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# Influence of Moringa Leaf Powder on Growth, And Blood Biochemistry in Growing Japanese Quails

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**Annotation:** The aim of this study was to determine the effect of different quantities of Moringa oleifera leaf powder supplementation (MOLP) on growth performance, feed intake, feed conversion ratio (FCR), and blood biochemistry of Japanese quail. Three hundred-twenty quails were randomly divided into 4 treatment groups, with 80 birds for each group and MOLP inclusion levels (0, 2.5, 5, and 7.5) %. The four weeks experiment included the quail, which were kept in single cages where they were raised under common environmental conditions. The assessment of growth was performed through regular measurements of performance metrics such as body weight, feed consumption, and FCR at regular intervals. Blood at the conclusion of the experiment was carried out to characterize biochemical analytically such as (Uric acid, glucose, total cholesterol, albumin, total protein and globulin). The data also showed there was no difference in body weight, blood biochemistry, and FCR between groups of treatment (P≤0.05). FI intake (FI) was much higher in experimental (Period 1, 2) periods, and more so for 2.5% group, and

this effect decreased with time, and no significant differences remained in period 4. Finally, period 2 and 4 showed the efficiency highest for feed conversion with T4 (7.5%), but not in all times period. The result showing that the supplementation of Moringa does not affect the experimental quality of Japanese quail, including its key traits and performance-biochemical results, at both the time and level, is indicative of low inclusion level or adaption over time. More research has to be done with increased levels of inclusion with long-lasting feeding periods, to fully appreciate the effectiveness of nutritional significance of Moringa supplementation in poultry feedings.

**Keywords:** Moringa, Quail, Blood, Biochemistry.

## Introduction:

Japanese quail (Coturnix coturnix japonica) represents a successful model and used market species for the study of growth physiology and testing of the use of nutraceutical feed additives due to its short generation interval, efficient feed utilization and sensitivity of blood biochemical determinants to dietary factors [1,2]. Increased application of plant-derived functional ingredients that can simultaneously enhance growth and health performance of growing quails and reduce dependence on antibiotics is emerging as an effective strategy for increasing growth and life span [3]. Of these, Moringa oleifera Lam. For many years, the rich nutrient content and antioxidant and immunomodulatory properties have attracted growing interest in leaf powder [4]. Moringa leaves contain a significant amount of (protein, vitamins and minerals together with phenolics and flavonoids), which give evidence towards high antioxidant activity [5, 6, 7]. From food and veterinary science literature there is general agreement that this chemical composition is the reason for benefits in animal nutrition as observed by boosting growth performance and the metabolic health in animals of different species [8]. The above characteristics of Moringa can lead to improved weight gain and feed conversion efficiency in rapidly growing birds while potentially improving redox balance and lipid metabolism in blood [9]. Data from a poultry population indicate that moringa or its extracts can be applied to poultry and improve growth, various carcass traits and some hemato-biochemical indices without any direct toxicity at moderate inclusion levels [10]. Supplementation with Moringa in broilers leads to enhanced body weight gain, whereas serum lipids and liver enzymes are positively correlated [11]. Mechanistically, leaf polyphenols and carotenoids may help reduce oxidative stress, and fiber and phytosterols may regulate lipid absorption and turnover [7]. Nevertheless, dosage is important: anti-nutritional agents present in Moringa leaves may depress performance if inclusion rates are excessive or leaves are not pre-treated to decrease these compounds [2, 12]. In quails, Moringa can affect growth and blood biochemistry [13]. A controlled study in female Japanese quail reported a

significant effect of 2.5% Moringa on overall weight gain that did not change values on hematology or serum biochemistry, and these remained within physiological limits [14]. In quails, different Moringa seed, or leaf products demonstrated enhancement of production traits and decreased circulating cholesterol and triglycerides, with insignificant effects on ALT and total protein suggesting that Moringa can be more lipomodulatory than hepatotoxic [1, 15]. Recently, quail work has also reported strategies addressing tannin-induced growth depression indicating formulation complexities within the applicability of MOLP in practice [12]. Aside from gross performance, the use of Moringa may alter biochemical endpoints revealing metabolic and antioxidant status [16]. Studies on chickens reported lower serum total cholesterol and triglycerides, sometimes with no or less variable effects in glucose and urea profile which is consistent with improved lipid handling and potential hepatoprotection [11, 2]. The objective of the present study was to evaluate the influence of increasing the quantity of Moringa on the quail diet and to investigate the impact of the addition on the body weight, feed consumption, FCR, and blood biochemistry.

