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Effect of dietary protein level on the performance and carcass characteristics of Japanese quail reared in Sudan

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Abstract

The current study was conducted to determine the optimum level of dietary protein for the best performance and carcass characteristics of Japanese quail from (3-6 wks). Two hundred and forty (240) unsexed dark brownish colored Japanese quails were used in this experiment. Treatments consisted of 3 isocaloric diets (2900 kcal/kg) metabolizable energy (ME) contained different levels of crude protein (CP) 22, 24 and 26%. Quails were randomly divided into 3 experimental groups and each group was then subdivided into 4 replicates of 20 quails each. Feed intake (FI), feed conversion ratio (FCR) and body weight gain (BWG) were recorded weekly. The results showed that, the group fed on 26% protein had the significant ($P < 0.05$) highest BWG and lowest FCR in the period 3 - 6 wks, but FI was not significantly different between groups. On the contrary, the quail's performance parameters in the period from 3-8 wks was not affected by the dietary protein level. There were no significant differences ($P < 0.05$) observed in breast, drum stick, legs and wings as percentage of live body weight. From these results it can be suggested that, the diet at 26% CP could be recommended for Japanese quail during the period 3- 6 wks to obtain the best performance. The carried out sensory test showed that quails are more delicious than chicken.

Keywords: period, diet, growth, meat

Introduction

The production of quails is becoming worldwide one of the promising investments. The countries: France, Spain, Italy, China and the USA are the largest quail producers. In the Sudan, the high cost of poultry feed ingredients and the scarcity of foreign currency for importation of other poultry production inputs increase the prices of chicken and eggs. Due to this factor and others the Sudanese government is now thinking of production of other poultry species as alternatives for chicken. Thus it encourages production of quails given some of its economic advantages such as smaller costs, less area and requirements needed, fast growth cycle and returns, etc. The intensive quail production in Sudan was unknown until the year 2013, although, quail birds were already owned by some people as hobby or

ornamental birds. Today, the quail meat is more widely known and more popular, but still quail meat is quite far from being a regularly consumed product in the Sudan. It is better seen and regarded as an exquisite food, a delicacy, something for special occasions or gourmet food items. Rogério (2009) reported that, in the poultry world, quail meat production is negligible when compared to broilers, yet quail meat is an interesting niche business.

In the late 1950's, the potential usefulness of Japanese quail, as a research animal, began to be recognized (Rogério, 2009). This study represents one of the first researches on quail production in the Sudan. The nutritional requirement for Japanese quail and mainly protein were obtained by many researcher worldwide, however, these might be not applicable under Sudan environmental and nutritional conditions. Thus it becomes necessary to find out more precise nutrients requirement, as protein, for quail production in the Sudan, with regards to the international results obtained.

Hyankova *et al.* (1997) reported that Japanese quails fed 26 and 21.6% crude protein (CP) had good performance from 1 to 21 and from 22 to 35 days of age, respectively. Thus, protein requirement decreased with age. Masada *et al* (2009) examined the effect of nine diets containing three levels of metabolizable energy (ME) (11.0, 11.72 and 12.55 MJ/kg) and three levels of CP (21, 24 and 27 %) by each of the energy levels, on quail growth performance (O- 6 wks of age). They found a linear increase in body weight gain (BWG) with increased CP levels. Seyed *et al.* (2011) provided quails with isocaloric (2900 kcal/kg) diets with three levels of CP 21, 24 and 27% from 0 to 45 days of age. The results displayed that, effects of different ratios of ME:CP on feed intake (FI), BWG and feed coversion ratio (FCR) during the period 0 to 45 days showed significant difference ($P < 0.05$). Significant differences were found in the percent of breast, legs and back bone ($P < 0.05$). The researcher suggested use of diets at 107 ME:CP (for starter diets) and 120 ME:CP (for finisher diets) in Japanese quail diet for best performance. Mohammed *et al.* (2011) evaluated the effect of feeding diets containing different levels of protein on performance parameters and carcass yields of Japanese quails. Their results showed that, body weight, daily BWG and FCR improved ($P<0.05$) for birds fed medium CP (22% from 21-42 days of age) and high CP (24% from 0-45 days of age) compared with birds fed low CP diet (22% from 0-45 days of age) and the effect of CP levels on the carcass yields of quails was not statistically significant ($P>0.05$). Hyankova *et al.* (1997) used two diet treatments (260 and 216 g/kg or 238 and 195 g/kg of CP in the starter and grower diets, respectively for Japanese quails. They found that, the positive effect of the high CP diet on body weight was significant only for the first 4 weeks after hatching and a higher FI and less efficient FCR were found for quails fed on the high CP diet in the period from 15 to 28 d of age. They, also, found that fattening traits such as body weight, cumulative FI and FCR, were not affected by dietary CP content at the age of 5 weeks.

