Bulgarian Journal of Agricultural Science, 31 (No 1) 2025, 175–182

Effect of using fermented layer manure with rumen liquor or unfermented in diets on productive performance of broiler

Ali J. Hammod*, Ali A. Bisly and Atheer Salih Mahdi

University of Kufa, Department of Animal Production, Faculty of Agriculture, Post code 54003, Kufa, Iraq
**Corresponding author:* alij.alhemaidawi@uokufa.edu.iq

Abstract

Hammod, A. J., Bisly, A. A. & Mahdi, A. S. (2025). Effect of using fermented layer manure with rumen liquor or unfermented in diets on productive performance of broiler. *Bulg. J. Agric. Sci., 31*(1), 175–182

In this experiment, 300 one-day-old, Ross 308 broiler chicks were housed in pens for 35 days from 09/10/2021 to 13/11/2021, with initial weight 40.5 g at the faculty of Agriculture University of Kufa. The experimental design was randomly distributed among 5 treatments, with 30 chicks per treatment. Each treatment included 3 replicates, and the replicates were randomly distributed among the pens, the area of each pens is 2*1.5 meters, as follows: T1: standard diet (control), T2: diet containing 5% unfermented layer manure, T3: diet containing 10% unfermented layer manure, T4: diet containing 5% layer manure fermented with ruminal liquor, T5: diet containing 10% layer manure fermented with ruminal liquor.

The results showed that the T4 had the best results in each of the final live body weights, the cumulative weight gain, the final feed conversion ratio and the economic figure. And there is no significant differences for all experimental treatments in each of the sensory characteristics (color, flavor, tenderness, general appearance), weight of the liver and spleen and the number of red blood cells.

Keywords: broiler; rumen liquor; fermentation; layer manure

Introduction

The scarcity of fed materials and their high prices in Iraq make efforts to find low-cost to improve production efficiency, one of these alternatives is using laying hen manure that breeding in cages, which produces large amounts of manure (Mohammed et al., 2013; Ewaid et al., 2020; Sharun et al., 2021).

The accumulation of these large quantities of manure leads to many health and management problems, also the manure of birds that reared in cages is considered better from a chemical point of view are than those raised on the floor because they contain only droppings and a few feathers and of fed leftovers (Saeed, 2008; Wu et al., 2016; Modak et al., 2019).

Poultry manure contains some feed ingredients, undigested nutrients, some epithelial cells, gut microbes and urine. The manure contains about 30% crude protein and energy about 1000 kcal/kg. Also, it is a good source of calcium, phosphorus and potassium (Al-Yaseen & Abdul-Abass, 2010; Peled & Livney, 2021).

The rumen liquor contains protozoa, bacteria, and fungi, and they live in Solidarity in the rumen. The rumen liquor contains about 10-20 billion bacteria and one billion protozoa per milliliter of liquid, in addition to varying numbers and different types of yeasts and fungi (Al-Faris, 2012; Mahdi, 2020). These organisms produce enzymes capable of digesting and analyzing cellulose and hemicellulose, which are not digested by animals with simple stomachs (Taoma, 2014; Xu et al., 2021; Su et al., 2022). The rumen liquor was also used to improve many fodder materials and agricultural waste (Darwazeh, 2010; Hammod, 2012; Has et al., 2013; Adesua & Onibi, 2014).

The fermentation process is used to improve the nutritional value of some grains, industrial and agricultural prod-

ucts and low nutritional waste, by increasing the proportion of protein and ether extraction and reducing the percentage of fiber or reducing the amount of fed inhibitors in some grains, in addition to using some of the enzymes produced by these organisms to improve digestive coefficient (Kanyinji & Moonga, 2014; Kanyinji & Sichangwa, 2014; Francisco et al., 2014; Tope, 2014; Choi et al., 2014; Supriyati et al., 2015).

There are no studies related to the use of poultry manure fermented with rumen liquor in the diets of poultry birds, so we believe that it is the first study using poultry manure fermented with rumen liquor in the feeding of broilers, and on this basis, the current study was conducted to use poultry manure and improve its nutritional value by fermenting it with rumen liquor in broiler diets in different proportions to see its effect on the productive characteristics of broiler.

The present study aims to establish the effect of the poultry manure and improve its nutritional value by fermenting it with rumen liquor in broiler diets in different proportions to see its effect on the productive characteristics of the broiler.

