COMPARISON OF DIFFERENT TYPES OF PROTEIN CONCENTRATES IN FEMALE JAPANESE QUAIL DIETS AND STUDY THEIR EFFECT ON PRODUCTION AND SENSORY CHARACTERISTICS

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ABSTRACT

This study aims to manufacture protein concentrates from the hydrolysates protein of poultry feathers and camel hair and comparing the effect of using these protein concentrates on some productive characteristics. The studied traits included the percentage of egg production, feed consumption, egg weight, egg mass, feed conversion efficiency, and total mortality. As well as the sensory characteristics of meat (colour, tenderness, juiciness, flavour and general acceptance). A total of 90 quail females aged 36 weeks were randomly assigned to three treatments (3 replicates for each treatment). The birds fed the following experimental diets: The first treatment (control diet containing 5% commercial protein concentrates). The second treatment (a diet containing hydrolysates protein manufacture from the feather of 5%). The third treatment (a diet containing hydrolysates protein manufacture of camel hair by 5%). The results showed significant differences ($P \leq 0.05$) in the percentage of egg production, egg mass, and feed conversion efficiency. Except for feed consumption, weight of eggs and total mortality rate, the differences were not significant. As for the sensory qualities, the quail meat samples treated with the protein concentrates made of feathers and camel hair have a higher degree of flavour compared to the control treatment. Differences did not appear in the degree of general acceptance of the meat product of birds in various treatment. It can be concluded that the addition of protein hydrolysates from poultry feathers and camel hair to the diets of Japanese quail by 5% improve the productive performance of this bird and most meat qualities.

INTRODUCTION

Japanese quail is the one of avian give rise to zoological farmed and has been used as a source of animal protein recently[1]. Protein is an important determinant of bird growth, especially in the first few weeks of life. Since protein sources are the most expensive compared to energy sources and other components of the diet, The goal of any breeder is to reduce the total cost of producing birds as forage ingredients account for more than 70% of the total cost. It necessary to reduce the cost of feed through the use of substitutes for imported protein concentrates [4]. Thousands of tons of waste from poultry and other animals, especially feathers, are dumped annually [8]. In recent years, the poultry industry has relied on the manufacture of poultry waste, especially feathers and feed poultry, but the problem facing the use of this waste in animal diets is the difficulty of digesting [14]. Keratin is the main protein of feathers or camel hair. It is known as a hydrophobic protein. It contains 56 hydrophobic amino acids out of 95, and the main amino acid is serine [11]. Keratin contains a percentage of praline, cysteine and a little lysine. The chemical inactivity of keratin is due to the presence of strong bilateral sulphur bonds, which must be destroyed by alkaline or acidic compounds [10] A protein concentrates made of feathers is a good source of protein and can be used to replace large parts of other protein sources in poultry feed [7].For this reason, researchers have used chemical methods using hydrochloric acid or sodium hydroxide to break down sulphur and transverse bonds to make digestible peptides easier and can be utilized. Senkoylu, [19] noted that the improvement of the production performance of laying hens fed diets using the protein concentrates made of bird feathers. This is confirmed by [12]. The use of protein concentrates made of feathers by (3 and 6)% in the laying hens diet resulted in a significant increase in egg production, a significant improvement in feed conversion ratio and a significant decrease in feed intake as compared to the group of birds fed a standard diet. The objective of this study is to find out the possibility of benefiting from poultry feathers and camel hair as sources of low-cost nutritional protein to support poultry diets and alternative to a known expensive protein concentrates as well as reduce the chances of environmental pollution due to the discharge of these waste in large quantities.

