Study effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methionine upon productive Performance, carcass characteristics For Broiler

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Abstract:

This experiment was conducted in poultry fields of the Department of Animal Production - College of Agriculture - University of Kirkuk for the period from 20/3/2021 to 1/5/2021 for a period of 42 days (field work) The aim of this study was to determine the effect of Betaine and Taurine with the DL-methionine upon the productive performance carcass characteristics for broiler ROSS 308. In this study,350 chicks of broiler type ROSS 308 were used, not naturalized, at the age of one day, as the primary rate per chicken was 42 g, Chickens were distributed from the first day to 7 feeding treatments, (50 birds/ treatment) with 5 replications/ treatment. (1 replicate/ 10 birds), and each duplicate included 10 birds in a pens 35 with dimensions (90×190cm). The birds were freely fed and the feeding treatments were as follows:

The first treatment (Control) is negative without any addition to methionine, And the second treatment ispositive to add the Industrial methionine to fill the needs,Andthird treatment adding the Betaine to meet the needs of thebird instead of the industrial methionine. And fourth transaction adds the Taurine to fill the needs of the bird instead of the industrial methionine. AndFifth Transaction is done Addition of Betaine at 50% and Taurine at 50% to meet the needs of the bird from synthetic methionine. And sixth treatment to meet the needs of methionine the Betaine Is added by 25% and the taurine 75%. And seventh treatment Betaine is added at 75% and Taurine at 25% to meet the birds' needs of industrial methionine. The results of statistical analysis showed that significant differences were found (P≤0.05) in weight gain average, also we noticed significant exceed for T3,T4,T5,T6 and T7 upon T2 and in feed intake average we notice significant decrease for all treatments were added by Betaine, Taurine and DL- Methionine in compared with control group (T1), While in feed conversion ratio average notice that the fifth, sixth and seventh treatments were added by Betaine and Taurine gave the best food conversion coefficient, significantly superior to the first (control)treatment, While in main carcass parts T6 and T7 were significant exceed over T3 and T4 in dressing ratio ,No significant differences were noticed in relative weight average for femoral joint among treatments. As for the relative weight for the back, wings, chest and neck(minor parts)T2,T3,T4,T5,T6 and T7 were significant exceed over T1(control).

Keywords: Betaine, Taurine, Industrial methionine ,broilers.

DOI Number:10.14704/nq.2022.20.8.NQ44588 **NeuroQuantology 2022; 20(8): 5596-5609**

The economic development and the rise in the standard of living for many countries has led to a change in the lifestyle of the population, The demand for rich sources of nutrients and poultry products such

as meat and eggs increased. It is the most important source of protein as a healthy food ingredient(adeola, 2006).In the last two decades, pepsin has been used to relieve heat stress, and it is used as food additives in the diet or in drinking water because it has two important Physiological functions The first is being a donor of the methyl group, and the second is regulating the osmotic pressure of the cell, being an ionic dipole. dipolar Zwitterions Which is Quickly soluble in water and has the ability to maintain cell fluid balance under heat stress conditions (Essen and Enting, 2007).The methyl group is involved in many chemical reactions in the body and because it cannot be synthesized in the body, so it comes from the raw materials, the most important of which are (methionine, choline and betaine). Betaine is more efficient than methionine and choline in giving it the methyl group, noting that vertebrates, including poultry, have a limited ability to synthesize betaine in sufficient quantities(Rao Rama et al., 2008),and because the body's increased need for the methyl group (CH3) when exposed to any challenge, it became necessary to add betaine as a donor In addition to its role in preserving cell water(Eklund et al. (2005),stated that adding betaine to the ration reduces the dehydration to which the bird is exposed, facilitates the process of water retention inside the cell, especially the intestine cells, and encourages a change in the structure of the epithelium layer of the intestine(Kettunen et al., 2001) . Leptin participates in protecting the intestinal epithelium, which leads to an improvement in growth rate and food utilization efficiency(Honarbakhsh et al., 2007a),in addition to its role in improving carcass quality (Xu and Zhan 1998).By partially inhibiting the growth and development of coccidiosis and indirectly by supporting the structure and structure of the intestine(Augustine et al., 1997),and it has an action in improving the mucous membrane of the gastrointestinal tract from heat stress and digestive disorders(Rama Rao et al., 2008).As for taurine, it is a semi-major amino acid It is found in high concentrations in all animal cells(Ripps and Shen, 2012).Taurine has a variety of regulatory functions and is considered a major regulator of cell homeostasis, although it does not include in protein synthesis or energy supply(Murakami, 2017).

