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Effect of Adding Different Levels of Moringa oleifera Leaves Extract to Drinking Water on Some Physiological traits of Broiler (Ross 308)

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Abstract: The Department of Animal Production at the College of Agriculture / Al-Qasim Green University conducted this experiment in the poultry farm to examine the effects on a few physiological traits of broiler chickens of adding varying levels of Moringa oleifera leaf nano-alcoholic extract (MOLE) to drinking water. 180 unsexed one-day-old Ross broiler chicks were utilized. Four groups were randomly assigned to them, 45 birds were used for each group, and each group was repeated three times (15 birds each replicate). The following were the experimental groups : the initial group (control), which involved not putting (MOLE) in the drinking water. The second group involved adding 10 milliliters (ml) of 0.02% level (MOLE) per liter of drinking water. The third group was the addition of a 10 ml/liter dose of a 0.04% level of (MOLE). The fourth group involved adding a 10 ml/liter dose of a 0.06% level of (MOLE). The following characteristics were examined in the experiment: hematological characteristics, including the number of red and white blood cells, packed cell volume, and hemoglobin level; biochemical characteristics, including all of the levels of glucose, cholesterol, triglycerides, globin, albumin, and total protein; and immunological characteristics, the delayed hypersensitivity test in wattles, relative weight, and evidence of Fabricia's gland. The findings show that, when compared to the other research groups , the addition of (MOLE) at a level of 0.06%/liter of drinking water significantly improved all evaluated attributes (P≤0.05).

Keywords: Nano-Alcoholic Extract Of *Moringa Oleifera* Leaves, Physiological Characteristics, Broiler Chickens

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Introduction

Because it generates white meat, eggs, and other byproducts, the chicken business is crucial to the agriculture sector and to improving human living standards. When compared to other farm animals, poultry exhibits superior food conversion efficiency, which is demonstrated by the quantity of feed they consume and the rate at which they gain weight.

Many medicinal plants, such as mint leaves (Nihad et al., 2016), moringa leaves (Aqeel et al., 2018; Oraibi and Ali, 2021; Nihad and Dakhil, 2022), and white tea leaves (Nihad et al., 2019) have recently been added to the feed of broilers and laying hens. The scientific name for this plant is Moringa oleifera. It is widely distributed throughout tropical regions (Olugbemi et al., Nazmy et al., 2010), and is known by the Arabs as the "miracle tree" or the "tree of life" because it can grow five meters tall from a single seed. Its effectiveness is attributed to the presence of flavonoids, saponins, tannins, terpenoids, and sterol glycoside (Nazmy et al., 2016). It grows quickly and can withstand salinity and drought (Donkor et al., 2013). Because of their high composition, the leaves are regarded as edible and have significant nutritional and medicinal significance. According to Nihad et al. (2016), It is abundant in minerals, especially calcium and potassium, carotenoids, AA, and antioxidants, It also has vitamins C and A in it. Moringa oleifera leaves are free of dangerous substances like arsenic, cadmium, and mercury (Murro and others, 2003). Similarly, Doughari et al. (2007) reported that the key biological characteristics of alcoholic extracts of Moringa leaves vary depending on the type of solvent used to extract the active substances contained in these leaves, and Bukar and colleagues (2010) showed that the alcoholic extract of moringa leaves has a significant and more effective effect on pathogenic bacteria compared to the aqueous extract.

Numerous technologies have emerged in the poultry industry in recent years, but nanotechnology stands out as the most significant. This promising and developing technology has the potential to completely transform the poultry industry globally. The field of poultry nutrition has made extensive use of this technology (Nbras and Nihad, 2019), and nanoparticles in general have dimensions. These nanoparticles, which range in size from 1 to 100 nanometers, are able to evade the body's natural processes for distributing and transferring nutrients across tissues and cell membranes. According to Troncarelli et al. (2013), nanotechnology is used to create new goods and explore the possibilities of repurposing conventional materials to get desired outcomes. Nanomaterials can be employed in a wide range of industries, including manufacturing, health care, and pharmacy, thanks to their newly formed physical qualities as a result of the material's drastically decreased volume (Feynman, 1959). Because there aren't many studies on the effects of putting (MOLE) in broiler water, The objectives of this study were to identify and assess the effectiveness of (MOLE), investigate the degree to which it affects physiological function, and identify the beneficial components.

Materials and Methods

Experiment design

The 35-day study took place in the Department of Animal Production's chicken farm at the College of Agriculture at Al-Qasim Green University. It began on March 22, 2024, and ended on April 25, 2024. 180 unsexed Ross broiler chicks were used. The chicks were raised in floor cages, and the chicks were randomly distributed into 4 groups , each consisting of 3 replicates, with each replicate containing 15 chicks. The feed was provided to the birds freely, as three types of diets used in feeding the birds during the experiment period (35 days) were manufactured, balanced with protein and energy. The starter diet, provided from the age of one day until 11 days, contained crude protein (23.1%) and represented energy (3065 kilocalories/kg of feed) for each of the experimental groups . As for the growth ration, it was provided from the age of 12 days until 22 days, and it had a protein content of 21.1%, and the energy represented by 3175 kilocalories/kg of feed. As for the final ration, it was provided from the age of 23 days until 35 days and contained crude protein (20.3%) and representative energy (3221 kcal/kg feed), as shown in the table (Table 1). Beginning with the first day of life, the drinking water was supplemented with the following (MOLE): The first group (control) was not putting any (MOLE) in the drinking water. The second group involved adding a 0.02% level of (MOLE) to one liter of drinking water (10 milliliters). The third group involves adding a 0.04% level of (MOLE) to one liter of drinking water at a dose of 10 ml. The fourth therapy involves adding a 0.06% level of (MOLE) to one liter of drinking water at a dose of 10 milliliters.

