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PROCEEDINGS

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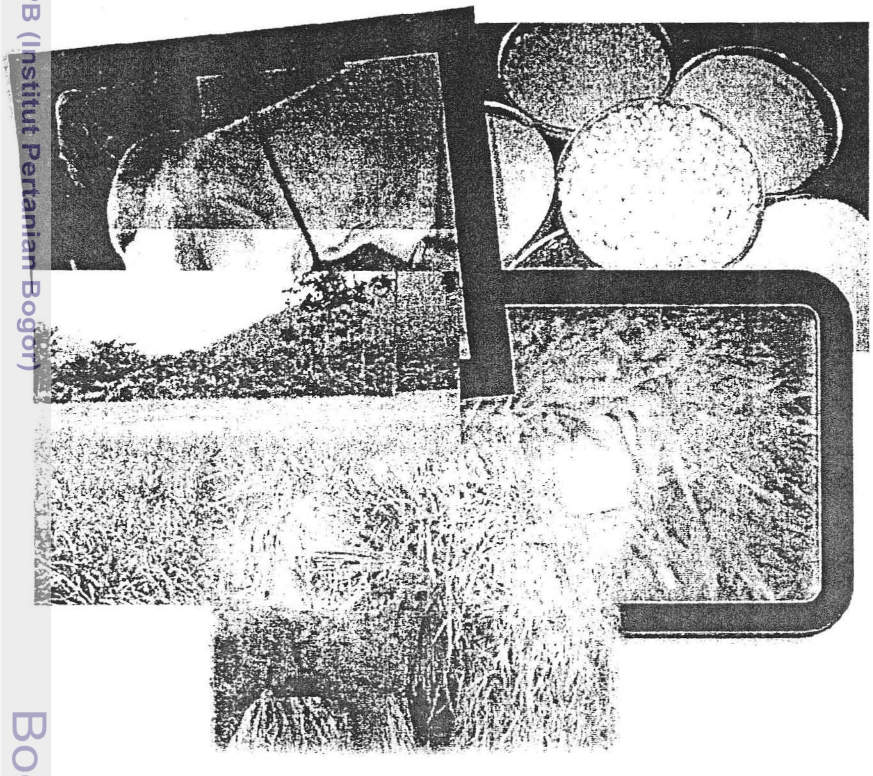
The 1st International Seminar and the 7th Biennial Meeting of Indonesian Nutrition and Feed Science Association

EMPOWERMENT OF LOCAL FEEDS TO SUPORT FEED SECURITY



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PREFACE

Let us thank to God the Almighty, because of His amazing grace, this proceeding was completed. This book consists of articles presented during The 1st International Seminar and the 7th Biennial Meeting of Indonesian Nutrition and Feed Science Association on the Empowerment of Local Feeds to Support Feed Security are held by the Indonesian Nutrition and Feed Science Association in collaboration with Faculty of Animal Science, UNSOED. The objectives of this event were, among others, to provide a forum for sharing and exchanging new information and technology, discussing the way how to attain a sustainable agriculture in supporting animal feed security and also establishing a new contact, renewing friendship and network among participants.

During the two-day meeting, reviewed papers from invited speakers as well scientific papers from the participants were discussed and presented in the sessions of supporting paper and poster presentations. Selected papers were published in the Journal of the Indonesian Nutrition and Feed Science Association (AINI). The meeting was attended by around 250 participants coming from the UK, Malaysia, and Indonesia. They are 96 % from universities, 4 % from research institutes, and the rest from government representatives and private companies. On behalf of the organizing committee, we would like to extend our great appreciation to all parties (sponsor, companies, and institution) for invaluable assistances and supports to the success of this seminar.

Purwokerto, July 2010

Chair of the Organizing Committee
Dr. Sri Suhermiyati

REMARKS OF THE CHAIRMAN OF AINI

Assalamu'alaikum Wr. Wb.,

AINI that was firstly established in 1996 with the objective to gather all of the animal nutrition and feed scientists in Indonesia permitting the exchange of knowledge and experiences under spirit of brotherhood, to stimulate the advancement of science and technology in nutrition and feed science, thus benefiting to the competitiveness of animal agribusiness. At the beginning, AINI scientific meeting was held, every year (1996, 1997) but due to the economic crisis in 1998, the meeting was held biannually. The first three scientific meetings were held in IPB Bogor (2001), while the next was conducted respectively in UNDIP Semarang (2003), UNIBRAW Malang (2005), and UGM Yogyakarta (2007).

