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Effect of adding different concentrations of mix-oil solution to drinking water of broiler chickens Ross 308 and breeders at elevated temperatures on productive performance

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Abstract

Background: The mix-oil solution added to broiler drinking water was tested at Al-Anwar Poultry Station in Babil Governorate, Iraq, from 10/7/2022 to 14/8/2022.

Methods: 300 Ross 308 broiler chicks, one day old and unsexed, A cohort of chicks, possessing an average mass of 40 g, were subjected to random allocation into five distinct treatments. Each treatment was replicated thrice, with each replicate consisting of 20 chicks. and given mix-oil in their drinking water from day one: T1: control. T2: 0.25 ml MIX-OIL L-1, T3: 0.50, T4: 0.75, T5: 1. The experimental birds received 28–35–28 c.

Results: Treatment T5 and all addition treatments outperformed the control treatment in live weight ($p < 0.01$). Total weight gain was significantly better for treatment T5 ($p < 0.01$) than T1 and T4, but not significantly different. T3, T2.

- The total consumption rate was much higher ($p < 0.01$). The T3 therapy outperformed all other added therapies.
- The T5 treatment had a "significant" improvement in total feed conversion coefficient ($p < 0.01$) over the T4 treatment, but not the control treatment.
- The addition treatments had 11.66% fewer deaths than the control treatment ($p < 0.05$).

Conclusion: High temperatures can reduce spent feed, increase the growth of harmful bacteria, and infect the digestive system, affecting broiler performance. However, adding a balanced mixture of highly concentrated fatty acids can reduce bacteria growth and numbers, increasing intestinal cell activity and surface area. It enhances nutrition uptake and boosts broiler output in heat stress.

Introduction

The non-specialized response to any external or internal challenges invites the bird to adapt to the new case [1], The detrimental effects of heat stress on poultry include a decrease in live body weight and feed intake, a reduction in feed conversion efficiency, and an elevation in mortality rates [2]. This phenomenon is attributed to the impact of heat stress as an environmental factor. The decrease in feed consumption leads to a decrease in the efficiency of food conversion and also to a change in the functions of the intestines and then a defect in the digestion processes, To address this matter many techniques and additives were used, including medicinal herbs, which noticed a significant improvement in the performance of growth when used [3] Or adding nano-selenium with vitamin E as an antioxidant and also to "reduce heat stress to which birds are exposed [4], and also" injecting hatching eggs with nanoscale silver to reduce the effect of heat stress to which thousands of hatchlings were exposed [5]. In the poultry industry, various antibiotics are utilized on a significant level [6]. However, the excessive use of antibiotics in poultry diets has led to the rapid spread of antimicrobial resistance [7, 8]. As a result, several countries have imposed bans on the use of antibiotics as growth stimulants in nutritional programs [9]. This has prompted the exploration of alternative options, such as essential oils and fatty acids [10]. Essential oils are hydrophobic liquids that possess a distinct aroma and are derived from various plant parts, including but not limited to flowers, buds, seeds, leaves, and roots, through diverse extraction techniques. These oils showed “antimicrobial” activity and stimulating effects on the digestive system of broilers, in addition to an antioxidant effect [11]. Essential fatty acids derived from plants with medicinal and aromatic properties are among the most important sources of alternative nutrition for broiler chickens, They are characterised by being volatile fatty acids that do not cause sedimentation in the tissues of the chicken, which makes them safe in terms of human use [12]. Feed additives are commonly used in poultry diets, either in the form of a powder or a solution added to the drinking water of broilers. This mixture is known to enhance growth performance and improve the efficiency of food conversion by stimulating the secretion of digestive enzymes [13]. In view of the lack of local studies that deal with the issue of using Mix-oil and adding it to the drinking water of broiler chickens and its role in enhancing productive performance, this study aimed at the effect of adding a Mix-oil solution with different concentrations to the drinking water of broiler chickens on some productive characteristics and under conditions of heat stress.

