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A STUDY ON THE EFFECT OF PROTEIN LEVELS AND BALANCE LYSINE/METHIONED IN LAYER DIETS WITH AND WITHOUT FISH MEAL[1]

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ABSTRACT

Two hundred and fourty-22 week old pullets were randomly alloted to 12 iso-caloric (2,700 kcal/kg) dietary treatments to meansure the biological effect and income over feed cost (IOFC) of formulation diets consisting of three protein levels (15, 16 and 17%), two combination levels of lysine/methionine (0.80%/0.40% and 0.85%/0.43%) and two type of diets (fish meal and all grain diets). Each dietary treatment was replicated to 5 with 4 pullets each. The other 5x4 pullets were also included and fed with commercial diet. The biological assay was factorially arranged in 3 x 2 x 2 and replicated to 5 for 6x28 days period of egg production. All parameters concerned with egg production were measured. Feed intake and egg production (HDA/HHA) statistically ($P \leq 0.05$) were the only parameters affected by type of diets (main effect) and interaction effect between protein levels and balance lysine / methionine, respectivaly. Further analysis indicated that layer fed 15% protein and 2,700 kcal ME had a tendency to compensate feed intake to achieve a comparable egg production (76.53% HDA/HHA) as compared with diets containing either 16% (75.08% HDA/HHA) or 17% protein (72.20% HDA/HHA). Generally it could be conducted that all grain diet containing 2,700 kcal ME, 15% protein, 0.85% lysine, 0.43% methionine and/or fish meal diet containing 2,700 kcal ME, 0.80% lysine and 0.40% methionine are prefereble to be applied as practical diets for laying hen.

(Key Words: Protein level, Lysine, Methionine, Fish meal, Performance, Layer.)

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KAJIAN TENTANG PENGARUH ARAS PROTEIN DAN KOMBINASI LISIN/MITIONIN DALAM RANSUM PETELUR DENGAN DAN TANPA TEPUNG IKAN

INTISARI

Dua ratus empat puluh ekor petelur umur 22 minggu secara acak dialokasikan ke dalam 12 perlakuan ransum isokalori (ME=2,700 kcal/kg) untuk mempelajari pengaruh biologik dan pendapatan di atas biaya pakan (*income over feed cost*, IOFC) dari ransum perlakuan dengan tiga aras protein (15%, 16%, 17%), dua kombinasi aras lisin/metionin (0,80%/0,40% dan 0,85%/0,43%) dan dua macam tipe ransum (ransum dengan dan tanpa tepung ikan). Tiap perlakuan ransum diulang 5 kali masing-masing menggunakan 5 ekor. Di luar rancangan percobaan sebagai pembanding diikutkan pengamatan dengan menggunakan ransum komersial (perlakuan ransum ke-13). Percobaan biologis ini dirancang dengan menggunakan rancangan acak lengkap pola searah dalam pola faktorial 3 x 2 x 2. Pengamatan biologik dilakukan selama 6 x 28 hari. Hasil penelitian menunjukkan bahwa hanya produksi telur (HDA/HHA) yang berbeda secara nyata ($P \leq 0,05$) karena pengaruh tipe ransum dan interaksi antara aras protein dengan kombinasi aras lisin/metionin. Analisis selanjutnya menunjukkan bahwa petelur yang diberi ransum 15% protein mampu menyelaraskan konsumsi ransum untuk mencapai produksi (76% HDA/HHA) yang relatif seimbang kalau dibanding dengan petelur yang diberi ransum mengandung 16% protein (75,08% HDA/HHA) maupun 17% protein (72,20% HDA/HHA). Secara umum dapat disimpulkan bahwa ransum tanpa tepung ikan dengan ME= 2,700 kcal/kg, 15% protein, 0,85% lisin dan 0,43% metionin atau ransum-ransum yang sama tetapi mengandung tepung ikan dengan 0,80% lisin dan 0,40% metionin adalah merupakan ransum pilihan untuk petelur.

(Kata Kunci: Aras protein, Lisin, Metionin, Tepung ikan, Performan, Petelur.)

Introduction

It is generally accepted that protein requirement for layer should be associated quantitatively and qualitatively with the requirement for essential and non-essential amino acids. The number and amound of essential amino acids have to be in exact balance to support sufficiently the rate of tissue synthesis and efficiency of feed utilization for growth and production. The improvement of performance associated with increasing/decreasing protein level in the diet was the result of the improvement of essential amino acids balance and could be accomplished equally as well as through amino acids supplementation.

It was stated before that among 10 to 11 essential amino acids, lysine and methionine to be considered as the first limiting (Patrick and Schaible, 1980).