Methionine is an essential amino acid that is first specified in poultry feeding(Farsand Al-Naimi, 2018),due to its vital role in the growth and production of poultry on the one hand, and most of the plant-source feed materials included in the composition of balanced feeds as energy sources such as grains or sources of vegetable protein such as vegetable cakes lack one or more of the amino acids. It is essential and important for optimum production performance and high qualitySi et al. (2001):, Abd El-Wahab et al., (2015):Ahmed and Abbas, (2015); Manju et al., (2015). While ensuring the positive conduct of vital activities in the body, including the action of methionine as an inhibitor of oxidation by considering methionine as a precursor or generator of the compound Glutathione, especially the production of the enzyme (Glutathione Peroxidase) to break down peroxides and prevent the formation of free radicals that damage living cells(Thomas, 2014), that Methionine is an essential amino acid that contains sulfur(Jalal andAl-Naimi, 2017,Almas and Al-Naimi, 2018,AL-Hadeedyand Al-Naimi, 2018). It does not form in the body of a bird from other amino acids, so it must be available in the ration and in sufficient quantities to meet the needs of the birdWalid, (2011), Kahila, (2012), Farkhoy et al., (2012).and the addition of methionine more than the recommended nutritional requirement for broilers improves the performance of birds, especially body weight and feed conversion efficiency(Khan et al., 2011), and in order to raise the readiness of nutrients by reducing the effect of anti-nutritional factors such as tannin.

Synthetic methionine has been added to diets to meet the needs of birds for growth and production since the fifties of the last century(Zangana and Al-Nuaimi 2020,Al-Naimi 1980).However, the leading countries, including the United States and European countries, in the field of animal production, especially meat and eggs production, tended to emphasize what is known as poultry organic production ofUSDA,(2012), Donoghue et al., (2015). Especially with regard to the substitution of feed additives from industrial sources to natural sources, i.e. plant origin, including the essential amino acids methionine and lysineKanduri et al., (2013), Kanagaraju and Rathnapraba, (2019). As industrial methionine is prepared from compounds produced from petroleum refining(Aldrich, 2007).With the accumulation of the compound (methylthio-propionate), which has toxic effects for birds and results from the industrial metabolism of methionine(Al-Hashimi, 2020). knowing that the synthetic methionine part of it is directed to produce the compound L-Carnitine important in the metabolism of fatty acids and cholesterol(Arslan, 2006). Through the use of the synthetic source L-

Carnitine and the replacement of the synthetic acid sourced with herbal source methionine and its impact on the productive performance of table egg hens and the possibility of it reducing body fat. Several researches have been conducted by universities and research institutes in the world on the use of herbal methionine as an alternative to synthetic methionine And most of the results were encouraging in the National Council for Organic Standards in the United States of America, the Department of Agriculture (USDA) as well as in India, and through the results of this research, herbal methionine can be used as a successful alternative to synthetic methionine.

the study aimed to know the effect of the synergistic metabolism of the two compounds Betaine and Taurine with synthetic methionine and its effect on the productive performance, carcass characteristics of broilers.

Methods

This study was conducted in the field of poultry of the Department of Animal Production / College of Agriculture / University of Kirkuk for the period from 20/3/2021 until 1/5/2021. ROSS 308.In this experiment, 350 non-naturalized chicks of Rose 308 strain were used at one day old, with a starting weight of 42 g / chick. Chicks were raised ground in a closed room using 35 pens with dimensions of 90 x 190 cm on a bed of sawdust with a thickness of 3 - 5 cm. Sugar was added to drinking water during the first day at a concentration of 50 g / liter of water for 12 hours in order to provide them with a source. The energy is fast and cleans the gastrointestinal tract, and water and feed were provided continuously in front of the bird throughout the experiment period. Plastic inverted manholes with a capacity of 2 liters were used in the first week, and they were gradually replaced by automatic hanging manholes.Gas incubators were used for the purpose of heating and obtaining appropriate temperatures of 35 m during the first week of life, then gradually reduced at a rate of two degrees per week until reaching 20-25 m at the end of the fifth week of the chicks 'life, as well as providing an appropriate light program during the breeding period, which includes 23 hours of lighting 1 hour of darkness in the first week and then to the end of the experiment, use 20 hours of lighting and 4 hours of darkness. Chicks were distributed randomly into seven treatments, each treatment included five replicates, and for each replicate 10 birds, the replicates were distributed randomly from the first day of life, the experimental treatments included the following:

1-First treatment (control) Negative without any additives.

2- Second treatment (control) Positive with DL-methionine additives when needed.

3- Third treatment Adding Betaine for birds replenish for methionine.

4- Fourth treatment adding Taurine for replenish for methionine.

5- Fifth treatment for replenish for methionine adding Betaine by 50% and Taurine by 50%.

6- Sixth treatment for replenish for methionine adding Betaine by 25% and Taurine by 75%.

7- Seventh treatment for replenish for methionine adding Betaine by 75% and Taurine by 25%.

Table (1) Chemical composition and calculated percentages of the initiator diet from 1 to 10 days age.

