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Effect of encapsulated organic acid (GALLINAT +) supplementation with diet on physiological parameters and performance of broiler at different ages.

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Abstract

The experiment was carried out from October 14 through November 24, 2021, in a private farm next to Qamchughah hamlet in Dukan town, 15 kilometers from Sulaymani City. This study was conducted to determine effects of using organic acids to diet will impact physiological parameters and production efficiency of broiler chicks. From a total of 400 broiler chicks (ross 308), 42-one day chicks divided to 4 treatments (C, T1, T2, and T3), each of which had four replications. A diet free of organic acid served as a control. Organic acid was added to the treatments T1, T2, and T3 at rates of 200 mg, 300 mg, and 400 mg/kg of diet, respectively. From 0 to 42 days, the organic acid was introduced to the meal. Body weight gain in T1, T2, and T3 birds was significantly higher (P 0.05) than in the other groups (T1, T2, and T3). Although FCR was significant (P0.05) in weeks 4 and 5, it was not significant (P>0.05) in 6 weeks of age compared to treatment 1. With the exception of T2 in the fourth week, which was not significant (P>0.05), feed intake was significantly higher in weeks 4, 5, and 6. Non-significant (P>0.05) cholesterol level on the fourth week. Creatinine and calcium did not differ significantly (P>0.05) between weeks 4 and 6, however calcium did differ significantly (P0.05) from week 6. The uric acid had no significant (P>0.05) effects.

Keywords: organic acid, broiler chicks, physiological parameter.

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Introduction:

The modern poultry industry requires increased production levels and improved feed conversion efficiency. One approach to achieve these goals is through the utilization of targeted feed additives. Historically, antibiotic feed additives have been incorporated into poultry feed as growth promoters. Their primary functions include stabilizing the microbial balance in the intestines, enhancing overall performance, and mitigating certain intestinal diseases [1]. Effect of utilizing organic acids as growth promoters instead of antibiotics on broiler performance and intestinal flora. The European Commission (EC) resolved to gradually phase out, and then outright ban (1 January 2006), sealing with using of medicine as growth grower in poultry diet due to the advent of bacteria resistant to it, that used to treat human and animal diseases. people preferring for poultry meats is forcing the poultry business to raise birds without antibiotics in other nations, such the USA. The usage of antibiotic growth promoters in European poultry diets throughout history.

It has been discovered that organic acid treatments made up of distinct PH and combinations of many acids exhibit antibacterial effects comparable to those of antibiotics. Effects of phenyl lactic acid on laying hen production efficiency, egg quality metrics, and blood traits. Because they are typically regarded as safe, the EU encourages the use of organic acids and their salts in the production of poultry [2]. Broiler reaction to dietary organic acid addition. For the majority of the time, organic acids are employed in manufactured feeds to preserve the feed, for which formic and propionic acids are particularly useful [3]. Effects of dietary potassium diformate on gastrointestinal health and growth in Vietnam's weaned pigs. These two organic acids, along with a number of others (lactic, citric, fumaric, and sorbic acids), and their salts (such as calcium format and calcium propionate), are used as "feed preservatives" in the EU [4]. Use of organic acids in animal nutrition, with particular emphasis on dietary potassium diformate under conditions seen in Europe and Austral-Asia.

Organic acids have a low dissociation constant and are weak acids. The majority of organic acids with antibacterial action have pKa values between 3 and 5. This refers to low pH half-dissociated. It’s come in a wide variety with varying physical and chemical characteristics, and many of them are added to water or as feed additives (acidifiers). Additionally, many are offered as sodium, potassium, or calcium salts (or partially esterified). Because salts are typically odorless and easier to use during manufacturing process due to their solid and less volatile state, they have an advantage over acids. They may also be more water soluble and less corrosive [5].

An update on broiler growth promoter alternatives to antimicrobials.