The benefit synthetic cristalline amino acid for supplementation specially lysine and methionine have been released. The result from biological experiment showed that digestibility of DL-methionine (Han, et al., 1988) and L-lysine_HCL (Nelson, et al, 1986) were 99.7 and 98%, respecctively.

Therefore, the following report of present study was the result of biological assay to measure the effect of three protein levels (15, 16 and 17%) and two combination levels of lysine/methionine (.80%.40% and .85%.43%) in the layer diets formulated with and without fish meal.

Material and Method

Two hundred and fourty-twenty two week old pullets after being reached 50% egg production were randomly allocated to 12 dietary treatments consisted of three protein levels (15, 16 and 17%), two combination levels of lysine/methionine (.80%/.40% and .85%.43%) and two type of diet (fish meal and all grain diets). Each dietary treatment was replicated to 5x4 pullets. The other 5x4 pullets were also included in this experiment and fed with commercial diet.

All experimental pullets were kept in an individual cage for 6 x 28 days. 12-typical iso-caloric (2,700 kcal/kg diet) dietary treatments (Table 1.) and a commercial diet were fed ad *lib.* trough out the experiment. Average performance in term of egg production rate (%HDA), feed intake, egg size and feed conversion, physical egg quality in term of haugh unit score, shell thickness, yolk color and income over feed cost (IOFC) statistically were analized with standard analysis of variance which is factorially arranged in 3x2x2 and replicated to 5. All parameters of commercial diet were not included in statistical analysis.

Results and Discussion

During the period of observation all experimental layers were survived, hence, the percentage value of HDA was equal to HHA.

The average performance, physical egg quality and income over feed cost (IOFC) of experimental layers as affected by dietary treatments containing main effect of three protein levels, two combination levels of lysine/methionine and two type of diets with their interaction are statistically summerized in Table 2, 3, 4 and 5.

Main effect

Statistical analysis of this study indicated that level protein (15, 16 and 17%) in the diets did not affected to all parameters concerned (Table 2). However, layers fed with diet containing 15% protein had a trend to compensate feed intake to support egg production (76.53% HDA/HHA) and performance as compared to diets containing 16% (75.08%)and 17% (72.20%), respectively. A similar result was reported by Nasroedin (1990), a comparable performance was achieved by laying hens fed with diet containing 15% protein after being supplemented with lysine and methionine equally to the diet containing 17% protein. However, the present result has a little disagreement with the report of Sugandi (1974), in which, to support production and performance of laying hen kept in hot climate (Indonesia) at least required 17% in the diet.

It was found that performance, physical egg quality and IOFC (Table 3) statistically were not affected by the two levels of combination lysine/methionine. Reffer to the formulated experimental diets, it seems that performance and physical egg quality were fully controlled by the amount of feed intake. As cited by Waldroup, et al; (1976), balance essential amino acid in in the diet was responsible to the pattern of feed intake, it is therefore the formulating lysine and methionine in experimental diets were required to stabilize the balance of their essential amino acids.

The present result of lower ($P \leq 0.5$) intake (Table 4) of laying hens fed all grain diet as compared to fish meal diet, suggested that the absent of fish meal in all grain diet might result slightly imbalance one or more essential amino acids and promoted to lower intake (Anabolic and Catabolic theories as cited bay Waldroup, et al; 1976). On the other sides, the better performance of hens fed with fish meal diets was related to either higher intake and/or to thee existing of APF in fish meal as production promoting factor, and consequently, IOFC was improved.

Interaction Effect

Statistical analysis (Table 5) showed that among two and/or three-way interaction effects, rate of egg production (%HDA) was the only parameter significantly affected ($P \leq 0.5$) by the interaction of protein level and combination lysine/methionine in the diet.

Whitin all grain diets, the diet containing 15% protein, .85% lysine and .43% methionine produced the highest performance in term of HDA (76.19%), and feed conversation (2.55). Both parameters are comparable to commercial diet (76.25% and 2.52). On the other side, within fish meal diets, the best egg production (80.54%) and feed conversion (2.49) was due to the diet containing 15% protein, .80% lysine and .40% methionine. Numerically, these parameters were higher to commercial diet.

In term of IOFC, all dietary treatments were superior to commercial diet. Within all grain and fish meal diet, the highest IOFC was due the diet containing 16% protein, .80% Lysine and .40% methionine.

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Conclusion

Layer fed diet containing 15% protein has a tendency to compensate feed intake to achieve a comparable performance and physical egg quality as compared with diets containing either 16 or 17% protein.

All grain diet containing 2,700 kcal ME, 15% protein, .85% lysine, .43% methionine and/or fish meal diet containing 2,700 kcal ME, 15% protein, .80% lysine, .40% methionine are preferable to be applied as practical diets for laying hens.