Four CP levels (20, 22, 24 and 26%) were evaluated for Japanese quails and it was concluded that after lysine and methionine + cystine requirements were met, 20% CP level resulted in the best performance from 1 to 42 days of age (Murakami *et al.* 1993a). Although, level of 24% of CP was recommended by the National Research Council (NRC,1994) for quail in the rearing periods.

The objective of this research was to assess CP requirements of Japanese quails during the growing period under Sudan conditions.

Materials and Methods

This experiment was conducted at the Poultry Farm of the Animal Production Research Center (APRC) on 27/01 and continued until 28/02/2014 in floor cages (1 m^2 each) inside an open sided poultry house. A number of 240 and 21 day old Japanese quails with one color (dark brown) donated by Khair Elsman company were used. Birds were distributed randomly using complete randomized design into 3 equal groups replicated 4 times with 20 birds per replicate per cage (3 × 4 × 20) and allocated to the experimental diets. No vaccination program was applied. The experimental house and equipments were carefully cleaned and disinfected prior to the arrival of birds. A deep litter 5 cm depth form wood shavings was used. Birds of each group were weighed at the beginning of the experiment and exchanged until the average initial weights of the groups were similar.

Experimental rations

Treatments of this experiment consisted of 3 levels of CP: (A) low protein diet (20% CP), (B) sufficient protein diet (24% CP) and (C) high protein diet (26% CP). These diets were isocaloric (2900 kcal/kg, ME) balanced to meet the nutrients requirement of Japanese quails during the growing period (21-45 day old) as recommended by the National Research Council (NRC, 1994). The period was then extended up to 60 day old. Feed and water were offered *ad libitum*. FI, BWG and FCR were recorded weekly. Mortality was monitored daily and recorded whenever occurred. Drinking water was daily changed, the passages sprayed with water in periods of high temperature. Cages were shut down from all sides with wire net specially the upper side, to avoid the flying of quail birds and the jumping between the different replicates or cages. The northern side of the house was partially covered with sackcloth in order to prevent the passage of the cold currents on the birds. An appropriate cardboard box, with openings, was used for weighing the birds.

Table 1: The experimental quail rations composition %

Raw material/ Treatment	A	B	C
Protein level	22% CP	24% CP	26% CP
Sorghum	64.5	61.3	57.0
Groundnut cake	23.0	29.0	34.2
Wheat bran	5.6	3.0	2.5
broiler concentrate 5%*	5	5	5
Lime stone	1.0	0.9	0.9
Salt	0.25	0.25	0.25
Dl methionine	0.2	0.1	0.1
Lysine	0.2	0.2	0.1
Zeatox (Antimycotoxine)	0.2	0.2	0.2
Total	100	100	100

Calculated nutrient composition

Protein %	22	24	26
ME, Kcal/ kg	2906	2919	2914
Calcium %	1.1	1.1	1.1
Phosphorus %	0.57	0.57	0.59
Lysine %	1.2	1.3	1.3
Methionine %	0.59	0.51	0.52

Broiler concentrate* (Intraco) =2300 Kcal/kg, 4% EE, 7% CF, 6% Ca, 4% Ph, 11% Lys and 3% Met. NRC 1994, recommendations for quail are; 2900 Kcal/kg, 24% CP, 0.8% Ca, 0.3% Ph,1.3% Lys and 0.50% Met.

