



## EFFECT OF USING (*Moringa oleifera*) SEED MEAL ON PERFORMANCE OF GROWING QUAIL BIRDS

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### ABSTRACT

The aim of the study was to investigate the effect of feeding quail chicks on diets containing different levels of *Moringa oleifera* Seed meal (MOSM) on growth performance, carcass quality and blood constituents. A total of 180 seven days, unsexed quail chicks were randomly divided into four experimental groups. Each group was further subdivided into 3 replicates, 15 chicks per each. Four levels of MOSM (0.0, 0.2, 0.4 and 0.6%) were fed during the experimental period for 6 weeks duration. The results showed that, birds fed on 0.2 % MOSM gained significantly higher body weight and body weight gain than birds fed the control diet. The lowest feed consumption ( $P \leq 0.01$ ), best feed conversion ratio were obtained by using 0.4% MOSM compared to control group and other treatments MOSM. Dressing, liver, heart, gizzard and giblets significantly increased by feeding quail birds on levels 0.2, and 0.4% MOSM respectively compared to the control group and those fed 0.6% MOSM. Group fed diet supplemented with 0.2% MOSM significantly ( $P \leq 0.05$ ) had the higher total edible parts compared with control group and other treatment groups. Birds fed diet without any MOSM insignificantly had higher total protein, albumin and A/G ratio compared to those fed diet supplemented with 0.2, 0.4 MOSM treatment. Birds fed diet Supplemented with 0.6% MOSM lead to significant increasing in the blood glucose as compared to control and other treatments. Blood cholesterol, ALT and AST had lower level in all treatments compared to control group. Inclusion, the present results showed that the use of MOSM at levels of 0.2 or 0.4% improved quail performance and economic efficiency.

**Key words:** Quail, *Moringa oleifera* seed, performance, blood and carcass.

### INTRODUCTION

The availability and price of concentrates, in particular of protein sources, are a serious problem for poultry producers, especially for small farms stakeholders. Consequently, there is a need for alternative ingredients with high protein content and balanced amino acids profile, and with a suitable cost. Plants leaf meal, forage trees, saltbush and shrubs are good and cheap sources of protein (Dey and De, 2013, Mahmud *et al.*, 2016). One of these potential tree forages is *Moringa oleifera* Lam (syns. *Moringa pterygosperm*, family

Moringaceae), which grows throughout the tropics (Debela and Tolera, 2013). *Moringa oleifera* is a plant possess multiple advantages. Different parts of the tree (leaves, fruits, immature pods and flowers) are edibles and entered in traditional diets in many tropics and subtropics countries (Anhwange *et al.*, 2004 ).

*Moringa oleifera* seeds have been reported as good sources of the main feed ingredients including fats, proteins and minerals (Compaoré *et al.*, 2011). The major saturated fatty acids present in seeds are palmitic, stearic, arachidic and benic acids.

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Oleic acid is the main unsaturated fatty acid whose high concentration is desirable in terms of nutrition and stability during cooking and frying. Recent studies indicated that moringa seed meal has been successfully used in poultry diets (Abbas and Ahmed, 2012, Olaniyan, 2012, Ochi *et al.*, 2015, Mousa *et al.*, 2016 Riry Shata *et al.*, 2016) who reported that feeding broilers on *Moringa oleifera* seed increased live body weight, body weight gain, feed consumption and improve feed conversion ratio. This study was, therefore, conducted to determine the effect of moringa seed meal supplementation on growth performance, carcass characteristics and economic efficiency of quail birds.

## MATERIALS AND METHODS

The study was carried out at the farm of the Department of Animal and Poultry Production, Faculty of Environmental Agricultural Sciences, Arish University, El Arish, North Sinai, Egypt.

A total number of 180 unsexed birds of Japanese quail-7 days old- are having nearly equal live weights (33g) were distributed into four groups. Each group was comprised of 45 birds which were subdivided into three replicates of 15 birds each. Birds were fed on 24% CP and 2900 Kcal. Dietary treatments were designed to contain 0.0 (control), 0.20, 0.40 and 0.60% *Moringa oleifera* seed meal (MOSM). All diets met the nutrient requirements of quail as set out by National Research Council (NRC) (1994). Table (1) represents the ingredients composition of the experimental diets. All birds received feed and water *ad libitum*. Body weight, and feed consumption were recorded biweekly and average body weight gains; feed conversion ratio were calculated.