Two commercial mixtures of organic acids (Galliacid® and Biacid®) were added to basal diets with 0.06% Galliacid, 0.1% Biacid, or 0.02% Eneramycin® in order to supplement the organic acid mixtures, which may be more effective than other antibiotic growth promoters in boosting broiler performance [1]. Effect of utilizing organic acids as growth promoters instead of antibiotics on broiler performance and intestinal flora. Fumaric acid, calcium format, calcium propionate, potassium sorbate, and hydrogenated vegetable oil were the main ingredients of Galliacid®. A matrix of fatty acids covers and shields (microencapsulates) these organic acids. Citric acid, calcium formate, calcium butyrate, calcium lactate, essential oils, and flavoring substances were all components of Biacid®. In comparison to the negative control and/or the birds given antibiotics, some trials likewise revealed no performance difference [6]. the effects of probiotics, organic acids, or antibiotic growth promoter supplementation on broiler performance, gut flora, and tissue. Thyroid function in broiler chickens fed additional organic acids, sanguinarine, and organic acids, as well as some blood components, organ morphology, and performance. Effects of formic acid treatment on intestinal microbiota, carcass contamination, and performance in male broilers under high ambient temperature. supplementing with organic acids has an impact on how well broiler chickens perform. According to [7], there are contradictory findings regarding the usage of acidifiers in poultry. Effect of formic acid on broiler chicken performance, digestibility, intestinal histomorphology, and plasma metabolite concentrations. These outcomes are influenced by the acid's chemical form, its PKA value, the species of bacteria and animals it affects, as well as the acid's place of action. Additionally, the majority of researcher adding organic acids as diet supplements for broilers were carried out in low health challenge environments, which may help to explain the contradictory results. This is because the effects of Antibacterial additives on growth are only noticeable when chickens are kept in less-than-ideal conditions, like lowing digestible diet or an unclean environment. This discrepancy would be connected to the source, the quantity of organic acids utilized.

The possibility of promoting the intestinal flora of chicken by the concomitant use of organic acids and essential oil blends (having an antibacterial impact) with OH (like prebiotic effects) has not been investigated. In actuality, it is more probable that a mix of additives will make the necessary advancements to completely remove or drastically cut the usage of antibiotics in poultry production. This could be seen in the modest successes that have been reported for the majority of additives that were applied alone. It is predicted that this combined strategy will offer fresh perspectives on the use of non-antibiotic substances and improve chicken health and output.

Materials and method

In all, 400 un-sexed, broiler chicks (Ross 308) were used. Chicks were raised in a heated, fumigated brooder home and given a beginning diet until they were 14 days old. Then, after each bird was weighed individually, they were separated into 4 treatments, each of which contained four replicates with 25 chicks in each. Weight average for all replicates was comparable. We added in capsulated organic acids in to the diet. First, control group we did not fix any supplementation in to the diet. Second, treatment group (2), we fixed a (200) mg/kg of organic acids into their diet. Third, treatment group (3), we fixed a medium level (300) mg/kg of organic acids. Fourth, treatment group (4) we fixed a high level to the diet (400) mg/kg into their diets. All of the birds had unrestricted access to food and water. Birds were routinely observed, and any dead or ill birds were removed along with any unexpected observations. The experimental trial lasted 21 days (between 22 and 52 days). The feed was offered in accordance with [8] advice. Using a known amount of feed and a daily feed refusal measurement, daily and cumulative feed intake was determined. Three feeding phases were used: the starter (0–14 day), grower (15–28 day), and finisher (29–42 day) phases. Table 1 shows the composition of the concentrate diets for each period in percentages. To calculate the overall body weight growth, birds were weighed for the first time on day 22 and then every week after that. Weekly calculations were made for the feed conversion ratio (FCR). In weeks 4 and 6, blood samples were drawn in the morning using disposable needles and vacutainer tubes, which were then placed in the refrigerator. The blood samples were then centrifuged for 10 minutes at 3000 rpm to separate the serum from the coagulated blood cells, and they were then kept at -20 until the analysis was performed. To determine (Cholesterol, Calcium, Uric acid, Creatinine, AST, ALT, ALP), use the

Auto Hematology Analyzer by (cobasc311). A statistical analysis system called XL Stat from 2016 was utilized to analyze the data. The Complete Randomized Design (CRD) was used to examine the effects of encapsulated organic acid in the feed on the growth performance and various blood profiles of broiler chickens. Several range tests and Duncan's (1955) were used to determine the significant differences between the means