Carcass characteristics determination

For the determination of carcass characteristics birds were slaughtered in two phases, at 45 and 60 days of age following the same procedure. A number of 2 quails from each treatment, about the group average body weight, were used. These birds were slaughtered by severing the jugular vein (Islamic method). After bleeding, birds were scalded, and then feathers, head, shanks and the internal viscera were manually removed. The eviscerated carcasses were weighed to determine the dressing out%. (Carcass weight/ live body weight x 100), chilled in iced and salted water, after that, kept in deep freezer under -18 C° at the APRC. The dissection was carried out for the cold carcass, whereby breast, thigh, drumstick and wings were carefully cut and weighed in a sensitive balance. Their proportions to live body weight were recorded.

Sensory Test of quail meat compared with broiler

This test was designed in order to assess consumer tasting quail compared with broilers. Commercial broilers 42 days old had been slaughtered at the same time of quails. Twelve quails whole carcasses (4 from each treatment) and meat of deboned breast from 2 chickens were used. Samples were first prepared at the Department of Meat Technology packaged with aluminum foil, then, put into an oven temperature of 250 ° C for an hour. The cooked samples were then placed in plastic dishes ready for eat. Fourteen persons were accompanied in this test. The test was designed by recording different degrees starting with 8 the highest acceptance (Excellent) up to 1 (unaccepted) to evaluate the samples under study for color, odor, tenderness and juiciness.

Statistical analysis

The results were statistically analyzed using one way analysis of variance. The significance of differences was determined using Duncan`s New Multiple Range Test (DNMRT) (Steel and Torrie, 1980) and Statistica (data analysis software system) version 7.0 software.

Results and discussion

Data collected was tabulated, statistically analyzed and recorded. The following tables carry the results followed by discussions.

Table 2: Feed intake, g /bird/week, mean±SD

Treatment/Week	4	5	6
A	148.75±7.1	142.24±8.3	191.02±11.4
B	151.75±16.0	144.38±4.3	204.69±6.4
C	140.94±12.3	139.06±3.9	199.69±6.4
LS	NS	NS	NS

Table 3: Live body weight gain, g/bird/week, mean ± SD

Treatment/Week	4	5	6
A	55.63±4.3[b]	41.92±3.9	44.96±0.9
B	59.25±3.1[b]	40.00±1.4	44.69±8.4
C	63.50±1.5[a]	39.69±3.3	46.88±5.4
LS	*	NS	NS

Table 4: FCR, g feed/g gain, mean±SD

Treatment/Week	4	5	6
A	2.69±0.3 [b]	3.41±0.3	4.25±0.2
B	2.56±0.3 [b]	3.61±0.2	4.75±1.2
C	2.22±0.2 [a]	3.52±0.3	4.29±0.4
LS	*	NS	NS

Table 5: Effect of protein level on quail performance (3-6 wks), mean ±SD

Parameter/ Treatment	FI g/bird	Initial BW g/bird	Final BW g/bird	BWG g/bird	FCR g feed/g gain
A	482.01±25.7	80±3.5	222.51±2.7[b]	142.51±2.7[b]	3.38±0.2[b]
B	500.81±21.5	80±4.1	223.44±3.7[b]	143.94±7.1[b]	3.48±0.2[b]
C	479.69±15.7	79±4.7	229.06±6.2[a]	150.06±6.2[a]	3.20±0.2[a]
LS	NS	NS	*	*	*

abc = Means with different superscript on the same row differ significantly ($p<0.05$). NS = Not Significant; SD = Standard deviation; LS = Level of Significance;

* = Significant at ($p<0.05$).

Table (2) shows that, FI was similar for all tested groups throughout the different experimental weeks from 3 – 8 wk. Table 3 and Table 4 show that, the quail group fed 26% CP gave the highest BWG and the best FCR compared to the other groups during the 4th. week of age, but no significant differences ($p \leq 0.05$) in BWG and FCR were observed during the other weeks (5, 6, 7 and 8). This result agrees with the findings of Hyankova *et al.* (1997) who, stated positive effect of a high CP diet on body weight being significant only for the first 4 weeks after hatching.

