Comparison of substitute of two types of local fishmeal powder as a source of protein instead of animal protein in the ration of Japanese quail in production traits

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ABSTRACT

This study was conducted to compare of two local fish meals (*Liza abu* and *Silurus glanis*) as a source of protein on production traits of Japanese quail (*Coturnix coturnix japonica*), during the first three months of egg production. The two type of local fishmeal were substituted instead of (50, 100%) from the percentage of animal concentrated protein in rations. A 150 bird of Japanese quail layers were distributed into five treatments (30 birds per treatment) and each treatment subdivided into three replicates (10 per replicate). The productivity traits, which included weekly live body weight, weight gain, feed consumption, food conversion factor, egg production, and egg weight were studied. Results showed that the local fishmeal 1 (*Liza abu* meal) representing by (T2 and T3) were significantly excelled in live body weight, weight gain, feed consumption, feed conversion coefficient, and egg production on the rest of the treatments during the period study. There were no statistically significant differences for the effect of substitution fishmeal 2 (*Silurus glanis* meal) (T4 and T5) compared to control treatment in most of the studied productivity traits. We conclude that the *Liza abu* meal or *Silurus glanis* meal can be replaced as an alternative to animal concentrated protein in Japanese quail rations during the first three months of egg production period.

Keywords: Fishmeal, Substitution, Quail layers, Production traits.

مقارنة احلال نوعين من مسحوق السمك المحلي كمصدر بروتيني محل البروتين الحيواني في علائق السمان الياباني في الصفات الانتاجية

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الخلاصة

استهدف البحث مقارنة نوعين من مسحوق السمك (مسحوق سمك الخشني و مسحوق سمك الجري) كمصدر للبروتين في العليقة وأثره في الأداء الإنتاجي لطيور السمان الياباني (*Coturnix coturnix japonica*) خلال الاشهر الثلاثة الاولى من انتاج البيض. تم احلال نوعين من مسحوق السمك المحلي محل 50 و 100% من نسبة المركز البروتيني الحيواني في العلائق. تم توزيع 150 طير من إناث السلوى الياباني على خمسة معاملات تغذوية (30 طير/ معاملة) وكل معاملة إلى ثلاث مكررات (10 طيور/ مكرر) ، ودرست الصفات الإنتاجية والتي شملت وزن الجسم الحي الأسبوعي والزيادة الوزنية واستهلاك العلف ومعامل التحويل الغذائي وإنتاج البيض ووزن البيضة. وقد بينت النتائج ان معاملتي احلال مسحوق السمك المحلي 1 (مسحوق سمك الخشني) وهما المعاملتان T2 و T3 قد تفوقتا معنويا ($P<0.05$) في وزن الجسم الحي الأسبوعي والزيادة الوزنية واستهلاك العلف ومعامل التحويل الغذائي وإنتاج البيض على بقية المعاملات خلال مدة الدراسة ، ولم تظهر فروق معنوية احصائيا لتأثير احلال مسحوق السمك 2 (مسحوق سمك الجري) مقارنة بمعاملة السيطرة في معظم الصفات الانتاجية المدروسة . نستنتج امكانية احلال مسحوق سمك الخشني او الجري كبديل عن المركز البروتيني الحيواني في علائق السمان الياباني خلال الأشهر الثلاثة الأولى من إنتاج البيض.

الكلمات المفتاحية: مسحوق السمك ، احلال ، اناث السمان الياباني ، الصفات الانتاجية.

1. INTRODUCTION

Fish meal is a good source of protein and amino acids, especially Methionine and Lysine. It is also a good source of mineral salts, especially calcium, phosphorus, manganese and iodine. Fishmeal is also a good source of fat, vitamins B12, Riboflavin, Niacin and choline. Fishmeal contains a high protein content of 60-70% and contains about 5% fat. This indicates that these powders are high in quality and if the protein content is

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less than that, this indicates that the fishmeal such as internal viscera, heads and fins as well as parts excluded from fish during the manufacture process, conservation and fish packing for using in human nutrition. The percentage of food components of fishmeal varies depending on the type of fish used and the area in which they are located and season (Pike, 1975; Liu, 2000; FIN, 2001; Dale, 2001), meal of fishmeal provides several of fatty acids which are essential for the growth and production of poultry bird of various kinds, especially long-unsaturated fatty acids (Maurice et al., 1994; Lee et al., 2004). It prefers to use fishmeal for plant protein because plant protein sources contain limited amounts of amino acids, especially Lysine, methionine and Cysteine. For example, soybean meal is a good source of amino acid (Lysine) but low in sulfur amino acids (FIN, 2001and 2004; Abiola, 2004 and 2009). The current study aims at comparing two types of fish powder (*Liza abu* meal or *Silurus glanis* meal) as a source of protein in the diet and its impact on the productive performance of Japanese quail (*Coturnix coturnix japonica*) during the first three months of egg production.