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APPENDIX

TABLE 1. COMPOSITION OF DIETARY TREATMENTS

	All Grain						Fish Meal					
	.80%/.40%			.85%/.43%			.80%/.40%			.85%/.43%		
ENGRIDIENT, %	15	16	17	15	16	17	15	16	17	15	16	17
Yellow Corn	59.30	57.82	56.52	59.53	58.09	56.68	59.30	57.84	56.68	59.30	58.59	56.68
Wheat pollard	10.00	8.11	6.01	10.00	7.98	5.94	10.00	8.11	10.76	10.00	7.98	5.94
SBOM	16.67	20.26	23.77	16.33	19.98	23.60	15.50	10.26	20.00	15.50	17.98	21.69
Sesame Meal	2.00	2.00	2.00	2.00	2.00	2.00	1.00	2.00	2.00	1.00	2.00	2.00
Fish meal	-	-	-	-	-	-	2.11	2.00	2.00	2.11	2.00	2.00
Palm oil	1.00	1.00	1.00	1.00	1.00	1.00	0.30	0.40	-	0.30	0.20	0.50
L-Lysine	0.18	0.08	-	0.25	0.16	0.06	0.10	0.05	-	0.16	0.11	-
DL-Methionine	0.17	0.16	0.14	0.20	0.18	0.17	0.14	0.14	0.14	0.17	0.17	0.15
L.Threonine	0.04	-	-	0.08	0.04	-	0.04	-	-	0.08	0.04	-
L-Tryptophan	0.01	-	-	0.03	0.01	-	0.01	-	-	0.03	0.01	-
DCP, 24/18	1.46	1.45	1.45	1.46	1.46	1.45	1.63	1.45	1.45	1.46	1.46	1.45
Lime stone	5.82	5.75	5.75	5.77	5.75	5.74	6.52	6.40	5.92	6.54	6.11	6.24
Sodium Chlorida	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Filler	3.00	2.98	2.99	3.00	3.00	2.99	3.00	3.00	0.70	3.00	3.00	3.00
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
NUTRIENS COIMPOSITION,%												
CP	15(14.69)	16(13.00)	17(16.56)	15(15.31)	16(14.00)	17(17.00)	15(16.81)	16(17.19)	17(18.06)	15(15.74)	16(17.75)	17(18.75)
ME,kcal/kg Diet	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00	2700.00
Crude feber	4.01	4.13	4.22	3.99	4.10	4.20	3.59	3.65	3.98	3.59	3.63	3.67
Ca	2.71	2.69	2.69	2.69	2.69	2.69	3.16	3.09	2.92	3.02	2.99	3.03
P,total/avail	.65/.40	.65/.40	.64/.40	.65/.40	.65/.40	.64/.40	.76/.50	.73/.47	.76/.48	.73/.47	.73/.47	.76/.47
Lysine	.80(.73)	.80(.76)	.81(.76)	.85(.75)	.85(.92)	.85(.90)	.80(.70)	.80(.70)	.80(.71)	.85(.85)	.85(.75)	.85(.78)
Methionine	.40(.35)	.40(.39)	.40(.37)	.43(.39)	.43(.44)	.43(.43)	.40(.38)	.40(.40)	.40(.42)	.43(.45)	.43(.41)	.43(.42)
Arginin	0.84	0.92	0.94	0.75	1.04	1.01	0.82	0.85	1.01	0.92	0.93	1.05

Common values were deried from table analysis
values in the bracket were derived from actual analysis.

TABLE 2. MEAN PERFORMANCE, PHYSICAL EGG QUALITY AND INCOME OVER FEED COST OF LAYERS INFLUENCED BY 3 LEVELS OF PROTEIN

Levels of Protein	Performance: Feed intake (g/d/hen)	HDR (%)	Egg size (g)	Feed Conversein	Physical Egg Quality: HU (HU score)	Shell thickness (mm)	Yolk color (color index)	IOFC (Rp/d/hen)
15%	107.41^{a}	76.53^{a}	56.13^{a}	2.54^{a}	96.63^{a}	0.301^{ab}	11.96^{a}	16.73^{a}
16%	105.54^{a}	75.08^{a}	56.10^{a}	2.54^{a}	96.13^{a}	0.297^{a}	11.85^{a}	17.02^{a}
17%	105.95^{a}	72.20^{a}	56.95^{a}	2.64^{a}	98.01^{a}	0.304^{b}	11.84^{a}	15.68^{a}