Table 5 shows the overall effect of protein level on the quail performance in the period from 21 to 42 days (3-6 Wk). The results show that quails fed 26% CP (112 ME: CP) gave significantly highest final BW, BWG and the best FCR ($p \leq 0.05$) compared to those fed 24 and 22% CP. On the contrary, the overall effect of protein level on quail performance in the period from 3 – 8 week (Table 6) was not significantly different ($p \leq 0.05$) between the experimental groups, which indicates that, the groups fed 22 and 24% protein (A and B) grow slower than those fed 26% protein (C) to reach the genetic maximum final body weight (market weight) of the Japanese quail (here 240-250 g). In spite of this, the group of high protein level 26% reached its final weight (243 g) at the 6th week of age, because of its high feed utilization i.e. low FCR (2.9 vers. 3.5 table 5).

It can be noted that, keeping quails targeted for meat production beyond 6 weeks of age increase feed consumption and cost of production. Birds, then, should be killed by the end of week 5. Results in Tables 3 and 4 show smaller BWG and higher FCR during the 7th and 8th week. Results indicate that quail genetically will not gain more weight after the 6 week of age. Quail birds are naturally not like hens, they start egg laying by 45 days of age and some start later until reaching the 8th week, when most of birds become sexually mature. As a result of that, dietary protein will be needed to meet protein requirements for egg production on the expense of growth. All of these factors and other unknown reasons may give another explanation of the general observed lower gain and high FCR within the group in the two last weeks of the experiments.

Although, the findings of this study recommend 26% CP for the growing or finishing period (3-6) which to some extend are higher than the values obtained in the reviewed literature. Several reports indicated that starter diets (0-3 wks) for quail should contain protein content of 24% this may become 20% at several weeks later (Shim and Vohra, 1984). Panda and Shrivastav (1978) indicated slightly higher dietary requirements of 27% protein for starting quail, a content that may be reduced to 24% after three weeks of age (Shrivastav *et al.* 1980). The recommended level is also higher than the levels of 24 and 20% of CP are recommended by NRC (1994) for quails in the rearing and production period respectively. As possible reasons for this difference could be, the amino acids content of the diets and the quail breed or the temperature degree.

Mohammed *et al.* (2011) showed that, body weight and daily BWG and FCR improved ($P<0.05$) for bird fed CP (24%) compared with birds fed low CP in diet (22%) from 0-45 days of age. The results also disagreed with Seyed *et al.* (2011) who suggested using diets at; 107 (27% CP) and 120 ME:CP (24% CP) for starter and finisher diets in Japanese quail to obtain the best performance. The results also disagreed with Hyankova *et al.* (1997) who reported that Japanese quails fed 21.6% CP had good performance from 22 to 35 days of age. The

results of this study displayed no significant difference in performance between group fed 22 and 24% protein in the period 3-6 wks of age (Table 5). The obtained results were also not in consistence with those of Murakami *et al.*, (1993a) who reported, 20% CP level balanced for lysine and methionine + cystine resulted in best performance compared to 22, 24 and 26 % from 1 to 42 days of age. The low protein diets well balanced with the essential amoino acids will give better performance. Hamid *et al.* (1997) did not find significant difference in broiler BWG and FCR by feeding 18, 22 and 25% protein diets balanced with all essential amoino acids and non essential amoino acids.

When the growing period was extended up to 8 weeks, there were no significant differences between the effect of the highest (26%) and the lowest (22%) protein level on quail meat attributes, thus, 22% CP level from an economic point of view is more recommended than 26 and 24% CP after the 6th week of age or during the laying period. This is in line with Hyankova *et al.* (1997) who showed that protein requirements decrease with age. Thus from this study results 22% protein level is recommended for quails older than 42 days (laying period). Mohammed *et al.* (2011) indicated that, the performance of quail fed 22% CP in the growing period (21-42 day old) was better compared to quails fed 22% CP in the starter and growing period (0-45 day old), which supports the recommendation of 22% CP level.

The disagreement with other authors in the recommended level of CP for (3-6 wks period) (26% versus 24% or less) could be attributed to nutritional and environmental reasons possibly together with the genetic variations of breeds reared.

Effect of the protein level on quail carcass characteristics

The data of the effect of protein level on quail carcass cuts as percentage of live body weight are presented in the following table 7.