Table 1. Composition of the experimental diets' ingredients (%) and nutrients

Ingredients	Starter (0-14 days)	Grower (15-28 days)	Finisher (29-42 days)
Soybean meal 46% protein	35.155	30.300	26.00
Corn	48.750	23.000	31.00
Wheat Flour	10.000	38.580	36.470
Wheat bran	-	1.500	-
Premix*	1.000	1.000	0.900
L- Threonine	0.170	0.070	0.040
Limestone	1.660	1.500	1.390
Soy bean oil	1.000	2.200	2.600
Lysine	0.420	0.260	0.290
Methionine	0.260	0.200	0.170
Sodium Bicarbonate	0.540	0.400	0.380
Mono Calcium Phosphate	0.650	0.510	0.390
NaCl	0.170	0.210	0.170
Toxin binder	0.150	0.150	0.150
Enzyme**	0.050	0.050	0.050
lysofort***	0.025	0.020	-
Anti-Coccidian****	-	0.050	-
Total	100	100	100
Calculated Chemical Composition			
Crude Protein %	21.840	20.840	18.930
Metabolisable Energy (kcal/kg)	2970	3000	3100
Methionine %	0.557	0.474	0.430
Lysine %	1.392	1.171	1.082
Methionine + Cysteine %	0.833	0.755	0.692
Threonine %	0.933	0.782	0.683
Tryptophan %	0.239	0.236	0.210
Ash %	6.407	5.800	5.286
Fiber %	2.242	2.169	2.000
Ether extract %	3.737	4.412	2.361
Calcium %	0.960	0.873	0.782
Available Phosphor %	0.480	0.436	0.390

*According to the Ross 308 broilers requirements guide from 2014, the following vitamins and trace minerals premix were added: arginine, 3.5%; threonine, 6%; tryptophane, 0.5%; BHT, 830 mg/kg; propyl gallate, 70 mg/kg; citric acid, 125 mg/kg; and betaine hydrochloride, 6000 mg/kg; Crude protein: 13.4%, M.E: 360 kcal/Kg, calcium: 30.7%, vitamins (A: 1300000 IU, D3: 500000 IU, E: 8000 mg, K3: 320 mg, B1: 320 mg, B2: 860 mg, B6: 540 mg, B12: 1.7 mg, H: 30 mg), niacin: 6000 mg, and other nutrients (crude fiber: 320 mg, B1: Folic acid: 220 mg; d-pantothenic acid: 2000 mg; colne chloride: 17,000 mg; betaine: 6,000 mg; copper: 1600 mg; manganese: 12,000 mg; zinc: 6,000; iron: 2000 mg; inositol: 125 mg; selenium: 30 mg;

**kimzyme ;

***Emulsifier;

**** Sscox (Salinomycin sodium)

Results and discussion

Performance and carcass haracteristics:

The effects of encapsulated organic acid (GALLINAT+) supplementation with diet on feed conversion efficiency (FCE) of broiler chicken at different ages in week (4th, 5th, 6th). we summarized in Table 2, it was showed a significant (p<0.05) among treatments in the feed conversion efficiency in week 4th and 5th, the groups fed on T1, 200 mg/kg, T2, 300 mg/kg, T3, 400 mg/kg, but in sixth week no significant (p>0.05) differences between the feed conversation efficiency of the treatment groups in the week (6th) The mean of feed conversion efficiency (FCE) of control group was (2.300) which was the greatest (FCE), and the smallest (FCE) was in T2 (1.525) in week (4th). Different Organic acid addition in broiler diets is typically linked to enhanced growth performance [9], [10], [11], [12], [13]. This can be linked to the capacity of organic acid to enhance food digestion and absorption, enhance crypt-villus structure, and stimulate digestive tract secretions [14]. Additionally, earlier studies [15] indicated that broiler chickens had a higher FCR when treated with propionic acid. The addition of different organic acids to broiler diets did not improve performance characteristics, according to [16], [17], while [7] also found no significant variations in weight increase and feed conversion. Additionally, [18] revealed that dietary 2.0 - 4.0% CA had no appreciable impact on growth performance metrics. 1.5% commercial acetic, citric, or lactic acid increased broiler performances, according to [10], however raising OA level to 3.0% produced no further advantages. Furthermore, broilers fed diets containing 4.0% CA showed a decline in growth, whereas 3.0% CA had no appreciable impact [16]. On the other hand, increasing organic acid level supplementation was associated with an increase in body weight, according to [19]. According to [20], dietary organic acids may inhibit the growth of specific bacterial species, especially those that are acid-intolerant like E. coli, Salmonella sp., and Campylobacter sp. Organic acids' main advantage was lowering the pH of the stomach and intestines, which made the environment in the gut too acidic for bacterial development. All treatment groups' feed consumption was found to be statistically significantly (p<0.05) lower than the control groups in (Table 3). The greatest feed intake of control was (1355) g in week (6th), and the smallest feed intake of T1 was (812) g in week (4th). Broiler chicken's body weight gain was significantly (p0.05) impacted by the addition of organic acid to meals, which resulted in a decreased body weight gain when compared to the control group (table 4). According to [21], [22], and [23], who found that the supplementation of organic acids in broiler chicken increased the body weight gain when compared to the unsupplemented group, the results of the current study on weight gains concur. [10] demonstrated that 1.5% commercial acetic, citric, or lactic acid increased broiler performances; however, increasing OA level to 3.0% had no additional advantages, and other research contradict our findings by demonstrating that organic acids had no positive impact on growth performance [24].