Mean value in one column with Superscript Were not Statistically defferent

TABLE 3. MEAN PERFORMANCE, PHYSICAL EGG QUALITY AND INCOME OVER FEED COST OF LAYERS INFLUENCED BY TWO TYPE OF DIETS

Type of diet	Performance: Feed intake (g/d/hen)	HDR (%)	Egg size (g)	Feed Conversein	Physical Egg Quality: HU (HU score)	Shell thickness (mm)	Yolk color (color index)	IOFC (Rp/d/hen)
All grain diets	105.13^{a}	74.16^{a}	55.88^{a}	2.58^{a}	96.03^{a}	0.300^{a}	11.89^{a}	15.50^{a}
Fish meal diet	107.48^{b}	75.05^{a}	56.90^{a}	2.57^{a}	98.48^{b}	0.301^{a}	11.88^{a}	17.45^{a}

Mean value in one column with same superscript Statistically were not different

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TABLE 4. MEAN PERFORMANCE, PHYSICAL EGG QUALITY AND INCOME OVER FEED COST OF LAYERS INFLUENCED BY RATIONS CONTAINING TWO LEVELS OF LYSINE/METHIONINE IN THE DIETS

	Performance				Physical Egg Quality			IOFC
Lysine/methionine	Feed intake (g/d/hen)	HDA (%)	Egg size (g)	Feed Conversein	HU (HU score)	Shell thickness (mm)	Yolk color (color index)	(Rp/d/hen)
.80/.40	106.20 [a]	74.22 [a]	56.23 [a]	2.61 [a]	97.27 [a]	0.301 [a]	11.94 [a]	16.98 [a]
.85/.43	106.40 [a]	74.59 [a]	56.58 [a]	2.54 [a]	97.24 [a]	0.299 [a]	11.83 [a]	15.97 [a]

Mean value in one column with same superscript were not statistically different.

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TABLE 5. MEAN PERFORMANCE, PHYSICAL EGG QUALITY AND INCOME OVER FEED COST OF LAYERS AS INFLUENCED BY TWO AND THREE WAY INTERACTIONS

			Performance [1]				Physical Egg Quality [1]			IOFC [1]
Type of diets	Lysine/ Methionime	Protein level	Feed intake (g/d/hen)	HDA (%)	Egg size (g)	Feed Conversein	HU (HU score)	Shell thickness (mm)	Yolk color (color index)	(Rp/d/hen)
All grain	.80/.40	15	106.77^{abc}	73.57^{a}	55.54^{ac}	2.65^{a}	95.78^{c}	0.300^{a}	12.07^{b}	11.78^{b}
		16	103.30^{a}	74.94^{ab}	54.87^{a}	2.54^{a}	93.87^{ac}	0.298^{a}	11.93^{ab}	17.25^{ab}
		17	103.27^{ac}	69.11^{a}	58.26^{bc}	2.65^{a}	99.11^{b}	0.312^{b}	12.03^{ab}	15.45^{ab}
	.85/.43	15	105.52^{ac}	76.19^{ab}	56.06^{ac}	2.51^{a}	96.04^{a}	0.302^{ab}	11.90^{ab}	15.07^{ab}
		16	105.38^{a}	75.37^{ab}	55.23^{ac}	2.54^{a}	96.04^{c}	0.294^{a}	11.64^{a}	14.79^{ab}
		17	106.54^{abc}	75.77^{ab}	55.34^{ac}	2.59^{a}	95.31^{c}	0.296^{a}	11.79^{ab}	15.64^{ab}
Fish meal	.80/.40	15	110.19^{b}	80.54^{b}	56.12^{abc}	2.49^{a}	97.97^{bc}	0.300^{a}	11.91^{ab}	20.61^{a}
		16	106.14^{abc}	78.84^{b}	55.25^{ac}	2.50^{a}	98.10^{bc}	0.296^{a}	11.88^{ab}	20.32^{a}
		17	107.58^{bc}	68.33^{ab}	57.33^{abc}	2.82^{a}	98.77^{b}	0.304^{ab}	11.82^{ab}	13.44^{ab}
	.85/.43	15	107.16^{abc}	75.84^{ab}	56.81^{abc}	2.51^{a}	100.73^{b}	0.302^{ab}	11.97^{ab}	16.46^{ab}
		16	107.38^{abc}	71.16^{ab}	59.05^{b}	2.57^{a}	96.49^{bc}	0.300^{b}	11.98^{ab}	15.70^{ab}
		17	106.43^{abc}	75.59^{ab}	56.86^{abc}	2.51^{a}	98.85^{b}	0.304^{ab}	11.74^{ab}	18.16^{ab}
Commercial feed [2]			106.41	76.25	56.76	2.52	94.86	0.300	6.74	10.49

[1] Mean value in one column with same superscript were not statistically different

[2] Mean value were not included in the statistical analysis