Table 7: Effect of protein level on quail carcass cuts (45 days) mean± SD

Parameter/ Treatment	Dressing out %	Breast %	Thigh %	Legs %	Wings %
A	72±1.3	24±2.6	9±0.1	5±0.7	5±0.4
B	72±1.7	25±1.8	10±0.4	6±0.6	5±0.0
C	70±4.1	22±1.1	8±0.6	5±0.5	5±0.1
LS	NS	NS	NS	NS	NS

NS = Not Significant (p>0.05); SD =Standard deviation; LS = level of significance

Table (7) displays no significant differences ($p \leq 0.05$) on the dressing out %. The results showed that, the dressing out of the quail carcass, ranged between 70 and 72%, which is higher than that of chicken. The results showed no significant differences ($p \leq 0.05$) on the carcass cuts; breast, thigh, drumsticks or wings % of the corresponding live body weight among the different groups. These findings agreed with those of Mohammed *et*

al. (2011), that the effect of CP levels on the carcass yields of quail were not statistically significant (P>0.05), however, the obtained results are in contrast with those of Seyed *et al.* (2011) who recorded statistically significant differences in the percent of breast, legs and back bone (P< 0.05) when included 21, 24 and 27% CP from 0 to 45d of age. Kirkpinar and Oğuz (2007) fed Japanese quails with various dietary protein 160 to 300 g/kg for 5 weeks and found that the carcass weight, dry matter, protein, ether extract and ash were affected and the high dietary protein content decreased moisture and increased protein content of the quail carcass.

Sensory test of quail meat

The study results revealed that the taste parameter; color scored 6.3 : 6, flavor 5.4 : 4.5, tenderness 6.9 : 6.2 and juiciness 5.3 : 4.6 for quail meat versus broiler meat. Thus, the taste of quail meat was more accepted compared to broiler meat. Rogério (2009) demonstrated that, quail meat has good acceptance by the consumer, based on quite positive sensory perception. Surprisingly, they found even higher ratings (in their category "taste") for laying quails as well.

Conclusions

- A 26% CP diet is recommended for quail in the period 3-6 weeks.
- Quails can reach target weight of 240-250 g in 42 days, when, should be slaughtered or kept for egg production.
- Dietary protein levels had no effect on quail carcass characteristics.
- The taste of quail meat was more accepted than broiler meat.

Recommendations

- More in depth research in quail production and consumption is needed.
- More advertsment and propaganda on quail meat quality and merits for more consumption is also demanded.

References

Duncan DB (1955). Multiple range test and multiple F-tests. Biometrics, 11:1-42.

Hamid I.I. E. Niess and Pfeffer (1997). Influss der Versorgung von Masthaehnchen mit Rohprotein und Energie auf den Koerperzusammen-setzung. *Proceeding of the Society of Nutrition Physiology*, Band **6**: 23-24.

Hyankova L, Dedkova L, Knizetva H, Klecner D. (1997). Responses in growth, FI and food conversion efficiency to different dietary protein concentrations in meat-type lines of Japanese quail. *British Poultry Science*; **38**(5):564-570.

Kirkpinar, F. and İ. Oğuz (1995) Influence of various dietary protein levels on carcass composition in the male Japanese quail *(Coturnix coturnix japonica)*. *British Poultry Science*, **34**: 605-610. Published online: 12 Nov 2007

Larbier M., Leclercq B. (1995). Żywienie drobiu (Poultry feeding). Translation from English to Polish (B. Pastuszewska and S. Smulikowska, Eds). WN PWN, Warszawa.

Mohammad R. Sharifi, Mahmmoud Shams-Shargh, Behrouz Dastar, Saeed Hassani (2011). The effect of dietary protein levels and synbiotic on performance parameters, blood characteristics and carcass yields of Japanese quail (Coturnix coturnix Japonica). *Italian Journal of Animal Science* Vol. **10**: No 1.

Mosaad, G.M.M. and Iben, C. (2009). Effect of dietary energy and protein levels on growth performance, carcass yield and

some blood constituents of Japanese quails (Coturnix coturnix Japonica) *Die Bodenkultur* **60** (4): 39-6.

Murakami AE, Moraes VMB, Ariki J, Junqueira OM, Kronka SN. (1993a). Níveis de proteínae energia para codornas japonesas (Coturnix coturnix japonica) em crescimento. *Revista Brasileira de Zootecnia,* **22**(4):534-540. [Links]

Murkowski A. (2000). *Przepiórka japońska* (The Japanese Quail). In Polish. P.W.R.L, Poznań.