Table 2- Effect of supplementation organic acids on FCR of broiler chicken. (Means ± S.E)

Treatments	Weeks		
	4	5	6
C	1.875 ± 0.048 a	2.475 ± 0.229 a	2.300 ± 0.297 a
T1	1.550 ± 0.104 b	1.975 ± 0.149 b	1.925 ± 0.025 b
T2	1.525 ± 0.063 b	2.225 ± 0.095 ab	2.01 ± 0.147 a
T3	1.710 ± 0.117 ab	1.925 ± 0.103 b	1.850 ± 0.096 a

Different letters inside each column means significantly differ at (P < 0.05) level.

Table 3- Effect of supplementation organic acids on feed intake (g) of broiler chicken. (Means ± S.E)

Treatments	Weeks		
	4	5	6
C	854.75 ±.922 a	1264 ± 21.696 a	1355 ± 11.930 a
T1	812 ± 5.164 b	1145 ± 22.174 b	1290± 18.36 b
T2	847 ± 2.517 a	1164 ± 25.456 b	1248 ± 16.411 b
T3	815 ± 1.291 b	1132 ± 28.936 b	1240 ± 26.783 b

Different letters inside each column means significantly differ at (P<0.05) level.

Table 4- Effect of Supplementation organic acids on body weight gain of broiler chickens (Means± S.E)

Treatment	Weeks		
	4	5	6
C	1.75 ± 0.01 a	2.26 ± 0.06 a	3.21 ± 0.20 a
T1	1.63 ± 0.036 b	2.21 ± 0.022 ab	2.86 ± 0.02 ab
T2	1.67 ± 0.030 ab	2.14 ± 0.024 ab	2.35 ± 0.17 c
T3	1.61 ± 0.033 b	2.07 ± 0.06 b	2.73 ± 0.05 bc

Different letters inside each column means significantly differ at (P < 0.05) level.

2 Cholesterol, calcium, Uric acid, Creatinine

Effect of organic acids supplementation with diet on cholesterol, calcium, uric acid, creatinine clarified in Table 5. Results showed effect of organic acid on broiler diet in week 4^{th} and 6^{th} no significant (P>0.05) except calcium in sixth week was significant (P < 0.05) increased treatments compared with control group. The smallest cholesterol was T2 (125.459) in 4^{th} week, the highest cholesterol T2 (146,417) in 6^{th} week. The greatest Calcium T1 (3.422) in 4^{th} week, control group (3.218) was the smallest calcium, control group (4.865) in 4^{th} week was the smallest uric acid, T2 (5.784) the greatest uric acid in 6^{th} week and creatinine was decreased compared with control group. Previously, organic acid supplementation had no impact on the broiler chicken blood metabolites [2]. [10] came to the conclusion that broiler chicken diets could contain dietary supplements of organic acids up to a level of 3% without having any negative effects on the kidney and liver functions. Broiler chicken serum concentrations of cholesterol, calcium, uric acid, and creatinine were not impacted by dietary OA supplementation, according to [25] and [26]. For broilers, blood uric acid is a deductive indicator of the bioavailability of protein sources; when dietary protein sources have high biological values relative to low biological values, the blood serum uric acid content is lower [27]. [28] found that adding 1.0% of CA to turkey diets did not significantly alter serum calcium concentrations. Additionally, [29] observed that dietary acidification of 3.0% butyric, fumaric, or lactic acids led to significant decreases in blood total protein and cholesterol. The ability of organic acids to lower pH brought on by microbial intracellular activities may be the cause of their beneficial impact in lowering blood lipids and cholesterol. According to [30], dietary CA (3.0 and 6.0%) had a significant impact on cholesterol concentration but not on AST, ALT, ALp, total protein, or Ca plasma concentrations.