Materials and Methods

Laboratory experiment

The laboratory experiment was conducted in the laboratories of the Faculty of Agriculture/ University of Kufa, by using Solid State Fermentation to ferment bird manure according to the method, mentioned by (Semeniuk et al., 1970; Yang et al., 2019), water was added to bird manure to make the total humidity around 60%. These amounts are placed in thermal polyethylene bags with a 2 kg capacity. The bags were closed tightly and sterilized by autoclave at a temperature of 121°C (249.8°F) and a pressure of 6.8 kg (15 lbs)/ psi for 30 min. After the bags cooled, the amounts were divided into two parts, the first part without adding the rumen liquor, and the other part mixed with sheep's rumen liquor, which was collected from the sheep according to the method mentioned by (Dirksen & Smith, 1987; Al-Mosawy, 2013).

The bird manure obtained from the laying hens houses raised in cages, these bags were closed tightly and placed at room temperature (27–30°C) for 72 h to start organisms growth on them shaking the bags daily to ensure growth, the fermented or non-fermented bird manure dried by spreading it on a dry and clean floor for 48 hours, stirring it from time to time, and using it in the diet at a rate of 5 and 10%.

Field experiment

This research was carried out in the poultry house of the Animal Production Department at the Faculty of Agriculture/ University of Kufa for the period from 09/10/2021 to 13/11/2021, to study the use of poultry manure before and after fermentation with rumen liquor and in different ratios in broiler diets to find its effect on performance and Production of broilers. Five treatments were used in the experiment, as follows:

T1: standard diet (control).
T2: A diet containing 5% unfermented layer manure.
T3: A diet containing 10% unfermented layer manure.
T4: A diet containing 5% fermented layer manure.
T5: A diet containing 10% fermented layer manure.

Chicks management

In this experiment 300 one-day-old, Ross 308 broiler chicks were experimental designed and randomly distributed among 5 treatments, with 30 chicks per treatment with an initial weight of 40.5 grams. Each treatment included 3 replicates (10 males and 10 females chicks for each replicate), and the replicates were randomly distributed among the pens, the area of each pens is 2*1.5 meters. The floor was covered with sawdust 7 cm thickening approximately. Five liters of plastic waterer per pens were used, and then they were replaced by a suspended automatic waterer in the third week. Circular plastic feeders with a diameter of 38 cm were used during the first week of the bird's life, and then they were replaced with cylindrical feeders, with a feed per pen, feeders elevation raised with the age of the bird to reach the bird's chest, and it was provided with water and feed *ad-libitum.*

Chicks were fed on two diets, 1–21 days starter diet (Table 1), from 22–35 days then the finisher diet until the fifth week (Table 2). During the experiment period, the characteristics of live body weight, weight gain, feed consumption, feed conversion ratio, and the relative weight of the heart, liver, gizzard, and spleen were studied. Also, some blood characteristics and blood biochemical indices were included such as; hemoglobin, packed cell volume, red blood cell counts, white blood cell counts, glucose, globulin, albumin, total protein and meat qualitative tests also studied such as; color, flavor, juiciness, and general acceptance.

The Economic Figure is calculated as the following law:

$$\text{Economic Figure} = \text{Total weight of marketed birds (kg)} / (\text{Number of housed birds}) * (\text{Length of rearing period (days)}) * (\text{Feed conversion ratio}) * 10^4$$

Statistical analysis

The data for this study trait were analyzed by using a complete random design (CRD) to find out the effect of the different treatments. The significance of the differences be-

Table 1. Chemical composition and calculated analyses of the starter diets

Ingredients	Starter diet% Control (T1)	Starter diet% (T2 and T4)	Starter diet% (T3 and T5)
Ground Corn	50.5	50.5	45
Soy bean meal (48% CP)	36	34	31.5
Layer Manure	0	5	10
Wheat	8	4	6
Premix*	2.5	2.5	2.5
Sun flower oil	0.5	1.5	2.5
Dicalcium phosphate	1	1	1
Limestone	1.2	1.2	1.2
Salt	0.3	0.3	0.3
Total	100	100	100
Calculated composition			
Crude protein%	23.11	23.13	23.2
Metabolizable energy (KJ/kg)	12246	12254	12242
Energy: Protein	126.5	126.5	126.0
Calcium %	1.37	1.36	1.36
Avi. Phosphorus%	0.91	0.97	1.01
Methionine%	0.49	0.48	0.47
Cystine%	0.35	0.33	0.33