NRC (1994). *Nutrient Requirements of Poultry*. National Research Council, National Academy Press, Washington, D. C, 9th Revised Edition.

Panda, B. and Shrivastav, A. Designation K. (1978). Protein requirement of starter Japanese quail. *Proceedings XVI World's, Poultry Congress*, Rio de Janeiro, Brazil, Pp. 1347.

Rogério G. T. da Cunha, (2009) Quail meat an undiscovered alternative. *World Poultry* Vol. **25** No. 2 *www.world poultry.net*.

Seyed-Alireza Siyadati, Mehrdad Irani, Khosro Ghazvinian, Afshar Mirzaei-Aghsaghali, Vahid Rezaipoor. Hasan Fathi, Kamel Alipoor 1 and Samad Zamanzad- Ghavidel (2011). Effect of varying dietary energy to protein ratio on productive performance and carcass characteristics of Japanese quail. Scholars Research Library. *Annals of Biological Research,* **2** (1):149-155.

Shim, K. F. and Vohra, R. (1984). A review of the nutrition of Japanese quail. *World Poultry Science* **40**: 261-374.

Shrivastav, A. K.; Reddy, V. R. and Panda, B. (1980). Protein and energy requirement of Quail. *Indian Poultry Gazette*.**64**: 109 - 111.

Soares R da TRN; Fonseca JB; Santos AS de O dos; Mercandante MB (2003). Protein requirement of Japanese quail (*Coturnix coturnix* japonica) during rearing and laying periods. *Rev. Bras. Cienc. Vic*. Vol. **5** No. 2 Campinas May/Aug. *http://dx.doi.org/10.1590/S1516 - 635X2003000200010.*

Statsoft, Inc. (2001). STATISTICA (data analysis software system), version 6. *www.statsoft.com*.

Steel, R. G. D. and Torrie, J. H. (1980), Principles and Procedures of Statistics, Second Edition, New York: McGraw-Hill.

تأثير مستوي البروتين في العلف على أداء وصفات ذبيحة السمان الياباني المرباه في السودان

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المستخلص

تم إجراء هذه الدراسة لتحديد المستوي الانسب من بروتين العلف لأحسن أداء وخصائص ذبيحة لطائر السمان من عمر – 6 أسابيع و 3 – 8 أسابيع. تم استخدام عدد 40 طائر سمان غير مجنس في هذه التجربة. تكونت التجربة من ثلاثة معاملات متعادلة الطاقة التمثيلية (2900 كيلو كالوري/كجم) و احتوت على مستويات مختلفة من البروتين 22 ، 24 و 26 %. تم توزيع طيور السمان عشوائيا إلى ثلاثة مجموعات وتم تقسيم كل معاملة إلى 4 مكررات بكل منها 20 طائر. تم تدوين كل من العلف المستهلك، كفاءة التحويل الغذائي و الوزن المكتسب أسبوعيا. أشارت النتائج إلى أن المجموعة التي غذيت على 26 % بروتين أعطت و بدرجة معنوية ($p \leq 0.05$) أعلى وزن مكتسب و أفضل كفاءة تحويل غذائي للفترة من 3 – 6 أسابيع، بينما لم يكن هناك فرق إحصائي معنوي لإستهلاك لعلف بين المجموعات المختلفة. على النقيض من ذلك فإن معايير الأداء لطائر السمان فى الفترة – 8 أسابيع لم تتأثر بمستوى البروتين في العلف. لم يكن هناك فرق إحصائي معنوي ($p \leq 0.05$) بين المجموعات للصدر، الفخذ، الأرجل و الأجنحة كنسبة مئوية من الوزن الحي للطائر. ن هذه النتائج يمكن أن يوصى بأن العلف الذي يحتوي على 26 % بروتين خام هو الأنسب لطائر السمان خلال الفترة 3 – 6 أسابيع من العمر للحصول على أحسن أداء.

أشارت نتائج اختبار التذوق إلى أن السمان أطيب طعما من فراخ اللحم.