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Influence of Liquid Methionine (methiogrow) in Drinking Water on Broiler Chicks Performance, Drinking Water, and Carcass Traits

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ABSTRACT

The effect of a liquid methionine source provided through the drinking water on broiler chick performance, water intake, and carcass characteristics were studied using 264 unsexed broiler chicks (Ross 308, 7 days old). Methionine was added within three replicates in four treatments with 22 birds in each as follows: T1 (control treatment): without adding liquid methionine, T2: adding 0.25 ml of liquid methionine/litter of drinking water, T3: adding 0.50 ml of liquid methionine/litter of drinking water, and T4: adding 0.75 ml of liquid methionine/litter of drinking water. Live body weight, body weight gain, feed intake, feed conversion ratio, water intake, and carcass traits were taken. The results showed that adding liquid methionine in drinking water were significantly increased ($P \leq 0.05$) live body weight, total feed intake, and body weight gain, as well as carcass traits also were significantly different among the treatments. Within the limits of the study, liquid DL-methionine provided in the drinking water was effectively assimilated by broiler chicks and increased total methionine intake, which increased the growth rate of the chicks.

INTRODUCTION

Nutritional supplements are described as the least amount of nutrition in balanced provender that an animal needed to conduct its physiological functions optimally, and each animal has various requirements that vary based on its age (Mohammed et al., 2019). It is for the most part connected with enhancements in nourishment and elective sources to build efficiency and the nature of the item is assumed (Ismail and Cheah, 2003). In any case, the poultry shares become costly and the shortage of customary diet has tested the arrangement of high-supplement broiler chicks to purchasers. Amino acids make up polypeptides and proteins, which are the most significant components of animal muscles and tissues (Bryden, 2010). The stock of these amino acids in feed is exorbitant and goes past the fortunes of poultry ranchers. Since this is a major issue in nourishment and that is the reason, you select the great elective feed fixings that contain the most basic amino acids (Maty, 2021). Methionine (Met) is generally the principal amino corrosive to restrain when taking care of ovens that are taken care of two soy-based weight control plans. Co-catalyst S-adenosyl methionine (a functioning type of methionine) is a significant giver to the methyl gathering, which permits the development of numerous fundamental mixes in the body of the

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winged animal including choline, creatine, epinephrine, DNA, glutathione, a significant wellspring of natural sulfur mixes in the body (Fanatico, 2010). The measure of methionine and cystine in feed is regularly too low to even think about ensuring its most gainful usage and ideal nature of grill corpses. Amino acids may discover in two isomers and this is D-or L-isomers, or as a partnership of these two isomers. D-isomers are naturally torpid, and the L structure has happened in most of the tissues (Leeson and summers, 2008).

In any case, chicken's liver has been demonstrated to have the option to deliver L-methionine from D-methionine (Baker, 2009) and afterwards use it for protein combination and as a component of other metabolic pathways. Our examination's motivation is deciding the effect of providing a bit of the chick's methionine required utilizing drinking water utilizing an economically accessible wellspring of fluid methionine on some meat qualities. The aim of this study to determine the feasibility of supplying a portion of the chick's liquid methionine requirement through drinking water on growth performance, feed conversation ratio, drinking water, and carcass traits.

MATERIALS AND METHODS

A total of (264) un-sexed (7 days old) chick is randomly distributed to four treatments, in three replicates with twenty-two birds each. The experiment was applied on one-week-old chicks to the following treatments:

T1: (control treatment): without liquid methionine.

T2: Add 0.25 ml of liquid methionine/litter to drinking water.

T3: Add 0.50 ml of liquid methionine/litter to drinking water.

T4: Add 0.75 ml of liquid methionine/litter to drinking water.

Chicks are reared using three different levels of diets as follows tables (1, 2, 3, and 4):

Starter diet: during age period7-11 days including 23% crude protein and 2900 Kcal/kg metabolizable energy.

Grower diet: during age period 12-25 days including 21.5% crude protein and 3000 Kcal/kg metabolizable energy.

Finisher diet: during age period 26-42 days including 20% crude protein and 3175 Kcal/kg metabolizable energy.

Growth Measurements

Live body weight

The birds were weighed per replicate at the start of the experiment and subsequently on daily basis (14, 21, 28, 35, and 42 days of age).