At 42 days of age, three birds from each treatment having live body weight around the average of treatment were selected and slaughtered to obtain the carcass; giblets (gizzard, liver and heart). Blood samples were taken to determine serum content of

total protein, albumin, globulin, glucose, total lipid, cholesterol, low density lipoprotein (LDL), high density lipoprotein (HDL) and liver enzymatic activity (AST and ALT) using commercial kits

The prevailing market prices of ingredients and *Moringa oleifera* seeds used during the period of the study were used for the economic appraisal of the feeds. Economical efficiency is defined as the net revenue per unit feed cost calculated from input, output analysis as described by Asar *et al.* (2010).

**The economics of efficiency was calculated by the following:**

Feed cost = number of kg feed per quail × price of kg feed.

Selling revenue = body weight gain per quail × price of kg for live body weight.

Net revenue = difference between selling revenue and feed cost.

E.EF (Economic efficiency) = (net revenue/ feed cost) × 100.

R.E.E (Relative economic efficiency), assuming control treatment = 100%.

The obtained data was statistically analyzed using the general linear model procedure described in SAS User's Guide (SAS., 2004). Differences among means were tested using Duncan's multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

### Growth Performance

Effect of dietary *Moringa oleifera* seed meal (MOSM) levels (0.0, 0.2, 0.4 and 0.6%) on live body weight (BW) and body weight gain (BWG) of quail chicks are summarized in Table 2.

The initial live body weights at 7 days of age for all treatments were nearly 33 g with no significant differences between them. This may create suitable condition to appraise the effect of dietary treatments during the subsequent experimental periods.

Table (1): The composition and calculated analysis of quail diets.

Ingredients (%)	Control	<i>Moringa oleifera</i> Seeds meal (%)		
		0.2	0.4	0.6
Yellow corn	55.78	55.88	55.99	56.10
Soybean	33.67	33.51	33.35	33.18
Corn gluten	7.3	7.3	7.3	7.3
Di-calcium phosphate	0.8	0.8	0.8	0.8
Limestone	1.58	1.44	1.29	1.16
Salt	0.35	0.35	0.35	0.34
(Vit. & Min.)Premix*	0.3	0.3	0.3	0.3
DL-Methionine	0.11	0.11	0.11	0.11
L-Lysine	0.11	0.11	0.11	0.11
MOSM	-	0.2	0.4	0.6
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated analyses (%)</b>				
Crude protein (%)	24	24	24	24
ME Kcal/Kg	2900	2900	2900	2900
Calcium	0.9	0.89	0.84	0.8
AV. Phosphorus	0.4	0.45	0.43	0.4
L. Lysine	1.23	1.23	1.24	1.22
DL. Methionine	0.46	0.46	0.46	0.46

Table (2): Effect of dietary *Moringa oleifera* seeds meal on growth performance of Japanese quail at of 42 days old.

Trait	Control	<i>Moringa oleifera</i> Seeds meal (%)		
		0.2	0.4	0.6
Initial body weight (g)	33.00a±0.00	33.00a±0.00	33.00a±0.00	33.00a±0.00
Final body weight (g)	253.65c±1.08	278.71a±0.71	274.18b±0.82	245.41d±0.73
Body weight gain (g)	246.65c±1.08	271.71a±0.71	267.18b±0.82	238.41d±0.73
Total feed intake (g)	554.16b±5.86	598.21a±3.06	567.10b±2.87	529.12c±4.68
Feed conversion (g/g)	2.25a±0.02	2.20a±0.01	2.12b±0.01	2.22a±0.03

a,b,c Means in the same row with different superscripts are significantly different (p<0.05).