(*)Use of Premix Jordanian Origin Type Provimi 3110 Contains: 2750 kcal/kg Representative energy, 10% crude protein, 1.1% fat, 21% calcium, 11.0% phosphorus, 6.5% methionine, 6.5% methionine + Lysine, 4.8% Sodium, 5.4% Chloride, 575 000 IU Vitamin A, 201250 IU Vitamin D3, 1380 mg Vitamin E, 138 mg Vitamin K3, 138 mg Vitamin B1, 345 mg Vitamin B, 1840 mg Vitamin B3, 552 mg Vitamin B5, 184 mg B6 vitamins, 46 mg vitamin B9, 1000 micrograms B12, 6900 micrograms peyutin, 14000 mg choline chloride, 460 mg copper, 2760 mg iron, 3680 mg manganese, 3680 mg zinc, 50 mg iodine, 9.2 mg selenium, 30 000 m Vitez mine, 250 mg antioxidants, 250 mg lincomycin, 2400 mg selenomycin

Table 2. Chemical composition and calculated analyses of the finisher diets

Ingredients	% finisher diet Control (T1)	% finisher diet (T2 and T4)	% finisher diet (T3 and T5)
Ground Corn	55	51.5	50.5
Soybean meal (48% CP)	29	26.5	24.5
Layer Manure	0	5	10
Wheat	8	8	5
Premix*	2.5	2.5	2.5
Sun flower oil	3	4	5
Dicalcium phosphate	1	1	1
Limestone	1.2	1.2	1.2
Salt	0.3	0.3	0.3
Total	100	100	100
Calculated composition			
Crude protein%	20.16	20.14	20.20
Metabolizable energy (KJ/kg)	13117	13117	13117
Energy: Protein	155.4	155.5	155.09
Calcium %	1.35	1.35	1.35
Avi. Phosphorus%	0.88	0.93	0.98
Methionine%	0.46	0.44	0.43
Systine%	0.31	0.30	0.28

(*)Use of Premix Jordanian Origin Type Provimi 3110 Contains: 2750 kcal/kg Representative energy, 10% crude protein, 1.1% fat, 21% calcium, 11.0% phosphorus, 6.5% methionine, 6.5% methionine + Lysine, 4.8% Sodium, 5.4% Chloride, 575 000 IU Vitamin A, 201250 IU Vitamin D3, 1380 mg Vitamin E, 138 mg Vitamin K3, 138 mg Vitamin B1, 345 mg Vitamin B, 1840 mg Vitamin B3, 552 mg Vitamin B5, 184 mg B6 vitamin, 46 mg vitamin B9, 1000 micrograms B12, 6900 micrograms peyutin, 14000 mg choline chloride, 460 mg copper, 2760 mg iron, 3680 mg manganese, 3680 mg zinc, 50 mg iodine, 9.2 mg selenium, 30 000 m Vitez mine, 250 mg antioxidants, 250 mg lincomycin, 2400 mg selenomycin

tween the treatments was tested using Duncan (1955) multinomial test at a significant level of 0.05 and using the statistical program SAS (2012) in the statistical analysis.

Results

Live body weight

From Table 3, the third week indicates that the treatment groups showeda significant increase ($P \leq 0.05$) compared to T1, T4 showeda significant increase compared with T3, and the second, fourth and fifth treatments did not differ significantly between them. In the fifth week, the fourth treatment had the highest average live body weight compared to all the experimental treatments. The results also showed a significant increase for each of the third, fourth and fifth treatments, as it recorded 2395, 2475 and 2387 gm respectively, compared with the control treatment, which recorded 870 gm.

Weight gain

Table 3 showed for (0–3) weeks there is a significant increase ($P \leq 0.05$) for all fermentation treatments with rumen liquor compared with the control treatment, and the fourth treatment recorded the highest rate of weight gain among the treatments, while it showed from 4–5 weeks there were no significant differences for all the experimental treatments except for the second treatment, which recorded a significant decrease, while the results of the period 0–5 weeks recorded that the fourth treatment had the highest rate of weight gain among the experimental treatments, as it recorded 2438 gm. The third, fourth and fifth treatments had a significant increase compared with the control treatment.

Economic Figure

Table 3 shows the effect of using poultry manure fermented with rumen liquor on the economic figure, the fourth

Table 3. Effect of fermented layer manure by rumen liquor or unfermented in diets on live body weight (g), weight gain (g) and Economic figure for broiler

Treatments	Live body weight (g)		Weight gain (g)			Economic figure
	Age/ week/ bird		Age/ week/ bird			
	3	5	0–3	4–5	0–5	
T1	870±4.6 c	2251±30.3 c	833±4.6 c	1380±31.5 a	2214±30.3 c	407±6.1 b
T2	1095±49.0 ab	2320±17.3 bc	1058±49.0 ab	1225±31.7 b	2283±17.3 bc	402±1.39 bc
T3	1077±15.8 b	2395±31.7 b	1040±15.8 b	1317±15.9 a	2358±31.7 b	409±13.9 b
T4	1160±6.2 a	2475±20.2 a	1123±6.2 a	1315±20.3 a	2438±20.6 a	460±3.77 a
T5	1090±5.5 ab	2387±21.6 b	1053±14.4 ab	1297±21.6 ab	2350±21.6 b	382±0.02 c
Significant	*	*	*	*	*	*

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate significant difference ($P < 0.05$)

treatment recorded a significant increase ($P \leq 0.05$) compared to all experimental treatments, while each of the first, second, and third treatments did not show significantdifferences between them.