Bodyweight gain

At the beginning of the experiment, all of the chicks were weighed. At the end of each week, every replicate chick was weighed and deducted from their first week's weight. Therefore, weekly weight gain can be measured. The same method was applied to measure weight gain in the periods overall period (7-42) days old.

Feed intake

To determine feed intake, specific amounts of ration were weighed and given to the birds for every replicate at the beginning of the week. At the end of the week, the rest of the ration from every replicate were weighed and deducted from the original ration, so a weekly consumed diet can be yielded. Feed intake in 7,14, 21, 28, 35 and entire feed intake in 7-42 days old was calculated.

Feed conversion ratio

After measuring feed intake and body weight gain over a week, the following equitation was used to determine feed conversion ratio:

$$\frac{\text{Feed intake over a week}}{\text{week's beginning weight} - \text{week's ending weight}}$$

Feed conversion ratio analysis was calculated in the overall period (7-42) days old, and the whole period intervals.

Drinking Water

To measure the amount of drinking water (liters/bird/day), the amount of water provided for each replication was measured daily or when the amount of water in the drinkers' decreases and the amount consumed is measured by measuring the remaining amount in the drinker and subtracting it from the total amount provided to the birds, so weekly consumed water can be yielded. Water intake in 7-14, 15-21, 22-28, 29-35 and 36-42 days of age was calculated.

Carcass traits

The previously selected broiler chickens were slaughtered by the halal method. The body weights and the weight of hot carcass, and internal organs and expressed as a percentage of the live body. The internal organs e.g., breast, thigh, back, neck plus ribs, wings, heart, gizzard, liver, and spleen.

All data will be statistically analyzed using the (Xlstate, 2019) method, and the differences between the means of groups will be separated using the Duncan Multiple Range Test (Duncan, 1955). Statistical significance will be determined using ($P \leq 0.05$).

Table (1) Composition and chemical analysis of experimental diets in starter, grower and finisher periods

Ingredients	Starter	Grower	Finisher
Wheat flour	15.90	16.00	15.50
Soybean	34.00	30.00	25.50
Corn yellow	43.35	46.60	51.87
Miavit premix	2.50	2.40	2.30
Choline	0.20	0.20	0.18
Enzyme	0.05	0.00	0.00
Anticoccidea	0.00	0.05	0.05
Antitoxin	0.10	0.05	0.10
Oil	2.00	3.00	3.00
Limestone	1.80	1.70	1.50
M.C.P.	0.10	0.00	0.00
total	100	100	100
Chemical analysis of diets			
Metabolizable energy Kcal/kg	2900	3000	3175
Crude Protein	23 %	21.0 %	20 %
Crude fat	5.6 %	5.3 %	5.3 %
Crude fiber	2.9 %	2.7%	2.6%
Moisture	11.7 %	11.8%	11.8%
Crude Ash	5.7 %	5.9%	5.8%
Phosphorus	1%	5.55%	0.55%
Lysin	0.61 %	1.29 %	1.16 %
Methionine	0.50 %	0.51 %	0.4 %
Meth+ Cyst.	1.33 %	0.99 %	0.77 %

RESULTS AND DISCUSSIONS

Table (2) showed the results of the effect of using liquid methionine at different levels on the characteristics of productive performance during different ages of broiler chicks. From the results at the end of the experiment, it is declared that adding 0.75 ml of liquid methionine/litter of drinking water (T4) were significantly improved ($P \leq 0.05$) the live body weight (3148.0 g) of birds compared to the control treatment (T1) (2623.30 g) and two additional factors adding 0.25 and 0.50 mil of liquid methionine/litter of drinking water (T2 and T3) (2850.67 g and 2718.0 g) respectively.

Through the same table, we find the effect of utilizing liquid methionine at different levels on the total feed intake (g/bird), it is observed that there were significant differences ($P \leq 0.05$) between the first treatment (in which the liquid methionine was not added to the drinking water) and the second treatment, and the first treatment birds are less feed consumed than the other treatments

(3959.0g) compared with the second treatment birds which consumed (4443.45 g), and that the third and fourth treatments are more feed consumption (4287.95 and 4278.54 g) respectively.

The results of live body weight gain during the overall period (7-42) days of age are shown in Table (4), significant differences ($P \leq 0.05$) were indicated between the fourth treatment and other treatments in the study and between the first and second treatments, while no significant differences were observed between the third treatment and each of the two treatments first and second, the fourth treatment birds gave the largest live body weight gain during this period as it was (3104.0 g) compared to the first treatment that recorded the lowest increase in live body weight (2579.33 g).