The 2009 meeting is the 7th meeting, organized by AINI members from Purwokerto especially from the Faculty of Animal Science UNSOED with the theme "Empowerment of local feeds to suport feed security" The actual meeting is declared as "The 1st International Seminar and 7th biennial meeting of AINI" This International seminar was firstly inspired by the fact that AINI has great potential to do so and it is now to show AINI member's scientific activities then ever to the stakeholders. Secondly, there is a political will of the government by offering the competitive grant for every profesional association to conduct the international symposium, and recently we have the good news that AINI is announced to get this competitive grant from Directorate General of Higher Education.

I would like also to take this opportunity to share the idea with all you, that AINI as the organization of scientist, to have a international scientific journal is a must. The journal deals with all aspects of nutrition and feed issues in tropical conditions. The Management board of AINI has taken the decision for revitalizing the AINI Journal to become the Journal of Nutrition and Feed Science, internationally recognized, by involving the International committee of lecture as the reviewers. To this end, we need fully your support and encourage the scientists especially the young scientists to publish their work in English. The accomplishment of this task will bring the association more respected in national and international level.

My sincere thanks to the Dean of the Faculty of Animal Science UNSOED, the organizing committee, sponsors, and any parties that can not be listed since we are deeply indebt to all of your effort and sacrifice to the success of this seminar. Our sincere thanks must go to the Directorate General for Higher Education Department of National Education for the grant awarded. For our invited speakers, Prof. Orskov from MLURI UK, Prof. AR Alimon from UPM Malaysia, Prof. Marsetyo, Dr. Didiek J. Rachbani, and Dr. Desianto from Indonesia, we are indebt to your effort and participation. Your views will enlighten and inspire how to empower our local feed resources in sustaining the feed security for the future.

Wassalamu'alaikum Wr. Wb.

Purwokerto, July 2010
Dr. Ali Agus

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STUDY ON EFFICACY OF METHIONINE ADDITION IN LAYING HENS FED CORN-SOY-PALM KERNEL BASED DIET

by
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Department of Animal Nutrition and Feed Science, Faculty of Animal Science, Bogor Agricultural University, Bogor

ABSTRACT

The objective of this study was to investigate the effect of methionine supplementation either in drinking water or diet on feed convertion ratio, henday egg production from hens age 21-25 weeks, egg production, egg weight, percentage of egg yolk, egg albumen, eggshell, as well as eggshell thickness in laying hens fed corn-soy-PKM based diet. Three hundred and fifty commercial laying hens age 16 weeks with initial weight of 1626.7±38.7 g were assigned randomly in a completely randomized design to one of seven dietary treatments. The treatments were as follows: (a) deficient in methionine without the addition of methionine; (b, c, d) deficient in methionine with addition of methionine in the diets at level of 0.05, 0.10, and 0.15 giving total methionine content in the rations of 0.33, 0.38, and 0.43%; (e, f, g) deficient in methionine with addition of methionine in the drinking water at level of 0.10, 0.15, and 0.20%. Diets and water were offered *ad libitum*. Data were analyzed statistically using analysis of variance (ANOVA) according to the procedure of SAS. The average intake of methionine of S2 during five weeks of the experiment was 388.8 mg/day/bird, while the average intake of methionine of S0 and S1 were less than the requirement, i.e., 276 mg/day/bird and 330 mg/day/bird, respectively. The intake of methionine of S3, S5, and S6 was over the requirement (432 mg/day/bird) and this amount of methionine could decrease the performances of the hens. Supplementation of 0.1% methionine in the diets (S2, total methionine in the diet was 0.38%), and 0.05% in the drinking water gave the best results in terms of hen-day egg production, feed conversion ratio, egg weight, albumin weight, and shell weight. It is concluded that methionine should be added to corn-soy-palm kernel based poultry diets as much as 0.1% in diet and 0.05% in the drinking water.

Keywords: corn-soy-palm kernel , methionine, egg production.