Studied attributes

The immunological traits were measured according to Voller et al. (1977), (Al-Dafai, 2000), the relative weight of the Fabricia gland and the Fabricia index according to Lucio and Hitchner (1979). At the conclusion of the fifth week, six birds from each group group had blood drawn from their wing veins. After the birds were killed, the blood was drawn into 10-milliliter glass tubes devoid of anticoagulant and arranged horizontally to remove the clot (which consisted of fibrinogen proteins) so that the quantity of blood cells could be examined. Hemoglobin (Hb) level (Varley et al., 1980), packed cell volume (PCV) (Archer, 1965), and red and white (WBC) (Natt and Herrick, 1952). The centrifuge was filled with the remaining samples. The serum was centrifuged for 15 minutes at 3000 rpm in Central, and it was then stored in additional sterile tubes at -18°C. The serum was used for laboratory analyses in accordance with the instructions that came with the pre-made kits, in order to estimate the levels of total protein (Wooton, 1964), globulin (Monika et al., 2012), albumin (Maxwell et al., 1992), triglycerides (Richmond, 1973), glucose (Barham and Trinder, 1972), cholesterol (Richmond, 1973), triglycerides (Fossati and Prencipe, 1982), and albumin (Barham and Trinder, 1972).

SAS (2012) was used for statistical analysis with the Duncan (1955) multinomial test.

Table 1. Percentages of feed materials included in the composition of the diets and their calculated chemical composition for the diets used in the experiment

Feed material %	Types of diets		
	Starter 23-35 days	Starter 12-22 days	Starter 1-11 days
yellow corn	46	50	52
wheat	11	11.26	11
Protein concentrate*	33	28	26

Soybean meal 48% **	5	5	5
Sun flower oil	3	4	4.4
Dicalcium and phosphorus	0.7	0.5	0.4
Table salt	0.1	0.1	0.1
Limestone	1.2	1.14	1.1
The total	100	100	100
Calculated chemical analysis***			
Representative energy (kilocalorie/kg feed)	3065	3175	3221
Crude protein (%)	23.1	21.1	20.3
Crude fiber (%)	2.7	2.6	2.6
Crude fat (%)	5.6	6.7	7.2
Lysine (%)	1.32	1.19	1.13
Methionine + Cysteine (%)	0.88	0.83	0.81
Calcium (%)	0.98	0.89	0.85
Available phosphorus (%)	0.48	0.44	0.42

***According to NRC (1994)

Results and Discussion

Immune traits

Table (2) shows it is observed that both cellular immunity and T4 group significantly improved ($P \le 0.05$) when on T2 group, which also significantly improved ($P \le 0.05$) when compared to control group DTH, defense against Newcastle disease, and the Fabricia gland's relative weight, although there were no appreciable variations between the two groups (T3 and T4). Regarding the Fabricia gland index, the T4 group showed a substantial improvement ($P \le 0.05$) in comparison to the T3 group, which in turn showed a significant improvement ($P \le 0.05$) in comparison to the T2 group. $P<0.05$) in contrast to the intervention.

Table 2. Effect of (MOLE) on the immune response of broilers

Groups	Cellular immunity (DTH)	Newcastle immunity (ELISA)	Relative weight of Fabricia gland	Fabricia guide
T1	0.001±0.166 c	89.37 ± 2434.6 c	0.001 ± 0.059 c	0.001 ± 1.000 d
T2	0.002±0.198 b	56.66 ± 2732.2 b	0.001 ± 0.086 b	0.010 ± 1.458 c
T3	0.001±0.217 ab	40.12 ± 2846.1 ab	0.001 ± 0.098 ab	0.012 ± 1.661 b
T4	0.001±0.234 a	77.06 ± 2929.8 a	0.001 ± 0.112 a	0.011 ± 1.898 a
Significant level	*	*	*	*

* There were significant differences at the level of $P \le 0.05$.

Blood traits

Table 3 displays the impact of incorporating (MOLE) into drinking water on various blood parameters in broiler chickens. Notably, in every case, the T4 group considerably outperformed the T2 group ($P \le 0.05$) and the T2 group outperformed the control group ($P \le 0.05$). The table above shows that, based on hemoglobin level (Hb), packed cell volume (PCV), and red blood cell count, the T4 group considerably outperformed the T2 and T3 groups (P≤0.05), which in turn outperformed the control group.