Ingredient (%)	T1	T2	T3	T4	T5	T6	T7
Wheat	58.14	57.94	57.84	57.84	57.84	57.39	57.39
Soybean meal, 47% CP	33.40	33.50	33.50	33.50	33.50	33.50	33.50
Vegetable oil	4.50	4.50	4.50	4.50	4.50	4.50	4.50
Di calcium phosphate	2.66	2.66	2.66	2.66	2.66	2.66	2.66
Limestone	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Salt (NaCl)	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Mineral and Vitamin premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10
L-Lysine	0.32	0.32	0.32	0.32	0.32	0.32	0.32
DL-Methionine	-	0.10	-	-	-	-	-
Betaine	-	-	0.20	-	0.10	0.50	0.15
Taurine	-	-	-	0.20	0.10	0.15	0.50

Total	100	100	100	100	100	100	100

Calculated Analysis**

ME (kcal / kg)	2966	2964	2959	2959	2959	2946	2946
Crude Protein(%)	22.71	22.75	22.73	22.73	22.73	22.68	22.68
Calcium (%)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Available phosphorus (%)	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Lysine (%)	1.48	1.48	1.48	1.48	1.48	1.48	1.48
Methionine (%)	0.31	0.31	0.31	0.31	0.31	0.31	0.31

a- use protein concentrate Wafi (Originating Hollander) and contain on 40%crude protein and 2100 (Kcal/ Kg) and 5% crude fat and 3.85% Lysine and 3.70% Methionine and 4.12% Methionine + cysteine and 5% Calcium and 4.68% phosphor

b- Calculated analysis depending for ingredient incoming in National Research Council(NRC, 1994).

Table (2) Chemical composition and calculated percentages of the growth diet from 11 to 24 days age**.**

Ingredient (%)	T1	T2	T3	T4	T5	T6	T7
Wheat	61.70	61.60	61.50	61.50	61.50	61.05	61.05
Soybean meal, 47% CP	29.50	29.50	29.50	29.50	29.50	29.50	29.50
Vegetable oil	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Di calcium phosphate	2.42	2.42	2.42	2.42	2.42	2.42	2.42
Limestone	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Salt (NaCl)	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Mineral and Vitamin premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10
L-Lysine	0.32	0.32	0.32	0.32	0.32	0.32	0.32
DL-Methionine	-	0.10	-	-	-	-	-
Betaine	-	-	0.20	-	0.10	0.50	0.15
Taurine	-	-	-	0.20	0.10	0.15	0.50
Total	100	100	100	100	100	100	100

Calculated Analysis**

ME (kcal / kg)	3036	3033	3030	3030	3030	3014	3014
Crude Protein(%)	21.26	21.24	21.23	21.23	21.23	21.18	21.18
Calcium (%)	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Available phosphorus (%)	0.81	0.81	0.81	0.81	0.81	0.81	0.81
Lysine (%)	1.37	1.37	1.37	1.37	1.37	1.37	1.37
Methionine (%)	0.29	0.29	0.29	0.29	0.29	0.29	0.29

a- use protein concentrate Wafi (Originating Hollander) and contain on 40%crude protein and 2100 (Kcal/ Kg) and 5% crude fat and 3.85% Lysine and 3.70% Methionine and 4.12% Methionine + cysteine and 5% Calcium and 4.68% phosphor

b- Calculated analysis depending for ingredient incoming in National Research Council (NRC, 1994).

Table (3) Chemical composition and calculated percentages of the initiator diet from 25 to the age of marketing.

Ingredient (%)	T1	T2	T3	T4	T5	T6	T7
Wheat	64.57	64.47	64.37	64.37	64.37	63.92	63.92
Soybean meal, 47% CP	27.00	27.00	27.00	27.00	27.00	27.00	27.00
Vegetable oil	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Di calcium phosphate	2.19	2.19	2.19	2.19	2.19	2.19	2.19

Limestone	0.69	0.69	0.69	0.69	0.69	0.69	0.69
Salt (NaCl)	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Mineral and Vitamin premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10
L-Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL-Methionine	-	0.10	-	-	-	-	-
Betaine	-	-	0.20	-	0.10	0.50	0.15
Taurine	-	-	-	0.20	0.10	0.15	0.50
Total	100	100	100	100	100	100	100

Calculated Analysis**

ME (kcal / kg)	3070	3067	3064	3064	3064	3048	3014
Crude Protein(%)	20.39	20.38	20.37	20.37	20.37	20.31	21.18
Calcium (%)	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Available phosphorus (%)	0.76	0.76	0.76	0.76	0.76	0.76	0.76
Lysine (%)	1.24	1.24	1.24	1.24	1.24	1.24	1.24
Methionine (%)	0.28	0.28	0.28	0.28	0.28	0.28	0.28

a- use protein concentrate Wafi (Originating Hollander) and contain on 40%crude protein and 2100 (Kcal/ Kg) and 5% crude fat and 3.85% Lysine and 3.70% Methionine and 4.12% Methionine + cysteine and 5% Calcium and 4.68% phosphor

b- Calculated analysis depending for ingredient incoming in National Research Council (NRC, 1994).