The results of FCR during the age period (7-42) days are shown in the same previous table, there were significant differences ($P \leq 0.05$) between the fourth treatment and other treatments in the study, while no significant differences were observed between the other three treatments, the fourth treatment birds scored the best FCR during this period which was (1.38) compared to the third treatment that recorded the poorest FCR and reached (1.60).

In a study on the Relative Bioavailability of DL-Methionine and L-Methionine in the diet of broiler chicks. Daenner and Bessei (2003) found significant differences between the different coefficients of all characteristics of productive performance. The results in table (2) of live body weight, weight gain and FCR obtained in this study are consistent with the results of (Cadirci and Koncagul, 2014) who were found that significant results ($P \leq 0.05$) observed in these traits when adding liquid methionine at different levels, as well as consistent with what the researchers found in the amount of feed consumed as there were no significant differences between the treatments in this trait

Table (2) Effect of Liquid Methionine on growth performance of broiler chicks (Mean ± SE)

Age (days)	Treatments			
	T1 (Control)	**T2**	**T3**	**T4**
Live body weight (g)				
7	117.16±1.16^{b}	124.21±1.94^{a}	125.12±1.33^{a}	123.94±0.47^{a}
14	320.67±14.15^{a}	212.12±2.494^{b}	208.64±0.48^{b}	215.17±7.49^{b}
21	636.27±19.95^{b}	685.15± 6.97^{a}	682.73±6.59^{a}	668.42±0.24^{ab}
28	1148.47±52.43^{a}	1272.33±17.95^{a}	1246.67±33.83^{a}	1242.33±38.83^{a}
35	1594.00±19.52^{b}	1776.30±37.90^{a}	1776.67±48.67^{a}	1753.00±58.50^{a}
42	2623.30±8.82^{c}	2850.67±50.67^{b}	2718.00±56.05b^{c}	3148.00±46.02^{a}
Feed intake, g/bird/week				
7	120.00± 1.39 ^{a}	136.36±1.96 ^{a}	136.36±1.43 ^{a}	136.36±1.66 ^{a}
14	254.33 ± 3.18 ^{a}	178.27 ± 1.41^{b}	176.67 ± 1.71^{b}	176.15 ± 0.58^{b}
21	428.33 ± 3.93^{b}	636.36 ± 0.00^{a}	617.50 ± 18.86^{a}	614.27 ± 22.09^{a}
28	673.00 ± 14.00^{b}	797.73 ± 21.68^{a}	827.27 ± 6.94^{a}	750.76 ± 45.31^{ab}
35	799.00 ± 4.36^{b}	1008.36 ± 5.77^{a}	977.88 ± 32.20^{a}	941.91 ± 67.61^{a}
42	1684.33 ± 9.91^{a}	1686.36 ± 10.50^{a}	1552.27 ± 147.82^{a}	1659.09 ± 7.87^{a}
Total feed intake (g/bird)				
Overall (7-42 days)	3959.00± 17.79^{b}	4443.45±35.18^{a}	4287.95±163.51^{ab}	4278.54±130.66^{ab}
Total body weight gain (g)				
Overall (7-42 days)	2579.33±8.82^{c}	2806.67±50.67^{b}	2674.00 ±56.05^{bc}	3104.00±46.02^{a}
FCR g feed intake/g body weight gain				
Overall (7-42 days)	1.51 ±0.01^{a}	1.58±0.02^{a}	1.60±0.03^{a}	1.38±0.04^{b}

Mean with a different letter (a, b) among rows (treatment) are significantly different ($P \leq 0.05$)

The results of live body weight, feed intake, body weight gain and FCR are consistent with what (Salary et al., 2015) found in their study on different sources and forms of methionine, where they showed an enhancement in FCR in the treatments in which methionine was added to feed or water compared to the treatment in which methionine was not added. The results of the quantity of consumed feed and FCR in this study did not agree with what (Ozung et al., 2018) has found, as the results obtained from his study showed that there were significant differences ($P \leq 0.05$) between the treatment birds in which different percentages of liquid methionine were added. These results indicate that the way of distributing methionine (in feed or water) is indifferent from the argument of view of sustaining requirements for the broiler chicks' performance (Rehman et al., 2019).

