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# Assessment of Moringa Oleifera Leaf Meal as a Feed Additive in Quail Nutrition

Research Project

Submitted to the department of (Animal Resources) in partial Fulfillment of the requirements for the degree of BSc. in (Agricultural Engineering Sciences)


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**April– 2023**

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# INTRODUCTION

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## INTRODUCTION

Poultry production is one of the fastest ways of dealing with the lack of animal protein supply and consumption in many countries. This is caused by their high rate of growth, short generational spacing, and their rapid conversion of nutrients into high-quality protein. Quail farming is used to diversify the poultry sector and support in the production of domestic fowl. This is as a result of the many advantages quails provide(Khalifa,2018). Quail belongs to the family Phasianidae, genus Coturnix bonnaterre and species Coturnix coturnix japonica. Commercial quail farming is gaining popularity and is being promoted more and more in a number of Asian and European nations, as well as more lately in Africa (E.F.S.A. 2004 and RSPCA, 2011). Quail are raised for their delicious meat, which also has economic and nutritional advantages (Odugbo, 2004). The meat of quail are known for their high biological value, high protein content, and low calorie content. They are also very nutrient-dense, having vital minerals and vitamins (Agiang, 2011). To promote development and control subclinical diseases in poultry, antibiotics have been given to feed as growth stimulants. The European Union has effectively banned the use of antibiotics as growth promoters since 1 January 2006 in response to increasing consumer concerns about bacterial resistance to antibiotics. (Catala-Gregori *et al.*, 2008). In order to keep animal health, productivity, and carcass quality, producers of livestock should be suggested alternatives to antibiotics as growth promoters. As a result, there is growing interest in safe and natural substitutes to antibiotics, such as plants(AL-Khaldani,2022). Moringa oleifera, commonly known as the drumstick tree there are about 13 species of Moringa trees in the family Moringaceae.They are native to India, the Red Sea area and/or parts of Africa. Of these species, Moringa oleifera is the most widely known. All species are referred to by their Latin name. In Egypt *M. oleifera* have been grown for decades in Aswan and North Sinai and have been a subject for research to increase the cultivated land (Moyo *et al*.,2012).

Moringa oleifera Leaf (MOL) high in bioactive components, may be added to diet as a phytogenic supplement. Moringa leaves are rich in vitamins, flavonoids, and carotenoids, which not only provide essential nutrients but also improve the taste of poultry meat and eggs. (Melesse *et al*, 2011). In addition, MOL contains a variety of phenolic compounds with antibacterial properties, including flavonoids, saponins, tannins, and others. However, because MOL naturally contains bioactive chemicals and essential nutrients, it can be used as a feed ingredient and a phytogenic feed additive to improve productive performance (Sulaiman and Sardar,2022). Dietary supplementation of Moringa formulated diets for Japanese quail gained significantly higher body weight and body weight gain than birds fed the control diet (Kout Elkloub, M. EL. Moustafa *et al*.,2015). François *et al*. (2020) found that The highest whole carcass yields ($P < 0.05$) were obtained with diet supplemented at 1 and 2% with MOLM. Therefore, the aim of the present study was to investigate the effect of feeding Japanese quail chicks on diets containing different levels of Moringa Oleifera leaf meal (MOLM) on productive performance, carcass quality and blood constituents.

# CHAPTER TWO

# MATERIALS AND METHODS

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## Location and Date of Experiment:

The experiment was conducted in an environmentally controlled house allotted to poultry production researches at quail research hall of Grdarasha farm/ Animal Resources Department/ College of Agricultural Engineering Sciences, Salahaddin University-Erbil. during the period from 30 Nov. 2022 until 4 Jan. 2023. To investigate into where various quantities of Moringa Oleifera leaf meal (MOLM) in the diet affect the productivity, carcass quality, and blood constituents of Japanese quail chicks.