It is inferred from the results shown in Table (4) the effect of adding Betaine and Taurine with synthetic methionine on the live body weight of broilers, the superiority of the second, third, fourth, fifth, sixth and seventh treatments to which betaine and taurine were added significantly (P≤0.05) on the first treatment. control) in the first week, while the fifth and seventh treatments were significantly (P≤0.05) superior to the fourth and sixth treatments during the second week, while in the third week, the second, third, fourth, fifth, sixth and seventh treatments were significantly superior to the betaine and taurine (P≤0.05) on the first treatment (control), while during the fourth and fifth weeks it was found that the fifth and seventh treatments were significantly (P≤0.05) superior to the third, fourth and sixth treatments. During the sixth week, the third, fourth, fifth, sixth and seventh treatments were significantly outperformed (P ≤0.05) on the second treatment and the final average weight was (2412.20, 2609.00, 2776.00, 2772.40, 2811.60, 2828.20, 2829.80) grams for the seven treatments, respectively.

Table(4)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methioninein average body weight of broiler meat at the age of (42) days (medium ± standard error).

treatments	Average live body weight in the first week	Average live body weight in the second week	Average live body weight in the third week	Average live body weight in the fourth week	Average live body weight 5th week	Average live body weight sixth week
First	154.20 ±0.66 b	448.40±1.28 c	762.60 ±10.23 b	1160.60±3.14 d	1876.00±8.71 d	2412.20±8.59 c
Second	154.80 ±0.86 ab	445.80±0.37 c	813.60±3.66 a	1213.40 ±3.80 c	1978.40 ±4.29 c	2609.00 ±14.71 b
Third	155.20 ±0.58 ab	448.20±0.37 c	816.00±1.61 a	1416.80±4.25 b	2184.80±2.63 b	2776.00±35.01 a
Fourth	156.20 ±0.37 a	458.40±1.86 b	817.60 ±1.02 a	1410.40 ±3.70 b	2184.00 ±11.22 b	2772.40 ±21.01 a
Fifth	157.20±0.48 a	467.20 ±0.86 a	818.60±1.20 a	1446.00 ±1.70 a	2223.80 ±12.64 a	2811.60 ±6.13 a
Sixth	156.60 ±0.37 a	459.80 ±1.87 b	820.40 ±1.03 a	1414.40 ±3.77 b	2189.00 ±11.40 b	2828.20 ±12.20 a

Seventh	158.20 ±0.50 a	467.20±0.86 a	818.60±1.20 a	1448.20±1.73 a	2229.40±12.84 a	2829.80±14.11 a
Level significant	*	*	*	*	*	*

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)
** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2gBetaine), T4:(2gTaurine), T5:(1gBetaine +1gTaurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

The results of Table (5) show the effect of adding Betaine and Taurine with manufactured methionine on the rate of weight gain of broilers on the superiority of the second, third, fourth, fifth, sixth and seventh treatments to which betaine and taurine were added significantly (P≤0.05) over the first treatment (control). in the first week, while the fifth and seventh treatments were significantly (P≤0.05) superior to the fourth and sixth treatments during the second week, while the second, third, fourth and sixth treatments were significantly (P≤0.05) superior to the fifth and seventh treatments during the third week, and in the fourth week The fifth and seventh treatments were significantly (P≤0.05) superior to the third, fourth and sixth treatments, and the second, third, fourth, fifth, sixth and seventh treatments to which betaine and taurine were added were significantly (P≤0.05) superior to the first treatment (control) during the fifth and sixth weeks. From the experiment, as for the total weight gain, we notice that the third, fourth, fifth, sixth and seventh treatments were significantly (P≤0.05) over the second treatment, and the total weight gain was recorded (2370.20, 2567.00, 2734.00 , 2730.40, 2769.60, 2786.20, 2787.80) g/fowl for the seven treatments, respectively.

Table(5)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methioninein average weight gain of broilers at (42) days of age (medium ± standard error)

treatments	first week	second week	third week	fourth week	5th week	sixth week	Total weight gain
First	±0.66 112.20 b	294.20±1.62 c	314.20±11.01 c	398.00±11.78 c	715.40±6.21 b	536.20±7.31 b	2370.20±8.59 c
Second	±0.86 112.80 ab	291.00±0.89 c	367.80±3.39 a	399.80 ±2.97 c	765.00 ±4.63 a	630.60 ±18.01 a	±14.71 2567.00 b
Third	±0.58 113.20 ab	293.00±0.54 c	367.80±1.39 a	600.80±4.34 b	768.00±4.03 a	591.20±36.54 ab	±35.01 2734.00 a
Fourth	114.20 ±0.37 a	303.20±1.98 b	358.20 ±2.41 ab	596.80 ±3.51 b	769.60 ±7.87 a	588.40 ±13.73 ab	±21.01 2730.40 a
Fifth	114.20±0.48 a	311.00 ±1.14 a	351.40±1.16 b	627.40 ±1.88 a	777.80 ±12.49 a	587.80 ±16.31 ab	2769.60 ±6.13 a
Sixth	±0.37 114.20 a	303.20 ±1.98 b	358.20 ±2.41 ab	596.80 ±3.51 b	769.60 ±7.87 a	644.20 ±11.84 a	±12.20 2786.20 a
Seventh	±0.48 114.20 a	311.00±1.14 a	351.40±1.16 b	627.40±1.88 a	777.80±12.49 a	606.00±15.77 a	±14.11 2787.80 a