2. MATERIALS AND METHODS

Bird Preparation: The study was conducted in commercial farm in Baghdad city from 18/7 to 5/12/2015 using a flock of Japanese quail birds brought from the commercial market with one day age, it was reared in cages until reaching the age of sexual maturity at the age of 43 days where the male was isolated and female only, A 150 quail layers birds were randomly assigned to five feeding treatments (30 birds / treatments) and each treatment was repeated to three replicates (10 birds / replicates). The birds were reared in a cage and the dimensions of the cage were 1.5 m.

Local fishmeal: Two types of local fishmeal available in the market were prepared. The first type was prepared from *Liza abu* fish. These fish were taken and dried in the electric oven, then grinded and dried. The second type of fish powder is a local catfish (*Silurus glanis*) and also collected amounts of it and dried with electric furnace and then grinding. The two types of fishmeal were chemically analyzed to estimate their content of nutrients as shown in Table (1).

Feeding: Tables (1) shows the rations used in feeding birds. In the growth stage, the initiator feed was used which It consisted of 22.2% protein and 2622 kcal Representative energy per kg feed and continued to be provided to the birds until reaching the stage before sexual maturity (NRC, 1994). Feeding and water were freely provided (*Ad libitum*), as reported by Al-Obaidi and Al-Shadeedi (2011).

The studied traits: Quail birds were weighed at the end of every two weeks from the beginning of the experiment until the end of the experiment. The weight was calculated using a sensitive balance. The weight gain of the birds was calculated by recording the amount of feed consumed at the end of the week and subtracting it from the total quantity provided at the beginning of the week for the extraction of daily feed consumption per fowl (gram / bird / day) and then extracted the conversion efficiency necessary to produce one kilogram of eggs (Jubouri, 2005).

Egg production and egg weight: Eggs were collected several times a day. Eggs were weighed individually with a sensitive balance reading to the nearest two decimal digits of grams and taking the weight of ten eggs of each repeater. The total weight of eggs produced per month was calculated.

Statistical analysis: The data were analyzed according to Complete Randomized Design. The differences between the treatments were analyzed using the Duncan test (1955) and using the prepared statistical program (SAS, 2001).

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Table 1: Chemical analysis of two types of local fishmeal.

Nutrient elements	Fishmeal 1	Fishmeal 2
Dry matter	97.2	97.5
Protein	49.6	40.8
Fat	15.8	15.1
Ash	22.0	28.5
Carbohydrates	9.8	9.1
Calcium	3.2	3.5
Phosphorus	1.81	1.84

Table 2: The initiator and production ration components for Japanese quail birds used in the experiment.

Feed materials				Production ration		
	Initiator ration	**1**	**2**	**3**	**4**	**5**
Yellow corn	31.8	32.05	32.05	32.05	32.05	32.05
Wheat	25	25	25	25	25	25
Soybeans meal	26	25	25	25	25	25
Proteins Concentration*	10	5	2.5	-	2.5	-
Fishmeal 1	-	-	2.5	5	-	-
Fishmeal 2	-	-	-	-	2.5	5
Limestone	0.25	5.5	5.5	5.5	5.5	5.5
Food salt	0.25	0.25	0.25	0.25	0.25	0.25
Soybeans oil	-	1.5	1.5	1.5	1.5	1.5
The calculated chemical analysis**						
Protein (%)	22.70	20.21	20.21	20.21	20.21	20.21
Metabolic energy (kCal / kg)	2950	2945	2945	2945	2945	2945
Lysine (%)	1.31	0.95	0.95	0.95	0.95	0.95
Methionine (%)	0.50	0.55	0.55	0.55	0.55	0.55
Methionine + Cysteine (%)	0.68	0.56	0.56	0.56	0.56	0.56
Calcium (%)	0.81	2.49	2.49	2.49	2.49	2.49
Phosphorus availability (%)	0.43	0.33	0.33	0.33	0.33	0.33

* Protein center containing 44% protein, 2800 kcal, 12% fat, 25% ash, calcium, 2.9% phosphorus, 1.75% methionine, 2.55% methionine + Cysteine, 2.8% Lysine. **(NRC, 1994).