## Materials and methods:

The experiment was carried out at the animal production department farms, college of agriculture, Kirkuk University from (2/7/2024 to 5/9/2024), in Japanese quails (*Coturnix coturnix japonica*). Quails were randomly assigned to 4 treatment groups composed of 80 birds each. To monitor the growth and feeding of the birds, they were placed in separate cages. A 12-hour light and 12-hour dark cycle was maintained, and the room temperature was controlled at 24±2°C. The quails were adjusted for 7 days prior to the beginning of the four-week experimental period. Throughout the entire period, quails were fed and given access to water on a permissive basis. For growth quails, a basal diet with the nutrients to meet the nutrient needs of the growing quail is given as per NRC [17]. The four experiments were included Moringa oleifera leaf powder with basal diets for 4 treatment sets (T1: Basal diet (control), T2: Basal diet + 2.5% MOLP, T3: Basal diet + 5% MOLP, T4: Basal diet + 7.5% MOLP). The MOLP was derived from fresh leaves of Moringa oleifera, drying fresh, under shadow, and grinding to powder finely to extract its bioactive components and storing in an airtight container. Whole diets were well mixed, though feed was offered to quails during the experiment. We explored various traits including growth Body Weight (BW), Feed Intake (FI), and the FCR). Four weeks after the experiment, blood samples were collected from all birds (5 birds per group). The blood was collected into serum Separator Tubes. For serum biochemical analysis, the blood samples were then allowed to clot at room temperature. The serum was then separated by centrifugation at 3000 rpm for 10 minutes. Serum samples were kept at -20 °C until further analysis. Standard laboratory kits were used to analyze the following biochemical parameters: Glucose, Total Cholesterol, Uric Acid, Albumin, Total Protein, Globulin. The data were all reported in the study via Windows (SPSS version 22) [18]. Data were analyzed through one-way analysis of variance (ANOVA). Duncan's Multiple Range Test [19] was used to compare the significance of the differences between treatment groups.

## Results and discussion:

The body weight of Japanese quail among the four treatments was measured over four periods. All over the period, there were no significant differences in body weight between treatments, according to the data collected. Multilateral supplementation of Moringa oleifera in poultry diets has been widely carried out and reports mixed results. Numerous experiments have demonstrated beneficial impact on growth performance, whereas studies showed no effects. The final body weight of quails fed with the 0.2% Moringa oleifera leaf meal was notably higher than the control as shown [20]. The present study, in contrast, did not find any significant differences in body weight between treatments, which means the inclusion levels or the duration of supplementation may not be optimal. Similarly, the Moringa supplement used in the present study did not provide sufficient nutrients in the amounts necessary to influence growth performance, leading to the non-significant findings.

**Table 1: The effect of adding different level of Moringa on the body weight of Japanese quail**

| Treatment | Body weight (g) | | | |
|---|---|---|---|---|
| | Period 1 | Period 2 | Period 3 | Period 4 |
| 1 | 141±0.002 | 156±0.004 | 156±0.004 | 170±0.005 |
| 2 | 149±0.003 | 165±0.003 | 165±0.003 | 191±0.006 |
| 3 | 144±0.005 | 161±0.004 | 161±0.004 | 185±0.005 |
| 4 | 145±0.005 | 155±0.002 | 155±0.002 | 180±0.008 |
| Sig | N.S. | N.S. | N.S. | N.S. |

Sig= significant, a-b = indicate significant differences between means in same column.

The feed intake of Japanese quail among the four treatment groups was measured over four periods are shown in table 2. The data show significant differences ($p \leq 0.05$) in feed intake during Periods 1, 2, and 3. In Period 1, feed intake ranged from (170 to 191) g, while in Period 2, it increased to (226–267) g. The highest feed intake occurred in Period 3, with values ranging from (452 to 514) g, followed by a decrease in Period 4, where feed intake varied from (0.438 to 0.653) g.

The adding of Moringa oleifera in poultry diets has been shown to affect feed intake in many studies, although results are inconsistent. The current study, significant differences were observed in feed intake during the initial periods that may be due to the enhanced palatability or nutritional value of Moringa. 96

**Table 2: The effect of adding different level of Moringa on the Feed Intake (g) of Japanese quail**

| Treatments | Feed Intake (g) | | | |
|---|---|---|---|---|
| | Period 1 | Period 2 | Period 3 | Period 4 |
| 1 | 170±0.005 a | 226±0.004 c | 514±0.125 a | 653±0.002 |
| 2 | 191±0.006 b | 267±0.003 a | 480±0.003 b | 655±0.003 |
| 3 | 185±0.005 ab | 247±0.004 b | 452±0.004 c | 460±0.005 |
| 4 | 180±0.008 ab | 022±0.002 d | 430±0.002 d | 438±0.005 |
| Sig | * | * | * | N.S. |

Sig= significant, a-b = indicate significant differences between means in same column.