Consumed feed

Table 4 showed that all treatments using poultry manure fermented with rumen liquor or unfermented between (0–3) weeks had a significant increase ($P \leq 0.05$) compared with the control treatment, and T5 recorded a significant increase in the amount of feed consumed compared with all experimental treatments. The results of the periods (4–5) and (0–5) weeks also showed that the third and fifth treatments obtained a significant increase in the rate of feed consumption compared to the rest of the experimental treatments, with the fifth treatment recording a significant increase compared to the third treatment for both periods.

Feed Conversion Ratio

Table 4 showed for the period 0–3 weeks there was a significant improvement for each of the second and fourth treatments compared to the control treatment, and the fourth group recorded a significant improvement compared to the second treatment, with no significant differences for each of the second treatments. Also, the third and fifth, while results of the period (4–5) weeks showed that, there were no significant differences for each of the first and fourth treatments, with no significant differences between each of the second, third, and

Table 4. Effect of Fermented layer manure by rumen liquor or non-fermented in diets on feed intake (g), and feed conversion ratio for broiler

Treatments	Feed intake (g)			Feed conversion ratio		
	Age/ week/ bird			Age/ week/ bird		
	0–3	4–5	0–5	0–3	4–5	0–5
T1	1067±26.8 c	2469±14.6 c	3537±14.9 d	1.28±0.04 a	1.79±0.04 c	1.59±0.01 c
T2	1216±3.4 b	2546±40.1 c	3762±43.5 c	1.15±0.04 b	2.09±0.08 ab	1.65±0.005 bc
T3	1235±20.2 b	2709±48.7 b	3944±28.5 b	1.18±0.003 ab	2.06±0.06 ab	1.67±0.03 b
T4	1175±8.6 b	2566±39.5 c	3741±30.8 c	1.04±0.008 c	1.95±0.007 bc	1.53±0.005 d
T5	1320±40.4 a	2877±36.0 a	4197±76.4 a	1.25±0.03 ab	2.21±0.07 A	1.78±0.01 a
Significant	*	*	*	*	*	*

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate significant difference ($P < 0.05$)

fifth treatments. The results of the period (0–5) weeks showed a significant improvement for the fourth treatment compared with all the experimental treatments, as it recorded 1.53, while the first and second treatments did not differ between them.

Relative weight of edible giblets and spleen

The results of Table 5 showed that there were no significant differences in the relative weight of the heart for each of the second and third treatments compared to the control treatment, with a significant decrease for the fourth and fifth treatments compared to the control treatment.

The results also showed that there were no significant differences in the relative weight of the gizzard for each of the second, third, and fourth treatments compared with the control treatment, with a significant increase in the fifth treatment compared with the rest of the experimental treatments. The results also showed that there were no significant differences in the relative weight of the liver and spleen for all experimental treatments.

Cellular characteristics of blood

We note from the results of Table 6 that there are no significant differences in the average size of compacted blood cells for all experimental treatments compared with the control treatment. We note that there is a significant increase ($P \leq 0.05$) in hemoglobin percentage for each of the second, fourth, and fifth treatments, compared with the first and third treatments. The results also showed that there were no significant differences in the number of red blood cells for all the experimental treatments. The results showed that there were no significant differences in the number of white blood cells for each of the third, fourth, and fifth treatments compared with the control treatment, with a significant decrease for the second treatment compared to the rest of the experimental treatments.

Table 5. Effect of fermented layer manure by rumen liquor or unfermented in diets on the relative weights of edible giblets and spleen for broiler

Treatments	Heart %	Gizzard %	Liver %	Spleen%
T1	0.61±0.003 a	0.89±0.101 b	2.51±0.008	0.143±0.003
T2	0.49±0.04 ab	0.99±0.17 b	2.52±0.32	0.140±0.00
T3	0.52±0.09 ab	0.92±0.03 b	2.78±0.10	0.106±0.04
T4	0.43±0.04 b	1.08±0.02 b	2.29±0.38	0.145±0.01
T5	0.43±0.01 b	1.71±0.07 a	2.36±0.05	0.141±0.01
Significant	*	*	NS	NS