Methods

The current investigation was conducted at the Al-Anwar Company's fields situated in Babil Governorate for a duration of 35 days, commencing from the 10th of July 2022 and concluding on the 14th of August 2022. The study employed a randomized experimental design, utilizing a sample of 300 unsexed chicks that were one day old. The sample was divided into five treatments, each with three replications. The study employed a sample size of 20 chicks per replicate as the experimental units, Subsequently, the aforementioned were allocated to enclosures measuring 1.5 meters by 1 meter. At the commencement of the experiment, the drinking water was enriched with the Mix-oil solution, and the ensuing interventions were dispensed in the subsequent sequence: T1: control treatment, T2: adding 0.25 ml mix-oil L^{-1} , T3: adding 0.50 ml mix-oil L^{-1}, T4: adding 0.75 ml mix-oil L^{-1}, T5: add 1 ml mix-oil L^{-1}.

Mix-oil solution was used, which is a commercial product consisting of a mixture of highly concentrated essential oils, from the Italian company Animal Wellness Products. Imported by Sama Al-Anwar Company for Veterinary and Agricultural Services.

Feed treatment

During the first three weeks of their life, the chicks were given a starter diet consisting of feed with a protein content of 23.04% and an energy quantity of 3021.45 kilo calories/kg.

Feed component	Feed starter breeding (1-21) days	Feed growth (22-35) days
Wheat (*Triticum aestivum*)	28.25	24
Protein concentrate	5	5
Limestone	0.9	0.6
soy bean (*Glycine max*)	31.75	24.8
Vitamin-mineral mix	0.2	0.2
Corn (*Zea mays*)	30	40
Dicalcium phosphate (DCP)	0.7	0.9
Sunflower oil	2.9	4.4
Nacl	0.3	0.1

* Each kilogram of Brocon-5 Special W protein concentrate from China contains 40.0 grams of protein, 3.5 grams of fat, 1.0 gram of fiber, 6.0 grams of calcium, 3.0 percent of usable phosphorus, 3.25% of lysine, 3.90% of methionine plus cysteine, and 2.2 percent of sodium. The average energy content is 2100 kcal/kg. Vitamin E 500 mg, Vitamin K3 30 mg, Vitamins B1, B2, B3, B6, and B12 100 mcg each, Folic Acid 10 mg, Biotin 100 mcg, Iron 1 mg, Copper 100 mg, Manganese 1.2 mg, Zinc 800 mg, Iodine 15 mg, Selenium 2 mg, Cobalt 6 mg, and Antioxidant BHT 900 mg make up the full complement of vitamins and minerals. The formula used was [12].

Table 1: Used feed ingredient percentages.

During the period spanning from the fourth week to the conclusion of the fifth week, the initial dietary regimen was substituted with a growth-oriented diet characterized by a protein ratio of 20.06 and an energy content of 3194.92 kilocalories per kilogram. Throughout this period, the chicks were provided with feed that contained nano selenium and astaxanthin in the concentrations specified above, as well as water, which was made available to them at all times. Table 1 displays the utilized feed.

Preventive program

Utilize the preventive health program outlined in Table 2 in the following manner:

Age (day)	Vitamins or Vaccines
1	Oily vaccine (Newcastle disease virus + IB + Camboro)
2--5	Vitamins AD3E + C + B-Complex + Antibiotics
14	Newcastle disease virus Vaccine IB (drinking water) + 30 Clone ophthalmic instillation

* Komipharm international's preventive program uses vitamin A to build tissues and organs, grow and develop the bird, E to improve metabolism, increase blood cells, and develop immunity, D to build bones, beak, and muscle contraction, and B to improve metabolism, growth, and production of red blood cells and immune cells.

Table 2: Preventive Program

Breeding room temperature

The daily temperature readings within the hall were documented at four distinct intervals of time (600, 1200, 1800, and 2400) using a set of four thermometers that were strategically placed throughout the hall. The temperature measurements are displayed in Table 3.