## Birds and Experimental Design :

A total of 150 Japanese quails at 2-week old were selected at random and divided into five equal experimental groups (30 birds each), with three replicates of 10 birds in each group. The birds were assigned according to the complete randomized design. the quail hens were reared in special cages 65cm×60cm×50cm length, width and height respectively, designed for quails. Dried MOL obtained from local market in Erbil city. The treatment groups fed standard diet and MOLM were: M1: control: diet without of MOL; M2: diet with 0.4%, M3: diet with 0.6%, M4: diet with 0.8% and M5: diet with 1.0%, respectively. The experiment period was 6 weeks. Water and feed were available adlibitum, all treatments are provided the same atmosphere and management. Temperatures were kept at 22-230C; humidity was 40-60%. Diet were formulated for birds according (NRC, 1994). Throughout the trial period. The components and chemical composition of the diet are shown in Table 1.

**Table (1) composition of the dietes with calculated chemical composition(Kg/ 100) .**

| Ingredients | Quantity |
|---|---|
| **Soybean meal** | 35.2 |
| **Corn** | 48.8 |
| **Flour** | 10.0 |
| **wheat bran** | 0 |
| **Premix*** | 1.0 |
| **L- Threonine** | 0.165 |
| **Limestone** | 1.66 |
| **Soy bean oil** | 1.0 |
| **Lysine** | 0.42 |
| **Methionine** | 0.26 |
| **Sodium Bicarbonate** | 0.54 |
| **MCP** | 0.65 |
| **T. Salt** | 0.165 |
| **Toxin binder** | 0.15 |
| **Enzyme**** | 0.05 |
| **Emulsifier***** | 0.025 |
| **Anti-Coccidian** | 0 |
| **Formulation** | 100 |
| **CP%** | 21.84 |
| **ME kcal/kg** | 2970 |
| **Methionine** | 0.557 |
| **Lysine** | 1.392 |
| **Methionine + Cystine** | 0.833 |
| **Threonine** | 0.933 |
| **Valine** | 0.890 |
| **Isoleucine** | 0.864 |
| **Leucine** | 1.595 |
| **Arginine** | 1.354 |
| **Tryptophan** | 0.239 |
| **Ash** | 6.407 |
| **Fiber** | 2.242 |
| **Ether extract** | 3.737 |
| **Ca** | 0.960 |
| **P** | 0.480 |
| **Na** | 0.227 |

| | |
|---|---|
| **Cl** | 0.224 |
| **K** | 0.945 |

-Chemical composition calculated according (NRC, 1994).

## Studied traits:

### A- Growth performance:

The following characteristics were studied: birds' live body weight (g), weight gain rate (g), feed intak rate (g), feed conversion ratio g feed/g weight gain, for quail at 49 days of age, were studied (Naji, 2006).

### B- Carcass characteristics:

At the end of the experiment, (3) birds were slaughtered from each replicate. The carcass measurements were done after defeathoring, removal the viscera. Afterwards the thigh, wing, back and breast were separated the percentage of each part was calculated by dividing the weight of the part by the carcass weight of bird.

**1-Meat pH :**

Meat pH was recorded immediately after slaughter (pHi) and 24 hours post slaughter (pH24) on the breast muscle (central area of the breast) using
a Corning Model 4 pH-temperature meter (Corning Glass Works, Medfield, MA) equipped with an Ingold spear-type electrode (Ingold Messetechnik AG, Udorf, Switzerland) (Standford et al., 2003).

**2-Meat cooking losses**:

After weighing, breast samples were placed in an oven set at 140°C for 20 minutes for determination of cooking losses (Gopinger et al., 2014). The following formula was used:

$$Cooking\ losses(\%) = \frac{initial\ weight - final\ weight}{initial\ weight} \times 100$$

**3- Drip loss :**

Drip loss measurement was determined using a method adapted from Zhang *et al.* (2009). Briefly breast meat samples were sliced with a knife into blocks weighing between 2-3 grams. The sample weights were recorded as initial weight (W1). The sample were hooked and suspended using wire steel in a plastic and sealed properly so that the samples did not touch the sides of the bottle. The bottles were then stored in cold room 4°C for 72 hours, the samples were taken out gently wiped to remove any liquid on the surface of the meat and the sample were reweighed (W2). The difference in weight of each sample before and after drip was conveyed as percentage drip loss and calculated as follows:

$$Drip\ loss\ (\%) = [\ \frac{(W1 - W2)}{W1}] \times 100$$

**C- Characteristics of blood biochemical:**

At the end of the experiment (49 day).After slaughtered 3 birds from each replicate blood samples were taken to determine serum content of total protein, glucose, cholesterol mg/dl and liver enzymatic activity (AST ,ALP,TSB and ALT) using commercial kits.