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate significant difference (P<0.05).
N.S: means non-significant differences between means

Table 6. Effect of fermented layer manure by rumen liquor or unfermented in diets on cellular characteristics of blood for broiler

Treatments	Packed cell volume%	Hemoglobin (g/dL)	RBC ($\times 10^6$/mm^3)	WBC ($\times 10^3$ /mm^3)
T1	29.0±0.57 ab	11.00±0.00 b	2.41±0.03	7.30±0.11 ab
T2	29.5±0.28 a	12.06±0.26 a	2.56±0.08	6.35±0.08 c
T3	28.0±0.57 b	10.40±0.17 b	2.18±0.07	7.15±0.02 ab
T4	29.5±0.28 a	11.97±0.54 a	2.52±0.08	7.65±0.31 a
T5	29.0±0.00 ab	12.20±0.05 a	2.08±0.29	7.04±0.02 b
Significant	*	*	NS	*

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate significant difference ($P < 0.05$).
N.S: means non-significant differences between means

Biochemical characteristics of blood

The results of Table 7 showed that there were no significant differences in the concentration of total serum protein for each of the second, third, and fourth treatments compared with the control treatment, with a significant decrease for the fifth treatment. The results also showed a significant increase ($P \leq 0.05$) in the concentration of albumin for each of the

Table 7. Effect of fermented layer manure by rumen liquor or unfermented in diets on the some blood biochemical indices for broiler

Treatments	Total Protein (g/dL)	Albumin (g/dL)	Globulin (g/dL)	Glucose (mg/dL)
T1	3.43±0.12 a	1.77±0.01 b	1.66±0.11 a	198.5±0.86 ab
T2	3.38±0.04 ab	1.85±0.02 ab	1.53±0.06 ab	205.5±0.28 a
T3	3.43±0.03 a	1.92±0.04 a	1.51±0.01 abc	193.2±7.07 B
T4	3.37±0.01 ab	1.93±0.02 a	1.44±0.01 bc	200.5±2.02 ab
T5	3.20±0.05 b	1.92±0.02 a	1.31±0.05 c	204.0±2.30 ab
Significant	*	*	*	*

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate significant difference (P<0.05)

Table 8. Effect of fermented layer manure by rumen liquor or unfermented in diets on the sensory traits for the thigh meat for broiler

Treatments	Color	Flavor	Tenderness	Juiciness	General appearance
T1	6.89±0.31	7.10±0.28	7.42±0.27	7.50±0.27a	7.28±0.18
T2	6.32±0.52	6.85±0.41	7.03±0.40	6.82±0.42ab	7.07±0.36
T3	7.25±0.31	7.60±0.38	7.53±0.38	7.10±0.24a	7.28±0.38
T4	7.14±0.50	6.89±0.33	6.71±0.48	6.00±0.48b	6.82±0.47
T5	7.35±0.47	7.39±0.26	7.32±0.33	7.10±0.30a	7.57±0.30
Significant	NS	NS	NS	*	NS

T1: Control (0% Manure), T2: (5% Manure unfermented), T3: (10% Manure unfermented), T4: (5% Manure fermented), T5: (10% Manure fermented).
* Different letters vertically indicate a significant difference ($P < 0.05$).
N.S: means non-significant differences between means

third, fourth, and fifth compared with the control treatment, with no significant differences for the second treatment. We also note that there are no significant differences in the percentage of globulin in blood serum for the second and third treatments compared with the control treatment, with a significant decrease for each of the fourth and fifth treatments compared with the control treatment. The results of glucose concentration for all experimental treatments did not show significant differences compared with the control treatment.

Sensory evaluation

Through the results of Table 8, it is clear that there are no significant differences in each of the degrees of color, flavor, tenderness, and general appearance of all experimental treatments compared with the control treatment, as well as the absence of significant differences in the degree of juiciness of all experimental treatments (except for the fourth treatment, which recorded a significant decrease) compared to with a control treatment.

Discussion

The presence of a significant increase in the live body weight and weight gain averages when using sterile bird manure by pressure and heat and fermented with rumen liquor or unfermented may be due to the high protein content of bird manure Up to 30% in addition to being a source of calcium, phosphorus, and potassium(Nahm, 2003; Al-Yaseen & Abdul-Abass, 2010; Marco et al., 2021). Especially, that the process of sterilization by pressure and heat can increase the coefficient of digestion of the undigested nutrients present in it, and the presence of different types of microorganisms in the rumen liquor has acted as a probiotic, and this was confirmed by Falaki et al. (2011) and Mahardhika et al. (2021) Which indicated that the addition of probiotics works on the growth and reproduction of beneficial organisms in the gastrointestinal tract and then improves the process of digestion and absorption, in addition to that the fermentation process works to improve the nutritional value of the fermented material (Hammod, 2016; Dahiya & Nigam, 2022). It increased the availability of undigested nutrients in poultry giblets and reduced the competition of harmful microorganisms in the gastrointestinal tract (Al Naemi et al., 2008; Zaefarian et al., 2016). While Dibner & Richards (2004) and Abid (2010) reported that the improvement in body weight is due to the improvement of the digestion process through the presence of microorganisms that secrete many enzymes, proteins, and organic acids.