The average of drinking water (liter/bird/day) in the table (3) was significantly ($P \leq 0.05$) influenced between treatments in different periods of bird's life, from the note of the table, we find that the results of the quantities of drinking water different between treatments in multiple age periods and that the water consumption increases clearly when adding the liquid methionine and when the adding of Liquid Methionine were increases in the treatments. In the last period of the experiment (36-42) days of age, it found that the biggest average water consumption of birds was 0.54 liter/bird/day, which belongs to the T3 birds in which adding 0.50 mil of liquid methionine/litter to drinking water. In contrast, the T1 birds recorded lowest amount of drinking water (0.50 liter/bird/day), in which liquid methionine was not added. In general, the T3 birds (adding 0.50 mil of liquid methionine/liter) are the most water intake birds. This variation might be because broiler finisher might not need oversupply of amino acid as the feed conversion efficiency at this phase might be slower compared to the chick phase, other reasons might be due to the genotype of the chickens and antagonistic reactions amongst individual dietary amino acids (Daenner and Bessei, 2003). The results of the amount of drinking water in this study are consistent with what was found by (Salary, 2015) in their study on possible effects of delivering methionine to broilers in drinking water were observed that primary attention is directed to the main effects of the way of methionine delivery on body weight gain, daily feed, water, and methionine intake. A significant reduction ($P<0.05$) of body weight gain and feed intake was observed, whereas water intake significantly increased ($P<0.05$). The same researchers declared that the increase was statistically significant in all groups except for the water consumption of the group receiving a small amount of methionine in feed. The results of the quantities of water consumed in this study were not consistent with what was mentioned by (Rehman, 2019) in their study on utilizing liquid methionine in feeding broiler chicks, where the addition of liquid methionine had no significant effect on the amount of water intake.

Table (3) Effect of Liquid Methionine on drinking water (Liters/bird/day) of broiler chicks (Mean ± SE)

Age (days)	Treatments			
	T1 (Control)	T2	T3	T4
7-14	0.28 ± 0.09^{a}	0.26 ± 0.05^{b}	0.25 ± 0.07^{b}	0.21 ± 0.03^{c}
15-21	0.32 ±0.03^{b}	0.35 ± 0.03^{a}	0.34 ± 0.05^{b}	0.33 ± 0.02^{b}
22-28	0.38 ± 0.08^{c}	0.40 ± 0.02^{b}	0.42 ± 0.06^{a}	0.39 ± 0.03^{b}
29-35	0.44 ± 0.06^{b}	0.46 ± 0.05^{a}	0.48 ± 0.07^{a}	0.46 ± 0.06^{a}
36-42	0.50 ± 0.02^{b}	0.52 ± 0.07^{a}	0.54 ± 0.07^{a}	0.53 ± 0.03^{a}

Mean with a different letter (a, b and c) among rows (treatment) are significantly different ($P \leq 0.05$)

The effect of utilizing liquid methionine in drinking water on carcass traits at the end of this study (42 days old) are shown in table (4). The results showed that there were no significant differences between all the carcass traits except for the leg weight (thigh and drum stick) of the carcass. The results showed the presence of significant differences ($P \leq 0.05$) between T1 and T2 and that the T2 birds recorded the highest leg weight (thigh and drum stick) which is reached (554.00 g) corresponding to the T1 birds which recorded the lowest weights and reached (495.33 g). Except for leg weight results, the results are in agreement with what (Esteve and Khan, 2018) who announced in their study on adding different sources of liquid methionine that carcass yields, as a percentage of live body weight, were not affected by dietary treatments. The results of the carcass traits in this study are inconsistent with what was found by (Kim et al., 2019), they confirmed that there were significant differences between the different nutritional factors in the carcass parts when feeding various sources of liquid methionine to broiler chicks. Some of the results achieved in this study are not consistent with what is found by (Conde et al., 2016), where they emphasized in their study on broiler chicks the sources of methionine had significant ($P \leq 0.05$) effects on the liver and heart weight, while methionine levels significantly influenced ($P \leq 0.05$) the liver and gizzard weight.

There were no differences between methionine sources on the growth rate of the birds and breast muscles (Roy et al., 2006). The relative weight of the thigh muscle was not affected by the diet, but the relative weight of all carcass meat was greatly decreased in birds fed the liquid methionine deficient diet. Thigh and breast muscles differ in the composition of fiber types. The all-carcass meat is a predominantly fast-twitch, glycolytic muscle containing mostly type IIB fibers, while thigh muscles are mostly slow-twitch, oxidative muscles mostly composed of type I and type IIA fibers (Roy et al., 2006). Zhai et al. (2012) reported that the Met supply affected four canonical pathways related to muscle development.