INTRODUCTION

Corn-soy-palm kernel based poultry diets are deficient in limiting amino acids such as methionine. Amino acid balance and nitrogen retention in poultry diets are improved by methionine supplementation. Adoption of low dietary protein and supplementation of synthetic amino acid in poultry diets recently is becoming relevant in feed formulation to minimize the nitrogen excretion and production cost. Levels and balance of amino acids in the diets are important nutritional variables that affect the feed efficiency in layer (Al-Saffar and Rose, 2002).

Methionine in the form of liquid methionine hydroxy analogue (LMA) and solid DL-Methionine (DLM) product are available in the market. Efficacy of the products is believed to be correlated with nutritional value of the diet, climate and the type of poultry. The previous experiment indicated that the supplementation of 0.25 % DL-methionine in starter diets and 0.20% in finisher diets in the corn-soya based diet increased performance of broiler (Jahja et al,. 2007). However, the optimum level of methionine addition in broiler may differ from that in layer, and moreover, inclussion of palm kernel meal (PKM) in laying hens diets may affect nutrient retention including methionine.

The objective of this study was to investigate the effect of methionine supplementation either in drinking water or diet on egg production and its quality in laying hens fed corn-soy-PKM based diet.

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MATERIALS AND METHOD

Materials

Three hundred and fifty ISA-Brown strain laying hens, 16 weeks of age, were purchased from commercial breeder. Liquid methionine hydroxy analogue (LMA) and solid DL-Methionine (DLM) was supplied by Sumitomo Chemical Co., Ltd. Feedstuffs were obtained and mixed in a small comercial feed mill in Bogor-Indonesia. The pullets were kept in individual cages in conventional house system (an open-side poultry house). Each cage was completed with feeder and drinking water. The lighting period was provided for 16 hours from 05:00 AM to 21:00 PM daily.

Methods

Rations used for feeding trials were formulated based on poultry requirement according to NRC (1994) using corn-soy-PKM based diet. The formula and chemical composition are shown in Table 1. The ration was fabricated twice a month.

Three hundreds and fifty commercial laying hens age 16 weeks with initial weight of 1626.7±38.7 g were assigned randomly in a completely randomized design to one of seven dietary treatments. The treatments were as follows: (a) deficient in methionine without addition methionine; (b, c, d) deficient in methionine with addition of methionine in the diets at level of 0.05, 0.10, and 0.15 giving total methionine content in the rations of 0.33, 0.38, and 0.43%; (e, f, g) deficient in methionine with addition of methionine in the drinking water at level of 0.10, 0.15, and 0.20%. Diets and water were offered *ad libitum*.

Feed and water intake, egg production, and egg weight were recorded daily. Feed convertion ratio, henday egg production from hens age 21-25 weeks, and methionine consumption were then calculated. During the last days of the experimental period, eggs sample from each treatments were taken to determine egg quality in terms of percentage of egg yolk, egg albumen, eggshell, as well as eggshell thickness. Data were analyzed statistically using analysis of variance (ANOVA) according to the procedure of SAS (Steel and Torrie, 1991).

RESULTS AND DISSCUSSION

Effect of DL-Methionine Supplementation on Feed Intake

The feed intake of the laying hens is presented in Table 2. Supplementation of DL-methionine either in the diets or in the drinking water did not affect the feed intake of the hens.

Table 1. Formula and chemical composition of experimental diets

Ingredients	(%)	Chemical Composition: Nutrient	(%)
Corn Local	53.96	DM	86.16
SBM India	18.08	Ash	10.18
Limestone Pow	9.0	CP	15.25
Rice Bran	7	CF	5.45
CGM USA	2.74	EE	2.66
Crude Palm Oil	2.13	NFE	52.62
DCP	1.28	Ca	4.38
Sodium Bicarbonat	0.29	P	0.99
Salt	0.20	NaCl	0.1
L-Lysine	0.11	GE (kcal/kg)	3984
Choline Chlorid	0.10		
MineralMix	0.05		
VitaminMix	0.05		

Table 2. Effect of DL-methionine supplementation on feed consumption (g/day/bird)*