**Statistical Analysis:**

All data were analyzed using CRD (Completely Randomized Design) by the SAS institute program (SAS, Statistical Analysis System. 2005). Duncan's multiple range tests were used to compare differences among the treatments.

# CHAPTER THREE

# Results and Discussion

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## Results and Discussion

## Productive Performance:

The results of data analysis of the effects of Moringa Oleifera Leaves Meal (MOLM) on the Productive Performance in Japanese quail is presented in Table (2). the results show that there is not significant difference among the treatments but the largest birds are the birds in T5, and the smallest was in the control group. Feed intake of the T5 is the highest and the T3 was the least. However khalifa *et al.,(*2018) noticed some significantly differences this study confirmed previous findings by kakengi *et al*., (2007) that indicated Moringa Leaf Meal promoted good growth and productivity in poultry is attributed to its nutrients and phytochemicals. Also, Fuglier (1999) and Ebenebe *et al*., (2012) reported high performance of livestock's fed on Moringa based diet. This finding might be due to natural enzymes in moringa which facilitate digestion of fibrous food in animals and improve bioavailability of nutrients (Foidl et al., 2001). About the Feed Conversion Ratio (FCR) there is no significant differences among the treatments but the FCR of T3 was increased and T5 was the lowest and T1 was the highest.

**Table (2) Effects of Moringa loifera leaves on Productive Performance of Japanies quail (Mean ± standard error).**

| Treatment / Traits | T1 control | T2 % 0.4 *M.olifera* | T3% 0.6 *M.olifera* | T4 % 0.8 *M.olifera* | T5 % 1 *M.olifera* |
|---|---|---|---|---|---|
| **Body weight at 14 day (g)** | **46.67 ± 0.17 a** | **46.83 ± 0.73a** | **46.83 ± 0.33a** | **46.5 ± 0.76a** | **46.5 ± 0.29a** |
| **Body weight at 49 day (g)** | **230.83 ± 6.72a** | **237.33 ± 13.92a** | **236 ± 11.25a** | **235.17 ± 6.35a** | **246.17 ± 0.33a** |
| ***Body weight gain (g)*** | **171 ± 3.12a** | **172.17 ± 11.56a** | **166.17 ± 5.36a** | **172.83 ± 3.35a** | **184.17 ± 1.36a** |
| **Total feed intake(g)** | **655.83 ± 23.79a** | **652.67 ± 43.3a** | **631.83 ± 15.69a** | **637.17 ± 16.88a** | **668.83 ± 8.65a** |
| **F.C.R.(g/g)** | **3.84 ± 0.2a** | **3.79 ± 0.04a** | **3.8 ± 0.03a** | **3.69 ± 0.09a** | **3.63 ± 0.07a** |

a, within each column means non-significantly differ.($P<0.05$).

## 2- Carcass Traits :

Table (3) show the results of data analysis of the effects of Moringa Oleifera Leaves Meal (MOLM) on the Carcass Traits in Japanese quail at 49-day old. the weight of the thigh in T2 was (16g) and was significantly ($P<0.05$) higher than other groups the result are not similar with elkloub *et al*., (2015) that the thigh section there is no significant differences between treatments , then the T5 and T1 came with similar weight and then T4 was less than previous groups and finally T3 with the least weight , the wings didn't had significant differences between groups , edible parts also didn't had significant differences ,in the breast section also there was no significant differences between treatments but T5 had the lowest weight and T2 was the highest, ,carcass weights of the growing Japanese quails in all treatments are similar to the finding of Zanu *et al.*, (2012), in the carcass weight section there was no significant differences between treatments but the weight of T4 was the highest and T5 was the lowest.