Age / Week	Temperature			
Time	6 am	12 pm	6 pm	12 am
1	33.60	35.14	35.90	33.24
2	29.84	35.28	35.45	29.46
3	28.71	35.57	36.17	28.10
4	29.52	36.67	36.33	28.24
5	27.65	36.80	36.54	29.60

* The temperature was controlled by not cooling the hall with the usual broiler chicken cooling method (cooling wet grooves made of wood) for 6 hours a day and measuring the temperatures with existing thermometers attached to the bird's level at the beginning, middle, and end of the hall. This is to stress the bird thermally and determine the additive's efficiency in broiler tolerance to Iraqi ambient temperatures.

Table 3: Weekly temperatures for 1-5 Weeks

Characteristics studied

Weight of live bird (g bird^{-1})

The average weight of each bird specimen in the replicates was ascertained at the end of every week for a duration of five weeks (1-5). The aforementioned task was accomplished by measuring the weight of all bird specimens in every iteration and computing the mean weight per individual utilizing the subsequent equation [15].

$$\text{Average live weight (g bird}^{-1}\text{)} = \frac{\text{Total live weights of replicate birds at weekend (gm)}}{\text{Number of birds in the replicate}}$$

The average weekly weight gain (g/week) was calculated:

$$Weekly\ weight\ gain\ \left(\frac{g}{bird}\right) = Bird\ weight\ at\ the\ end\ of\ the\ week\ (g) - Bird\ weight\ at\ the\ beginning\ of\ the\ week\ (g)$$

Feed consumption (g bird^{-1})

The weekly feed intake rate of bird specimens in a singular replication for the initial five weeks was assessed by computing the difference between the weight of the feed remaining at the conclusion of the week and the weight of the feed dispensed at the commencement of the week. In the event of any loss in a particular replicate, the feed consumption rate was determined by employing equation 16.

$$\text{Average daily feed consumption (g / bird)} = \frac{P}{H\times7+x}$$

Where p is weekly feed consumption. H is the week's live chick count. x is days the dead birds fed

Feed conversion factor (g feed / g weight gain)

Feed conversion factor was estimated using following equation:

$$\text{Feed conversion facto(g feed /g weight gain)} = \frac{The\ average\ amount\ of\ feed\ consumed\ (g)\ during\ the\ week}{Average\ weight\ gain\ (g)\ during\ the\ week}$$

Total loss percentage (%)

Fatalities were documented throughout the duration of the experiment, from its commencement until its conclusion, specifically at the termination of the fifth week. The calculation method employed was as follows:

$$\text{Total loss rate\%} = \frac{The\ number\ of\ dead\ birds\ for\ the\ duration\ of\ the\ experimenty}{The\ total\ number\ of\ birds}$$

Results

Weight of live bird (g bird^{-1})

The study's fourth table illustrates the effects of different concentrations of mix-oil solution added to the drinking water of broilers subjected to heat stress on their mean live body weight measured in grams. The findings suggest that in the initial week of avian life, all interventions incorporating the addition of mix-oil solution exhibited superior performance in comparison to the control intervention. Treatment T2 and T5 demonstrated a statistically significant ($p \leqslant 0.01$) elevation in mean live body weight in comparison to the control treatment T1. The characteristic in question exhibited a noteworthy ($P \leqslant 0.01$) enhancement in Treatment T3 and T4, relative to the control treatment. However, there was no significant dissimilarity between the two treatments in relation to the mean live weight. According to the statistical analysis table, it was found that treatment T2 demonstrated a statistically significant advantage at a significance level of ($p \leqslant 0.05$) in comparison to the other treatments. Treatment T3 exhibited analogous outcomes to T1 and T2 concerning the mean live weight in the second week. In contrast, it was observed that treatments T5, T4, and T1 did not demonstrate any noteworthy distinctions among each other with respect to this aspect.