Table 5- Effect of supplementation organic acids with diet on cholesterol, calcium, uric acid and creatinine of broiler chicken. (Means ± S.E)

Treatment	4 weeks				6 weeks			
	Cholesterol (g/dl)	Calcium (g/dl)	Uric acid (g/dl)	Creatinine (g/dl)	Cholesterol (g/dl)	Calcium (g/dl)	Uric acid (g/dl)	Creatinine (g/dl)
C	133.417 ± 2.140 a	3.587 ± 0.173 a	4.865 ±0.662 a	0.301 ±0.036 a	132.542 ±9.814 a	3.218 ±0.038 a	5.396 ±0.097 a	0.207 ± 0.027 a
T1	133.833 ±10.569 a	3.422 ±0.115 a	5.099 ±0.577 a	0.292 ±0.069 a	146.417 ±9.159 a	3.533 ±0.100 a	5.106 ±0.246 a	0.187 ±0.013 a
T2	125.459 ±10.411a	3.300 ±0.137 a	5.552 ±0.286 a	0.252 ± 0.032 a	138.375 ±4.095 a	3.392 ±0.077 a	5.784 0.379 a	0.181 ±0.006 a
T3	138.335 ± 7.093 a	3.271 ±0.113 a	5.170 ±0.288 a	0.291 ±0.025 a	130.667 ±5.624 a	3.391 ±0.049 ab	5.084 ±0.148 a	0.176 ± 0.002 a

Different letters inside each column means significantly differ at (P < 0.05) level.

3 Alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP)

The effects of organic acid supplemented with broiler food on aspartate aminotransferase (AST), alkaline phosphatase (ALP), and alanine aminotransferase (ALT) were shown in Table 6's results. Effect of organic acid on broiler resulted no significant (P>0.05) except (AST) in 4th week significant (P < 0.05) increased compared with control group, the resulted decrease AST in 6th week, ALT was decreased in 4th, 6th and ALP increased the result in 4th, 6th week compared with control group. These findings demonstrated that adding antibiotics to broiler diets had no beneficial influence on the activity of the liver enzymes in this investigation confirming our findings [31]. However, a number of studies have found a beneficial impact of probiotics on broiler growth performance [32], [33].

Table 6- Effect of supplementation organic acids with diet on activity of AST, ALT and ALP of broiler chickens. (Means ± S.E)

Treatments	4 weeks			6 weeks		
	AST (U/L)	ALT (U/L)	ALP (U/L)	AST (U/L)	ALT (U/L)	ALP (U/L)
C	251.811 ± 12.128 ab	17.461 ± 1.402 a	4858.000 ± 328.228 a	710.809 ±489.177 a	16.928 ± 2.645 a	3920.485 ± 447.915 a
T1	296.9 ±20.627 ab	15.5 ±2.805 a	5163.167 ± 497.484 a	219.755 ± 12.985 a	11.031 ± 1.519 a	4187.042 ± 669.062 a
T2	316.8 ±14.644 a	12.6 ±2.215 a	5101.749 ± 427.618 a	209.788 ± 8. 356 a	22.106 ± 6.598 a	4773.334 ±1110.482 a
T3	251.8 ±10.676 a	17.4 ±1.552 a	5608.667 ±369.131 a	252.675 ±11.000 a	16.586 ± 0.787 a	5528.667 ±354.274 a

Different letters inside each column means significantly differ at (P < 0.05) level.

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مجلة جامعة كركوك للعلوم الزراعية

تاثير استخدام الحامض العضوي GALLINAT في العليقة على الاداء الانتاجي والفسلجي لفروج اللحم بأعمار مختلفة

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- تاريخ استلام البحث 2023/06/26 وتاريخ قبوله 2023/08/10
- البحث مستل من رسالة ماجستير للباحث الاول.

الملخص

تم اجراء هذا البحث للفترة من 10/14الى 2021/12/24 في حقل خاص في قضاء دوكان / محافظة السليمانية ،وهدف البحث لمعرفة تأثير زيادة الحمض العضويGALLINAT في عليقة فروج اللحم على الاداء الفسلجي والانتاجي . تم تربية 400 فرخ من سلالة روز 308 لمدة 42 يوم اذ تم تقسيمها الى اربعة معاملات وهي المعاملة الاولى سيطرة بدون اي اضافة اما المعاملة الثانية والثالثة والرابعة فكانت باضافة 200و300و400 ملغم/كغم علف، تم البدء بالاضافة من عمر يوم واحد ولغاية نهاية فترة التجربة . من خلال نتائج التجربة يتبين ما يلي ان الزيادة الوزنية للمعاملات كلها تفوقت بصورة معنوية ($P>0.05$) على معاملة السيطرة كذالك بالنسبة لصفة التحويل الغذائي نلاحظ تفوق المعاملات في الاسبوع الرابع و الخامس ولاكن في الاسبوع السادس لم يتاثر في حين ان الصفات الفسلجية لم تتاثر.

الكلمات المفتاحية: الاحماض العضوية، فروج اللحم ،الصفات الفسلجية