Level significant	*	*	*	*	*	*	*

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)
** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2g Betaine), T4:(2g Taurine), T5:(1g Betaine +1g Taurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

It is inferred from the results shown in Table (6) the effect of adding the two compounds Betaine and Taurine with the manufactured methionine on the rate of feed consumption (grams/birds/week). which differed significantly (P≤0.05) with the rest of the treatments added to betaine, taurine and synthetic methionine, while in the second week it was found that the first treatment (control) was significantly (P≤0.05) superior to the second treatment added to betaine, and the first treatment outperformed (Control) significantly (P≤0.05) on the second and third treatments in the average feed consumption during the third, fourth and sixth weeks. As for the total feed consumption, we notice a significant decrease in the total feed consumption for all treatments added to it the two compounds betaine, taurine and manufactured methionine, which amounted to 4337.00, 4311.20 , 4188.80, 4178.60, 4190.40, 4179.00) g/bird for the second, third, fourth, fifth, sixth and seventh treatments compared with the control group, which recorded 4835.40 g/bird.

Table(6)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methioninein average feed consumption of broilers at (42) days of age (medium ± standard error).

treatments	first week	second week	third week	fourth week	5th week	sixth week	Total feed intake
First	±0.50 178.40 a	±0.89 532.00 a	±2.42 692.00 a	±4.23 788.60 a	±29.32 1060.00 a	1584.40 ±21.24 a	4835.40 ±52.46 a
Second	±0.50 175.40 b	±0.50 419.60 b	±2.45 587.80 b	±2.54 748.00 b	947.40 ±2.50 b	1458.80 ±13.39 b	4337.00 ±19.54 b
Third	±0.67 176.40 b	±2.54 409.60 c	±3.21 588.20 b	±1.30 746.00 b	942.00 ±6.13 b	1449.00 ±8.09 bc	4311.20 ±16.35 b
Fourth	175.20±0.66 b	413.80±1.28 c	553.40±1.46 c	704.00±1.97 c	922.20 ±2.08 b	1420.20 ±2.83 c	4188.80 ±7.46 c
Fifth	175.20±0.48 b	404.40±1.60 d	554.20±4.07 c	710.20±3.72 c	917.00±0.70 b	1417.60±0.81 c	4178.60±4.62 c
Sixth	±0.66 175.20 b	±1.28 413.80 c	±1.46 553.40 c	±1.97 704.00 c	922.20 ±2.08 b	1421.80 ±1.31 c	4190.40 ±5.03 c
Seventh	±0.48 175.20 b	±1.60 404.40 d	±4.07 554.20 c	±3.72 710.20 c	917.00 ±0.70 b	1418.00 ±0.94 c	4179.00 ±4.54 c
Level significant	*	*	*	*	*	*	

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)

** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2gBetaine), T4:(2gTaurine), T5:(1gBetaine +1gTaurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

It is noted from the results shown in Table (7) the effect of adding the two compounds Betaine and Taurine with industrial methionine on the rate of the food conversion factor, the second, third, fourth, fifth, sixth and seventh treatments gave the best rate of food conversion factor (gm of feed/gm of weight gain) during the week The first, third, and fifth treatments (P≤0.05) were significantly superior to the first treatment (control), which gave the highest value of the feed conversion ratio, which was 1.59 g feed/g weight gain. In the second and fourth week, the fifth and seventh treatments were significantly superior (P≤0.05). Which gave the best rate of food conversion factor (gm feed/gm weight gain) at a rate of 1.30, 1.13(gm feed/gm weight gain) for the two treatments respectively for the second and fourth week over the first treatment (control) which amounted to1.80, 1.98(g feed/gm weight gain) for the two treatments for the two weeks in a row, but during the sixth week, the sixth treatment recorded the best food conversion factor of 2.20 grams of feed/gm. 2.95 g feed / g extra weight Intention was not significantly different (P≤0.05)) with the other experimental treatments. As for the total productive period of the experiment, we note from the table that the fifth , Sixth and seventh treatments gave the best food conversion ratio, which amounted to 1.51 , 1.49 and 1.50 grams of feed/gm. Weight gain for the two treatments, respectively, was significantly superior (P≤0.05)) over the first treatment (control), which gave the highest The value of the average food conversion factor was 2.00 g of feed / g of weight gain.