An adjective is a lexical category that functions to modify or describe a noun or pronoun. The aforementioned statement furnishes supplementary details pertaining to the specified noun. In the third week, it was noted that all of the supplementary interventions demonstrated enhanced efficacy in comparison to the control intervention. The statistical analysis revealed a significant difference ($p \leqslant 0.01$) between Treatment T3 and T2 in comparison to Treatment T5, T4, and T1. Furthermore, it was observed that treatments T5 and T4 demonstrated superior performance in comparison to the control treatment T1 with regards to live weight characteristics over the course of this week. The treatment labeled as T3 was observed to be markedly substandard ($p \leqslant 0.01$) in comparison to the treatment that exhibited superior efficacy among all the treatments investigated. The T2 treatment exhibited superior performance compared to the T5, T4, and T1 treatments, ranking second in effectiveness. In relation to treatments T5 and T4, it was noted that their rate of live weight was inferior to that of the control treatment in the fourth week of the avian subjects' lifespan. The statistical analysis demonstrated a significant level of significance ($p \leqslant 0.01$) for treatment T5 when compared to all other treatments that were investigated. Treatment T3 demonstrated superior performance in comparison to T1, T2, and T4, whereas T2 exhibited better performance than T1 and T4.Based on the experimental findings, it can be inferred that the control group demonstrated the least live weight trait rates for the present week.

Treatment	Starting weight	Averages ±standard error				
		1 week	2 week	3 week	4 week	4 week
T1	0.31± 40.36 a	144.08 0.96±c	443.91 3.29±Ab	872.03 1.01±c	1281.47 1.98±d	1761.23 4.90±E
T2	0.33± 39.66a	19050 1.01±a	455.08 0.83±A	893.66 2.04±a	134683 1.58±b	1840.27 2.08±C
T3	0.33± 39.66 a	176.75 3.90±b	455.33 7.23±A	894.00 0.76±a	1363.10 3.20±a	1919.00 3.11±B
T4	1.66± 38.33 a	179.41 0.71±b	442.58 1.17±B	879.57 1.86±b	1253.87 1.98±e	1788.53 2.06±D
T5	±0.06 40.06 a	186.91 1.55±a	441.41 0.65±B	878.91 1.46±b	1323.33 1.66±c	2005.63 5.18±A
	n.s	**	*	**	**	**

** Different letters in one column indicate a significant difference ($p < 0.01$).

* The letters inside a column indicate a significant difference ($p < 0.05$).

N.S: non-significant

Table 4: Weight of live bird (g bird^{-1}) of broiler chickens Ross 308 exposed to heat stress after adding varied mix-oil solution concentrations to their drinking water for 1-5 weeks.

Average weekly weight gain (g bird^{-1})

Table 5 illustrates the effects of different concentrations of mix-oil solution, broilers that are subjected to heat stress and have it added to their drinking water, on their average weekly weight gain (in grams). The findings suggest that in the initial week of avian existence, treatment T2 manifested a weight gain rate that was significantly higher ($P \leqslant 0.01$) in comparison to treatments T4, T3, and T1. In this regard, it was observed that treatment T2 exhibited a level of similarity to treatment T5. In contrast, it was observed that treatment T5 did not demonstrate any noteworthy variation in weight gain in comparison to treatment T4 over the course of this week. Furthermore, it was observed that treatments T4 and T3 exhibited comparable rates of weight gain, surpassing the control treatment in terms of efficacy. During the second week of the research, a statistically significant reduction ($P \leqslant 0.01$) in the pace of weight increase was noted in all supplementary treatments as compared to the control treatment. Treatment T3 demonstrated a statistically significant superiority over treatments T4 and T5, albeit it did not manifest any observable distinction in comparison to treatment T2. The study findings indicate that there were no significant differences in the rate of weight gain among treatments T5, T4, and T2. In relation to the third week, the statistical analysis table revealed that there was no statistically significant rise in weight observed among the different treatments under investigation.

