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Evaluate the role of *Moringa oleifera* in improving the performance and productivity of broiler chickens

Ruya Fareed Jasim* and Sawsan Abdul Faraj Mohammed

Collage of Nursing, University of Kirkuk, Iraq.

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Abstract

Moringa oleifera, popularly known as the "tree of life" or "miracle tree," is considered an essential herbal plant due to its numerous medical and non-medicinal properties. So, the current study aimed to evaluate the role of *M. oleifera* in improving the performance and productivity of broiler chickens. 120 broiler chicks of the Lohman breed were raised in the poultry field belonging to the College of Agriculture/University of Tikrit for the period from February to April 2024. The herd was divided into three groups: the first group was the control treatment, and the second group was given 10% *M. oleifera* leaf powder to the diet. As for the third group, 10% *M. oleifera* seed oil was used with the feed, this study was designed to calculate the following criteria: live body weight, weight gain, feed intake, and mortality rate. The results showed that the live body weight was better in treatment with *M. oleifera* seed oil (2095.16±25.42) compared to treatment with *M. oleifera* leaves (1983.14±29.26) still, when compared to the control group (1842.65±13.57), the two groups had a significant difference (P≤0.05). The average weight gain was better in treatment with *M. oleifera* seed oil (1968.83±12.62) compared to treatment with *M. oleifera* leaves (1935.37±8.02), but the two groups showed a significant difference (P≤0.05) compared with the control group (1820.61± 11.35). The average of feed intake was better in treatment with *M. oleifera* seed oil (3391.41±9.57) compared to treatment with *M. oleifera* leaves (3315.27±11.82) still, when compared to the control group (3137.18±14.21), the two groups had a significant difference (P≤0.05). the mortality rate was better in treatment with *M. oleifera* seed oil (2.5%) compared to treatment with *M. oleifera* leaves (5.0%), but the two groups were better than the control group (7.5%). it is concluded that the leaves and seed oil of *M. oleifera* are a good enhancer in improving the performance and productivity of broiler chickens.

Keywords: M. *oleifera*; Broiler; Growth Performance; Weight gain.

1. Introduction

Every plant that includes bioactive components utilized in treatment or a precursor for the production of a medicine could be classified as medicinal [1-2]. Due to the scarcity and high cost of the main protein sources used to prepare rations in this industry, the poultry production sectors in the majority of developing countries are dealing with issues like rising feed costs [3-5]. For certain chicken feed ingredients, especially protein sources, this has meant investigating less expensive, more accessible, and less competitive substitutes [6]. One possible low-cost source of protein that could be used in this scenario for poultry feeding is the leaves of tropical legumes like *M. oleifera* [7-8]. Numerous plant species or parts are commonly recognized as feed components that to increase feed consumption and performance efficiency [9]. Some have been shown to have bioactive substances that function similarly to growth promoters for antibiotics [10]. In tropical nations, adding fresh or dried leaves to animal feed can boost productivity and make a major difference in the fight against nutritional inadequacies [11]. The most significant bioactive compounds found in the *M. oleifera* tree are flavonoids, alkaloids, phenolics, glucosinolates, carotenoids, saponins components, tannins, different phenolic acids and isothiocyanates. These substances are found in significant amounts throughout the plant [12]. It was discovered that M. oleifera seeds had an impact on broiler performance during the starting phase [13]. *M. oleifera* is a highly prized

* Corresponding author: Ruya Fareed Jasim.

food plant with a variety of applications [14]. The antibacterial properties of *M. oleifera* seeds were demonstrated in a report [15]. Additionally, because *M. oleifera* and *M. stenopetala* seed extracts produced an inhibitory effect on *Vibrio cholerae, Escherichia coli, and Salmonella typhii*, they could reduce water-borne illnesses [16]. Moreover, it has been noted that M. oléifera seeds are a good source of lipids, proteins, and minerals—the main constituents in feed [17]. *M. oleifera* may be significant to the chicken industry's economics. It has been discovered that the feed cost can be reduced by partially substituting *M. oleifera* leaf meal with fish meal [18]. Therefore, the current study aimed to evaluate the role of *M. oleifera* in improving the performance and productivity of broiler chickens.

2. Material and methods

120 broiler chicks of the Lohmann breed were raised in the poultry field belonging to the College of Agriculture/University of Tikrit from February to April 2024. The herd was divided into three groups: the first group was the control treatment, and second treatment was given 10% *M. oleifera* leaf powder to the diet. The third treatment, 10% *M. oleifera* seed oil was used with the feed (for every 100 grams of feed, 1 ml of oil was mixed with it). The *M. oleifera* plant was ground in the Food Industries Laboratory/College of Agriculture in the required quantities, then the powder was divided into parts The first one was mixed with the feed It was made homogeneously and presented to the birds. As for the second part (seeds), it was used to make seed oil. Both powdered leaves and seed oil were added to the diet, and the diet provided to the chicks consists of the materials shown in Table (1).

