

Effect of adding moringa oleifera leaves and seed to diet on the Immunity and physiological performance of broilers (Ross 308)

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Abstract

The experiment was conducted at the poultry farm Department of Animal Production _ College of Agriculture University, during the period from- 7/9/2023 to 18/10/2023 to study the effect of adding moringa oleifera leaves and seed powders to the diet of broiler chickens on the immunity and physiological performance. 225 unsexed broiler chicks (Ross308), one day old with. an average chick weight of 40 g were randomly distributed into five treatments; with three replicates and 15 birds/replicate, and the experimental treatments were as follows: T1 = control treatment (standard diet without the addition), T2 = standard diet added to 3 g/kg of Moringa oleifera leaf powder diet, T3 = standard diet added to 6 g/ kg of diet moringa oleifera leaves powder, T4 = standard diet with 3 g/ kg of moringa oleifera seed powder diet added, T5 = standard diet with 6 g/ kg of moringa oleifera seed powder diet added. The results of the experiment were as follows: The results showed that there is a significant superiority ($P \leq 0.05$) in the physiological characteristics, While the third treatment (T3) recorded the highest concentration of glucose compared to the control treatment, while the control treatment recorded the highest concentration of uric acid compared to the other treatments. Also, the results of the experiment recorded a high P-Value superiority in immunological measurements when different levels of moringa oleifera leaves and its seeds added to the diet of broilers (Ross 308) during the experimental period. All the moringa oleifera treatmentsshowed the highest values when measuring the volumetric standard for antibodies to infectious bronchitis IB virus and Newcastle Disease (N.D.). compared to the control.

Keywords: broilers, moringa oleifera leaves and seed powder, physiological, immunity.

* This research is part of a master's thesis. Message of the first researcher .

Introduction

The poultry sector is characterized by several main advantages, including rapid growth and high diet conversion efficiency compared to other livestock sectors, which gives it the ability to meet the increasing demand. Chicken meat is also characterized by its low fat content, which makes it a healthy choice compared to other types of meat. These

advantages contribute to strengthening the position of the poultry sector as a basic pillar of food security and providing animal protein with high efficiency [1, 2]. This has prompted poultry producers to use antibiotics to accelerate the growth of broilers, increase meat production, and to meet animal protein needs. This rapid growth causes a

deterioration in meat quality traits, which is why many poultry producers around the world have focused on increasing carcass productivity and meat quality through good management and care of broilers, in addition to the ban imposed by the European Union. on the general use of antibiotics other countries have also imposed strict penalties on the use of antibiotics in animal production. Due to public concern about bacteria developing resistance to antibiotics [3, 4, 5] and the accumulation of these chemicals in meat produced from broiler chickens, and in order to stop this accumulation, medicinal plants are used as diet additives. This helps maintain the health of the animal and preserves the meat and quality of the carcasses [6]. Moringa oleifera is a common multi-purpose legume that belongs to the moringa oleifera family which used medicinally [7] Due to the phytochemicals found in its leaves, such as (carotenoids, flavonoids, chlorophyll, phenols, xanthines, cytokines, alkaloids) [8], in addition to their antioxidant antibacterial, antiviral, antifungal, and anti-inflammatory properties. and also due to the presence of many active substances such as carotene, vitamin C, vitamin A, and vitamin E that fight free radicals, which stop the production of reactive oxygen species (ROS), and prevent them from migrating into meat and eggs [9]. In addition, it can be used to strengthen immune responses, promote intestinal health in broilers [10], and reduce the number of bacteria due to antioxidants that strengthen the immune system in broilers [11]. Moringa oleifera seeds also contain amino acids such as (glutamic, glycine, alanine). It works to lower blood pressure. which affects the heart and blood vessels by reducing cholesterol

levels [12]. The aim of this study is to find out the effect of adding different amounts of moringa oleifera leaves and seed powders to broiler chicken diets on their immunity and physiological.

Material and Methods

This experiment was conducted at the poultry farm Department of Animal Production - College of Agriculture - University of Diyala for the period from 7/9/2023 until 18/10/2023 to study the effect of adding powdered moringa oleifera leaves and seeds to the diet on immunity and physiological performance broilers (Ross 308). 225 unsexed one day old broiler chicks (Ross 308) with an average weight of 40 g were randomly distributed into five treatments with three replicates and 15 birds/replicate. The treatments were described as follows:

- .1 The first treatment (T1): was the control treatment: a standard diet without addition.
- .2 The second treatment (T2): Standard diet with moringa oleifera leaves powder added at a level of 3 g/ kg of diet.
- .3 The third treatment (T3): Standard diet with moringa oleifera leaves powder added at a level of 6 g/ kg of diet.
- .4 The fourth treatment (T4): Standard diet with moringa oleifera seed powder added at a level of 3 g/ kg of diet.
- .5 Fifth treatment (T5): Standard diet with moringa oleifera seed powder added at a level of 6 g/ kg of diet.