In the fourth week of the study, a statistically significant superiority ($P \leqslant 0.01$) was observed in the avian subjects who received treatment T3 in comparison to all other treatments. Treatment T2 demonstrated a higher level of efficacy when compared to treatments T5, T4, and T1, in that order. In relation to treatments T5 and T4, their results demonstrated reduced weight gain when compared to the control treatment. During the fifth week, a statistically significant advantage ($P \leqslant 0.01$) was detected in all addition interventions relative to the "control factor.". The T5 treatment displayed the most substantial weight gain rate compared to all other treatments. The T3 treatment showed notable superiority ($P \leqslant 0.01$) over the T4, T2, and T1 treatments. Furthermore, the T4 treatment demonstrated superiority over the T2 and T1 treatments, whereas the control treatment manifested the lowest weight gain rate (479.76).

The study found that the avian subjects in treatment T5 had a statistically significant increase ($P \leqslant 0.01$) in weight gain compared to treatments T4 and T1 in terms of overall weight gain rate. However, their weight gain was similar to treatments T3 and T2. Concurrently, it was noted that the effectiveness of intervention T3 did not display any statistically noteworthy deviation when compared to T2, T1, and the group that did not receive any treatment. Nevertheless, no statistically significant disparity was detected between T4, T2, and T1 treatments concerning this specific feature. The total weight gain rates were documented as follows: 1965.8, 1620.56, 1879.33, 1801.93, and 1721.23, respectively.

Treatment	Averages ±standard error					
	1 week	2 week	3 week	4 week	5 week	Total weight gain
T1	104.08 ±0.96 d	299.83± 3.20 a	28.12± 3.43	409.43± 2.32 d	479.76± 3.06e	1721.23± 4.90 bc
T2	152.167 ± 1.30 a	264.58± 3.20a	438.58± 1.30	453.167± 0.66b	493.43± 1.10d	1801.93± 2.58 abc
T3	136.75 ±3.90c	278.58± 9.69b	438.67 ±7.58	469.10 ±2.90a	556.23± 1.61b	1879.33 ±1.78 ab
T4	141.08 ±0.96bc	263.16± 0.50c	307.32 132.03	374.29± 3.8e	534.70± 3.67c	1620.57 ±13.5c
T5	146.91± ab 1.55	254.50± 1.56c	437.50 ±0.90	444.41± 2.67c	682.53± 7.08a	1965.8± 5.41a
	**	**	N.S	**	**	**

** Different letters in one column indicate a significant difference (p < 0.01).

* The letters inside a column indicate a significant difference (p < 0.05).

N.S: non-significant

Table 5: Adding various concentrations of MIX-OIL solution to Ross 308 broilers' drinking water under heat stress affected weight gain (g/bird) throughout the first five weeks.

Feed consumption rate (g bird^{-1})