The presence of high quantities of feed consumed for treatments that use bird manure sterilized by pressure and heat and fermented with rumen liquor or not fermented may be due to the low amount of energy in bird droppings, and this was confirmed by (Al-Yaseen & Abdul-Abass, 2010; Turzyński et al., 2022) that found bird droppings contain low energy, about 1000 kcal/kg, which led the birds to consume larger quantities to compensate for the lack of energy in the diet, as we notice a high percentage of feed consumption when using fermented or unfermented bird droppings by 10%.

The absence of a significant difference in the relative weight of each of the liver and spleen, as well as the absence of significant differences or a decrease in the relative weight of the heart,maybe not affected by the use of this treatment or due to the absence of fermented or unfermented bird manure from any harmful products, especially aflatoxins that are produced from fungi (Ibrahim & Al-Jubory, 1998; Wanget al., 2019; Auza et al., 2021), which It can grow on poultry giblets. The results of the sensory characteristics also showed that there were no significant differences in each of the color, flavor, tenderness, and general appearance, as well as the absence of significant differences in the juiciness values of all the experimental treatments except for the fourth treatment, which showed a significant decrease, and this indicates the absence of odors, flavor or an undesirable taste in chicken meat Feeding on fermented or unfermented bird droppings

with rumen liquor, and this result agrees with Yasar (2018) and Uguru et al. (2022) who found that The use of fermented feed recommended for best carcass traits and desirable sensory qualities.

Conclusions

We conclude from the current study that the use of poultry manure fermented with rumen liquor or unfermented has significantly improved most of the productive and physiological characteristics of broiler chickens, as the treatment of using bird manure by 5% gave the best results "excluding the feed conversion ratio", and all the studied sensory characteristics of broiler meat were not affected by the use of rumen liquor, especially Flavor and taste.

Acknowledgments

We would like to thank the Faculty of Agriculture, University of Kufa for allowing me to do this research at its laboratories.

Disclaimer*:* None

Conflict of Interest*:* None

Source of Funding*:* None.

References

Abid, F. M. (2010). The effect of contains multiple probiotic on productive performance for two strain of broiler chickens. *Journal of Techniques, 23*(2), 8-14.

Adesua, A. A. & Onibi, G. E.(2014). Growth performance, haematology and meat quality of broiler chickens fed rumen liquor-fermented wheat bran-based diets. *Jordan J. of Agri. Sci., 10*(4), 725-736.

Al-Faris, A. K. A. (2012). Partial replacement of barely by soy bean meal or urea and addition of Saccharomyces cerevisiae to male Arabi lambs and their effects on rumen microbial performance and growth. Philosophy Doctor thesis, College of Agriculture, University of Basrah.

Al-Mosawy, J. E. Q. (2013). Effect of different levels of whole date on productive performance and some physiological traits in Awassi sheep. PhD. in Veterinary Medicine/public health. College of Veterinary Medicine at the University of Baghdad.

Al Naemi, M., Ali, K. A. & Mohammad, S. M. S. (2008). Effect of supplementation locally probiotic, imported bakery yeast and multi enzymes in the performance of broiler. *Iraqi Poultry Sciences Journal*,*3*(1), 121-132.

Al-Yaseen, A. A. & Abdul-Abass, M. H. (2010). Nutrition of Poultry. University of Baghdad. College of Agriculture. Iraq.

Auza, F. A., Purwanti, S., Syamsu, J. A. & Natsir, A. (2021). The relative weight of internal organs and digestive tract in native chickens age 12 weeks that are given various levels of BSF larvae meal (*Hermetia illucens* L.) in the ration. In IOP Conference Series: Earth and Environmental Science,788, 1-7.

Choi, Y. J., Lee, S. R. & Oh, J. W. (2014). Effects of dietary fermented seaweed and seaweed fusiforme on growth performance, carcass parameters and immunoglobulin concentration in broiler chicks. *Asian-Aust. J. Anim. Sci., 27*(6), 862-870.