**Table (3) Effects of Moringa loifera leaves on Carcass W. (g) of of Japanies quail in 49 days old. (Mean ± standard error).**

| Treatment | %Carcass W.(g) | %Breast W.(g) | %Thigh W.(g) | %Wings (g) | %Edible parts (g) | %Back(g) |
|---|---|---|---|---|---|---|
| T1 control | 166 ± 3.79 a | 36.33 ± 2.19 a | 13.67 ± 0.33 ab | 10 ± 0.58 a | 23.33 ± 0.67 a | 35.69 ± 2.03 a |
| T2 % 0.4 *M.olifera* | 167.67 ± 6.36 a | 36.67 ± 1.86 a | 16 ± 1.53 a | 10.33 ± 0.67 a | 22.33 ± 1.86 a | 37.28 ± 1.33 a |
| T3% 0.6 *M.olifera* | 155 ± 9.87 a | 33.67 ± 2.19 a | 12.67 ± 1.2 b | 10 ± 1.15 a | 20 ± 1.53 a | 39.51 ± 1.63 a |
| T4 % 0.8 *M.olifera* | 170.67 ± 10.59 a | 36 ± 2.08 a | 13 ± 0.58 ab | 10.67 ± 1.2 a | 25.33 ± 3.18 a | 38.22 ± 1.32 a |
| T5 % 1 *M.olifera* | 148.33 ± 7.06 a | 34.33 ± 2.03 a | 13.67 ± 0.33 ab | 10 ± 0 a | 19.67 ± 0.33 a | 35.71 ± 2.2 a |

**a,b :means within each column had the different subscript were differ significantly ($P<0.05$).**

## Biochemical Parameters:

### A- Lipid Profile:

The results of data analysis of the effects of Moringa Oleifera Leaves Meal (MOLM) on the biochemical parameters in Japanese quail is presented in Table (4). significant differences had been noted between replicates of every treatment and the results are similar to elkloub *et al*., (2015) and khalifa *et al*.,(2018) and Ashour *et al*.,(2020), in the glucose section T3 was the highest and T2 was the lowest also there was significant differences between replicates , in the cholesterol level there also was significant differences between replicates where the lowest level was T3 that was 140.2( mg/dl) and T5 was 225.2 (mg/dl) , there was significant differences between replicates of TG section and the highest was T2 294.4 (mg/dL) and the lowest was T3 91.8 (mg/dL) , in the HDL section also there was significant differences between replicates the highest was T5 169.1 (mg/dL) and the lowest was T3 112.2 (mg/dL) , also there was significant differences between replicates of LDL section the highest was T2 144 and T4 29.6. M. oleifera leaves have bioactive phyto-constituent which lower cholesterol effects, β-sitosterol is capable of reducing cholesterol, suggesting that MOLM can reduce cholesterol levels in quail meat (Ghasi et al., 2000).

**Table (4) Effects of Moringa loifera leaves on Glusose (mg/dL) and Lipid profile of Japanese quail (Mean ± standard error).**

| Treatment | GluCose (mg/dL) | Cholesterol (mg/dL) | TG (mg/dL) | HDL (mg/dL) | LDL (mg/dL) |
|---|---|---|---|---|---|
| T1 control | 302.2 ± 0.58 b | 174.7 ± 0.58 d | 149.3 ± 0.58 c | 137.4 ± 0.58 d | 34.3 ± 0.58 c |
| T2 % 0.4 *M.olifera* | 294.4 ± 0.58 c | 193.7 ± 0.58 b | 294.4 ± 0.58 a | 143.3 ± 0.58 c | 144 ± 0.58 a |
| T3% 0.6 *M.olifera* | 315.3 ± 0.58 a | 140.2 ± 0.58 e | 91.8 ± 0.58 e | 112.2 ± 0.58 e | 30.6 ± 0.58 d |
| T4 % 0.8 *M.olifera* | 303.3 ± 0.58 b | 190.7 ± 0.58 c | 165.5 ± 0.58 b | 151.7 ± 0.58 b | 29.6 ± 0.58 d |
| T5 % 1 *M.olifera* | 302.8 ± 0.58 b | 225.2 ± 0.58 a | 109.1 ± 0.58 d | 169.1 ± 0.58 a | 75.6 ± 0.58 b |

a,b :means within each column had the different subscript were differ significantly ($P<0.05$).