The present study utilized data from Table 6 to examine the effects of different concentrations of mix-oil solution on the feed consumption of broilers subjected to heat stress. The research was conducted over a period of five weeks and demonstrated a significant rise in feed intake during the initial week of administering treatment T5, which was similar to T3 and T1 ($p \leqslant 0.01$). On the other hand, treatment 4 (T4) demonstrated a noteworthy reduction in feed intake ($P \leqslant 0.01$) in comparison to all the other interventions. There was no statistically significant difference observed in feed consumption among T1, T2, and T3. Treatments T5, T3, and T2 were shown to be significantly more effective than treatments T4 and T1 in Week 2 of the research ($P \leqslant 0.01$). The treatments mentioned above demonstrated comparable levels of significance in this specific attribute. In contrast, the statistical analysis revealed that the rate of feed intake did not exhibit a significant variance in treatment T4 when compared to the control treatment. Treatment T4 demonstrated a statistically significant advantage ($P \leqslant 0.01$) over treatments T5, T3, and T2 during the third week. Nevertheless, the efficacy of the intervention was similar to that of the control group T1. Subsequent to the implementation of Treatment T4, Treatment T3 was administered and exhibited superior performance when compared to Treatment T2. Concurrently, it was noted that the efficacy of treatment T5 did not manifest any significant differentiation in comparison to treatment T3 and treatment T2. The tabulated statistical analysis, as presented during the fourth week, demonstrates a significant elevation in the effectiveness of treatment T3 in comparison to all other treatments examined. This finding is supported by a level of significance of $P \leqslant 0.01$. Treatment T2 exhibited a relatively high level of efficacy, ranking second in performance after T3, while outperforming T5, T4, and T1. Furthermore, it was observed that treatment T5 exhibited superior performance compared to treatments T4 and T1, with the performance of the latter being documented. During the current week, the rate of consumption of feed exhibited the fourth lowest value. During the course of the study, it was observed that the T3 treatment consistently demonstrated superior performance in relation to feed consumption rate when compared to all other treatments that were being investigated. In the fifth week of the study, it was observed that the T4 treatment exhibited a relatively greater level of feed intake in comparison to T5, T2, and T1. Treatment T5 demonstrated superior performance in comparison to T2 and T1. The current week's rate of feed consumption was observed to be the minimum. The findings of the study revealed that the avian participants exhibited a predilection towards the T2 intervention.

Treatment T3 demonstrated a statistically significant ($P \leqslant 0.01$) advantage over all other treatments in the experiment with regards to the total feed consumption rate. Treatment T5 exhibited a superior performance in comparison to treatments T4, T2, and T1. The results of the experiment indicate that Treatment T4 exhibited superior performance compared to T2 and T1. Furthermore, it was observed that T2 had the lowest total feed consumption rate over the course of the experiment. The statistical table presents the total rates as 2654.96, 2628.75, 2773.15, 2673.80, and 2687.41, respectively.

Treatment	Averages ±standard error					
	1 week	2 week	3 week	4 week	5 week	Total fodder consumed
T1	113.25± 4.20 ab	334.25± 1.37 b	610.10± 2.80 A	703.96± 2.81d	893.40± 1.41d	2654.96± 4.92 d
T2	108.08± 1.48 b	342.58± 1.15 a	560.00± 5.00 C	750.52± 2.93b	867.56± 1.69e	2628.75± 3.80 e
T3	112.75 ±1.37 ab	342.50± 1.25 a	576.66± 3.33 B	775.43± 3.00a	965.80±2.6 6 a	2773.15± 3.22 a
T4	94.33 ±0.54 c	334.83±1.06 b	600.00± 2.88 A	686.00± 2.08e	958.63± 1.10b	2673.80± 3.68 c
T5	116.66± 1.04 a	340.25± 0.66 a	570.00± 2.88 Bc	722.66± 2.92c	937.83± 0.43c	2687.41± 4.28 b
	**	**	**	**	**	**

** Different letters in one column indicate a significant difference (p < 0.01).

* The letters inside a column indicate a significant difference (p < 0.05).

N.S: non-significant

Table 6: Adding different MIX-OIL concentrations to Ross 308 broilers' drinking water during heat stress on feed consumption (g/bird) over the first five weeks of their lives.

Feed conversion factor

findings of an experiment examining the impact of varied concentrations of mix-oil solution added to the drinking water of broilers under heat stress on their feed conversion coefficient, as measured by the quantity of feed consumed per unit of weight gain, are presented in Table 7. The results indicate that during the first week of life, T4 and T2 treatment groups exhibited a significant improvement in feed conversion ratio (P⩽0.01) when compared to T5, T3, and T1 treatment groups. The trait's significance was found to be comparable in both T2 and T4 treatments. The T5 and T3 interventions exhibited a statistically significant improvement in comparison to the control intervention. In the second week of the study, a noteworthy reduction in the feed conversion ratio was observed among the treatment cohorts in comparison to the control cohort. The tabulated data demonstrates a statistically significant improvement (P⩽0.01) in the T3 intervention when compared to the T5 and T2 interventions. However, there was no statistically significant difference observed between the T3 and T4 interventions during the corresponding period. The significance of the food conversion coefficient was discussed in the context of the T2 treatment as the ultimate treatment. During the second week of the study, T5 exhibited the lowest rates of food conversion factor. However, there was no significant difference observed between T5 and T2 with regards to this aspect.