The effect of adding (MOLE) to drinking water on some biochemical characteristics of broiler chicken blood plasma is shown in Table 4, where the levels of cholesterol and triglycerides in group T4 were significantly lower (P≤0.05) than in groups T1 and T2, and the levels of glucose, albumin, globulin, and total protein were significantly higher (P≤0.05) in group T4 than in groups T2 and T3, which were significantly improved (P≤0.05) when compared to the control group.

Table 3. Effect of (MOLE) to on the number of red and white blood cells, the percentage of packed cell volume, and the level of hemoglobin in the blood of broiler

Groups	Red blood cell count (× 10^6.mm^{-3} blood)	White blood cell count (× 10^3.mm^{-3} blood)	PCV (%)	Hb (g/100ml)
T1	0.02±2.19 c	0.09±20.26 c	0.13±26.77 c	0.05±8.38 c
T2	0.01±2.37 b	0.11±23.33 b	0.05±28.46 b	0.04±8.89 b
T3	0.03±2.42ab	0.07±24.51 b	0.09±28.94ab	0.03±9.22ab
T4	0.01±2.57 a	0.05±25.72 a	0.11±29.39 a	0.02±9.64 a
Significant level	*	*	*	*

* There were significant differences at the level of P≤0.05.

Table 4. Effect of (MOLE) on the level of glucose, cholesterol, triglycerides, total protein, albumin, and globulin in the blood plasma of broilers ± standard error

Groups	Glucose level (mg/100ml)	Cholesterol level (mg/100ml)	Triglyceride level (mg/100 ml)	albumin level (g/100ml)	globulin level (g/100ml)	Total protein (g/100ml)
T1	0.50±158.21 c	0.79±192.52 a	0.37±65.73 a	0.01±1.18 c	0.01±1.06 c	0.03±2.24 c
T2	0.56±164.73bc	0.41±179.76 b	0.13±59.44 b	0.01±1.37 b	0.01±1.28 b	0.04±2.65 b
T3	1.11±172.55ab	0.16±174.83 b	0.40±56.79bc	0.02±1.46 b	0.02±1.35 b	0.01±2.81 b
T4	0.93±184.69 a	0.33±166.17 c	0.05±53.90 c	0.01±1.61 a	0.01±1.51 a	0.01±3.12 a
Significant level	*	*	*	*	*	*

* There were significant differences at the level of P≤0.05.

Discussion

Immune traits

The relative weight of the Fabricia gland at high levels of the (MOLE), as well as the notable improvement in both cellular immunity (DTH) and immunity against Newcastle disease, are both attributed to the (MOLE). These characteristics of the extract may be the cause of the good and effective effects on the body's functions. Due to the presence of potent compounds like flavonoids and phenols, which function as antioxidants and suppress free radicals to keep the body in a normal state, it plays a significant role in boosting the immune system's activation and stimulation as well as immune response (Sudha et al., 2010). According to Najafi and Torki (2010), using medicinal plants—including moringa—may help broiler immune systems function better by increasing the ratio of helper to inhibitory T lymphocytes, boosting natural killer cell activity, or triggering the production of antibodies by B lymphocytes. Active compounds, most notably resinous substances like thymine and tannin, may also promote the synthesis of particular cytokines from lymphocytes and enhance the creation of white blood cells in the bone marrow.

Blood traits

The blood qualities of broiler chickens were enhanced by the (MOLE). The increase in red blood cells could be attributed to either the body's ability to meet the demands of delivering oxygen and nutrients to the cells through an increase in the birds' metabolic rate, or to the protective effects of phenolic compounds against oxidative stress on blood cells (Burton and Guin, 1968). Additionally, tannin has been shown to be an effective means of stimulating the production of white blood cells in broiler blood (Youssef et al., 2017), and the significant increase in both. Blood and hemoglobin level result from an increase in the number of red blood cells (Al-Hasani, 2000). The findings show that at high levels of the (MOLE), there was a significant increase in blood glucose level. This might be because (MOLE) have an impact on the body that is comparable to that of glucocorticoids, which raises blood sugar levels. According to Nihad et al. (2016), the process of gluconeogenesis produces sugar from non-carbohydrate sources in the blood plasma of birds. This process also results in an increase in total protein level when (MOLE) groups are applied as opposed to a control group. This may be due to the fact that the Moringa plant contains glycyrrhetic acid and lycyrrhizin, which work by promoting protein synthesis and inhibiting protein degradation in a manner akin to steroid hormones. This promotes muscle growth and increased protein metabolism in blood plasma. According to Varley et al. (1980), increased protein level in blood plasma is caused by the transportation of certain mineral elements, vitamins, fatty acids, carbohydrates, and hormones like thyroxine by plasma proteins, especially albumin. Nihad and Dakhil claim that growing more moringa plants will reduce blood plasma cholesterol. According to (2022), one way moringa leaves help lower blood serum levels of cholesterol and triglycerides is through higher metabolism, which is primarily demonstrated by increased thyroid gland activity and increased thyroxine hormone secretion.

Conclusion

This investigation came to the conclusion that broiler physiological traits might be enhanced by incorporating (MOLE) into drinking water.

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