MATERIALS AND METHODS

This study was carried out in the field of (Japanese quail) that belong to the Department of Animal Production / Agriculture College/ University of Basra, for the period from 15/03/2019

until 15/05/2019. A total of (90) birds of (36) weeks aged females Japanese quail, they were randomly assigned into three experimental treatments by 30 birds for each treatment (each treatment three replicates of 10 birds each). Birds were housed in cages. Cages dimension was (71 * 71 * 50 cm). Feeding groups included the first treatment (control) birds fed with commercial protein (5%). The second group fed with 5% protein extracted from poultry feathers. The third group fed with 5% protein extracted from camel hair. Lighting was given 16 hours a day.

Preparation of protein decomposition of feathers and camel hair

Dirt and dust were removed from feathers and camel hair and washed with distilled water and dried with air, the protein hydrolysates were prepared for each according to the method described by [15]. The feather and camel hair powder were moistened with distilled water and placed in the autoclave individually at a temperature of 135 C° under a pressure of 35 lb for 60 minutes.

Chemical analysis of protein decomposition

Chemical analysis of protein decomposition samples was carried out in the laboratories of the Faculty of Marine Sciences. The analysis included protein, fat, fibber, ash, dissolved carbohydrates, and moisture as stated by Analytical Official Association of Chemists [2]. The estimated energy represented (kcal/kg) in protein decomposition was determined according to the equation of [9] cited by [17]. Yield product: The percentage of all protein concentrates extracted was calculated according to the following equation:

Yield product = (dried product weight) × 100 / (sample weight).

Sensory evaluation

At the end of the experiment (60 days), the birds were slaughtered manually. The method described by [13]. Using the grilling method of Price and schweight [18]. According to the scale of seven degrees as follows: (1-2= is acceptable, 3-4= Acceptable, 5= Average, 6=good, 7= very good). By ten (10) randomly selected experienced panellists in the Department of Animal Production College of Agriculture University of Basrah to assess the sensory qualities that included (colour, tenderness, juiciness, flavour, general acceptance).

Table (1): Composition of imported protein concentration, feather and Camel hair meal

IPC= Imported protein concentration; FM= feather meal; CHM Camel hair meal.

Diet	Dry matter (%)	ME (kcal/kg)	CP (%)	Fat (%)	Crude Fibbers (%)	Ash (%)	Yield (%)
IPC	94	2800	49	12	10	8	-
FM	96.2	2375	85.15	5.80	4.85	4.20	17.9
CHM	97.4	2240	90.20	3.60	3.30	2.90	17.8

Table (2): Compositions and chemical analysis of the diet used in the experiment

Ingredients	Control Diet 1	Diet 2	Diet 3
Yellow corn	43.2	43.2	43.2
Wheat	22	22	22
Wheat bran	3	3	3
Imported Protein concentrated (IPC)	5	0	0
Feather meal (FM)	0	5	0
Camel hair meal (CHM)	0	0	5
Soybean meal	20.5	20.5	20.5
Limestone	5.5	5.5	5.5
Oil plant	0.5	0.5	0.5
Iodide salt	0.3	0.3	0.3
Total	100	100	100
Metabolic energy (kcal/kg)	2910	2888.75	2882
Protein (%)	19.2	21.01	21.26
Crude Fibbers (%)	2.50	2.24	2.17
Ash (%)	6.06	5.87	5.81
Methionine	0.4456	0.3724	0.3522
Lysine	1.211	1.352	1.021
Methionine + cysteine	0.766	0.728	0.742
Calcium (%)	2.5	2.5	2.5
Phosphorus (%)	0.4228	0.4062	0.3956

Calculated nutrient levels in diets

Data collection

Egg production was recorded daily and feed consumption, egg mass, and egg weight were recorded at two weekly intervals. Feed conversion ratio (FCR) was calculated by determining the amount of feed consumed per one kg of egg.

Statistical analysis

The data from the experiment were analysed by using the Complete Randomized Design (CRD) were executed to a one-way ANOVA within the statistical program SPSS as the following model:

$y_{ij} = M + T_i + e_{ij}$

Where y_{ij}= the value of each trait.