The Feed Conversion Ratio (FCR) of Japanese quail was assessed across four treatment groups over four periods of meals are presented in Table 3. Significant differences were observed in FCR during Periods 1, 2, and 3 ($p \leq 0.05$). In Period 1 the FCR values varied from (1.21 to 1.28), T1 being the lowest. FCR increased to (1.14 to 1.62) during Period 2, with T4 showing the lowest FCR. FCR increased markedly for all treatments (2.49 to 3.29) by Period 3. From Period 4, we see an average FCR value going from (2.43 to 3.84), again T4 is also the best performer. The FCR measures feed efficiency by evaluating the amount of feed needed in order to produce a unit gain in body weight. In previous studies, differences in FCR were detected between periods (T4 with best feed efficiency especially in Period 2 and Period 4). Our result is consistent with previous findings that nutrient digestibility and utilization of Moringa oleifera in poultry by Moringa supplementation can improve FCR by enhancing nutrient digestibility in poultry [21]. But for Period 3, FCR values are higher, especially in the cases of (T1 and T2), implying a decline in feed efficiency during the adaptation of quails to the Moringa diet. This decreased efficiency may be attributable to the prolonged supplementation period, as reported by [22], wherein prolonged feeding of Moringa led to decreased feed efficiency due to adaptation effect. Curiously, the lack of differences occurred in Period 4 indicating that the quails reached a plateau of feed conversion efficiency, presumably because of saturation or because the quails have adapted to the nutrients present in the diet.

**Table 3: The effect of adding different level of Moringa on the FCR of Japanese quail**

| Treatment | FCR | | | |
|---|---|---|---|---|
| | Period 1 | Period 2 | Period 3 | Period 4 |
| 1 | 1.21±0.039 a | 1.45±0.045 b | 3.29±0.806 c | 3.84±0.114 |
| 2 | 1.28±0.048 c | 1.62±0.035 c | 2.91±0.056 b | 3.43±0.109 |
| 3 | 1.28±0.057 c | 1.53±0.046 bc | 2.81±0.074 ab | 2.49±0.072 |
| 4 | 1.24±0.070 b | 1.14±0.013 a | 2.77±0.038 a | 2.43±0.112 |
| Sig. | * | * | * | N.S. |

Sig= significant, a-b = indicate significant differences between means in same column.

Table 4 shows the blood biochemistry traits of Japanese quail was measured for four treatment groups regarding Uric Acid, Glucose, Total Cholesterol, Albumin, Total Protein, and Globulin. No significance was determined in all of the measured parameters ($p \geq 0.05$). For the Uric acid concentrations (7.1-10.6 mg/dL) T4 was found to be the highest value, the glucose concentrations ranged from (356.5 to 368.8) mg/dL, and T1 showed the highest magnitude. Total cholesterol levels varied from (203.3 to 238.5) mg/dL. Albumin levels were comparable between treatments (1.6 and 1.7) g/dL, and total Protein values ranged from (3.6 to 4.1) g/dL. Furthermore, levels of globulin ranged from (2.0 to 2.5) g/dL, statistical analysis did not compare any of the biochemistry traits ($p \geq 0.05$). Not significant effects, when examining blood biochemistry traits of Japanese quail with treatments, suggest the effects of Moringa supplementation in metabolic markers at tested levels were not significant on those examined in this study. Prior works have demonstrated the effects of Moringa supplementation on biochemical parameters, although the effects may be inconsistent under different levels of inclusion of diet food, over different dietary terms of administration, and by various metabolic pathways [20]. Moringa had been reported to decrease serum cholesterol levels [22] in studies of broilers, but no improvement was demonstrated in this study. However, results obtained in the present study are similar with those of [21], where supplementation of Moringa showed little change to the levels of blood glucose, cholesterol, and protein in Japanese quail. The low levels of Moringa used in this study may not have reached a level at which a measurable impact could be observed on the blood biochemistry parameters. Additionally, the metabolic responsiveness of quail to dietary modifications may be responsible for the results, as they would have adapted to the supplementation over the study duration. The lack of impact on serum levels of uric acid and protein is in agreement with previous study [22] that showed no significant effects of Moringa on serum protein and uric acid during supplementation of poultry.

**Table 4: The effect of adding different level of Moringa on the blood biochemistry traits of Japanese quail**

| Treatment | Uric Acid mg/dL | Glucose mg/dL | Total cholesterol mg/dL | Albumin g/dL | Total Protein g/dL | Globulin g/dL |
|---|---|---|---|---|---|---|
| 1 | 8.0±0.98 | 368.8±14.50 | 232.0±40.57 | 1.7±0.13 | 3.7±0.74 | 2.0±0.71 |
| 2 | 7.1±1.62 | 357.0±15.42 | 203.3±16.56 | 1.7±0.06 | 3.9±0.44 | 2.3±0.25 |
| 3 | 8.4±1.85 | 356.5±15.76 | 238.5±38.66 | 1.7±0.09 | 4.1±0.43 | 2.5±0.29 |
| 4 | 10.6±2.51 | 362.5±17.13 | 216.8±19.93 | 1.6±0.07 | 3.6±0.35 | 2.0±0.41 |
| Sig. | N.S. | N.S. | N.S. | N.S. | N.S. | N.S. |

Sig= significant, a-b = indicate significant differences between means in same column.

## Conclusion:

Ultimately, the addition of Moringa oleifera to the diets of Japanese quail had the least effect on body weight, blood biochemistry, and feed conversion ratio in either treatment arm although there was some discrepancy in feed ingestion and performance, indicating that the levels of intake and the duration of the supplementation were not enough to be able to produce significant effects.

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