Unsexed one day old chicks were obtained from the Saif Poultry Hatchery - Baghdad - Bob Al-Sham, with an average weight of 40 g/chick, old and raised in a semi-closed hall. The floor of the cages designated for the chicks was covered with sawdust materials approximately 5 cm thick, then chicks placed

in the cages. The area of each cage was 2 x 1.5 m (15 chicks/cage). Dieters in the form of plastic dishes were used for each replicate during the first week of the study (rearing period), after that circular feeder with a diameter of 45 cm were used until the end of the study (six weeks). The lighting program used was 23 hours of light and 1 hour of darkness during the first three days, and then 20 hours of light and 4 hours of darkness was applied until the end to the study, according to what was indicated by [13]. The temperature was 33-34 °C on the first day, after that the temperature was reduced every day by 0.5 °C to reach a temperature of 21 °C at the end of the third week, which was stabilized until marketing (end of the study) according to [13], and at night, incubators that operate on gas system were used to provide appropriate heat for the chicks from the beginning of the

study until the end of the third week. The birds were fed a starter diet from the age of 1-14 days, and a growth diet from the age of 15-35 days. And a final diet from 36-42 days old, as shown in Table 1.

Moringa oleifera leaves and seeds were obtained from one of the apothecary shops in the local markets, which was imported from India in the form of dried leaves and seeds. After that, leaves and seeds were grinded into a powder form using a blender of Chinese origin, and the analysis was performed. The statistical analyse were carried out using Complete Randomize Design (CRD), and the significant differences between (means) the averages of the coefficients were determined using Duncan's multi-range test [14] with a significance level of 0.05

[15]The ready-made statistical program SPSS [16], was used to analyze the data

Table 1. Ingredients and nutrient composition of basal diets in the starter, growth, and final periods of broilers diet.

Diet material	Starter diet (1-14 days)(%)	Growth diet (15-35 days)(%)	Final diet (36-42 days)(%)
Yellow corn	48.3	51	54.7
Flour	6	6	6
Bran	3	3.5	3.5
Soybean meal*	37	33	29
Premix**	2.5	2.5	2.5
Limestone	1.2	1	0.8
Sun flower oil	2	3	3.5
Total	100	100	100
Calculated analysis***			
Crude protein (%)	23	21.5	20
Represented energy (kcal/kg)	3000	3096	3176

Lysine (%)	1.44	1.32	1.23
Methionine (%)	0.66	0.61	0.59
Methionine + Cystine (%)	1.02	0.96	0.92
Calcium (%)	0.93	0.90	0.81
Available phosphorus (%)	0.52	0.50	0.49

*Soybean meal of Argentinian origin contains 44% crude protein and 2230 kilocalories/kg represented energy.

**Ingredients of the FRACON premix produced by the international company SASU, containing protein 22.59%, energy 998.82 Kcal/kg, lysine 11.97%, methionine 15.46%, methionine + cysteine 16.20%, available phosphorus 13.08%, sodium 4.82%, calcium 14.27%, potassium 0.03 %, chloride 6.09% with a group of vitamins and mineral elements .

***According to the chemical composition based on analyzes of diet materials contained in the reports of the US National Research Council [17].

Results and Discussion

Physiological performance: Biochemical characteristics of blood:

The results showed that there is a significant effect $P \leq 0.05$ when different levels of moringa oleifera leaves and seeds powders added to the diet on the amount of glucose (table2), whereas T3 was significantly gave higher amount of to the glucose about 140.67 mg/100 ml compared to the control treatment (T1) and (T2), when recorded (134.33) and (132.67) mg/100 ml, respectively, but they did not significantly different with other two treatments (T4, T5) when they recorded (136.67) mg/100 ml, for both of them. However, moringa oleifera leaves and seeds powders have significantly reduced the amount of uric acid in treatments (2,3,4, and 5) with values of (9.07, 9.19, ,8.45 and 8.95) mg/100 ml respectively compare to the control, where it was 10.29 mg/100 ml. In addition, no significant differences have been found among other parameters including total protein, cholesterol, albumin, and globulin.