Dahiya, D. & Nigam, P. S. (2022). Probiotics, prebiotics, synbiotics, and fermented foods as potential biotics in nutrition improving health via microbiome-gut-brain axis. *Fermentation, 8*(7), 303.

Darwazeh, M. M. (2010). Effects of rumen filtrate fermented wheat bran on performance of finishing broiler chickens. Master thesis, Faculty of Graduate Studies. An-Najah National University.

Dibner, J. J. & Richards, J. D. (2004). The digestive system: challenges and opportunities. *Journal of applied poultry research, 13*(1), 86-93.

Dirksen, G. & Smith, M. C. (1987). Acquisition and analysis of bovine rumen fluid. The Bovine Practitioner (USA).

Duncan, B. D. (1955). Multiple range and multiple F. Tests.*Biometrics, 11*, 1-42.

Ewaid, S. H., Abed, S. A. & Al-Ansari, N. (2020). Assessment of main cereal crop trade impacts on water and land security in Iraq. *Agronomy, 10*(1), 98.

Falaki, M., Shargh, M. S., Dastar, B., Zarehdaran, S. & Khomairi, M. (2011). The investigation of intestinal microflora and growth response of young broiler given feed supplemented with different levels of probiotic and prebiotic. *J. of Anim. and Vet. Adv., 10*(3), 385-390.

Francisco, K., Elina, B. & Joseph, S.(2014). Effects of partially replacing maize meal in broiler finishing diets with rumen filtrate fermented-maize bran on broiler chicken performance. *Int. J. of Livestock Research, 4*(5), 28-34.

Hammod, A. J. (2012). The effect of fermented barley with some of fungi in productivity, hematological traits and microbial balance of broiler chicks. M.S.c thesis, Technical College/Al-Musayab, Al-Furat Al-Awsat Technical University.

Hammod, A. J. (2016). Effect of Replaced Partial or Complete Fermented Wheat Instead of Corn on some Productive and Physiological Traits of Broiler Chicks. Ph. D. thesis, Collage of Agriculture, University of Basrah.

Has, H., Yunianto, V. D. & Sukamto, B. (2013). The effectivity of fermented mulberry leaves with rumen liquor as broiler feed on final body weight, dry matter and crude fiber digestibility, and metabolic energy. *Anim. Prod., 15*(3), 173-179.

Ibrahim, I. K. & Al-Jubory, K. M. Th. (1998). Mycotoxins: Their Effects and Risks. IPA Agriculture Research Center. Iraq.

Kanyinji, F. & Moonga, M. (2014). Effects of replacing maize meal with rumen filtrate-fermented cassava meal on growth and egg production performance in Japanese quails (*Cortunix japonica*). *J. Adv. Vet. Anim. Res., 1*(3), 100-106.

Kanyinji, F. & Sichangwa, M. M. (2014). Performance of broilers fed finishing diets with fermented cotton seed meal as partial replacement for soybean meal. *J. Anim. Sci. Adv.,4*(7), 931-938.

Mahardhika, B. P., Mutia, R. & Ridla, M. (2021). Effort to reduce ammonia gas in the broiler chicken excreta with the addition of probiotic as substitute for antibiotic growth promoter. In *IOP Conference Series: Earth and Environmental Science, 883*(1), 1-7.

Mahdi, A. S. (2020). Role of dietary dried red grape pomace with Saccharomyces cerevisiae on some physiological and productive aspects in Awassi male lambs (Doctoral dissertation, MSc. Dissertation. College of Veterinary Medicine, University of Baghdad, Republic of Iraq).

Marco, A., Ramzy, R. R., Plath, M. & Ji, H. (2021). Evaluating the impact of bird manure vs. mammal manure on Hermetia illucens larvae. *Journal of Cleaner Production, 278*, 123570.

Modak, M., Chowdhury, E. H., Rahman, M. S. & Sattar, M. N. (2019). Waste management practices and profitability analysis of poultry farming in Mymensingh district: A socioeconomic study: Poultry waste management, its impacts and BCA. *Journal of the Bangladesh Agricultural University, 17*(1), 50-57.

Mohammed, A. A., Abbas, R. J. & Al-Jrrah, I. A. T. (2013). Evaluation of replacing various levels of dried broiler manure reared in cages containing house fly larvae in diet of local ducks 2- some physiological characters and gut measurements. *Basrah J. Agric. Sci., 26*(1), 110-126.

Nahm, K. H. (2003). Evaluation of the nitrogen content in poultry manure. *World's Poultry Science J., 59*(1), 77-88.

Peled, S. & Livney, Y. D. (2021). The role of dietary proteins and carbohydrates in gut microbiome composition and activity: A review. *Food Hydrocolloids, 120*, 106911.