Treatments	Age (Weeks)			
	21	22	23	24
S0	96.60 ± 1.71	96.06 ± 2.71	97.33±2.73	103.27± 5.65
S1	98.37 ±0.76	96.14 ± 3.63	97.40 ±3.40	108.36±1.87
S2	98.16 ±1.14	98.75 ±1.29	99.80±1.03	112.33±2.63
S3	96.45 ± 2.06	95.96 ± 3.82	97.12±2.41	109.79± 1.32
S4	98.21 ±1.14	94.53 ± 3.69	97.41±2.79	106.63±4.01
S5	97.34 ±5.19	97.77 ± 2.35	95.85±4.42	106.68± 0.36
S6	97.22 ± 2.99	94.90 ± 2.52	94.72±7.90	105.12±1.57

* The basal diet contained 0.28% methionine; 0.56% methionine+cystine; S0= the diet without DL methionine supplementation; S1= +0.05% DL-methionine in the diet; S2= + 0.1% DL-methionine in the diet; S3= + 0.15% DL-methionine in the diet; S4=+0.05% DL-methionine in the drinking water; S5= + 0.1% DL-methionine in the drinking water; S6= + 0.15% DL-methionine in the drinking water

Table 3. Effect of DL-methionine supplementation on water consumption (ml/day/bird)*

Treatments	Age (Weeks)			
	21	22	23	24
S0	215.09± 8.27	298.54±12.99	316.74±13.47	361.11±35.92
S1	193.49±16.98	244.54±26.28	263.63±8.59	298.67±51.07
S2	224.80±17.92	264.97±17.80	265.14±19.78	279.76±46.95
S3	203.94±20.31	256.03±16.42	235.43±13.61	250.90±34.94
S4	205.54±9.73	249.86±14.14	266.06±15.36	293.41±48.01
S5	193.43±12.43	248.80 ± 2.80	258.91±22.06	278.46±25.17
S6	166.71± 10.21	216.89±21.33	228.17±17.07	49.51±29.20

However, the average of feed intake of the hens offered supplemented with methionine in diet or drinking water were higher than that of the hens offered control diet (without supplementation), except for the hens fed S6 diet (+ 0.15% DL-methionine in the drinking water). This feed intake was similar to that reported by Bell and Weaver (2002) that feed intake of brown egg layers at 21 weeks, 22 weeks, 23 weeks, 24 weeks, and 25 weeks old were 96.4 g/hen/day, 99.1 g/hen/day, 101.4 g/hen/day, and 103.2 g/hen/day, respectively.

Effect of DL-Methionine Supplementation on Water Intake

The average of water intake of the laying hens were presented in Table 3. Supplementation of DL-methionine either in the diets or drinking water decreased the average of water intake during the first five weeks of laying period. Compared to the water intake of the hen fed control diet, the decreasing water intake were 16.04% (S1), 13.16% (S2), 20.58% (S3), 14.82% (S4), 17.78%, and 27.71% (S6). The hens fed S6 (+ 0.15% DL-methionine in the drinking water) had the lowest water intake. The reduction in water intake could be due to the taste of water as the result of rather high content DL-methionine. Water intake recommended by Bell and Weaver (2002) in laying hens was 220 ml/hen/day at house temperature of 28.9°C and 300 ml/hen/day at 34.4°C.

Effect of DL-Methionine Supplementation on the Egg Weight

The data of egg weight of this research were presented in Table 4. Supplementation of DL-methionine either in the diets of drinking water increased the egg weight with the value of 3.22% (S1), 5.2% (S2), 3.45% (S3), 4.96% (S4), 5.10% (S5), and 3.22% (S6). Leeson and Summers (2005) reported that apart from manipulating feed intake, egg size could be manipulated by adjusting dietary levels of energy, fat and linoleic acid, or by adjustment to levels of protein, methionine and sulphur amino acids (TSAA). There was a

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Table 4. Eggs weight (gr) of layer with and without methionine supplementation*

Treatments	Replication					Average
	1	2	3	4	5	
S0	51.4	50.84	50.89	51.88	51.18	51.24
S1	51.52	50.81	50.28	50.72	51.47	50.96
S2	52.15	50.29	53.09	52.26	52.12	51.98
S3	51.65	52.21	52.15	50.34	51.75	51.62
S4	52.35	51.49	51.65	51.67	53.52	52.14
S5	53.4	49.34	52.39	51.37	51.95	51.69
S6	51.75	50.75	50.74	52.9	51.67	51.56

Table 5. Henday egg production (%) of layer with and without methionine addition*