Results showed that birds fed MOSM level 0.2% recorded significantly ( $P \leq 0.05$ ) higher BW, BWG and feed intake values compared to control group and other treatments during the period from 7 - 42 days. Addition of MOSM up to 0.6 % to the diet significantly ( $P < 0.05$ ) lowered BW and BWG compared to control group and other treatments. The improved weight gain of birds fed on *Moringa oleifera* seed meal compared to control group may be due to *Moringa oleifera* seeds are good source of fat, protein, antioxidants and minerals (**Compaoré *et al.*, 2011**). These results are in agreement with **Abbas and Ahmed (2012)** who used *Moringa oleifera* seed powder at levels of 0.37, 0.75 or 1.5% in broilers diets and observed that the level of 0.37% increased live body weight compared to control

Also, **Ochi *et al.* (2015)** mentioned that the inclusion of *Moringa oleifera* seed powder (MOSP) at levels 0.5, 1 and 2% in the diet of the broilers significantly ( $P \leq 0.05$ ) enhanced their body weight, body weight gain and feed intake. On the other hand, **Mousa *et al.* (2016)** used 0.25, 0.50 and 0.75% germinated *Moringa oleifera* seed (GMOS) in the quail chicks' diet and observed that 0.75% MOSP significant increased ( $P \leq 0.05$ ) body weight and body weight gain. Also, **Olaniyan (2012)** reported that feeding 10% Moringa seed to broilers increased live body weight than the control diet. On the other hand **Atuahene *et al.* (2010)** reported insignificant effect of diets containing Moringa leaf meal at 0, 2.5, 5 and 7.5% levels on body weight gain and feed intake of broiler chickens. For feed conversion, data in Table 2 indicted that the birds fed diet supplemented with 0.4% *Moringa oleifera* seeds meal had the best feed conversion ratio compared with control and other treatments.

This improvement in body weight gain and FCR may be attributed to rich content of nutrients in *germinated Moringa oleifera*

seed (**Toye *et al.*, 2013**) and anti-microbial properties of Moringa (**Fahey *et al.*, 2001**). These results are in agreement with **EIDeeb *et al.* (2014)** who observed that level 2% in quail diets improved feed conversion compared to control group.

However, **Shehta *et al.* (2016)** found that quail birds fed diet supplemented with 5% *Moringa oleifera* seed meal (MOSM) had the best feed conversion compared with control group. On contrary, **Makanjuola *et al.* (2014)** observed no effect on FCR when broilers were fed 0.2, 0.4 and 0.6% MOLM. While birds fed control, 0.2 and 0.6 % had higher feed intake than birds fed 0.4%. Also, **Paguia *et al.* (2014)** found that using 0.20 , 0.30, 0.40 and 0.50% MOLM in broiler diets did not ( $P < 0.05$ ) significantly influence the FCR values.

#### Carcass Characteristics:

Statistical analyses of carcass yield in different groups are shown in Table 3. The birds fed diet supplemented with 0.2 or 0.4% *Moringa oleifera* seeds meal significantly ( $P \leq 0.05$ ) increased dressing %, liver, heart, gizzard and giblets compared with control and group fed 0.6% *Moringa oleifera* seeds.

However group fed diet supplemented with 0.2% (MOSM) significantly ( $P \leq 0.05$ ) had the higher total edible parts compared with control group and other treatment group. Birds fed diet supplemented with 0.4 or 0.6% *Moringa oleifera* seeds meal significantly ( $P \leq 0.05$ ) had higher head weight compared with control and group fed 0.2% *Moringa oleifera* seeds. These results may be due to antioxidant activities of some components of *Moringa oleifera* like vitamins C and E (**Rocha *et al.*, 2010**) and phenols especially flavonoids (**Diallo *et al.*, 2009**).

These results are in agreement with **Ochi *et al.* (2015)** and **Mousa *et al.* (2016)** who found that germinated moringa seed meal supplementation increased gizzard weight

**Table (3): Effect of dietary *Moringa oleifera* seeds meal on carcass characteristics of quail at 42 days old.**

Traits	Control	<i>Moringa oleifera</i> Seeds meal (%)		
		0.2	0.4	0.6
Live weight(g)	250.00b±0.97	279.89a±1.03	277.89a±1.06	245.89c±1.57
Dressing (%)	73.33c±0.19	78.20a±0.08	77.73a±0.36	73.24b±0.19
Head (g)	10.08b±0.01	10.06b±0.10	10.47a±0.02	10.34a±0.02
Liver (g)	5.48b±0.03	6.54a±0.14	6.37a±0.14	5.29b±0.02
Heart (g)	2.16b±0.06	2.65a±0.03	2.48b±0.03	2.18c±0.02
Gizzard (g)	4.20b±0.03	5.22a±0.14	5.05a±0.14	3.97b±0.02
Giblets *(g)	11.84b±0.04	14.41a±0.26	13.90a±0.26	11.45b±0.06
<b>Total edible parts** (g)</b>	<b>195.17c±0.72</b>	<b>233.30a±1.06</b>	<b>229.90b±0.95</b>	<b>191.56d±1.41</b>

a,b,c Means in the same row with different superscripts are significantly different ( $p < 0.05$ ).