Table 1 Diet composition used in the experiment

Feed material	Percentage (%)
yellow corn	39
Soybean	22
Wheat	28
Salt	0.3
Limestone	0.7
Concentrated protein	10

*Each kg of protein concentrate contains crude protein, fat, crude fiber, calcium, phosphorus, lysine, methionine, sodium, 1.7% chlorine, vitamins E and A, and D3 vitamins, vitamin K, Folic acid, B12, B6, Pantothenic acid, Vitamin C, iron, copper, zinc, iodine, cobalt, selenium.

2.1. Growth and performance characteristics [4]

2.1.1. Live body weight

Live body weight of each replicate were calculated by weighting the live boiler of each replicate.

2.1.2. Weight gain

The weight gain was calculated as follow:

$$Weight\ gain\ (g)\ =\ weight\ at\ end\ of\ week\ (g)\ -\ weight\ at\ beginning\ of\ week\ (g)$$

2.1.3. Feed intake

Weekly feed consumption for every replicate is calculated according to the following formula:

$$Feed\ consumption\ (g) =\ food\ quantity\ at\ the\ beginning\ of\ week\ -\ food\ quantity\ at\ the\ end\ of\ week$$

2.1.4. Feed-conversion ratio

$$Feed-conversion\ ratio =\ quantity\ of\ feed\ consumption\ (g)\ /\ weight\ gain\ (g)$$

2.1.5. Rate of mortality

Due to *M. oleifera*, daily monitoring of the various treatment groups was implemented in order to record and check for any deaths that may occur within each treatment. The MR calculation is stated as a percentage in this way:

$$Mortality\ Rate = number\ of\ death\ /\ number\ of\ total\ birds$$

2.2. Statistical Analysis

Statistical Packages of the Social Sciences (SPSS) enabled the management of the data and the establishment of a complete randomized design (CRD) using one-way analysis of variance (ANOVA). The significance of the differences among means was evaluated using Duncan's Multiple Range Test (DMRT). To create tables, Microsoft Excel 2010 was used [19].

3. Results and discussion

Table (2) shows the weekly live body weight in the study groups, and it is noted that after the end of the fifth week, live body weight was better in treatment with *M. oleifera* seed oil (2095.16±25.42) compared to treatment with *M. oleifera* leaves (1983.14±29.26), but when compared to the control group (1842.65±13.57), the two groups had a significant difference (P≤0.05).

Table 2 The effect of adding of the *M. oleifera* to the standard diet on the average live body weight / g (mean ± SD)

Treatments / Period	Control treatment	Leaf treatment	Oil-seed treatment
Week 1	168.31±4.31 a	173.92±5.08 a	171.46±8.57 a
Week 2	474.72±7.54 a	488.17±7.41 a	472.39±4.12 a
Week 3	873.11±12.9 b	865.18±11.52 b	914.72±15.25 a
Week 4	1492.73±21.04 c	1572.45±17.38 b	1644.93±22.10 a
Week 5	1842.65±13.57 c	1983.14±29.26 b	2095.16±25.42 a

* different letters indicate that differences are significant (P≤0.05), whereas similar letters indicate that no differences are significant (P≤0.05).

Table (3) shows the weekly weight gain in the study groups, and it is noted that after the end of the fifth week, average weight gain was better in treatment with *M. oleifera* seed oil (1968.83±12.62) compared to treatment with *M. oleifera* leaves (1935.37±8.02), but when compared to the control group (1820.61±11.35), the two groups had a significant difference (P≤0.05).

Table 3 The effect of adding of the *M. oleifera* to the standard diet on the average weight gain/ g (mean ± SD)

Treatments / Period	Control treatment	Leaf treatment	Oil-seed treatment
Week 1	131.93±2.66 a	129.78±3.15 a	133.94±2.42 a
Week 2	258.14±9.51 a	261.48±5.13 a	264.11±6.91 a
Week 3	427.26±4.73 b	452.24±7.82 a	463.42±10.34 a
Week 4	471.21±5.17 c	503.41±4.26 b	516.13±5.92 a
Week 5	535.42±9.23 b	589.12±6.05 a	594.14±4.51 a
Total	1820.61±11.35 c	1935.37±8.02 b	1968.83±12.62 a

* different letters indicate that differences are significant (P≤0.05), whereas similar letters indicate that no differences are significant (P≤0.05).