Treatments	Age (Weeks)			
	21	22	23	24
S0	26.32 ±14.56	43 ±14.52	63.00 ±16.95	68.04 ± 7.45
S1	29.96 ±17.16	46 ±20.06	62.72 ±18.08	75.60±12.52
S2	40.88 ±13.91	60 ±16.55	70.00 ±16.54	81.48±10.77
S3	38.36 ± 9.53	57 ± 6.96	71.96 ±11.90	83.72± 8.82
S4	36.68 ±19.78	60 ±23.42	72.52 ±16.46	80.36±10.50
S5	38.92 ±18.87	56 ± 6.49	65.24 ±12.07	70.84± 9.37
S6	17.36 ± 6.07	37 ± 5.65	56.00 ±12.60	69.44±15.51

consistent linear trend in the increase in egg weight in young birds as the increased in TSAA level from 0.65 to 0.81%. Analysis of this data indicated that egg size of young layers increased by 0.7g for each 0.05% increase in diet TSAA. The TSAA of the diets in this study was 0.56% (S0), 0.61% (S1), 0.66% (S2), and 0.71% (S3). The hens fed S2(+ 0.1% DL-methionine in the diet) yielded the highest egg weight. The eggs weight were almost the same to the standard egg weight suggested by Bell and Weaver (2002) who reported that the weight of commercial egg was 46 g/egg (at 21 weeks of age), 47.5 g/egg (at 22 weeks of age), 49.0 g/egg (at 23 weeks of age), 50.7 g/egg (at 24 weeks of age), and 52.3 g/egg (at 25 weeks of age).

Effect of DL-Methionine Supplementation on Henday Egg Production

Henday egg production is presented in Table 5. There was no different in henday production in the first five day production period. Henday egg production at the first week of the production period ranged from 17.36 to 40.88%. During the first five weeks, all groups of laying hen indicated the similar trend in hen day production. Although the methionine supplementation either in solid or liquid form had no significant effect on hand day production, the supplementation tended to improve the productivity of layer. The excess of supplemented methionine tended to reduce henday production. Supplementation of DL-methionine either in the diet or drinking water increased henday egg production by 5.2% (S1), 19.37% (S2), 19.28% (S3), 18.49% (S4), and 9.94% (S5). However, the supplementation of methionine in the drinking water at the level of 0.15% (S6) decreased the henday egg production by 8.85%. The increasing of this henday egg production could be due to methionine role in protein synthesis in the liver of hens, and then increasing the follicle forming. The henday egg production of S3 and S4 at 25 weeks of old was 88.48%, and 88.20%, respectively. The values were similar to that standard according to Bell and Weaver (2002) who reported that henday egg production for commercial laying hens at 25 weeks of old was 89.5%.

Effect of DL-Methionine Supplementation on Feed Convertion Ratio

Feed conversion ratio of laying hen offered rations supplemented with methionine is presented in Table 6. Supplementation of DL-methionine in the diets and drinking water decreased feed conversion or increased feed efficiency. This resuls indicated that basal diet (S0) had mild deficient of methionine. Pesti *et al.*, (2005) reported that feed efficiency is reduced when imbalanced proteins are fed.

Feed conversion decreased with the progress of the production period. Variation of feed conversion was high during the first three week of laying period. The values ranged from 2.47 to 2.96 in the week 4 of the laying period. Supplementation of methionine tended to decrease feed conversion ratio during the first five week of the production period. The excess of supplemented methionine tended to increase feed conversion. Available methionine in the experimental rations did not meet the requirement of the experimental laying hen. The supplementation of methionine at level up to 0.1% corrected the defficiency of methionin in the ration. However the methionine supplementation up to 0.15% resulted in excess of methioeine or in balance in amino acid.