M=the common mean

T_i= the effect of i the nutritional treatment (i=3)

e_{ij}= the experimental error

Mean were compared by Lest Significant Difference Test at ($P \leq 0.05$).

RESULTS

Egg production, feed conversion ratio, egg mass were significantly ($p \leq 0.05$) affected by treatments (Table 3). Egg production of the FM and CHM treatments groups was superior highest than the control group: 85.92, 87.66 vs. 82.29 %, respectively. The feed conversion ratio of the control treatment was the highest and lowest in FM and CHM treatments groups: 2.98 vs. 2.82, 2.76 g/g respectively. Egg mass was significantly ($P \leq 0.05$) highest highest in the transactions that were fed on the diet with FM and CHM as compared with the control group: 641.29, 652.22 vs. 609.18 g, respectively. There were no statistically significant differences between control and other treatment in feed consumption, percentage of mortality and egg weight.

The results of sensory testing are as shown in Figure 1. Colour, tenderness, juiciness, and general acceptance there were not significantly different from those of other treatments.Flavor in the, FM and CHM treatments were significantly ($p \leq 0.05$) Improved than of the Control.

Table (3). Effects of feather meal and camel hair meal and imported protein concentration on quail performance (36 to 45 wk. of age).

diet	HDP (%)	FC (g/hen/60day)	EW (g)	EM (g/hen per60 d)	FCR (g of feed/g of egg)	Mortilaty (%)
IPC	82.29[b]	1812.73	12.34	609.18[b]	2.98[b]	0.067
FM	85.92[a]	1809.33	12.44	641.29[a]	2.82[a]	0.033
CHM	87.66[a]	١٧٩٩.6٧	12.40	652.22[a]	2.7٦[a]	0.067
SEM	0.852	6.63٣	0.043	7.381	0.038	0.018
P	0.003	0.763	0.673	0.013	0.023	0.729

IPC= Imported protein concentration; FM= feather meal; CHM= Camel hair meal; HDP = hen day production; EW = egg weight; FC = feed consumption (g/60 day); FCR = feed conversion ratio (g feed consumed per g of eggs produced); EM = egg mas (g/hen per60 day); SEM = standard error of means; a,b,c means in the same column having d-ifferent superscripts are significantly different ($P \leq 0.05$)

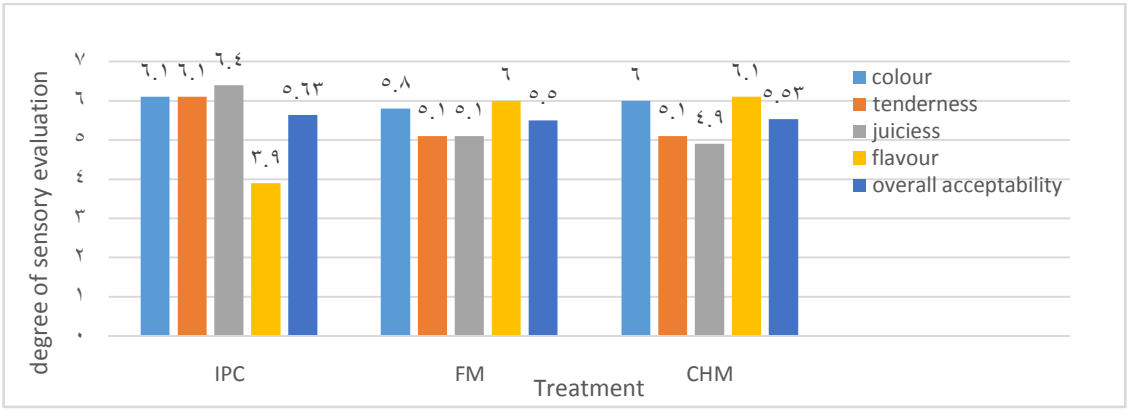

Figure 1. Effects of feather meal and camel hair meal and imported protein concentration on Sensory evaluation of quail meat.