\*giblets = gizzard+ liver+heart. \*\* total edible parts = dressing + giblets

of quail chickens. On the other hand, **Shata et al. (2016)** reported no improvements in dressing carcass and carcass organs except the gizzard due to inclusion of moringa seed meal in the diets of growing quail birds.

### Blood Constituents

The results of the estimated blood plasma parameters at 42 days old as affected by dietary *Moringa oleifera* seed Meal (MOSM) are presented in Table 4 Results indicated that there was no significant effect in the average values of blood total lipids, LDL and HDL in chicks fed all levels of MOSM compared to control group.

Birds fed diet without any *Moringa oleifera* seed Meal supplementation insignificantly had higher total protein, albumin and A/G ratio compared to those fed diet supplemented with 0.2 or 0.4 of MOSM treatment. However, Globulin was significantly increased in group 0.2, 0.4 and 0.6% MOSM as compared to control group. These results are in agreement with **Mousa et al. (2016)** who found that A/G ratio was decreased in quail

chicks fed different levels of germinated *Moringa Oleifera* seed (GMOS); 0.0, 0.2, 0.4 and 0.6% compared with control group. On contrary, **Makanjuola et al. (2014)** found that 0.2%, 0.4% and 0.6 MOLM did not influence the serum total protein, albumin and globulin.

Birds fed diet Supplemented with 0.6% MOSM lead to significant increasing in the plasma glucose as compared to control and other treatments. Same result was obtained by **Kout Elkloub et al. (2015)** who found that quail birds fed diet supplementing with 0.4% and 0.6% *Moringa oleifera* leaf meal (MOLM) had high plasma glucose as compared to control and 0.2% MOLM. On the other side **Mousa et al. (2016)** found no significant effect in plasma glucose when quail birds fed diet supplemented with 0.2, 0.4 and 0.6% of germinated *Moringa oleifera* seed (GMOS).

Plasma cholesterol, ALT and AST were significantly ( $P \leq 0.05$ ) reduced in all treatments compared to control. Similar results have been obtained by **Mousa et al. (2016)** who found significant ( $P \leq 0.01$ )

**Table (4): Effect of dietary *Moringa oleifera* seeds meal on some blood parameters of quail at 42 days old.**

Traits	<i>Moringa oleifera</i> Seeds meal (%)			
	Control	0.2	0.4	0.6
<b>T. protein(g/dl)</b>	4.73a±0.07	4.60a±0.02	4.47ab±0.14	4.28b±0.08
<b>Albumin (A) (g/dl)</b>	2.59b±0.18	2.99a±0.11	2.85a±0.02	2.95a±0.10
<b>Globulin (G) (g/dl)</b>	1.71a±0.14	1.54ab±0.02	1.45ab±0.12	1.27b±0.12
<b>A/G ratio</b>	0.67a±0.10	0.52ab±0.02	0.51ab±0.05	0.43b±0.06
<b>T .lipids (mg/dl)</b>	460.59a±6.80	481.36a±3.55	454.51a±17.35	434.97a±22.23
<b>Glucose (mg/dl)</b>	155.37b±0.23	153.98b±1.79	163.57ab±6.96	171.65a±5.14
<b>LDL (mg/dl)</b>	111.83a±26.37	69.91a±7.88	86.00a±0.90	76.48a±7.75
<b>HDL (mg/dl)</b>	64.31a±12.95	77.69a±11.24	59.74a±4.12	75.36a±7.61
<b>T. Cholesterol (mg/dl)</b>	176.14a±13.44	147.61b±3.74	145.74b±3.24	151.84b±1.37
<b>ALT U/L</b>	44.28a±1.08	42.75ab±0.30	40.53b±0.63	41.78b±0.78
<b>AST U/L</b>	12.26a±0.16	11.78ab±0.07	11.44b±0.23	11.58b±0.25

a,b,c Means in the same row with different superscripts are significantly different ( $p < 0.05$ ).

reduction in total cholesterol and ALT in birds fed different levels from germinated *Moringa Oleifera* seed. Also, **Durgesh *et al.* (2013)** found significant ( $P \leq 0.01$ ) reduction in total cholesterol in germinated *Moringa oleifera* seed supplemented birds

### Economic Evaluation

Economic evaluation of feeding quail birds on moringa seeds meal supplementation is presented in Table 5.