Table(7)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methioninein average feed conversion factor of broilers at (42) days of age (medium ± standard error).

treatments	first week	second week	third week	fourth week	5th week	sixth week	Total feed conversion ratio
First	1.59 ±0.01 a	1.80 ±0.01 a	2.20 ±0.07 a	1.98 ±0.06 a	1.48 ±0.03 a	2.95 ±0.06 a	2.00 ±0.01 a
Second	1.55 ±0.01 b	1.44 ±0.02 b	1.59 ±0.01 b	1.87 ±0.01 b	1.23 ±0.01 b	2.31 ±0.06 bc	1.66 ±0.10 b
Third	1.56 ±0.01 b	1.39 ±0.01 c	1.59 ±0.01 b	1.24 ±0.01 cd	1.22 ±0.01 b	2.45 ±0.13 b	1.57 ±0.08 c
Fourth	1.53 ±0.01 b	1.36 ±0.01 d	1.54 ±0.06 b	1.17 ±0.07 c	1.19 ±0.06 b	2.41 ±0.05 bc	1.53±0.03 d
Fifth	1.53±0.02 b	1.30±0.01 e	1.57±0.01 b	1.13±0.04 d	1.17±0.01 b	2.41±0.06 bc	1.51±0.06 e
Sixth	1.53 ±0.01 b	1.36 ±0.01 d	1.54 ±0.01 b	1.17 ±0.08 cd	1.19 ±0.02 b	2.20 ±0.04 c	1.49 ±0.02 e
Seventh	1.53 ±0.02 b	1.30 ±0.01 e	1.57 ±0.04 b	1.13 ±0.06 d	1.17 ±0.01 b	2.33 ±0.06 bc	1.50 ±0.08 e
Level significant	*	*	*	*	*	*	*

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)
** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2gBetaine), T4:(2gTaurine), T5:(1gBetaine +1gTaurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

The results of the statistical analysis that were reached through the above table show that the addition of betaine and taurine together (the fifth and seventh treatments) has improved and caused a significant and arithmetic difference in the rate of the food conversion factor compared with the other experimental treatments.

The results shown in Table (8) show the effect of using betaine and taurine and their mixture and synthetic methionine in diets on the average relative weight of

edible internal organs and belly fat of broilers during the experiment period. The third, fourth, fifth, sixth and seventh treatments were significantly (P≤0.05) superior to the second treatment to which synthetic methionine was added by 1g in the average live body weight before slaughter, while it was found that the weight of the empty carcass was significantly superior to each of the fifth, sixth and seventh treatments significantly (P≤0.05) on the third and fourth treatments, and it is noted from the results shown in Table (5) that the second, third, fourth, fifth, sixth and seventh treatments were significantly (P≤0.05) superior to the first treatment (control) in the mean relative weight, liver and gizzard, as for the average weight Relative heart ratio, the second, third, fourth, fifth and seventh treatments were significantly (P≤0.05) superior to the first (control) and sixth treatments, as for abdominal fat, the first treatment (control) was significantly (P≤0.05) superior to the second treatment added to methionine. industrial 1 gram.

Table(8)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methionineon the percentage of viscera edible and abdominal fat of broilers at (42) days of age (medium ± standard error).

treatments	Heart%	Liver%	Gizzard%	abdominalfat%
First	0.45 ±0.01 b	2.03 ±0.04 b	2.03 ±0.07 b	1.89 ±0.03 a
Second	0.50 ±0.02 a	2.39 ±0.12 a	2.35 ±0.15 a	1.61 ±0.01 b
Third	0.49 ±0.01 ab	2.36 ±0.14 a	2.39 ±0.02 a	1.18 ±0.04 c
Fourth	0.46 ±0.01 ab	2.48 ±0.08 a	2.32 ±0.09 a	1.14 ±0.02 c
Fifth	0.47±0.01 ab	2.50±0.06 a	2.36±0.05 a	1.16±0.01 c
Sixth	0.45 ±0.01 b	2.43 ±0.07 a	2.28 ±0.08 a	1.12 ±0.02 c
Seventh	0.47 ±0.01 ab	2.49 ±0.06 a	2.35 ±0.01 a	1.16 ±0.01 c
Level significant	*	*	*	*

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)
** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2gBetaine), T4:(2gTaurine), T5:(1gBetaine +1gTaurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

The results shown in Table (9) show the effect of adding the two compounds Betaine and Taurine with industrial methionine on the dressing ratio and the relative weight of the carcass cuts. where the fifth, sixth and seventh treatments were significantly (P≤0.05) superior to the third and fourth treatments in the purification ratio which reached (73.30 , 74.45, 75.36, 75.41, 75.68, 75.87, 75.98)% for the seven treatments respectively, and no significant differences were observed in the average relative weight of the thigh among the treatments, as for the relative weight of the chest, drumstick, back, wings, and neck, superiority was found for the second treatment. and the third, fourth, fifth, sixth and seventh significantly (P≤0.05) on the first treatment (control) and the relative weight of the chest was (35.01, 35.10, 34.48, 35.62, 35.92, 35.40, 35.44)% for the seven treatments, respectively, and the relative weight of the drummer stick for the seven treatments) The average back weight of the seven treatments was (18.81, 19.90, 19.46, 18.98, 19.07, 19.89, 19.30)%, respectively, and the relative weight of the wings was (8.53, 8.20, 8.93, 8.37, 8.26, 8.95, 8.15)% of transactions The relative weight of the neck was (5.70, 5.45, 5.16, 4.28, 5.28, 4.27, 5.23)% for the seven treatments, respectively.