Table (4) Effect of Liquid Methionine on carcass traits of broiler chicks (Mean ± SE)

Carcass traits	Treatments			
	T1 (Control)	T2	T3	T4
Bodyweight (Kg)	2.59 ± 0.07[a]	2.78 ± 0.09[a]	2.77 ± 0.11[a]	2.64 ± 0.12[a]
Carcass weight (Kg)	1.79 ± 0.04[a]	1.98 ± 0.07[a]	1.96 ± 0.09[a]	1.87 ± 0.08[a]
Breast (g)	578.50 ± 27.45[a]	635.67 ± 24.30[a]	653.33 ± 44.80[a]	627.33 ± 28.08[a]
Leg (Thigh and Drum stick) (g)	495.33 ± 3.71[b]	554.00 ± 19.85[a]	524.67 ± 11.16[ab]	507.00 ± 26.47[ab]
Back (g)	237.83 ± 11.53[a]	241.33 ± 11.03[a]	241.50 ± 16.73[a]	227.00 ± 10.74[a]
Neck+ ribs(g)	240.83 ± 14.80[a]	253.67 ± 10.30[a]	284.67 ± 38.21[a]	269.17 ± 19.85[a]
Wings (g)	200.00 ± 7.95[a]	207.67 ± 5.49[a]	200.50 ± 8.43[a]	197.67 ± 7.82[a]
Heart (g)	10.72 ± 1.06[a]	10.72 ± 0.94[a]	10.16 ± 0.56[a]	10.65 ± 1.42[a]
Gizzard (g)	28.88 ± 1.08[a]	28.38 ± 1.82[a]	31.11 ± 2.17[a]	32.06 ± 4.158[a]
Liver (g)	61.72 ± 4.93[a]	69.03 ± 3.13[a]	68.89 ± 5.46[a]	73.13 ± 6.25[a]
Spleen (g)	2.79 ± 0.14[a]	3.41 ± 0.64[a]	2.69 ± 0.22[a]	3.61 ± 0.35[a]

Mean with a different letter (a, b) among rows (treatment) are significantly different ($P \leq 0.05$)

CONCLUSION

In conclusion, the addition of liquid methionine in drinking water was significantly improved the live body gain, feed intake, drinking water, some carcass traits and feed conversation ratio, especially when used a high level of volume of Methionine.

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تأثير اضافة الميثيونين السائل الى مياه الشرب في الأداء الانتاجي وكمية الماء المتناول ومواصفات الذبيحة لأفراخ فروج اللحم

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الكلمات المفتاحية:
الميثايونين السائل، افراخ فروج اللحم، اضافة ماء الشرب.

الخلاصة

اجريت هذه التجربة على 264 من افراخ فروج اللحم (غير مجنسة) بعمر سبعة اسابيع لدراسة تأثير استخدام الميثايونين السائل عن طريق ماء الشرب في الأداء الانتاجي وكمية الماء المتناول ومواصفات الذبيحة. تمت اضافة الميثايونين السائل من خلال اربعة معاملات مختلفة بواقع ثلاثة مكررات لكل معاملة (22 طائرا لكل مكرر)، وزعت المعاملات كالاتي: T1 : (معاملة المقارنة) بدون اضافة الميثايونين السائل، T2 : اضافة 0.25 مللتر من الميثايونين السائل لكل لتر من ماء الشرب، T3: اضافة 0.50 مللتر من الميثايونين السائل لكل لتر من ماء الشرب و T4: اضافة 0.75 مللتر من الميثايونين السائل لكل لتر من ماء الشرب. تم قياس صفات الاداء الانتاجي (وزن الجسم الحي الاسبوعي، الزيادة الوزنية، كمية العلف المستهلك، معامل التحويل الغذائي، كمية الماء المتناول وصفات الذبيحة). تشير النتائج الى ان اضافة الميثايونين السائل الى ماء الشرب قد ازدادت معنويا ($P \leq 0.05$) من وزن الجسم الحي، كذلك حسنت معنويا من كمية العلف المستهلك، الزيادة الوزنية وصفات الذبيحة. استنتج من الدراسة ان استجابة افراخ فروج اللحم للميثايونين السائل كانت عالية، وازدادت من كميات الميثايونين المتناولة والتي ادت الى زيادة النمو.