Table (4) shows the weekly feed intake in the study groups, and it is noted that after the end of the fifth week, average of feed intake was better in treatment with *M. oleifera* seed oil (3391.41±9.57) compared to treatment with *M. oleifera* leaves (3137.18±14.21), but when compared to the control group (1820.61±11.35), the two groups had a significant difference (P≤0.05).

Table 4 The effect of adding of the *M. oleifera* to the standard diet on the feed intake (mg/bird) (mean ± SD)

Treatments / Period	Control treatment	Leaf treatment	Oil-seed treatment
Week 1	156.31±3.41 a	158.47±5.84 a	155.21±1.88 a
Week 2	381.45±5.72 a	386.34±4.52 a	380.62±3.73 a
Week 3	662.92±5.15 b	693.12±6.26 a	695.07±6.12 a
Week 4	842.03±3.29 c	877.13±4.11 b	892.41±6.41 a
Week 5	1105.52±12.61 b	1195.48±10.26 a	1267.55±7.18 a
Total	3137.18±14.21 c	3315.27±11.82 b	3391.41±9.57 a

* different letters indicate that differences are significant (P≤0.05), whereas similar letters indicate that no differences are significant (P≤0.05).

Table (5) shows the weekly mortality rate in the study groups, and it is noted that after the end of the fifth week, the mortality rate was better in treatment with *M. oleifera* seed oil (2.5%) compared to treatment with *M. oleifera* leaves (5.0%), but the two groups were better than control group (7.5%).

Table 5 The effect of adding of the *M. oleifera* to the standard diet on mortality rate (%)

Treatments / Period	Control treatment	Leaf treatment	Oil-seed treatment
Week 1	2.5%	0.0%	0.0%
Week 2	5.0%	2.5%	0.0%
Week 3	5.0%	2.5%	0.0%
Week 4	7.5%	2.5%	0.0%
Week 5	7.5%	5.0%	2.5%

The utilization of *M. oleifera* as a cost-effective feed source for chicken diets was the subject of numerous investigations. Because of its superior qualities, *Moringa* leaves could be used in place of fish or soybean meal [20]. Up to 24% of leaf meal from *M. oleifera* in broiler diets showed comparable growth rates to those of traditional commercial feeds, and up to 25% of M. oleifera meal in broiler diets had no effect on bird performance or mortality [21, 22]. M. oleifera leaves added to broiler diet have been shown in several tests to improve growth performance [23]. Performance was unaffected when soya bean meal was substituted in broiler feed at quantities up to 5% [24]. Feed intake, feed conversion ratio, and weight gain were unaffected by adding 7.5% leaf meal from *M. oleifera* to broiler meals; however, feed intake declined above this amount [25]. When fed at an 8% dietary level, leaf meal from *M. oleifera* improved weight gain, while feed intake and feed conversion ratio showed no change [26]. According to a number of earlier research, broiler chicken performance was not adversely affected by the use of *M. oleifera* leaf meal up to a 10% level, but performance was adversely affected by levels over 10% [27–28]. The existence of several bioactive substances may have a good impact on broiler performance. There are studies showing that extracts from a wide variety of herbal plants contain a large number of secondary metabolites, or plant bioactive, which may enhance broiler performance by raising the feed efficiency and live weight gain of broiler chickens [29–30]. These substances have the potential to alter the microarchitecture of the intestine, which could enhance nutritional absorption [31]. The increased feed efficiency and improved feed utilization in the *M. oleifera* supplemented treatment may have resulted in reduced FCR values [32]. Additionally, the presence of several antioxidant chemicals, vitamins, and minerals in *Moringa* leaves may have contributed to improved growth performance. Additionally, in line with the current investigation, Edu et al. [26] reported greater dressing percentage values in birds fed diets containing 10% *M. oleifera* leaf meal. Longer small intestines and heavier gizzards were observed in chicken strains supplemented with higher inclusion levels of 10% *M. oleifera* leaf meal, according to research by Sebola and Mokoboki [33] on *M. oleifera*. Because *M. oleifera* leaf meal contains a large amount of carotenoids, higher inclusion rates of this meal resulted in brighter yellowish coloration of the carcass [25].

4. Conclusion

Based on the results of the current study, it is concluded that both the leaves and seed oil of *M. oleifera* are a good enhancer in improving the performance and productivity of broiler chickens, as they lead to weight gain and increased meat weight when added to standard feed components.

Recommendations

Conduct several studies to investigate the effect of *M. oleifera* extracts on some blood and physiological parameters in broiler chickens.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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