The best economic efficiency and relative economic efficiency were recorded for quail fed 0.4 followed with 0.2% of *Moringa oleifera* seed Meal. While the lowest value was recorded for birds fed diet supplemented with 0.6% of *Moringa oleifera* seed Meal. The same results were obtained by **El-Badawi *et al.* (2014)** who found that growing rabbit fed diet supplemented with 0.15% of moringa dry leaves had the highest economic efficiency and relative economic efficiency compared with the control group.

### Conclusion

It could be concluded that the use of *Moringa oleifera* seed meal in quail diets improved performance, carcass characteristics and blood constituents without any adverse. The best level occurred by 0.20 % *Moringa oleifera* seed meal in quail diets.

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**Table (5). Effect of dietary *Moringa oleifera* seeds meal on economical evaluation of quail at 42 days old.**

Item	Control	<i>Moringa oleifera</i> Seeds meal (%)		
		0.2	0.4	0.6
Feed intake/ bird (g)	0.554	0.598	0.567	0.529
Final body weight (g)	253.65	278.71	274.18	245.41
Price/Kg feed (L.E)*	4.62	4.69	4.76	4.84
Price of K.g (L.E) **	28.00	28.00	28.00	28.00
Cost of feed (L.E)	2.56	2.80	2.70	2.56
Fixed cost (L.E)	1.25	1.25	1.25	1.25
Total cost (L.E)	3.81	4.05	3.95	3.81
Selling revenue (L.E)	7.10	7.80	7.68	6.87
Net revenue	3.29	3.75	3.73	3.06
Economic efficiency***	86.35	92.49	94.34	80.45
Relative economic efficiency****	100	106.88	109.01	92.97

\* Based on average price of diets during the experimental time.

\*\* According to the local market price at the experimental time.

\*\*\* Net revenue per unit feed cost.

\*\*\*\* Assuming economic efficiency of control group equals 100.

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## المخلص العربي

## تأثير استخدام بذور المورينجا أوليفيرا على الأداء الإنتاجي لطيور السمان النامية

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أجريت هذه الدراسة لمعرفة تأثير إضافة بذور نبات المورينجا أوليفيرا على الأداء الإنتاجي وصفات الذبيحة ومكونات الدم لطيور السمان في الفترة من ٧ الى ٤٢ يوماً من العمر. تم استخدام عدد ١٨٠ كتكوت عمر ٧ أيام قسمت عشوائياً الى ٤ معاملات تجريبية كل مجموعة تحتوي على ٣ مكررات بكل مكرر ١٥ كتكوت. غذيت الكتاكيت على ٤ مستويات من بذور المورينجا صفر، ٠,٢، ٠,٤، ٠,٦ و ١,٠% خلال مدة التجربة ٦ اسابيع. وأظهرت النتائج أن الطيور المغذاة على بذور المورينجا بنسبة ٠,٢% حدث بها تحسن معنوي في وزن الجسم الحي ومعدل الزيادة في وزن الجسم مقارنة بالكنترول، في حين سجلت المعاملة ٠,٤% اقل معدل لاستهلاك العلف وفضل معدل للتحويل الغذائي مقارنة بالكنترول والمعاملات الأخرى. زاد معنوياً نسبة الذبيحة والقلب والقانصة والأجزاء المأكولة بالتغذية على مستويات ٠,٢% و ٠,٤% بذور مورينجا مقارنة بالكنترول. انخفض معنوياً مستوى الكوليستيرول وأنزيم الكبد ALT وAST في الدم باستخدام جميع المستويات مقارنة بالكنترول، وبصفة عامة فإن استخدام بذور المورينجا في علائق السمان في الفترة من ٧-٤٢ يوماً بنسب ٠,٢، ٠,٤، ٠,٦% حسنت معنوياً الأداء الإنتاجي وصفات الذبيحة ومكونات الدم والكفاءة الاقتصادية وأن مستوى ٠,٢% كان أفضلها.

الكلمات الإسترشادية: مسحوق بذور المورينجا أوليفيرا، الأداء الإنتاجي، السمان، ظروف شمال سيناء.

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