3. RESULTS AND DISCUSSION

Table (3) shows that there is no significant difference between the five nutritional factors in live body weight after one month of the experiment. However, the progressing to the second month led to a significant increase (P <0.05) for the second and third treatments (2.5, 5.0% *Liza abu* meal) on the rest of nutritional treatments, Where the two treatments recorded (207.7, 209.1 g) followed by the fourth and fifth treatments (2.5, 5.0% of *Silurus glanis* meal) by recording an average of live body weight of (206.3, 205.5 g), respectively and without significant difference from the first treatment (control treatment), which recorded 205.8 g. Statistical analysis indicated that the second and third treatments were significantly excelled in the averages body weight for the three months of the experiment which recorded

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an average of body weight (201.8, 202.6 g) respectively. The differences between the first, fourth and fifth treatments were not significant in the general average of body weight by giving it an averages (199.2, 199.3, 199.0 g), respectively. Table (4) shows that there is no significant effect of adding two types of local fishmeal as a protein source in the feed consumption ratio of Japanese quail birds after one month of feeding. As the experiment age was increased to 2 months, significant differences ($P < 0.05$) were observed in the average of feed consumption, The second and third treatments recorded the highest values, reaching (643, 640 g) respectively, followed by the fourth and fifth treatments which recorded an averages (630, 631 g), with no significant difference from the first treatment which gave (631 g) respectively, with no difference between them. The second and third treatments were significantly excelled on the rest of the nutritional treatments ($P < 0.05$) in monthly feed consumption until the end of the third month of the Japanese quail. The rest nutritional factors did not differ significantly from the control treatment, The analysis showed that the second and third treatments were significantly excelled in the total feed consumption during the experiment period by recording it (638, 634 g / feed / month) respectively. There was no significant difference between the first, fourth and fifth treatments in the overall average weight of the living body which recorded of (628, 627, 628 g / bird / month), respectively. Table (5) shows that there is a significant effect of adding two types of local fishmeal as a protein source in the average of conversion efficiency of Japanese quail eggs during the first three months of egg production. The second and third treatments were significantly excelled on the rest treatments during the three months of the study, followed by the fourth and fifth treatments. The differences were not significant between them, while the first treatment recorded the lowest conversion efficiency for this traits. The statistical analysis showed that the second and third treatments were significantly excelled in the general average of conversion efficiency during the experiment period followed by the fourth and fifth treatments in the general average and the first treatment which recorded the lowest general average of conversion efficiency. The effect of adding two types of local fishmeal as a protein source to the ration in the percentage of egg production of Japanese quail eggs during the first three months of egg production as shown in Table (6). The second treatment has significantly excelled on the rest of the nutritional treatments during the first month of the study, which recorded 77.1%. The differences were not significant between the rest of the treatments and the control treatment (the first treatment). When the age of the experiment increased during the second and third months of the experiment, the second and third treatments has significantly excelled on the rest of the nutritional treatments which did not differentiate between them and the first treatment significantly in this trait. The statistical analysis showed that the second and third treatments were significantly excelled in the general averages of egg production during the experiment period which recorded an averages of (89.2, 88.7%), respectively, and the differences were not significant between the first, fourth and fifth treatments in the general average of this trait, The averages were 83.8, 83.8 and 81.9%, respectively. Table (7) shows the effect of adding two types of local fishmeal as a protein source in the average weight of egg for Japanese quail eggs during the first three months of egg production (g). There were no statistically significant differences in the effect of nutrition factors on egg weight during the three months of egg production or in the general weight of the egg during the three months of egg production, Although there was an increase in egg weight produced with age and all nutrition factors. Fishmeal is one of the most important sources of

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animal protein used in poultry birds rations for many decades (Dale, 2001). The percentage of protein in fishmeal varies depending on the type of fish and the method of preparation. The protein content ranges from 60 to 64%. Fishmeal is also characterized by high nutrition value of protein, easy digestion and absorption, high amino acid lysine, as well as high content of Representative energy, The percentage of protein in fish meal that has a high concentration of bones and fins due to the use of meat steaks is reduced for human consumption, As is the case with the use of the remnants of Catfish, the remainder is large head size and skin and residues meat and calcium-rich and phosphorus-rich bones. In general, the proportion of protein in these residues is about 53% (Zaviezo and Dale, 1994). Therefore, adding it contributes to improving the productive performance of poultry birds in general and Laying Hens in particular. Therefore, the results of this study are consistent with the results of previous studies that the fishmeal or fish meal contribute to increase the production of eggs and overall productivity performance. The improvement in production performance is proportional to the percentage of protein in the fish meal that was in favor of the powder 1, which is *Liza abu* meal, which is high in protein content (49%), as shown in Table (1).