## B-Liver function:

Table (5) shows the effects of Moringa loifera leaves on liver function of Japanese quail significant difference between treatments in AST(U/L) the results are in harmony with elkloub *et al*., (2015) and Ashour *et al.(*2020) , there is no significant differences in ALT(U/L) but the highest was the control group and the lowest was T5 and T3 the results are not like elkloub *et al*., (2015) because there was significant difference between treatments ,significant differences are present also in ALP(U/L), but there is no significant differences between treatments in TSB(mg/dl) the highest is T2 with 0.08 and the lowest was T5. Bioactive compounds in MOLM are also known to protect against liver injury by restoring glutathione activities

These results are in agreement with who reported that MOLM have no negative effect on the health status of broilers.

**Table (5) Effects of Moringa loifera leaves on liver function of Japanese quail (Mean±standard error).**

| Treatment | AST (U/L) | ALT (U/L) | ALP (U/L) | TSB (mg/dL) |
|---|---|---|---|---|
| **T1 control** | **438 ± 0.58 a** | **3.9 ± 0.58 a** | **877.4 ± 0.58 a** | **0.03 ± 0.58 a** |
| **T2 % 0.4 *M.olifera*** | **269.3 ± 0.58 d** | **2.3 ± 0.58 a** | **694.7 ± 0.58 b** | **0.08 ± 0.58 a** |
| **T3% 0.6 *M.olifera*** | **251 ± 0.58 e** | **2.2 ± 0.58 a** | **538.2 ± 0.58 e** | **0.07 ± 0.58 a** |
| **T4 % 0.8 *M.olifera*** | **306.5 ± 0.58 b** | **2.3 ± 0.58 a** | **629.4 ± 0.58 c** | **0.05 ± 0.58 a** |
| **T5 % 1 *M.olifera*** | **272.6 ± 0.58 c** | **2.2 ± 0.58 a** | **600.6 ± 0.58 d** | **0 ± 0.58 a** |

a,b :means within each column had the different subscript were differ significantly ($P<0.05$).

### 3-Meat Quality:

The results of data analysis of the effects of (MOLM) on the Meat quality in Japanese quail is presented in Table (5). The Cooking loss section there was significant differences between replicates for example the highest cooking loss T1 55.54 and the lowest was T5 48.12 , also the drip loss section had some significant differences between replicates T5 was the lowest 6.99 and the highest drip loss was T2 11.51 , PH section like other sections of this table had significant differences between replicates were the T5 5.21 was the highest and T1 4.4 was the lowest , in the protein% section there was significant differences between replicates the highest was T5 23.64% and the lowest was 20.67%, in the fat ratio section we detected significant differences among replicates , the highest fat ratio was in T1 1.89% and the lowest was in T1 1.89 .

**Table (5) Effects of Moringa loifera leaves on some meat parameters of local quail (Mean ± standard error).**

| Treatment | Cookng loss | Drip loss | PH | Protein% | Fat % |
|---|---|---|---|---|---|
| T1 control | 55.54 ± 0.47 a | 11.33 ± 0.05 b | 4.4 ± 0.06 c | 21.65 ± 0.32 c | 1.89 ± 0.01 a |
| T2 % 0.4 *M.olifera* | 52.65 ± 0.24 b | 11.51 ± 0.04 a | 4.8 ± 0 b | 20.67 ± 0.38 d | 1.67 ± 0.03 b |
| T3% 0.6 *M.olifera* | 51 ± 0.11 c | 9.63 ± 0.02 c | 4.81 ± 0.04 b | 22.49 ± 0.07 b | 1.44 ± 0.02 c |
| T4 % 0.8 *M.olifera* | 48.84 ± 0.14 d | 7.53 ± 0.02 d | 5.3 ± 0.02 a | 23.21 ± 0.1 ab | 1.26 ± 0.03 d |
| T5 % 1 *M.olifera* | 48.12 ± 0.11 d | 6.99 ± 0.04 e | 5.21 ± 0.02 a | 23.64 ± 0.05 a | 1.05 ± 0.02 e |

**a,b :means within each column had the different subscript were differ significantly (P<0.05).**

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