Effect of DL-Methionine Supplementation on Egg quality

Egg quality of laying hen offered rations supplemented with methionine is presented in Table 7. Supplementation of DL-methionine in the diet and drinking water did not affect the yolk weight, but it increased the albumen weight. This results showed that methionine supplementation increased the protein synthesis in term of albumen protein. Pesti *et al.*, (2005) reported that the essential, or dietary indispensable, amino acids are needed to make protein and other compound. Amino acid needs change when protein synthesis changes. When birds are actively producing feather or egg, for instance, their requirements reflect the amino acids in these products as well as those needed for muscle growth and maintenance Pesti *et al.* (2005) reported that the most important factor in determining egg size is the size of yolk, largely lipids, and the second most important factor in determining egg size is the albumen, almost entirely protein. Because hens need for protein and amino acids to synthesis albumen is high, any lack of protein results in a decrease the amount of albumen, and consequently egg size even though the quantity yolk may be similar. Increasing the protein and amino acid contents of the diet has a marked effect on increasing egg size, particularly when the hen is laying small eggs

Supplementation of DL-methionine in the diets and drinking water increased the egg shell weight, except for the S4 and S5. This results indicated that there was an increasing in calcium retention in the egg shell due to increasing of protein synthesis as methionine supplementation was done. According to Pesti *et al.*, (2005) that calcium may be bound to protein in the enterocytes and is transported in the blood in both ionized and protein-bound forms. The results of this research showed that supplementation of 0.1% methionine in the diets (S2, total methionine in the diet was 0.38%) resulted in the best performances in terms of hen-day egg production, feed conversion ratio, egg weight, albumin weight, and shell weight. It could be due to meet the requirement of methionine to perform those performances of the hens. The estimated methionine requirement for egg number and weight are 364 mg/day/bird and 356 mg/day/bird, respectively. The average intake of methionine of S2 group during five weeks of the experiment was 388.8 mg/day/bird, while the average intake of methionine of S0 and S1 group were less than the requirement, i.e., 276 mg/day/bird and 330 mg/day/bird, respectively. The intake of methionine of S3 was 21.35 % over the requirement (432 mg/day/bird) and this amount of methionine could decrease the performances of the hens. This result indicated that there was a mild excessive of methionine in the S3 diet. Supplementation methionine 0.05 % in the drinking water yielded a better performances compared to others (S5 and S6). The methionine intake of S5 and S6 group could be excessive the requirement of the hens. The methionine intake of S6 group was 161.97% above the requirement, and it could be excessive to the birds.

Table 6. Feed conversion ratio of layer with and without methionine addition*

Treatments	Age (Weeks)			
	21	22	23	24
S0	14.51±17.31	8.87±9.36	5.16±3.02	2.91± 0.50
S1	32.93±60.44	5.3 ±2.74	4.67±1.74	2.69±0.54
S2	5.70±2.81	3.44±0.90	4.15±1.28	2.54±0.33
S3	5.60± 1.66	3.38±0.36	3.84±0.65	2.44± 0.24
S4	6.56±2.92	3.54±1.46	3.79±1.17	2.47±0.24
S5	7.13±5.63	3.48±0.56	4.15±0.93	2.79± 0.33
S6	14.51±17.31	8.87±9.36	5.16±3.02	2.91± 0.50

Table 7. Eggs components weight in laying hens offered diets with and without methionine addition*

Treatments	Parameters			
	Weight (g)	Yolk weight (%)	Albumin weight (%)	Eggshell weight (%)
S0	51.81	22.56	63.67	10.87
S1	51.84	21.97	64.52	11.29
S2	51.90	22.00	64.47	11.43
S3	51.96	22.38	64.37	11.01
S4	52.19	22.44	64.52	10.84
S5	51.92	22.67	64.19	10.93
S6	52.09	22.53	63.79	11.08

Table 8. Eggs yolk and eggshell characteristic in laying hens offered diets with and without methionine addition*

Treatments	Parameters		
	Yolk height (mm)	Yolk Score	Eggshell thickness (mm)
S0	9.93	9.50	0.34
S1	9.58	9.80	0.36
S2	9.25	9.50	0.35
S3	9.48	9.70	0.35
S4	8.87	9.50	0.37
S5	9.25	9.70	0.37
S6	9.50	10.20	0.36

CONCLUSION

Supplementation of 0.1% methionine in the corn-soy-palm kernel based diets wich was equal with 0.38% of the total dietary methionine, or 0.05% in the drinking water with the same formula of the diet resulted in the best performances of young laying hens in terms of hen-day egg production, feed conversion ratio, egg weight, albumin weight, and shell weight. It is recomended that methionine should be added to corn-soy-palm kernel based poultry diets as much as either 0.1% in diet or 0.05% in the drinking water.

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