During the third week, all supplementary interventions demonstrated a statistically significant improvement (P ⩽ 0.01) In terms of the feed conversion ratio, a comparison was made between the experimental group and the control intervention. The findings suggest that Treatment T2, T5, and T3 exhibited a statistically noteworthy enhancement (P ⩽ 0.01) in contrast to Treatment T4 and T. Additionally, it was observed that Treatment T5, T3, and T2 demonstrated a comparable degree of significance in relation to this specific characteristic. The experimental findings indicate a statistically significant enhancement (P ⩽ 0.01) in the feed conversion efficiency of avian specimens administered with treatment T5, T3, and T2 in contrast to those subjected to treatment T4 and T1. The feed conversion ratio exhibited a significant decrease in Treatment T4, indicating its significance. In the fourth week of the study, variations in the feed conversion ratio were observed across the treatments under investigation.During the fifth week of the study, a statistically significant enhancement (P ⩽ 0.01) was noted in the feed conversion ratio of avian subjects who were administered supplementary interventions as opposed to those in the control cohort. The results indicate that Treatment T5 exhibited a statistically significant improvement in comparison to Treatments T4, T3, T2, and T1. Treatment T3 demonstrated superior performance when compared to treatments T4, T2, and T1. However, there was no significant differentiation noted between treatment T2 and treatment T3, as well as between treatment T2 and treatment T4. At a significance level of P ⩽ 0.05, it was observed that treatment T5 exhibited a statistically significant improvement in the food conversion rate as compared to treatment T4. However, the results indicate that there was no statistically significant difference observed in the effectiveness of treatment T5 compared to treatments T3, T2, and T1. Simultaneously, it exhibited a noteworthy resemblance to the therapeutic interventions denoted as T4, T3, T2, and T1. Regarding the overall feed conversion rate.

Treatment	Averages ±standard error					
	1 week	2 week	3 week	4 week	5 week	total food conversion factor
T1	1.08 ±0.03a	1.11± 0.005d	1.42± 0.003A	1.71± 0.008b	1.86± 0.01a	1.50±0.02 ab
T2	0.66 ±0.02c	1.29± 0.005ab	1.27± 0.01C	1.65± 0.01 c	1.75±0.003bc	1.45± 0.003 ab
T3	0.82 ± 0.02b	1.22± 0.04c	1.31±0.02C	1.65± 0.005c	1.73± 0.008c	1.47± 0.003 ab
T4	0.66 ± 0.008c	1.26± 0.003bc	1.37±0.005B	1.82± 0.02a	1.79± 0.01b	1.66± 0.14 a
T5	0.79 ± 0.01b	1.33± 0.008a	1.29± 0.008C	1.62± 0.005c	1.36± 0.01d	1.36± 0.005 b
	**	**	**	**	**	*

** Different letters in one column indicate a significant difference (p < 0.01).

* The letters inside a column indicate a significant difference (p < 0.05).

N.S: non-significant

Table 7: The feed conversion factor (mg feed consumed/gm weight growth) of Ross 308 broilers exposed to heat stress was affected by varying concentrations of MIX-OIL solution in their drinking water for 1-5 weeks.

Percentage of losses%

Table 8 illustrates the effects of different concentrations of mix-oil solution introduced into the drinking water of broilers subjected to heat stress on the mortality rate of the chicks. The study found that the mortality rates were highest at 11.66%. Treatment T2 had a greater proportion of deaths compared to treatments T3, T5, and T4. It is noteworthy that treatments T5 and T3 did not record any mortalities throughout the course of the experiment.