Saeed, A. A. (2008). Effect of different levels of the dried poultry manure as NPN source on the nutritive value of wheat straw silage for lamb feeding. *Journal of Kerbala University, 6*(2), 215-221.

SAS 2012. SAS/STAT User's Guide for Personal Computers. Release 7.0 SAS Institute Inc., Cary, N. C., USA.

Semeniuk, G., Harshfield, G. S., Carlson, C. W., Hesseltine, C. W. & Kwolek, W. (1970). Occurrence of mycotoxin in Aspergillus spp.185-190. Proc. First U.S. Japan Conf. Toxic. Microorg., *U.S. Govt. Printing Office.* Washington. D.C.

Sharun, K., Manjusha, K. M., Kumar, R., Pawde, A. M., Malik, Y. P., Kinjavdekar, P., Maiti, S. K. & Amarpal (2021). Prevalence of obstructive urolithiasis in domestic animals: An interplay between seasonal predisposition and dietary imbalance. *Iraqi Journal of Veterinary Sciences, 35*(2), 227-232.

Su, M., Hao, Z., Shi, H., Li, T., Wang, H., Li, Q., Zhang, Y. & Ma, Y. (2022). Metagenomic analysis revealed differences in composition and function between liquid-associated and solid-associated microorganisms of sheep rumen. *Frontiers in Microbiology, 13,* 1-14.

Supriyati, T., Haryati, T., Susanti & Susana, I. W. R. (2015). Nutritional value of rice bran fermented by Bacillus amyloliquefaciens and humic substances and its utilization as a feed ingredient for broiler chickens. *Asian Australas. J. Anim. Sci., 28*(2), 231-238.

Taoma, B. J. J. (2014). Effect of using different levels of wheat bran fermented with rumen Sheep content in diets on productive performance broiler chickens. M.Sc. thesis, University of Baghdad, College of Agriculture. Iraq.

Tope, A. E. K. (2014). Effect of fermentation on nutrient composition and anti-nutrient contents of ground Lima bean seeds fermented with *Aspergillus fumigatus, Rhizopus stolonifer* and *Saccharomyces cerevisiae. Int. J. of Adv. Research., 2*(7), 1208-1215.

Turzyński, T., Kluska, J. & Kardaś, D. (2022). Study on chicken manure combustion and heat production in terms of thermal self-sufficiency of a poultry farm. *Renewable Energy, 191*, 84-91.

Uguru, J. O., Amah, U. J., Umoren, E. P., Unigwe, C. R., Obinna-Echem, P. C., Onainor, E. R., Torhemen, M. & Ucheji, C. C. (2022). Carcass traits, nutrient composition and sensory properties of broiler chickens fed diets containing graded levels of fermented cassava (*Manihot esculenta* Crantz) tuber meal as replacement for maize meal. *Nigerian Journal of Animal Production, 49*(1), 268-283.

Wang, L., Wu, J., Liu, Z., Shi, Y., Liu, J., Xu, X., Hao, S., Mu, P., Deng, F. & Deng, Y. (2019). Aflatoxin B1 degradation and detoxification by *Escherichia coli* CG1061 isolated from chicken cecum. *Frontiers in Pharmacology, 9*, 1548.

Wu, S., Ni, P., Li, J., Sun, H., Wang, Y., Luo, H. & Dong, R. (2016). Integrated approach to sustain biogas production in anaerobic digestion of chicken manure under recycled utilization of liquid digestate: Dynamics of ammonium accumulation and mitigation control. *Bioresource Technology,205*, 75-81.

Xu, Q., Qiao, Q., Gao, Y., Hou, J., Hu, M., Du, Y., Zhao, K. & Li, X. (2021). Gut microbiota and their role in health and metabolic disease of dairy cow. *Frontiers in Nutrition, 8,* 701511.

Yang, Y., Wang, L., Zhang, Y., Li, L., Shi, X., Liu, X., Ren, X. & Dou, S. (2019). Transformation of corn stalk residue to humus-like substances during solid-state fermentation. *Sustainability, 11*(23), 6771.

Yasar, S., Boselli, E., Rossetti, F. & Gok, M. S. (2018). Effect of fermented cereals, probiotics, and phytase on the sensory quality of poultry meat. *Scientia Agriculturae Bohemica, 49*(3), 225-235.

Zaefarian, F., Abdollahi, M. R. & Ravindran, V. (2016). Particle size and feed form in broiler diets: impact on gastrointestinal tract development and gut health. *World's Poultry Science Journal, 72*(2), 277-290.

Received: **July, 14, 2023**; *Approved*: **January, 10, 2024;** *Published:* **February, 2025**