Table(9)effect of synergistic metabolism for Betaine and Taurine compounds with synthetic methionineon the average dressing ratio and relative weight of carcass cuts of broilers at (42) days of age (medium ± standard error).

treatment	dressing	Chest %	Thigh piece%	Drum stick%	Back%	Wings%	Neck%

s	percentage%						
First	73.30 ±0.07 d	35.01 ±0.40 b	16.30 ±0.14 a	15.65 ±0.14 b	18.81 ±0.25 b	8.53 ±0.11 b	5.70 ±0.18 b
Second	74.45 ±0.15 c	35.10 ±2.00 a	16.18 ±0.60 a	15.17 ±0.57 a	19.90 ±1.02 a	8.20 ±0.33 a	5.45 ±0.02 a
Third	75.36 ±0.17 b	34.48 ±1.04 a	15.88 ±0.35 a	16.09 ±0.34 a	19.46 ±0.39 a	8.93 ±0.24 a	5.16 ±0.06 ab
Fourth	75.41 ±0.13 b	35.62 ±1.06 a	16.40 ±0.50 a	16.35 ±0.45 a	18.98 ±0.62 a	8.37 ±0.40 a	4.28 ±0.17 a
Fifth	75.68±0.06 ab	35.92±0.98 a	15.81±2.18 a	15.66±0.49 a	19.07±0.70 a	8.26±0.33 a	5.28±0.19 a
Sixth	75.87 ±0.06 a	35.40 ±0.88 a	15.63 ±0.42 a	15.86 ±0.37 a	19.89 ±0.53 a	8.95 ±0.36 a	4.27 ±0.15 ab
Seventh	75.98 ±0.08 a	35.44 ±0.88 a	16.31 ±0.55 a	15.57 ±0.55 a	19.30 ±0.65 a	8.15 ±0.32 a	5.23 ±0.18 ab
Level significant	*	*	NS	*	*	*	*

* the different letters within the same column refers to Significantly differences at possibility level (p≤0.05)

** T1 (control):(Control diet devoid of any addition), T2: (1g DL-methionine), T3: (2gBetaine), T4:(2gTaurine), T5:(1gBetaine +1gTaurine), T6: (0.5g Betaine +1.5g Taurine), T7: (1.5g Betaine + 0.5g Taurine) .

4. Discussion

The improvement in body weight and weight gain in favor of betaine and taurine treatments is consistent with the results reached by(Noll and Kalbfleisch,2002), who mentioned that betaine improves the performance of turkeys and broilers when exposed to most stresses during the care period, as well as with what was found by(Saunderson and Mackinlay, 1990),as they mentioned that betaine encourages muscle deposition in turkeys and broilers through its effect on fat metabolism or through the role of betaine in regulating the osmotic pressure of the cell when the bird is exposed to heat stress, thus reducing the energy spent on the sodium pump in the cell membrane to regulate the level of salts inside and outside the cell When exposed to a high osmotic tension medium(Siljander et al., 2003),and our results converge with regard to live body weight and weight gain with what was found byAl-Jubouri(2013); Al Shukri (2011); Al Shukri and his group (2012); Al Khafaji and his group (2013) Mahmoudain and his group (2013);Madani(2012), Rama Rao and his group (2008), who indicated a significant superiority in the mentioned traits when adding betaine and taurine to the diet or drinking water for birds.The results of our experiment differed with what was found byAl-Rubaie, (2010); Sakomura and his group, (2013),who indicated that there were no significant differences in the characteristics of body weight and weight gain by adding betaine and taurine to the diet or drinking water for birds. The action of betaine in improving living body weight, weight gain, through its work in providing essential amino acids important in the formation of body protein(Wang and his group, 2004),such as methionine, and may improve the availability of sulfur amino acids (methionine, cysteine), which is a basic requirement in The composition of body proteins(Eklund and his group, 2006).It is evident from Table (6) that there are significant differences in the amount of feed consumed between treatments in the cumulative feed consumption. With the findings ofAl-Rubaie (2010); Al-Shukry (2011); Konca and his group (2008) and Waldentedt and his group (1999).As for the cumulative feed conversion factor, it is noted that there is a significant improvement for all treatments compared to the first treatment (control). Our results converge with what was found byAl-Jubouri (2013); Al Shukri (2011); Al Shukri and his group (2012); Al Khafaji and his group (2013), Mahmoudain and Madani (2012); Rama Rao and his group (2008). mentioned when adding betaine to the feed for birds, the results of our experiment differed with what was found byAl-Rubaie (2010), Mike (2014) and Sakomura and his group (2013),who indicated that there were no significant differences by addingbetaine to the diet for birds. Treatments to which betaine has been added may have the action of betaine in protecting the intestinal epithelium and improving its functions and strengthening the intestinal wall and thus improving the absorption of nutrients whose absorption depends on the healthy intestinal