Table 3: The effect of adding two types of local fishmeal as a protein source in the ration on the average weight of live body for the Japanese quail during the first three months of egg production.

	Treatments				
	T1	**T2**	**T3**	**T4**	**T5**
First month	180.7 a	180.4 a	181.2 a	180.2 a	180.2 a
Second month	205.8 b	207.7 a	209.1 a	206.3 b	205.5 b
Third month	211.0 b	217.2 a	217.6 a	211.5 b	210.8 b
Average	199.2 b	201.8 a	202.6 a	199.3 b	199.0 b

* The different characters in each row indicate significant differences between the average of the treatments at ($p < 0.05$), (T1) control, (T2) 50% *Liza abu* meal, (T3) 100% *Liza abu* meal, (T4) 50% *Silurus glanis* meal, (T5) 100% *Silurus glanis* meal.

Table 4: The effect of adding two types of local fishmeal as a protein source in the ration on the average feed consumption body for the Japanese quail during the first three months of egg production.

	Treatments				
	T1	**T2**	**T3**	**T4**	**T5**
First month	620 a	622 a	621 a	620 a	620 a
Second month	631 b	643 a	640 a	630 b	631 b
Third month	633 b	648 a	641 a	631 b	632 b
Average	628 b	638 a	634 a	627 b	628 b

* The different characters in each row indicate significant differences between the average of the treatments at ($p < 0.05$), (T1) control, (T2) 50% *Liza abu* meal, (T3) 100% *Liza abu* meal, (T4) 50% *Silurus glanis* meal, (T5) 100% *Silurus glanis* meal.

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Table 5: The effect of adding two types of local fishmeal as a protein source in the ration on the average feeding conversion efficiency for the Japanese quail during the first three months of egg production.

	Treatments				
	T1	**T2**	**T3**	**T4**	**T5**
First month	2.1a	1.9c	1.9c	2.0b	2.0b
Second month	2.2a	2.0c	2.0c	2.1b	2.1b
Third month	2.2a	2.0c	2.0c	2.1b	2.1b
Average	2.2a	2.0c	2.0c	2.1b	2.1b

* The different characters in each row indicate significant differences between the average of the treatments at (p <0.05), (T1) control, (T2) 50% *Liza abu* meal, (T3) 100% *Liza abu* meal, (T4) 50% *Silurus glanis* meal, (T5) 100% *Silurus glanis* meal.

Table 6: The effect of adding two types of local fishmeal as a protein source in the ration on the average Percentage of egg production for the Japanese quail during the first three months of egg production.

	Treatments				
	T1	**T2**	**T3**	**T4**	**T5**
First month	75.3 b	77.1 a	75.9 b	76.0 b	75.7 b
Second month	88.4 b	94.6 a	95.1 a	88.5 b	84.8 b
Third month	87.7 b	95.8 a	95.0 a	86.9 b	85.1 b
Average	83.8 b	89.2 a	88.7 a	83.8 b	81.9 b

* The different characters in each row indicate significant differences between the average of the treatments at (p <0.05), (T1) control, (T2) 50% *Liza abu* meal, (T3) 100% *Liza abu* meal, (T4) 50% *Silurus glanis* meal, (T5) 100% *Silurus glanis* meal.

Table 7: The effect of adding two types of local fishmeal as a protein source in the ration on the Average egg weight for the Japanese quail during the first three months of egg production.

	Treatments				
	T1	**T2**	**T3**	**T4**	**T5**
First month	9.6	9.6	9.5	9.6	9.5
Second month	10.4	10.6	10.5	10.5	10.4
Third month	10.7	10.9	10.7	10.8	10.6
Average	10.2	10.4	10.2	10.3	10.2

* The different characters in each row indicate significant differences between the average of the treatments at (p <0.05), (T1) control, (T2) 50% *Liza abu* meal, (T3) 100% *Liza abu* meal, (T4) 50% *Silurus glanis* meal, (T5) 100% *Silurus glanis* meal.

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