IPC= Imported protein concentration; FM= Feather meal; CHM= Camel hair meal

DISCUSSION

Significant improvement in egg production, egg mass and feed conversion ratio in treatments use feather and camel hair hydrolysate in bird diets can be attributed to the high crude protein content in these diets leading to the development of the reproductive system. The conversion of keratin in feathers and camel hair hydrolysate makes it useful for feeding poultry. Exposing feather and camel hair to steam temperatures, pressure, or chemical treatments leads to denaturation of the protein and the breakage of the peptide chains into a form that digestive enzymes can act on [6] . This is confirmed by Appleby et al. [5], their changes in keratin form under the influence of heat, which facilitate the work of digestive enzymes and thus improves their nutritional qualities, which reflected in digestibility improvement. The majority of essential amino acids, particularly lysine and methionine, these acids are available with a balance [7] Abd El-Maksoud et al. [3] confirmed the significant effect of different crude protein levels on layer performance, where egg mass and egg production increased with increasing protein levels for laying hen diets. Besides, Mousav et al. [16] observed a linear increase in hen-day egg production with an increase in crude protein. A similar finding was reported by [20]. this proved that feather meal does not have any effect on mortality of chicks.

The flavour of the quail meat used in the experiment was more desirable when using the protein hydrolysate of feathers and camel hair was very good while the use of commercial protein obtained a medium degree and the reason is that the commercial protein contains fish powder in its composition, which affected the flavour of the meat.

CONCLUSIONS

The findings of this study suggested that the use of 5% feather or camel hair in the diet of female Japanese quails are recommended for laying period.

مقارنة أنواع مختلفة من المركزات البروتينية في علائق اناث السمان الياباني ودراسة تأثيرها في بعض الصفات الإنتاجية والحسية

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الخلاصة

تهدف هذه الدراسة الى تصنيع المركزات البروتينية من المتحلل البروتيني لريش الدواجن ووبر الجمال، ومقارنة تأثير استخدام هذه المركزات البروتينية في علائق طيور السمان على بعض الصفات الإنتاجية التي تتمثل بنسبة انتاج البيض والعلف المستهلك ووزن البيض وكتلة البيض وكفاءة التحويل الغذائي والصفات الحسية للحم تتمثل باللون والطراوة و العصيرية والنكهة والقبول العام واستخدم في الدراسة ٩٠ من اناث السمان بعمر ٣٦ اسبوعاً وزعت عشوائياً على ثلاثة معاملات بواقع ثلاثة مكررات لكل مكرر ١٠ طيور غذيت الطيور بالمعاملات التجريبية التالية: المعاملة الأولى (عليقة سيطرة تحتوي على المركز البروتيني التجاري بواقع ٥%)، المعاملة الثانية (عليقة تحتوي على المتحلل البروتيني المصنع من الريش بواقع ٥%)، المعاملة الثالثة (علقة تحتوي على المتحلل البروتيني المصنع من الوبر بواقع ٥%). أشارت نتائج التحليل الاحصائي الى وجود فروق معنوية ($P<0.05$) في نسبة انتاج البيض وكتلة البيض ومعدل ومعامل التحويل الغذائي اما استهلاك العلف وزن البيض المنتج ونسبة الهلاكات الكلية فلم تكن الاختلافات معنوية اما بالنسبة للصفات الحسية فقد حصلت عينات لحم السمان المعاملة بالمركز البروتيني المصنع من الريش والوبر درجة اعلى في صفة النكهة مقارنة بمعاملة السيطرة ولم تظهر اختلافات في درجة القبول العام للحم المنتج من الطيور في المعاملات المختلفة. يمكن الاستنتاج بان إضافة المتحللات البروتينية المصنعة من ريش الدواجن ووبر الجمال الى علائق الإنتاج لطائر السمان الياباني بنسبة ٥% تعمل على تحسين الأداء الإنتاجي لهذا الطائر في معظم الصفات.

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