet dilution technique for measuring the response of broiler chickens to increasing concentrations of lysine. *Br. Poult. Sci.*, 26:147-161.

Gultom, D., Wiloeto, D. and Primasari. 1989. Protein dan energi rendah dalam ransum ayam buras periode bertelur. *Seminar Nasional Tentang Unggas Lokal*, Universitas Dipenogoro, Semarang.

Han, Y., and D.H. Baker. 1994. Digestible lysine requirement of male and female broiler chicks during the period three to six weeks posthatching. *Poultry Sci.*, 73:1739-1745.

Holsheimer, J.P. and C.H. Veerkamp. 1992. Effect of dietary energy, protein, and

lysine content on performance and yields of two strains of male broiler chicks. *Poultry Sci.*, 71:872-879.

Iskandar,S., D. Zainuddin, S. Sastrodihardjo, T.Sartika, P. Setiadi and T. Susanti. 1996. Respon kinerja dua jenis ayam lokal terhadap ransum berbeda kandungan protein. *Laporan Penelitian. Balai Penelitian Ternak*, Bogor.

Kurtini, T. 1995. Pengaruh imbangan energi protein ransum terhadap penampilan ayam buras selama periode pertumbuhan. *Prosiding Seminar Nasional Sains dan Teknologi Peternakan*, 25-26 Januari. Balai Penelitian Ternak, Bogor.

LatshawJ .D. 1993. Dietary lysine concentrations from deficient to excessive and the effects on broiler chicks. *Br. Poult. Sci.*, 34:951-958.

March, B.E. and J.Biely. 1972. The effect of energy supplied from the diet and from environment heat on the response of chicks to different levels of dietary lysine. *Poultry Sci.*, 51:665-668.

Mendes, A.A., S.E. Watkins, J.A. England, E.A.Saleh, A.L. Waldroup and P.W. Waldroup. 1997. Influence of dietary lysine levels and arginine : lysine ratios on performance of broilers exposed to heat or cold stress during the period of three to six weeks of age. *Poultry Sci.*, 76:472-481.

Morran, E.T., and S.F. Bilgili. 1990. Processing losses, carcass quality, and meat yields of broiler chickens receiving diets marginally deficient to adequate in lysine prior to mar-keting. *Poultry Sci.*, 69:702-710.

Morris T.R., K. Al - Azzawi, R.M. Gous and G.L. Simpson. 1987. Effects of protein concentration on responses to dietary lysine by chicks. *Br. Poult. Sci.*, 28:185-195.

National Research Council. 1994. *Nutrient Requirements of Poultry*. 9 th rev. ed. National Academy Press, Washington, DC.

Olomu, J.M. and S.A. Offiong. 1980. The effect of different protein and energy levels and change from starter to finisher ration on performance of broiler chicken in the tropics. *Poultry Sci.*, 59:828-835.

Resnawati, H., A. Gozali and Supriadi. 1991. Kebutuhan imbangan protein dan energi dalam ransum ayam nunukan periode pertumbuhan. *Prosiding Seminar Pengembangan Peternakan dalam Menunjang Pengembangan Ekonomi Nasional*, 4 Mei. Fakultas Peternakan Unsoed. Purwokerto.

Sinurat, A.P. and Balnave, D. 1985. Effect of dietary amino acid and metabolizable energy on performance of broilers kept at high temperatures. *Br.Poult. Sci.*, 26:117-128.

Steel, R.G. and O.J. Torrie. 1980. *Principles and Procedures of Statistics*. 2nd ed MC.Graw - Hill International Book Co. Tokyo.

Subiharta, D.M., Yuwono and Muryanto. 1995. Pengaruh kualitas ransum dan kepadatan kandang terhadap penampilan ayam buras umur 6 - 14 minggu. *Prosiding Pertemuan Ilmiah Komunikasi dan Penyaluran Hasil Penelitian*. Pendayagunaan hasil penelitian untuk menunjang industri peternakan di pedesaan, Sub-Balitnak Klepu, Semarang.

Suryono, I.K. Amrullah and B.H. Ahmad. 1983. Pengaruh Tingkat Protrein dan Energi pada Penampilan Ayam Kampung. *Karya Ilmiah*, Institut Pertanian Bogor.

Wihandoyo, S. Sudaryanti and T. Yuwanta. 1981. Pertumbuhan ayam kampung jantan dan betina yang hidup berkeliaran serta hubungan antara bobot badan dengan umurnya. *Bulletin Fakultas Peternakan* UGM, Tahun V No.4.