The results in table 2 showed that there was a significant increase in blood glucose when different levels of moringa oleifera leaves and seeds powder added to broiler diet (Ross 308) for a period of 1-42 days. The reason for increasing blood glucose levels is due to the high percentage of moringa oleifera leaves powder in the diet, which leads to increase the concentration of active compounds and the amount of carbohydrates in the feed thus, the absorption of glucose in large quantities from the feed is increased. However, when adding 3 g/kg of moringa oleifera leaves powder, the amount may not sufficient to affect glucose levels in the blood [18], These results are consistent with the results found by [19] when dried moringa oleifera leaves powder added to the diet at levels 1, 3, 5, 7%, whereas the 3% level recorded the highest concentration of glucose. The results of our study also agree with the results published by [20], where it was stated that adding Moringa oleifera leaves powder at levels of 1, 2, or 3%, while the 3% level led to an increase in glucose

concentration compared to the rest of the treatments, which did not differ from the control. While the results reported by [21] differed when moringa oleifera leaves were added to the diet at levels of 25, 50, 75, and 100 grams/kg diet, as adding 50 and 75 grams/kg diet led to a decrease in blood glucose concentration compared to the control treatment. The results of Table (2) also showed that when adding moringa oleifera leaves and seed powder, there was a significant decrease in the concentration of uric acid in the addition treatments compared to the control treatment, which recorded the highest concentration of uric acid. The reason

for this is attributed to the content of moringa oleifera leaves and seeds on a variety of compounds. Active ingredients, including proteins, vitamins, minerals, amino acids, polyphenols, and flavonoids [22]. The reason is also attributed to moringa oleifera leaves ability to improve the process of digestion and absorption of protein, which reduces the amount of remaining protein that is decomposed into acid. Urinary tract, nitrogen metabolism and purine proteins in birds [23], while the results did not agree with the results of [24] when adding moringa oleifera seeds at a rate of 0.01, 0.02, 0.03, 0.04% to the diet of broilers.

Table 2. Effect of adding powdered leaves and seeds of Moringa oleifera to the diet on the biochemical blood characteristics of broilers at the age of 42 days, (means \pm SE.)

parameters	Treatments					P-Value
	T1	T2	T3	T4	T5	
Glucose (mg/100 ml)	134.33 \pm 1.76 b	132.67 \pm 1.76 B	140.67 \pm 0.88 a	136.67 \pm 0.88 ab	136.67 \pm 1.20 ab	0.019
Total protein(mg/100 ml)	4.19 \pm 0.30	4.28 \pm 0.35	4.39 \pm 0.33	4.10 \pm 0.48	3.85 \pm 0.46	0.894
Cholesterol (mg/100 ml)	157.66 \pm 6.56	167.00 \pm 5.13	162.33 \pm 7.85	161.00 \pm 20.42	153.00 \pm 7.21	0.916
Uric acid(mg/100 ml)	10.29 \pm 0.48 a	9.07 \pm 0.42 B	9.19 \pm 0.14 b	8.45 \pm 0.17 b	8.95 \pm 0.14 b	0.022
Albumin (mg/100 ml)	1.83 \pm 0.39	2.17 \pm 0.39	2.25 \pm 0.18	2.19 \pm 0.09	2.08 \pm 0.04	0.823
Globulin (mg/100 ml)	2.35 \pm 0.47	2.10 \pm 0.28	2.14 \pm 0.45	1.91 \pm 0.42	1.77 \pm 0.45	0.885

T1: control (no addition), T2, T3: adding moringa oleifera leaves powder (3, 6) g/kg diet, T4, T5: adding moringa oleifera seeds powder (3, 6) g/kg diet.

Different letters within one row indicate the presence of significant differences between the means at the level $P \leq 0.05$ according to Duncan's multiple range test .

Humoral immunity

Measurement of antibodies directed to Newcastle disease and infectious bronchitis:

The results shown in table (3) indicated the presence of highly significant differences $P \leq 0.01$ when adding different levels of moringa oleifera leaves and seeds powders to broiler diet. It showed significant superiority in the 2nd treatment when 3g/kg of moringa oleifera leaves added to the diet compared to other treatments. Whereas the volumetric concentration of antibodies directed against Infectious Bronchitis (IB) virus disease was recorded to be (8643.20) of the volumetric standard while other treatments (T1, T3, T4, and T5), have recorded these values (2012.33, 6492.33, 5598.67, 4747.00) respectively. In addition, the concentration of the volumetric standard of antibodies directed against Newcastle Disease (ND) virus showed a significant superiority for the 2nd (T2), which recorded 7575.33 volumetric standards against the ND virus compared with other treatments (T1, T3, T4, and T5) have recorded these values (604.33, 5557.67, 3152.00, 3320.00) respectively, Also, the 3rd treatment (T3) using 6 g/kg of moringa oleifera leaves powder was superior to the control treatment (T1) and other two treatments (T4, T5).). Which means that titer of ND antibodies linearly decreased by increasing the level of moringa oleifera leaves powders compared to the control. In addition, other two treatments (T4 and T5) using 3 and 6 g/kg of moringa oleifera seed powder were superior to the control treatment (T1) in measuring the concentration of the volumetric standard for antibodies directed against the Newcastle Disease ND virus

Table 3. Effect of adding Moringa oleifera leaves and seeds (Moringa oleifera) powder to the diet on the humoral immunity of broilers at the age of 42 days, (means \pm SE.)

Treatments	Titter of Antibodies of N.D	Titter of Antibodies of I.B
T1	604.33 \pm 164.83 d	2012.33 \pm 287.20 c
T2	7575.33 \pm 576.64 a	8643.20 \pm 721.84 a
T3	5557.67 \pm 401.31 b	6492.33 \pm 751.58 b
T4	3152.00 \pm 420.74 c	5598.67 \pm 422.85 b
T5	3320.00 \pm 348.62 c	4747.00 \pm 355.71 b
P-Value	3.00E-06	9.20E-05

T1: control (no addition), T2, T3: adding moringa oleifera leaves powder (3, 6) g/kg diet, T4, T5: adding moringa oleifera seed powder (3, 6) g/kg diet .

Different letters within one row indicate the presence of significant differences between the means at the $P \leq 0.01$ level according to Duncan's multiple range test.

The results of tables (3) showed an improvement in the immune response of the 2nd treatment (T2) when 3 g/kg of moringa oleifera leaves and seeds powder was added to the diet. Where it was significantly higher than other treatments through whole the study in measuring antibodies directed against Newcastle disease virus ND and infectious bronchitis IB. The reason for this is due to the moringa oleifera leaves content of vitamins (A, C, E) and phytochemicals such as flavonoids, carotenoids, alkaloids, phenols, cytokines, as well as their antioxidant properties and fighting free radicals and suppressing them, which led to Enhancing the health and immunity of broilers [3]. Moringa oleifera leaves also contain high levels of antioxidants and compounds with an anti-inflammatory effect, which led to an increase in the titer of antibodies directed against Newcastle Disease (ND) [25]. The antioxidants contained in moringa oleifera leaves work to scavenge free radicals caused by oxidative stress [26]. It is possible to use moringa oleifera leaves to prevent diabetes and blood pressure, and it is also possible to use moringa oleifera seeds to treat arthritis, rheumatism, and high blood pressure [27], the results of this experiment agreed with the results found by [28] when adding moringa oleifera leaves powder and pomegranate peels to broiler diets at a rate of 500 and 1000 mg/kg respectively for 42 days, which resulted an improvement in antibodies directed against

Newcastle virus disease, while the results of the current study did not agree with the results published by [29], when adding moringa oleifera leaf powder to the diets of broiler chickens at a rate of 2, 4 and 6% for 5 weeks. Likewise, this results did not agree with the results stated by [30] when adding moringa oleifera seeds to broiler diets at a rate of 10, 15, 20 and 25% for 42 days.

Conclusion

It concluded that adding Moringa oleifera leaves powder at the rate of 6 g/kg of diet led to an increase in blood sugar levels. Also, all the levels of moringa oleifera leaves and seeds powders added to the diet led to a decrease in the levels of uric acid. While no significant effect was shown on total protein, cholesterol, albumin, and globulin. In addition adding moringa oleifera leaves and seeds powder at both levels (3 and 6) g/ kg to broiler diets, led to a noticeable improvement in the humoral immunity to antibodies directed against Newcastle virus N.D. and infectious bronchitis virus I.B.

Acknowledgments :

Thanks and appreciation

I can only extend my sincere thanks and gratitude to everyone who contributed on the completion of this thesis. Firstly, I would like to express my deep gratitude to the statistical analyst who helped me analyzer the data statistically. I also extend my sincere thanks to my honorable supervisor for his continuous

support and guidance, which was the main reason for the completion of this work.

I do not forget to thank my friends and colleagues who provided me with support and assistance throughout the study period. I would also like to thank the professors who provide us with valuable information and guidance that paved the way for the completion of this study. Many thanks and appreciation to all of you.

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