Treatment	Perishability ± Experimental Error (%)
T1	11.66 ±1.12 A
T2	3.33 ± 1.34B
T3	0.00 ±0.00 D
T4	1.67 ± 1.22C
T5	0.00 ± 0.00D

** Different letters in one column indicate a significant difference (p < 0.01).

Table 8: The effect of adding different quantities of mix-oil to the drinking water of heat-stressed broiler broilers Rose 308 on total chick mortality %

Discussion

The observed augmentation in the live body weight and weight gain among the T5 treatment group, which was administered Mixoil at a concentration of 1 ml per liter of water, could plausibly be ascribed to the impact of the amalgamation of aromatic essential oils present in the Mixoil solution. The observed outcomes may have been a result of the mixture's potential contribution to the improvement of the internal environment of the gastrointestinal tract and intestines. The augmentation of intestinal health may be attained by elongating villi and deepening crypts in the jejunum, thereby leading to an expansion of the intestinal surface area. Consequently, this results in an enhanced assimilation of essential nutrients [13]. In addition, the mitigation of pathological agents, such as bacteria, has the potential to avert probable infections in the gastrointestinal tract. This, in turn, facilitates the ability of avian species to sustain optimal growth rates, even in the face of adverse environmental factors, such as elevated temperatures [17-19]. The optimization of lipid digestion and nutrient absorption can be attributed to the enhancement of productive performance in broiler chickens, resulting in an increase in feed intake and subsequent improvement in feed conversion ratio [20].

The results of the study, as depicted in Tables 4 and 5, indicate an enhancement in growth performance, nutrient assimilation, live weight, and weight gain. The observed enhancement can be ascribed to the influence of fatty acids, specifically Lauric acid and Linolic acid, which are constituents of the blend of oils. There is a hypothesis that suggests that certain types of fatty acids have a significant effect on increasing both the number and size of goblet cells. The cells mentioned above are accountable for the synthesis of mucin, a vital constituent of the mucosa that coats the gastrointestinal tract. The aforementioned substance functions to protect the beneficial microbiota inhabiting the intestinal lumen, fortify the gastrointestinal tract against pathogenic agents, and modulate body mass indices within acceptable ranges, particularly under conditions of heightened thermal stress [21]. These substances possess antibacterial and antioxidant properties, which may enhance the immune system and offer defense against oxidative stress. The inclusion of essential oils in avian drinking water has demonstrated potential as a viable strategy for enhancing the well-being and productivity of birds in conditions of elevated temperatures. This assertion is substantiated by prior scholarly investigations that have underscored the advantageous properties of essential oils in augmenting vitality and conferring antioxidant and antibacterial properties. The distinct scent and taste of this substance facilitate the control of digestive mechanisms and enzyme excretion in the gastrointestinal tract, thereby augmenting the adaptability of broiler chickens to elevated temperatures and accelerated growth rates [23, 24].

The efficiency of broiler chickens can be significantly improved by the optimal balance of fatty acids obtained from a combination of oils. The previously mentioned occurrence is attributed to the heightened concentrations of palmitic acid, oleic acid, and alpha-linolenic acid in the blend. These components enhance nutrient absorption, leading to an increase in feed consumption, live weight gain, and total weight gain [24].

Increased temperatures possess the capability to hinder the reduction of utilized feed, encourage the growth of harmful microorganisms, and undermine the soundness of the digestive tract, ultimately jeopardizing the efficacy of broiler chickens. The inclusion of a balanced combination of concentrated fatty acids has been shown to effectively reduce bacterial growth and proliferation, leading to improved intestinal cell function and increased surface area. The improvement of nutrient assimilation is advantageous for the amplification of broiler chickens' efficiency in the presence of thermal stress.

Author Contributions

Each of the authors made contributions to the study by engaging in data collection, analysis, and discussion of the findings. The authors engaged in a discourse regarding the outcomes and made contributions to the ultimate document.

Conflict of Interest Statement

Authors don't have any conflict of interest to declare concerning this study.

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