epitheliumEklund and his group (2006), as Xu and Yu (2000), mentioned that betaine has an important work in improving The shape and consistency of the intestinal villi, thus increasing the efficiency of food utilization. This result is in agreement with the findings ofSakomura et al. (2008), Enting and Eissen (2007), Zarei and Yazdani, (2008), where a significant improvement was observed in the feed conversion factor of birds exposed to stress. Thermal and home additive N to the bush.And on the relative weight of some vital organs and abdominal fat:The results obtained are similar to what was found byAl-Khafaji and others (2013), who found a significant superiority in the weight of the heart and the weight of the gizzard when adding betaine to the diet of broilers, and converge with what was found byKhojaNeama (2014), which indicated a significant superiority in the weight of the liver. The gizzard when adding betaine to the diet of broilers, and the role of betaine in increasing the weight of the liver and gizzard may be due to the role of betaine in reducing heat stress on treated birds with betaine and taurine compared to the control treatment (T1), and our results differed with what was found byEnting et al (2007), who indicated The results indicated that there were no significant differences in the weight of the internal organs of broilers, and our results differed with what was found byMasoud et al.(2014), as they indicated that there was no significant effect on the weight of the heart and liver when adding betaine to the diets of broilers.The significant decrease in abdominal fat in betaine treatments may be due to the important role of betaine in the manufacture of important CH3 methyl compounds in the liver and muscles, such as creatine and carnitineZhan and others (2006): Rama Rao et al. (2008): Xu and Yu (2000): Gu and Li (2003),as Carnitine is required to transport long-chain fatty acids across the inner mitochondrial membrane for the purpose of oxidation and thus reduce the amount of long-chain fatty acids that can be deposited in adipose tissueWang and Feng, (2004) and Gu and Li (2003), or it may be decreased Body fat due to the role of betaine in conferring the CH3 group that is used to form lecithin, which facilitates the transfer of fat through the bodySaunderson and Mackinlay (1990). Also, adding betaine increases the activity of lipase enzyme in poultry(Zhan and Zhao ,2006). Our results differed with what was found byEnting et al. (2007): Al-Rubaie (2010): Zulkifli et al. (2004),as they recorded the absence of a significant effect of betaine added to the diet on the percentage of belly fat.Our results with regard to the dressing ratio converge with what was found by Al-Khafaji et al. (2013), who indicated that adding betaine to the ration or drinking water for broilers led to an improvement in the dressing ratio, and converge with what was found byWaldroup et al. (2006) , who indicated that there was a significant improvement in the dressing ratio. When adding betaine or choline to broiler diets, it did not converge with what was found by Al-Rubaie (2010: Al Shukri (2011): Sakomura et al. (2013), who indicated that adding betaine to the ration or drinking water had no significant effect on the purification ratio of broilers.As for the significant increase in the relative weight of the chest muscle and the yield of breast meat for betaine-treated birds compared to the control, it agrees with what Al-Shukry (2011): KhojaNima(2014): Al-Khafaji et al. (2013) Noll and Kalbfleisch (2002): Remus, (2001), as they recorded A significant increase in the yield of breast meat for broilers and turkeys The moral improvement in breast meat of betaine-treated birds may be due to the role of betaine in giving it to the methyl group CH3 and increasing the formation of methionine from homocystine and improving the digestion and absorption of lysine and methionine and thus increasing protein deposition in the muscles of the body, especially muscle The chest as well as the role of betaine in increasing the absorption of amino acids, especially methionine and lysine, and thus increasing protein deposition in the muscles of the body, especially the chest muscle, Maghoul et al. (2009: Zhan et al. (2006). 2012 Sakomura et al. (2013), who indicated that adding betaine to broiler diets has no effect on pectoral muscle weight.

5. Conclusions

1- The addition of betaine at 75% and taurine at 25% to the broiler ration led to a significant improvement in the production performance, dressing ratio and relative weight of the heart, liver, gizzard, chest, back, wings and neck compared to the birds fed on synthetic methionine.

2- Significant decrease (P≤0.05) in the amount of ration consumed and a significant improvement in the rate of feed conversion factor when feeding birds on ration prepared with betaine 75% and taurine 25% (seventh treatment) compared to treatments (first, second, third, fourth, fifth and sixth).

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